EVIDENCE FOR EXPERIENTIAL LEARNING IN SUSTAINABLE AGRICULTURE EDUCATION TEACHING FARMS AT HIGHER EDUCATION INSTITUTIONS

By

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In loving memory of Helen Mazurkewicz and Tina Mazzeo

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According to Parr and Van Horn (2006), the agricultural community wants Higher Education institutions to provide more opportunities for education on sustainable agriculture. Teaching farms have the potential to offer students practical knowledge for their future careers (Andreasen, 2004). It is unclear if sustainable agriculture programs at Higher Education institutions 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). Purposive curricula needs to be designed and implemented utilizing the experiential learning model to enhance learning experiences and prepare future sustainable agricultural practitioners (Parr & Van Horn, 2006).

The theoretical framework used was Kolb's (1984) cyclical four-stage experiential learning model. The first stage is concrete experience in which learners use their senses to experience the phenomenon (Kolb, 1984). During the reflective observation stage, learners try to make sense of the experience by breaking the information apart and internalizing it (Kolb, 1984). Generalizations are made during the abstract conceptualization stage. During active experimentation, learners test out their generalizations in a new situation (Kolb, 1984).

A basic qualitative design was used to determine where and how teaching farms are used for sustainable agriculture programs at Higher Education institutions in the U.S. Syllabi from courses that use teaching farms at Higher Education institutions were collected using a snowball sample. Evidence for experiential learning was determined using the collected syllabi. For this study, the constant comparative method, a form of content analysis, was used to determine if teaching farms are truly applying the experiential learning model to ensure the quality of sustainable agriculture curricula (Merriam, 1998).

The findings of this study indicated that public and private Higher Education institutions utilized teaching farms. The public institutions included land-grant universities and community colleges. The following disciplines emerged from the course syllabi: agricultural systems, horticulture, animal science, natural resources, soil science, and sustainable agriculture. Overall there was evidence for the presence of both concrete experience and active experimentation in the syllabi. Fewer syllabi had evidence for the cognitive stages of reflective observation and abstract conceptualization. Abstract conceptualization was the least represented stage of the experiential learning cycle.

Additional curricula materials should be analyzed to fully understand what is occurring at teaching farms. 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.

CHAPTER 1
INTRODUCTION

Sustainable Agriculture and Teaching Farms

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. In order to keep up with the times, 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.

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). Each state was given an allotment of 30,000 acres for each Senator and Representative in Congress in order to establish colleges of agriculture and mechanical arts (Meyer, 1998). The states were able to sell the land and use the money to fund agricultural institutions. In 1890, the Morrill College Aid Act was passed creating access to the benefits of the Morrill Act of 1862 for the previously excluded African American population (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, 2003).

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 (2009) found students sought to connect concepts learned in the classroom to field experiences. According to Parr (2009), 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).

Experiential Learning

The National Research Council (2009) made suggestions on how universities can better provide agricultural education to their students. It was suggested that teaching methods shift from traditional lecture style to a more interactive way of teaching. This suggestion emulated Dewey's (1938) philosophy on the importance of experience in education.

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

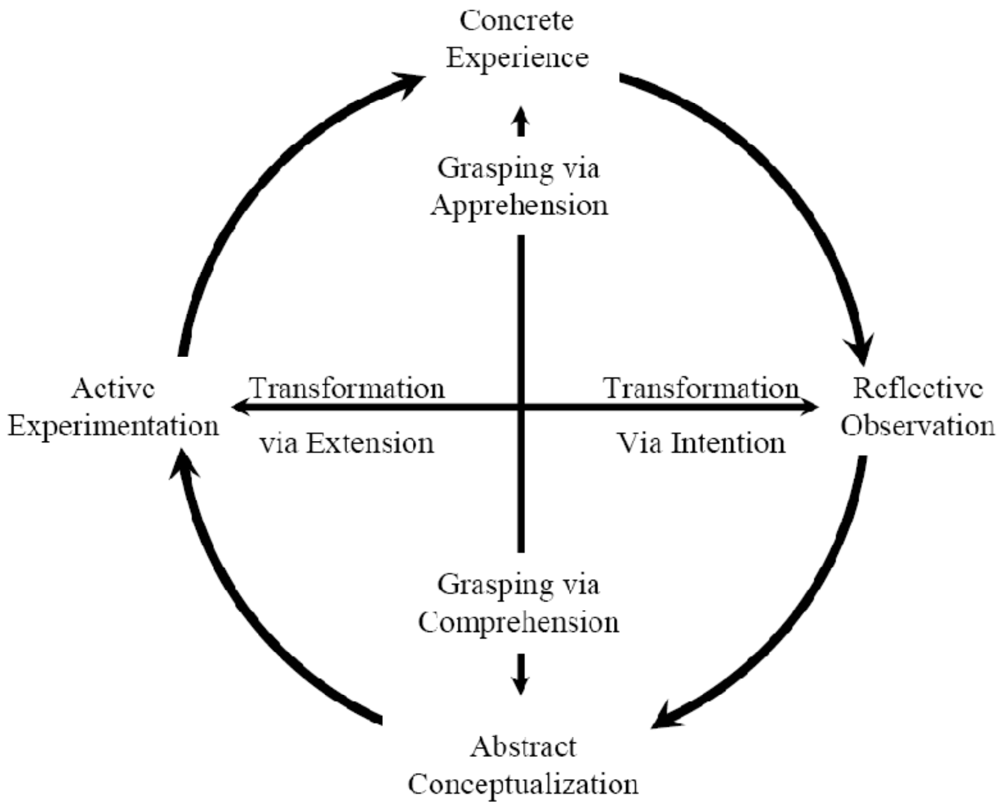

Figure 1-1. Kolb's model of experiential learning (Kolb, 1984)

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 more as a facilitator (Beard & Wilson, 2006). The facilitator helps to create a learning environment to enhance the learning experience. Depending on the learners, the facilitator will offer more or less guidance (Dewey, 1938).

Statement of the Problem

Sustainability in agriculture is a growing trend. According to Parr and Van Horn (2006), the agricultural community wants 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.

As sustainable agriculture education becomes more present in higher education, it is necessary to establish education theory for these programs (Parr et al., 2007; Parr & Van Horn, 2006). The technical nature of sustainable agricultural topics lends itself to educators that are fairly specialized and most likely do not have formal educational training (Bawden, 1996). According to Sayre (2005), on-campus farms allow students to "develop manual skills alongside intellectual power" (para. 9). To fully enhance learning experiences and prepare future sustainable agricultural practitioners, purposive curricula needs to be designed and implemented, utilizing the experiential learning model (Parr & Van Horn, 2006).

Purpose and Objectives

The purpose of this study was to develop an understanding of the use of teaching farms at higher education institutions in the United States. With this purpose, the objectives of this study were:

- Objective 1: To determine which institutions use teaching farms and their locations throughout the United States;
- Objective 2: To describe what subject areas utilized teaching farms; and
- Objective 3: To describe the evidence for the presence of experiential learning theory as indicated in syllabi of teaching farm courses.

Significance of Study

It is necessary to prepare agricultural college students and future agricultural professionals with a broad depth of experiences in order to best prepare them for the multitude of career opportunities in the diverse field of agriculture (Bawden, 1996). Sustainable agriculture students should be provided with educational opportunities rich in experience and applied knowledge. It is important to provide students with practical knowledge that will be vital for their future careers, especially as the demographics of agricultural programs shift from students with agricultural backgrounds to those lacking agricultural backgrounds (Zhao, 2010).

Food security and environmental health are major issues related to agriculture. Educators and agricultural practitioners need to be prepared to address these growing concerns (Redden, 2009). Agricultural universities are expected to be at the forefront of sustainable agricultural education (Bawden, 1996). Undergraduate programs are being developed across the country, necessitating useful and effective curricula based on education theory (Redden, 2009). The research that exists in this area is mostly focused on specific institutions. This study fulfills the need for a comprehensive assessment of existing sustainable agriculture courses that include a teaching farm throughout the United States.

The findings can be used by faculty to effectively design curricula for sustainable agricultural courses that take place at teaching farms. Teaching farms will be able to incorporate best practices into their curricula as well amend ineffective practices to include purposive educational techniques based upon the experiential learning. In addition, the best practices can be used to develop new curricula at teaching farms.

Definitions of Terms

- LAND GRANT UNIVERSITY - higher educational institution established by the Morrill Act of 1862 that allotted 30,000 acres to each state. The land and money from the sale of the land was used to fund colleges for agriculture and mechanical arts (Meyer, 1998).

- SUSTAINABLE AGRICULTURE - an integrative system of agriculture that provides the food and fiber needs of humans using environmentally sound, economically viable, and socially equitable practices for the present and future (Gold, 2007).

- COOPERATIVE EXTENSION SERVICE - a joint effort between land grant universities and the United States Department of Agriculture to provide educational programs in order to improve the lives of citizens based on university research and the needs of the people (Rasmussen, 1989).

- TEACHING FARM - A farm used for agricultural education at colleges and universities, including private and public institutions that are funded primarily for educational purposes. According to Sayre (2005), they range in size, can supply dining halls, can be certified organic, and are utilized by a variety of disciplines.

- EXPERIENTIAL LEARNING- The cyclic process of learning in which the learner undergoes a concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). Beard and Wilson (2006) defined it as “the sense-making process of active engagement between the

Limitations and Assumptions of Study

There were several limitations to this study. The first was the use of a snowball sample. When using a snowball sample, it is unclear if the original population frame is comprehensive or missing potential cases from the start (Bernard & Ryan, 2010). Because a snowball sample relies on key informants or well situated people to identify potential cases the sample may not fully represent the target population (Bernard & Ryan, 2010; Gall, Gall, & Borg, 2007). Even if a case is identified by a well situated person there is no guarantee that each case will participate; some cases will be more willing than others. It will be assumed that the cases that do participate will provide current syllabi for actual courses.

The second limitation of this study is how well syllabi represent what was actually occurring in the corresponding courses. Assumptions are made in this study that certain types of activities create the opportunity for students to progress through stages of the experiential learning cycle. Due to the source of data it may not be possible to have a fully representative assessment of how teaching farms are using experiential learning.

The assumption that the courses are truly using a teaching farm as part of the curricula was made. It is not possible to know for sure that the courses were using the teaching farm as an integral part of the curricula. One way to address this limitation was to exclude syllabi that made it clear that a teaching farm was used minimally throughout the course.

CHAPTER 2
THEORETICAL FRAMEWORK

Experiential Learning

The theoretical framework used in this study was the experiential learning model developed by David Kolb (1984). This model was built off of the works of Jean Piaget, Kurt Lewin, and John Dewey (Beard & Wilson, 2006). In order to fully understand experiential learning theory it is necessary to know the origins of the components of the theory. Other scholars such as Carl Jung, Erik Erikson, Carl Rogers, and Paulo Freire are also noted as having related ideas to experiential learning; however, the focus will be on the contributions of Piaget, Lewin, and Dewey.

Piaget, a developmental psychologist whose work focused on cognitive-development of children, proposed that experience and action are central components to building intelligence (Kolb, 1984). Experiences build on each other over time in gradually increasing complexity. As defined by Piaget, development is made up of four stages: sensory-motor, representational, concrete operations, and formal operations (Piaget, 1970). Piaget created his model based off of child development yet the concepts he presented can be transferred to that of adult learning (Kolb, 1984).

Kolb (1984) recognized the work of Dewey as the foundation for experiential learning in education. Dewey (1938), in the book Experience and Education, made a case for a theory of experience and learning. As an advocate of experience being central to learning, Dewey recognized that not all experiences are equal. Dewey stated, “the belief that all genuine education comes about through experience does not mean that all experiences are genuinely or equally educative” (Dewey, 1938, p. 25). Dewey placed major emphasis on reflection and the difference between activity and intelligent activity. According to Roberts (2006), Dewey considered intelligent activity, or education, an experience that puts off action until sufficient observation and reflection is done in order for generalizations to be made. Like Piaget, Dewey recognized that new experiences are influenced by past experiences, creating a cyclical learning process (Roberts, 2006).

Lewin, a social psychologist, contributed to the organizational behavior field as well as social research. Lewin's work in action-research methods and group dynamics led to the discovery that "learning is best facilitated in an environment where there is dialectic tension and conflict between immediate, concrete experience and analytic detachment" (Kolb, 1984, p. 9). Involvement from the individual learner and recognition of the individual's experiences and feelings are emphasized in Lewin's work. Lewin's model of action research as presented by Kolb (1984), similar to Dewey, included four stages: concrete experience, observations and reflections, formation of abstract concepts and generalizations, and testing implications of concepts in new situations (Lewin, 1951). Underlying these four stages are feedback loops, inspired by electrical engineering, that were intended to strengthen the link between observation and action (Kolb, 1984).

Similarities to Kolb's (1984) theory of experiential learning are seen in the ideas of Lewin, Dewey, and Piaget. Themes found in the scientific method are found throughout the models of experiential learning presented by Lewin, Piaget, Dewey, and Kolb (Kolb, 1984). Experiential learning is a holistic view of learning, including the whole person and the environment (Kolb, 1984). As Kolb (1984) explained, "The fact that learning is a continuous process grounded in experience has important educational implications. Put simply, it implies that all learning is relearning" (p. 28). To fully understand learning, Kolb (1984) stated that the relationship of knowledge and learning must be understood.

Knowledge is built through experience (Kolb, 1984). More specifically, knowledge is the sum of previous human cultural experiences, and individual experiences. In the transaction of these experiences, a person is able to learn (Kolb, 1984). Learners do not come into a new experience void of previous experiences. Because of this, learners bring with them their past knowledge and that has an effect on the new knowledge built in the learning process (Kolb, 1984).

Lewin, Dewey, and Piaget all proposed that the process of learning involves resolving conflicts between methods of interacting with the world (Kolb, 1984). Lewin (1951) presented the conflict between concrete experience and abstract concepts as well as between observation and action. The conflict discussed by Dewey was between "impulse that gives ideas the 'moving force' and reason that gives desire its direction" (Kolb, 1984, p. 22). Kolb (1984), explained learning and knowing further:

> The central idea here is that learning, and therefore knowing, requires *both* a grasp or figurative representation of experience and some transformation of that representation. Either the figurative grasp or operative transformation alone is not sufficient. The simple perception of experience is not sufficient for learning; something must be done with it. Similarly, transformation alone cannot represent learning, for there must be something to be transformed, some state or experience that is being acted upon. (p. 42)

In Figure 1-1, Kolb's (1984) model of experiential learning displays the cyclical process of engaging in an experience, reflecting on the experience, conceptualizing the experience, and actively experimenting. Due to the cyclical nature of this model, the learner can enter the cycle at any of the four points (Kolb, 1984).

Learning through experience is not restricted to a formal classroom setting. The concept of lifelong learning stressed by Kolb (1984) is supported by the view that learning is holistic and adaptive. Kolb explained that learning involves the transaction of the person and their environment. Kolb stressed not using the word interaction but rather transaction to emphasize that both person and environment can be affected by one another (Kolb, 1984). Kolb defined learning as “the process whereby knowledge is created through the transformation of experience” (Kolb, 1984, p. 38).

The experiential learning model as presented by Kolb (1984) is cyclical and can therefore be entered at any point, as explained previously. Discussion about the experiential learning model often starts at the concrete experience stage, as explained by Roberts (2006). At that stage, learners use their senses to experience the phenomenon (Roberts, 2006). During the reflective observation stage, learners reflect on their experiences and try to make sense of the information by breaking the information apart and internalizing it (Roberts, 2006). Generalizations are made during the abstract conceptualization stage. In the fourth stage, learners test out their generalizations in a new situation. After this series of stages, the cycle starts over again (Roberts, 2006).

Application of Experiential Learning

Experiential learning is applicable to many disciplines. In their analysis of two wildlife technique courses at separate universities, Millenbah and Millspaugh (2003) emphasized the importance of experiential learning in content retention, critical thinking, and competency building. Experiential learning was used to enhance the learning of the students in an effort to prepare wildlife students for a professional career (Millenbah & Millspaugh, 2003). Students are able to get the most out of the learning experience due to the learner-centered nature of experiential learning. Millenbah and Millspaugh looked at two separate wildlife techniques courses to show how Kolb's (1984) four stage learning cycle was implemented. Concrete experience took the form of using radio telemetry equipment to find tracking collars. Reflection was done through field journals and group discussion. Abstract conceptualization and active experimentation were done by applying the original experience to similar scenarios (Millenbah & Millspaugh, 2003). Overall, it was found that experiential learning is beneficial to preparing students for future careers by strengthening critical thinking, increasing confidence, personalizing the learning experience, increasing retention, and accommodating the learning experience to a diversity of learning styles (Millenbah & Millspaugh, 2003).

Colleges of agriculture use capstone courses to help students make connections between coursework and application to career related situations (Andreasen, 2004). Andreasen found the framework of experiential learning is apparent in the components of the capstone courses although capstone courses may not be designed based on experiential learning theory. The model for integrating experiential learning into capstone courses (MIELCC) was proposed to strengthen capstone courses and ensure that experiential learning theory criteria are being met in capstone courses (Andreasen, 2004). In the MIELCC, the six components of capstone courses (team work, problem solving, decision-making, critical thinking, and communication) and the four stages of the experiential learning cycle (concrete experience, reflective observation, abstract conceptualization, and active experimentation) are integrated using five steps. The five steps are: receive, relate, reflect, refine, and reconstruct (Andreasen, 2004). A similar model could be used to incorporate the experiential learning framework into sustainable agriculture education courses at teaching farms.

Battisti, Passmore, and Sipos (2008) looked at the use of action learning, a form of experiential learning, in sustainable agriculture education. After providing an overview of experiential learning and its history at universities, they argued that experiential learning is more than just giving students the opportunity to do something hands-on (Battisti et al., 2008). Battisti et al. (2008) stressed the need for changes in sustainable agriculture curriculum in order to implement experiential learning.

The idea of experiential learning in agricultural education can be traced back to 1905 to Liberty Hyde Bailey, a Cornell professor (Parr et al., 2007). Parr et al. (2007) explained that “Bailey proposed students should learn by engaging in concrete field experiences, making observation and reflecting on the relationship of the discoveries to the more abstract disciplinary knowledge found in the classroom” (p. 524). The use of farms for teaching agriculture goes back to the origins of the land grant university. In the beginning of the land grant history, there was little educational material available to teach about agriculture (Richter, 1962). Often, educators at land grant universities used model farms to allow students to practice what they learned through experimentation and observation (Richter, 1962).

Parr and Van Horn (2006) proposed the use of experiential learning theory to develop curricula for a sustainable agriculture undergraduate major at University of California, Davis, in response to the National Research Council and the Boyer Commission as well as the growing need for sustainable agriculture education. Similarly, Trexler, Parr, and Khanna (2006) elicited the need for experiential learning in their study on the necessary content for an undergraduate sustainable agriculture major. The need for more research on sustainable agriculture education curricula is due to the increased interest in sustainable agriculture and the calls for curricula reform (Trexler et al., 2006).

Parr et al. (2007) explained college curricula have been historically and contemporarily debated in their study on the perspectives of academics regarding sustainable agriculture curricula. Historically, curricula were content focused and more traditional in nature. Land grant universities were intended to use more progressive education, yet there is still conflict between traditional and progressive rationale when designing curricula (Parr et al., 2007). Traditional education is more lecture based while progressive education, championed by Dewey (1934), is more student-centered and experiential in nature (Parr et al., 2007).

An existing teaching farm, the Student Experimental Farm (SEF), at University of California, Davis was started by students in 1977. The education associated with this farm is rooted in learning through experience, being student-centered, and focusing on sustainable agriculture (Parr & Van Horn, 2006). The desire for a sustainable agriculture major has lead to the need to determine the appropriate education theory and curricula content for sustainable agriculture. Based on a Delphi study done by Trexler, Parr, and Khanna (2006) about practitioner opinions on a sustainable agriculture major, Parr and Van Horn (2006) proposed seven components that should be included in a sustainable agriculture major including experiential learning as one of the key components.

Parr and Van Horn (2006) added that “experiential learning also necessitates building upon students’ sense of purpose, current conceptions, and cycles of reflective observation, abstract conceptualization, and experimentation in real-world contexts" (p. 431). Through these studies the importance of utilizing experiential learning is seen in addition the need to assess the current use of experiential learning in existing courses.

Parr et al. (2007) researched the topic of sustainable agriculture curricula development due to the lack of information about necessary content and teaching theory. Using the Delphi technique, faculty, staff, and graduate students were questioned on what content and experience students should get in a Sustainable Agriculture major. Experiential learning was one of three top recommended methods for teaching approaches along with experience in the classroom and the field and the opportunity to apply learned theory into practice. Results found by Parr et al. (2007) are harmonious with the findings of Bawden (1996) and the philosophy that "knowledge is generated through a reflective process on past experiences that result from everyday practice" (Parr et al., 2007, p. 530). Overall, Parr et al. (2007) conclude that "sustainable agriculture education requires progressive, integrated, experiential, interdisciplinary, systems-based curricula where learning grounds theory to practice in relevant and purposeful social and environmental contexts" (p. 530). Similarly, Ngouajio et al. (2006) reported more people are incorporating experiential learning in their curricula development as interest in sustainable agriculture curricula grows.

Examples of institutions that have developed experiential sustainable agriculture curriculum include Hawkesbury Agricultural College, Norwegian University of Life Science, EARTH University, and Zamorano University (Juma, 2007; Parr & Van Horn, 2006). Zamorano University upholds a "learning-by-doing" philosophy (Zamorano University, 2005). EARTH University, located in Costa Rica, was founded in 1990 designed around the U.S.A. land grant model (Juma, 2007). According to Juma (2007), “EARTH University has developed an innovative, learner-centered and experiential academic program” (p. 8). All students at EARTH study sustainable agriculture. Lifelong learning, as stressed by Kolb (1984), is encouraged through EARTH’s use of experiential learning (Juma, 2007).

During the four years at EARTH, students take part in four key activities that clearly display the use of the experiential learning model: Work Experience, Professional Experience, Community Outreach, and Entrepreneurial Projects Program. EARTH has an active farm on campus where students take part in during the Work Experience activity, starting by learning production skills in the first year and progressing to management skills in the second (Juma, 2007). During their third year, students work with local producers for the Work Experience where they are able to utilize their experiences and apply them to real life settings. Also, students take part in Community Outreach. During the Professional Experience, students work on campus to strengthen their professional skills. An international internship during their third year is the highlight of experiential learning used at EARTH (Juma, 2007). Through the Entrepreneurial Projects Programs, the students are able to fully prepare for careers in sustainable agriculture and build entrepreneurial skills (Juma, 2007). During field trips, EARTH’s student-centered characteristic is evident when faculty participate directly along with the students (Chakeredza et al., 2008).

In addition to University of California, Davis, other institutions that have implemented experiential learning into their sustainable or organic agriculture courses include Michigan State University and Iowa State University (ISU) (Biernbaum, Thorp, &

Ngouajio, 2006; Trede & Andreasen, 2000; Trede, Soomro, & Williams, 1992). In 1943, a laboratory farm, known as the Ag 450 farm, was established at Iowa State University to allow a space for hands-on learning for the senior-level capstone course for Agricultural Education and Agricultural Studies majors (Trede, Soomro, & Williams, 1992). Currently, this farm is still being used as the experiential learning laboratory for the capstone course (Trede & Andreasen, 2000).

Trede and Andreasen (2000) conducted a study to determine students' perceptions on the experiential component of the ISU capstone course as it related to their first career. Overall, the participants in the study indicated that the experiential opportunities in the AgEdS450 course prepared them for their first career (Trede & Andreasen, 2000). The authors concluded, "the experiential learning process provides for integration, synthesis, and evaluation of the activities desired and is deemed essential to the success of the course" (Trede & Andreasen, 2000, pg. 39).

Summary/Conceptual Framework

Experiential learning theory according to Kolb (1984) is based on the works of Lewin, Dewey, and Piaget (Beard & Wilson, 2006). The cyclical process indicates how learners develop knowledge by taking their experiences, reflect on them, take abstract concepts and apply them in new settings. As explained by Kolb (1984), experiential learning can occur in a wide range of settings and disciplines. Experiential learning theory has been used in undergraduate capstone courses, sustainable agriculture teaching farms, and wildlife techniques courses (Andreasen, 2004; Millenbah & Millspaugh, 2003; Parr & Van Horn, 2006). International agriculture universities including EARTH University and Zamorano University, utilize experiential learning theory to structure their curricula (Juma, 2007; Zamorano University, 2005).

Universities and colleges that have teaching farms often use terminology on their websites and syllabi that describe the farm and its curricula as experiential and hands-on. As stated previously, not all experiences allow for equal learning potential (Dewey, 1934). Experiential learning allows learners to experience a phenomenon, reflect, make generalizations, and experiment (Kolb, 1984). Higher Education institutions can use teaching farms to facilitate sustainable agriculture education. It is necessary to determine if teaching farms are truly applying the experiential learning model to ensure the quality of sustainable agriculture curricula.

Based on experiential learning theory and its practical application evident in the literature, the following categories have been identified to be indicative of experiential learning theory: concrete experience-direct interaction and observation; reflective observation-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-opportunities for students to develop models and make hypotheses, demonstrates opportunities for students to make generalizations, written reports with a discussion or synthesis component, and students given opportunities to make plans for future action; active experimentation-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 require students to adapt to specific situations.

CHAPTER 3
METHODOLOGY

Research Design

A basic qualitative design was used to determine where and how teaching farms are used for sustainable agriculture programs at colleges and universities throughout the United States. 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). Data from interviews, observations, or document analysis can be used in basic qualitative studies (Merriam, 1998). 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). 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).

Data Sources

A snowball or network sample was used. This type of sampling technique is used when “potential respondents are not centrally located but scattered in different sites” (Ary, Jacobs, Razavieh, & Sorensen, 2006, p. 473). Well situated people are contacted initially and potential cases to study are suggested (Gall et al., 2007, p. 185). The institutions that use teaching farms were selected in order to describe the current use of teaching farms across the U.S.A.

Approval was received from the Institutional Review Board (IRB02) to contact the institutions on the initial institution list (Appendix A). After the initial institution list was compiled, the institutions were contacted by the researcher on September 7, 2010 via e-mail to determine whether or not the faculty involved with the relevant programs used a teaching farm for their courses. The first email contact explained why the person was contacted and a question regarding whether or not a teaching farm was used at the institution. In addition, the first email included a request for the contact information for faculty involved with the teaching farm, if one existed (Appendix B). Follow up e-mails were sent on September 14, 2010 and (September 21) based on Dillman, Smyth, and Christian’s (2009) Tailored Design Method (see Appendices C & D). Contact information for the relevant faculty was collected until no new cases were given (Bernard & Ryan, 2010).

The population was more clearly defined based on e-mail correspondence with the institutions to determine if they had a teaching farm or not. Two hundred and forty three institutions were initially contacted. Of the 243 institutions contacted 80 responded. Twenty-eight 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 they have teaching farm or not. Based on the responses, the faculty that utilized teaching farms were contacted by e-mail on September 27, October 11, and October 25, 2010 to request the relevant syllabi.

Not all syllabi that were collected were used in the data analysis. Thirty-two of the 110 syllabi were excluded. Exclusions were made if similar syllabi were submitted from the same institute but from varying years (S11, S12, S17, S19, S20, S21, S25, S27, S36, S37, S38, S39, S65, S70, S72, S83, S91, S92, S93, & S94). Also, syllabi were excluded if they did not make regular use of the teaching farm facility (S30, S33, S85, S90, S100, S101, S102, & S111). In addition, internship based courses were excluded (S3, S4, S5, S41, & S109)

Data Analysis

Content Analysis

According to Bernard and Ryan (2010), content analysis "is a set of methods for systematically coding and analyzing qualitative data" (p. 287). The aim of this content analysis was to "describe prevailing practices" (Ary et al., 2006, p. 464). For this study, 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). Glaser (1965) stated "the basic defining rule for constant comparative method: *while coding an incident for a category, compare it with the previous incidents in the same category"* (p. 439).

This study used preset category codes in the form of an index to guide the content analysis (Gall et al., 2007).. According to Gall et al. (2007) each category "should be mutually exclusive, such that any bit of communication can be coded by only one category in the category system" (p. 289). There was no existing experiential learning index for course syllabi. An index was created by the researcher in order to assess the degree of the incorporation of experiential learning in courses at institutions that utilize teaching farms (Appendix E). Identifiers of experiential learning were developed based on the experiential learning model and the literature (Kolb, 1984; Millenbah & Millspaugh, 2003; Roberts, 2006). The main sections of the index were based on the four parts of the experiential learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). In addition, the discipline of each syllabus was noted. One coder was used for this study. Using the experiential learning theory as a framework, criteria for what determines the use of experiential learning at teaching farms was established (Kolb, 1984). 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 was reviewed for content and construct validity by a panel of experts in Agricultural Education and Communications; Agronomy; and Family, Youth, and Community Sciences at the University of Florida. According to Ary et al. (2006), validity of an instrument must be determined in order to ensure that the information the instrument was designed to obtain was truly measured. McMillan and Schumacher (2010) defined validity as “the degree to which scientific explanations of phenomena match reality” (p. 104). The generalizability of the results was addressed by external validity. Threats to external validity were addressed by using snowball sample of institutions with teaching farms in the United States. The results will not be generalized past institutions in the U.S. Internal validity is “the degree to which extraneous and confounding variables are controlled” (McMillan & Schumacher, 2010, p. 488). To reduce the threat to internal validity, the same index was used to score each syllabus and all collected syllabi were used (Ary et al., 2006).

As defined by Ary et al. (2006), construct validity is “the extent to which a test or other instrument measures what the researcher claims it does” (p. 630). In order to reduce the threats to construct validity, a thorough explanation of the constructs was defined based on the literature (Ary et al., 2006). The use of the panel of experts to contribute items was another method to increase the construct validity.

Trustworthiness

Trustworthiness in qualitative research refers to consistency and “the extent to which variation can be tracked or explained” (Ary et al., 2006, p. 509).Trustworthiness needs to be established in order to show the results are valid and reliable (Merriam, 1998). According to Lincoln and Guba (1985), trustworthiness is addressed by credibility, transferability, dependability, and confirmability.

Credibility

The believability of the findings refers to the credibility of the study (Ary et al., 2006). According to Lincoln and Guba (1985), credibility can be established using five major techniques. For this study, “activities that make it more likely that credible findings and interpretations will be produced” and “activities that provide and external check on the inquiry process” were used to establish credibility (Lincoln & Guba, 1985, p. 301). A thorough literature review was completed as well as consulting an expert panel regarding indicators of experiential learning in course syllabi.

Transferability

Transferability refers to the level that this study can be generalized to other contexts or situations (Ary et al., 2006). 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 have been recorded for this purpose and included in the findings.

Dependability

Credibility and dependability are linked. If a study is credible, the methods used to ensure credibility help build the case for dependability (Lincoln & Guba, 1985). This study referred to a panel of experts to “examine the *process* of the inquiry” and “attest to the *dependability* of the inquiry” by using an inquiry audit (Lincoln and 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.

Confirmability

Confirmability refers to the level at which others would arrive at the same conclusions in similar scenarios (Ary et al., 2006). To account for confirmability, an audit trail was done as well as the inquiry audit (Lincoln & Guba, 1985). The audit trail included the following categories: raw data, data reconstruction and synthesis products, process notes, materials relating to intentions and dispositions, and instrument development information (Lincoln & Guba, 1985, p. 319). These materials included notes from meetings, drafts of the instrument, and e-mails.

Researcher Bias Statement

In qualitative research, it is necessary for the researcher to be aware of personal bias. Merriam (1998) explained the importance of recognizing researcher bias, "because the primary instrument in qualitative research is human, all observation and analyses are filtered through that human being's worldview, values, and perspective" (p. 22). The researcher has a background in horticultural science and therefore has taken many courses in disciplines related to sustainable agriculture. Through this experience she has seen courses with effective hands-on components as well as courses lacking in opportunities for direct student involvement.

The researcher went into this study with the assumption that while some components of experiential learning will be apparent, concrete experience and possibly reflective observation, abstract generalizations and active experimentation would be lacking. This assumption was developed due to the information the researcher received in a graduate course on experiential learning as well as from the literature. This assumption was accounted for by having the panel of experts review the indicators of each stage of experiential learning.

CHAPTER 4
FINDINGS

Findings by Objectives

Objective 1

The first objective was to determine which institutions of higher education in the United States of America use teaching farms as part of their sustainable agriculture curricula. Also, the locations of the identified institutions throughout the United States of America were determined. Two online directories were used as part of the initial institution search. Table 4-1 displays the number of institutions found in each state based on the two existing directories of teaching farms or student farms. Based on the two databases a range of 36-76 institutions were identified. Twenty-eight institutions contributed a total of 78 syllabi. Figure 4-1 displays the geographic distribution of the institutions that participated in this study.

Both public and private institutions were represented in this study (Table 4-1). Of the public institutions there were three categories: public institutions, land grant institutions, and community colleges. Most of the institutions that were studied were public institutions including nine land grant institutions. There were only two states that included community colleges, California and Arizona. Most states only had one type of institution. California contained community colleges, a land grant institution, and a private institution. Vermont and Oregon similarly had three types including a land grant institution, private institution and public institution. Washington and North Carolina contained land grant institutions as well as other public institutions.

Table 4-1. Number of student or teaching farms located in each state based on existing online farm directories

State	Rodale Institute	SAEA
Arizona	1	1
California	12	6
Colorado	2	0
Connecticut	1	0
Florida	1	0
Georgia	3	0
Hawaii	0	0
Idaho	1	1
Indiana	2	1
Iowa	2	1
Kentucky	1	1
Maine	3	2
Massachusetts	1	2
Michigan	1	2
Minnesota	3	1
Missouri	2	0
Montana	1	0
New Hampshire	2	1
New Jersey	1	1
New Mexico	1	0
New York	2	1
North Carolina	3	3
Ohio	2	1
Oregon	3	0
Pennsylvania	5	2
South Carolina	1	1
Vermont	7	3
Virginia	1	1
Washington	4	2
West Virginia	1	1
Wisconsin	5	1
Wyoming	1	0
Total	76	36

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Figure 4-1. Geographic distribution of participating institutions of higher education

Objective 2

The second objective was to describe what subject areas instructors were utilizing at teaching farms. Eight main disciplines were found throughout the courses that were studied. The main disciplines were the following: agricultural systems, horticulture, animal science, natural resources and soil science. Table 4-2 displays the disciplines and the sub-disciplines that emerged as well as the number of syllabi in each category. Appendix F displays the course titles along with the corresponding discipline and institution type. The majority of the syllabi studied were from courses in the animal science and sustainable agriculture disciplines. Horticulture had the third highest number of syllabi.

Table 4-2. Disciplines and sub-disciplines represented by the teaching farm course syllabi

Discipline and sub-disciplines	Total Syllabi for discipline	Total Syllabi in sub-discipline
Agricultural Systems	9	9
Horticulture	12	5
Weed Science		1
Crops-Floriculture, vegetable, fruit and nut		4
Hydroponics/Nursery Management		2
Animal Science	24	4
Beef		1
Breeding/Reproduction/Physiology/Vet. Practices		4
Dairy		1
Equine		6
Evaluation/Shows/Feed		3
Sheep/goat		3
Swine		2
Natural Resources	3	3
Soil Science	3	3
Sustainable Agriculture	27	11
Agroecology		5
Organic Agriculture		11

The course titles found in agricultural systems included examples such as *Introduction to Agricultural Systems; Agricultural Techniques; Food, Agriculture, and the Environment; and Agricultural Machine Systems. Horticulture courses included Weed Identification and Control; Principle of Horticulture; Plant Science; Tropical Fruit and Nut Production; Vegetable Crop Production; Orchid Culture; Nursery Management;* and *Hydroponics*. The animal science courses were titled *General Livestock Production; Beef Production; Fairs & Exposition; Equine Science; Vet Practices; Feeds and Feeding; Technical Management of Dairy Cattle;* and *Animal Breeding and Genetics*.

The three natural resource courses were the following: *Orientation to Natural Resources and Park Management Practices; Wildland Trees and Shrubs;* and *Urban Tree Management*. The three soil science courses were indicated by the titles such as *Soil and Soil Fertility Management* and *Soils, Sustainable Ecosystems*. Examples of the sustainable agriculture courses were *Organic Crop Production Practices; Introduction to Sustainable Agriculture; Fundamental of Organic Agriculture;* and *Advanced Agroecology*.

Objective 3

The third objective was to describe the presence of indicators of experiential learning theory as reflected in the syllabi of teaching farm courses. This section is divided by the four components of the experiential learning theory model (Kolb, 1984).

Concrete Experience

Most (e.g. S7, S24, S25, S34, S35, S47, S68, and S78) of the syllabi had clear indications that concrete experience was present while some (e. g. S1, S2, S6, S10, S15, S15, S18, S32, S46, S56, and S66) had weak evidence that lacked clear description of specific activities. Weak evidence typically meant that there was some indication that the potential for a stage was present but there was limited information to support the evidence. An example of weak evidence was found in syllabus 32 in which a lecture and lab section were indicated but no description of activities were included.

The concrete experiences were divided into three categories: in class, on farm, and other field experiences. For each category the experiences were divided between direct interaction and observation. The following are how each category was defined:

- DIRECT INTERACTION. Activities in which the students directly interact with the phenomenon such as setting up and maintaining field plots.
- OBSERVATION. Events in which students watch videos or listen to a lecture with indirect engagement with the phenomenon.
- OUT OF CLASS. Experiences that included students being required to read course material prior to lectures on a related topic.

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 (S1, S2, S6, S7, S8, S9, S10, S13, S14, S15, S16, S18, S22, S24, S25, S32, S42, S43, S44, S45, S46, S47, S49, S50, S52, S57, S58, S59, S68, S71, S73, S74, S75, S76, S77, S78, S79, S80, S81, S82, S84, S86, S87, S88, S89, S104, S105, & S110). Other courses (e.g. S28, S29, S62, S64, S95, S96, & S103) did not have lecture components and were strictly labs. Videos were often included in the course calendars (S6, S15, S16, S24, S25, S53, S73, S86, S107,& S110). In syllabus 68 the presence of demonstrations was included in the course structure section of the syllabus.

Most of the courses had a field work or lab component. Some of the courses (S1, S40, S48, S54, S84, & S98) had field experiences in a garden or greenhouse setting. For example, syllabus 1 included an explanation of the uniqueness of each student's field experiences. For that course students were required to participate in 7 of 10 possible field experience activities. Other courses (S2, S6, S7, S9, S10, S13, S16, S24, S28, S29, S34, S35, S47, S49, S51, S54, S60, S61, S63, S67, S68, S69, S77, S78 S79, S95, S96, S99, S105, S106, S107, & S108) had opportunities for students to directly interact in the farm setting. One such course (S24) stated the expectation that students should be "getting sweaty and your hands dirty in the lab portion."

Farm tours and tours of facilities were found in several of the syllabi (S1, S8, S14, S15, S53, S54, S60, S95, S98, and S107). Such tours constituted *on farm observation* activities. Farm tours were often placed in the course calendar.

Observations in other field experiences were comprised of field trips, industry tours, and field days. Field trips took place at local farms or other agricultural operations (S6, S14, S16, S22, S25, S34, S35, S40, S47, S50, S51, S52, S54, S67, S80, S81, S82, S88, S106, and S110) as well as other on-campus facilities (S2 and S89). Several syllabi mentioned field trips in the course format or in the course calendar (S24, S28, S42, S53, S57, S68, S71, S73, S74, S75, S76, S86, S87, and S99). Syllabus 35 offered more detail on the types of experiences included in the field trips. For example, “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 (S14, S16, S18, S22, S23, S25, S49, S55, S60, and S89). 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

Evidence for reflective observation was identified based on the following criteria: reference to class discussion, assignments that allow students to incorporate existing knowledge, readings that are intended to help students internalize the experience, the use of a field journal, and written reports. Twenty two of the 78 syllabi included evidence that class discussions took place (S2, S6, S7, S14, S18, S24, S25, S35, S43, S47, S49, S50, S53, S54, S60, S61, S67, S68, S89, S99, S104, and S107). Other opportunities for reflective observation were literature reviews with a reflection component (S15, S25, S50, S67, and S76) in addition to annotated bibliographies (S16, S24, and S98).

Reflection was evident in literature reviews based on requirements such as “include a summary of the information, along with a few sentences that reflect your personal opinion” (S15). There was less description about the details of the annotated bibliography assignments.

Response papers (S6, S40, S47, S49, S50, S68, S88, S98, S106,& S110) and lab reports (S8, S9, S10, S13, S24, S25, S43, S46, S47, S57, S58, S59, S76, S79, & S84) were indicated in several of the syllabi. Syllabus 40 had a response paper assignment following field trips. This assignment was described in the following way: “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 (S8, S9, S10, S13, S24, S25, S43, S46, S57, S58, S59, S76, and S84). 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 (S14, S18, S24, S25, & S98) 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 (S14, S24, S25, S28, S29, S47, S63, S77, S78, S79, S86, S88, S99, and S106). 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. First, 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 (S24, S40, S48, S50, S58, and S84).

Written assignments with a discussion or synthesis component was another form of abstract conceptualization that was found in several of the syllabi. In syllabus 6 the students were required 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. Syllabus 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 and 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 (S47), creating a farm production and management plan (S48), generating a field plan (S68), and a crop production plan (S82).

Individual syllabi presented unique opportunities for students to go through the abstract conceptualization stage in addition to the previous mentioned opportunities for abstract conceptualization. One such opportunity was found in three syllabi in which students were assigned to create a systems diagram (S16, S47, and S98). Students were also given the task of writing papers that link theory and practice (S25 and S43).

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 (S6, S9, S10, S13, S14, S16, S18, S22, S24, S25, S34, S35, S42, S48, S49, S50, S52, S53, S57, S58, S59, S66, S67, S68, S77, S80, S81, S84, S86, S88, S89, S98, and S110). In syllabus 16, it was clear that one of the purposes of the project was for students to have the opportunity to apply course concepts. This 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). The project found in syllabus 34 takes place throughout the entire length of the course and included “quality of design, implementation, monitoring, and final crop quality.” Syllabus 59 offered less description of the project but some indication of the purpose of the project was evident in its title: “comprehensive group project.”

In addition to projects, 21 syllabi contained oral presentations. The presence of oral presentations was indicated in course calendars (S9, S10, S42, S53, S57, and S95) and in project descriptions (S14, S16, S25, S47, S49, S50, S58, S59, S68, S76, S77, S84, S86, S87, and S98). There were 18 syllabi that indicated group work (S2, S6, S14, S16, S18, S22, S25, S29, S43, S47, S48, S49, S50, S58, S59, S77, S82, and S98). Group work represents opportunities for students to adjust to certain situations. There was no evidence for active experimentation in 24 of the 78 syllabi (S15, S23, S28, S31, S32, S45, S54, S55, S56, S60, S61, S62, S64, S71, S73, S74, S75, S97, S103, S104, and S105).

General Experiential Learning Theory

Evidence for experiential learning theory outside of the specific four stages occurred in several of the syllabi. The major themes that arose were the use of the phrase hands-on as well as directly referring to the course as an experiential learning course. There were 13 syllabi (S34, S40, S49, S56, S62, S63, S67, S86, S88, S95, S96, S97, & S105) that made reference to hands-on learning. Some examples of this include: “hands-on experience where students learn by doing” (S67); “this course provides an essential hands-on experience” (S40); and “classroom learning is put into practice during the lab portion of the class, which involves hands-on learning” (S105).

Three syllabi (S6, S68, and S69) directly referred to the courses as experiential learning courses. This was stated in syllabi 68 and 69 in the following way: “as an experiential learning course, students will gain experience in….” In syllabus 6 the following statement was used: “this course will have an experiential component in which we continue to gradually build the garden.” Other syllabi expressed that students will gain experience (S2) and that “activities are included that will provide students with experiences from which they can build knowledge" (S48). The philosophy of the instructor was clearly seen in syllabi 68, 69, and 95. The instructor indicated that the instructor and the students were “partners in the learning process” in syllabus 95 while the instructor of syllabi 68 and 69 took on a facilitator or guide role in the learning process.

Evidence for each Discipline

Evidence for each stage of the experiential learning cycle was looked at across the disciplines. Table 4-3 displays the number of syllabi in each discipline that had evidence for each stage of the experiential learning cycle.

Agricultural Systems

In the agricultural systems discipline all nine of the syllabi included evidence for concrete experience. Only three of the nine syllabi in this discipline contained clear evidence for reflective observation. However, four of the syllabi had some indication of reflective observation. Four of the syllabi in the agricultural systems discipline had clear evidence abstract conceptualization. Most of the syllabi in this discipline possessed a strong indication for active experimentation.

Horticulture

All of the horticulture syllabi had evidence for concrete experience. Most of the syllabi had evidence for reflective observation with only 4 lacking any indication of this stage of the experiential learning cycle. Five of the twelve horticulture syllabi showed the presence of opportunities for abstract conceptualization. Similar to concrete experience, most of the syllabi in this discipline had evidence for active experimentation with only two lacking any indication of this stage.

Animal Science

Sixteen of 24 animal science syllabi had strong evidence for concrete experience while 8 had some indication of concrete experience. Half of the syllabi in this discipline indicated that reflective observation was present. In addition, 4 syllabi offered vague indications of this stage of the cycle. Only 5 of the 24 syllabi suggested that abstract conceptualization was present. Active experimentation was strongly evident in 10 of the syllabi and weakly evident in 2.

Natural Resources

All of the three natural resources syllabi had indicators for concrete experience. Two of the three syllabi showed signs of reflective observation. There was only one syllabus that had evidence for abstract conceptualization. In this discipline there was evidence for active experimentation strongly in two and weakly in one syllabus.

Soil Science

Similar to other disciplines, the three soil science syllabi indicated the presence of concrete experience. In addition, all three had evidence for reflective observation.

Two of the three syllabi in this discipline indicated the presence of abstract conceptualization. This was also found for the active experimentation stage of the cycle.

Sustainable Agriculture

All 27 sustainable agriculture syllabi contained evidence for concrete experience. All but 5 syllabi had indicators for reflective observation. Only 13 of the 27 sustainable agriculture syllabi contained evidence for abstract conceptualization. Twenty-two of the syllabi in this discipline provided indication for opportunities for active experimentation in addition to two syllabi with weak evidence for this stage in the cycle.

Table 4-3. Occurrences of evidence for each stage of the experiential learning cycle found in each sub-discipline

Disciplines and sub-disciplines	**CE**	**RO**	**AC**	**AE**	**Total Possible**
Agricultural Systems	9	7	4	6	9
Horticulture	5	3	0	4	5
Weed Science	0	1	0	0	1
Crops-Floriculture,Vegetable,Fruit and nut	4	3	3	4	4
Hydroponics/Nursery MGMT	2	1	2	2	2
Animal Science	4	1	1	2	4
Beef	1	1	1	1	1
Breeding/Reproduction/physiology/vet practices	4	2	0	1	4
Dairy	1	1	1	1	1
Equine	6	6	1	2	6
Evaluation/shows/feed	3	2	0	3	3
Sheep/goat	3	2	1	2	3
Swine	2	1	0	1	2
Natural Resources	3	2	1	3	3
Soil Science	3	3	2	2	3
Sustainable Agriculture	11	11	6	10	11
Agroecology	5	3	2	4	5
Organic Agriculture	11	8	4	10	11

CHAPTER 5
DISCUSSION

Summary

The purpose of this study was to determine the use of teaching farms throughout the United States for sustainable agriculture education at institutions of higher education. There has been an increase in the demand for sustainable agriculture education at institutions of higher education (Shroeder, Creamer, Linker, Mueller, & Rzewnicki, 2006). Experiential learning theory, as defined by Kolb, has been used in agricultural education to help link practice and theory (Perez, Parr, & Beckett, 2010). As curricula for sustainable agriculture is refined and newly developed it is important to ensure that agricultural students will be properly prepared for the variety of potential careers available (Bawden, 1996).

Syllabi were collected from higher education institutions across the U.S. All of the syllabi that were assessed were from courses that utilized a teaching farm as part of the curricula. Common themes were found in the syllabi as well as differences between courses and disciplines. The conclusions made from the findings will be presented in this chapter as well as a look at the existing literature on the subject of teaching farms at higher education intuitions.

Conclusions and Implications

Objective 1

Institutions of higher education in the U.S. that use teaching farms were determined in this study. A total of 78 syllabi were collected from 27 institutions. These institutions were found throughout 18 states. These findings may be limited to the institutions that responded. The most represented type of institutions that were found in this study was public institutions. Of the 21 public institutions there were 9 land grant institutions. Public institutions were found in all states included in this study excluding Pennsylvania and New York. Of the public institutions, land grant institutions with teaching farms were in California, Washington, Oregon, Utah, Montana, Minnesota, North Carolina, and Maine. The community colleges were only found in California and Arizona. Private institutions with teaching farms were found in Oregon, California, Wisconsin, Pennsylvania, New York, and Maine.

It was difficult to ascertain from the institutions' websites whether or not a teaching farm existed. If it was clear that a teaching farm did exist at a specific institution it was not always easy to determine the contact information for the relevant faculty. The use of existing directories provided by the Rodale Institute and Sustainable Agriculture Education Association (SAEA) were helpful in determining what institutions to include in the pool of institutions that were contacted however not all information was up to date.

The institutions that participated in this study are not the only institutions in the U.S. that have teaching farms. This study was limited by whether or not faculty responded to the series of email requests. The institutions that participated in this study were also limited by whether or not it was possible to find accurate contact information via the institutions' websites.

Objective 2

The following disciplines were the original focus of this study when requesting syllabi from faculty: sustainable agriculture, agro ecology, organic agriculture, alterative cropping systems, and food systems. Based on the syllabi collected additional disciplines emerged. The main disciplines that were found included agricultural systems, horticulture, animal science, natural resources, and soil science. There was a prevalence of sustainable agriculture syllabi as well as the sub-disciplines of organic agriculture and agroecology. Animal science and the sub-disciplines were the second largest set of syllabi. Horticulture was the third most abundant with agricultural systems following close in number. The least represented disciplines were natural resources and soil science.

Experiential learning has been found in similar courses including agricultural capstone courses (Andreasen, 2004; Trede & Andreasen, 2000). Also, the use of experiential learning has been looked at in sustainable agriculture, organic horticulture, and organic and sustainable agriculture (Battisti et al., 2008; Ngouajio et al., 2006; Schroeder et al., 2006). Similarly, sustainable agriculture and rural development education at Hawkesbury Agricultural College has emphasized the use of experiential learning as well as sustainable agriculture at University of California, Davis and ecological horticulture at U.C., Santa Cruz (Bawden, 1996; Parr et al., 2007; Perez et al., 2010). Michigan State University has used experiential learning in organic agriculture courses (Biernbaum et al., 2006). Linking practice and theory has been emphasized in an agroecology Masters program at the Norwegian University of Life Sciences (Lieblein, Salomonsson, & Francis, 2007). Experiential learning has been incorporated into wildlife courses at the University of Missouri-Columbia (Millenbah & Millspaugh, 2003). Another international example is EARTH University in Costa Rica (Juma, 2007).

Based on the findings there is a number of animal science courses that are using teaching farms as part of the curricula. It was found that the animal science courses had many opportunities for hands on learning but were weak in the reflective observation and abstract conceptualization stages of the experiential learning cycle. More research should be done to determine how well experiential learning is being incorporated into the educational activities in these courses. However, this study found a similar diversity of disciplines as represented by existing literature on teaching farms and experiential learning excluding animal sciences and soil science. Disciplines that were not represented in this study but found in the literature include integrated pest management and disciplines related to social sciences that are relevant to sustainable agriculture (Schroeder et al., 2006).

Objective 3

Evidence for each stage of the cycle was found throughout 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 through 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. Battisti et al. (2008) raised the question of what defines an experience. This question was asked in light of Dewey’s assertion that experiences can have varying degrees of educational value (Battisti et al., 2008). 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. According to Lieblein et al. (2007), agricultural students need to be provided “relevant educational experiences that will strengthen their motivations and prepare them for a complex future” (p. 37).

“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.

Some syllabi had richer descriptions of the activities than others. Syllabus 50 contained explanations of the expectations of each activity that included all four stages of the experiential learning cycle (Kolb, 1984). For example, the internship component was described as an opportunity for students to “make connections between the academic and practical arenas” and it was “not meant to be ‘busywork’ just for the sake of doing it, but hands-on work that will improve the Farm and perhaps introduce students to new skills” (S50). 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. Concrete experience cannot stand alone. 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 model of experiential learning, learners need the opportunity for reflective observation in order to "change or affirm the meaning made from prior experiences" (Perez et al., 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 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). The other two stages are more external and require active participation from the learner. 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 or not. However, it was evident in some syllabi that opportunities for synthesis and future planning, and therefore abstract conceptualization, were included.

The abstract conceptualization stage of the cycle is necessary in order to incorporate new knowledge for the use of future applications. Evidence for this stage of the experiential learning was lacking significantly from the syllabi. Over half of the syllabi had no evidence while the remaining syllabi had varying degrees of opportunities for abstract conceptualization. As with other parts of the cycle single activities provided the venue for several stages of the cycle to occur. In several of the syllabi abstract conceptualization was evident in student projects. 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 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.

In the abstract conceptualization stage instructors may need to take on the role of a facilitator and guide students through the linking of course concepts and theories to the students' personal experiences (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). To achieve this stage of the cycle students can look at specific situations analytically from a variety of perspectives to compare and contrast the strengths and weaknesses of each view point (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 et al., 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). Students should be given opportunities to not only try something once but be able to apply it and make adjustments based on what was learned during the first exposure. Knowledge should be built upon prior experiences, as reflected in the cyclical form of the experiential learning cycles (Kolb, 1984).

Implications for the Experiential Learning Model

Kolb’s (1984) model of experiential learning is made up of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. 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). Figure 5-1 displays the first part of Roberts’ (2006) model. This model looks very similar to Kolb’s (1984) model however it combines the concrete experience stage with the active experimentation stage.

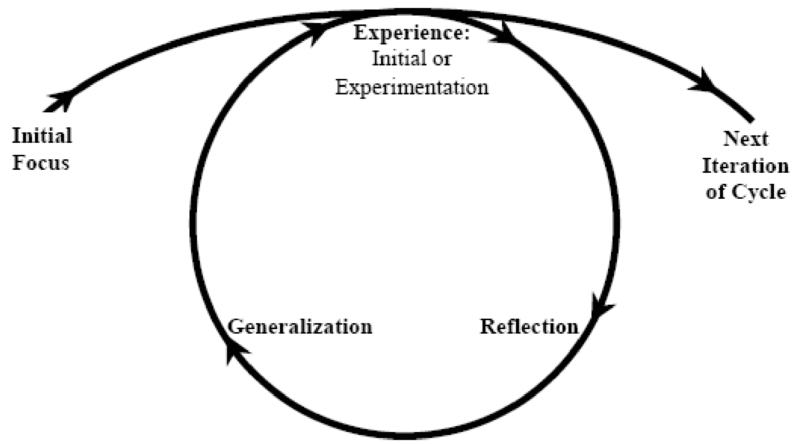

Figure 5-1. Roberts' (2006) Model of the Experiential Learning Process

The use of Roberts' (2006) Model of the Experiential Learning Process has been found to be more useful based on the results of this study. The experience stage in this model includes both the initial experience and experimentation (Roberts, 2006). Reflection and then generalization, the two cognitive based stages, follow the experience stage. After generalization the process cycles back to the experience and into the next iteration of the cycle (Roberts, 2006).

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. In practice the stages of the cycle may not manifest in the proposed order.

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.

This study looked at the use of experiential learning theory based on Kolb's (1984) model and terminology. Similar philosophies on learning were used at teaching farms but with different words to describe the process. Battisti et al. (2008) used the term action learning to describe the type of learning they suggest for sustainable agriculture education. Action learning is similar to but not exactly the same as experiential learning. According to Battisti et al. (2008), action learning differs from experiential learning because "it is distinguished by critical reflection, and can also be referred to as double loop learning" (p. 28) (Figure 5-2).

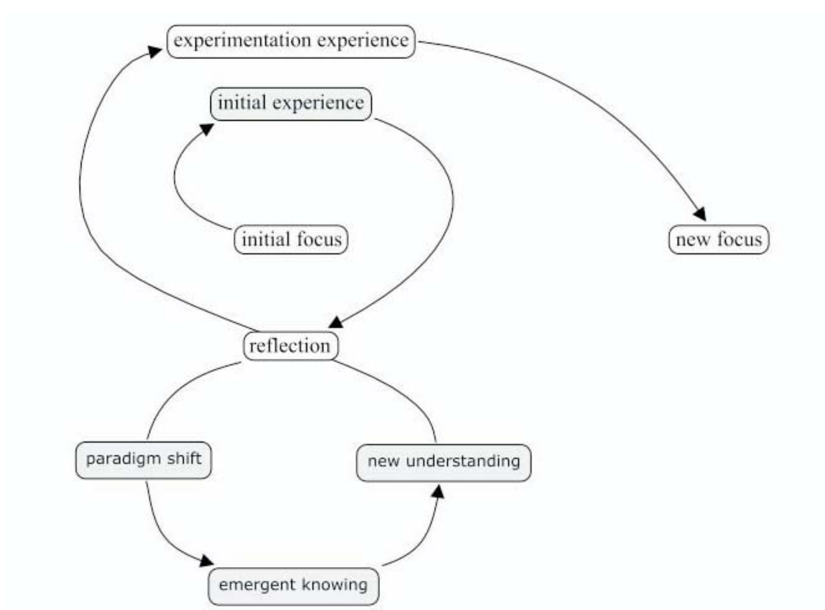

Figure 5-2. Action learning model (Battisti et al., 2008)

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 this 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 teaching farms included in this study had evident concrete experience and abstract conceptualization activities. Reflective observation and abstract conceptualization were present in a significant number of 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.

Of the 78 syllabi, 17 were found to have the most evidence for the presence of experiential learning (S7, S24, S25, S29, S35, S43, S47, S48, S50, S67, S68, S76, S77, S79, S84, S89, S98). 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. To do this, 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 then initial experience. Throughout the learning experience instructors will need to take on several roles including facilitator and instructor.

Recommendations for Future Research

Based on the findings several recommendations have been made. First, a study that includes interviews or focus groups with teaching farm faculty, staff, and students should be conducted in order to find out what is occurring at teaching farms and whether or not teaching theory is incorporated and applied. It should be determined how intentional faculty are at incorporating the stages of the experiential learning cycle into their activities and lessons.

In addition, 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. Research should be conducted with students of teaching farms to understand their perceptions of the learning process. Follow up studies should be done with students after they graduate to gather their perceptions of their preparation for their careers.

Additional studies should be conducted on other educational theories that are used at teaching farms. 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.

Recommendations for Practitioners

From the findings, recommendations have been made for faculty and staff that use teaching farms as part of their curricula. Clear descriptions of opportunities to major in sustainable agriculture should be included on higher education institutions' websites. Additionally, the presence of a teaching farm should be transparent and easily accessible to prospective students. 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.

While this study was not intended to assess the quality of how syllabi are written, it is suggested that practitioners clearly state their expectations for assignments. More information given to students initially will help the learning process to be enhanced and ensure that both instructor and student have a shared vision for the outcomes of the course.

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.

Opportunities for experience that are included in teaching farm courses should have purpose and be intentional and more than just mere activity. 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.

APPENDIX A
IRB APPROVAL

UF | Institutional Review Board
UNIVERSITY *of* FLORIDA

PO Box 112250
Gainesville, Fl32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

August 30, 2010

TO: Melissa Mazurkewicz
PO Box 110540
Campus

FROM: Ira S. Fischler, PhD; Chair ISF/dl
University of Florida
Institutional Review Board 02

SUBJECT: **Exemption of Protocol #2010-U-775**
The Use of Experiential Learning / Sustainable Agriculture Teaching Farm Curricula at Institutions of Higher Education

SPONSOR: None

The Board has determined that your protocol is exempt from review. This exemption is issued because this protocol does not involve the use of human participants in research in accordance with 45 CFR 46. Human participants are defined by the Federal Regulations as living individual(s) about whom an investigator conducting research obtains (1) data through intervention or interaction with the individual; or (2) identifiable private information.

Should the nature of your study change or if you need to revise this protocol in any manner, please contact this office before implementing the changes.

IF:dl

An Equal Opportunity Institution

APPENDIX B
INITIAL CONTACT

Dear Faculty or Staff Member:

I am writing to request syllabi that you use in your courses at the teaching farm at your institution. Over the past three weeks I have been compiling a list of institutions of higher education that use a teaching farm as part of their curricula. You have been identified by someone in your institution as faculty that uses the teaching farm for one or more of your courses. If this is not true, please let me know.

For my Master's thesis research at the University of Florida I am determining best practices for curricula that utilize teaching farms for the following or related disciplines: sustainable agriculture, agroecology, organic agriculture, alternative cropping systems, and food systems. The reason you are being contacted is to find out how teaching farms are being used in current courses.

A teaching farm is defined as a farm used for agricultural education at colleges and universities, including private and public institutions that are funded primarily for educational purposes. According to Sayre (2005), "They range in size from less than an acre to more than two hundred acres. Some are run as community-supported agriculture programs; others supply dining halls or sell at farmers markets. Some are certified organic; others follow organic or sustainable methods but are not certified. Some, like Dartmouth's, are overseen by a full-time staff person, while others are loosely supervised by professors of ecology or plant and animal sciences. Many are linked to courses in subjects like ecological agriculture, organic gardening, sustainability, or global food politics" (para. 5).

Your contribution of syllabi to my study would be greatly appreciated. University of Florida Institutional Review Board approval has been received for this study. If you have any questions regarding how your syllabi will be used please feel free to contact me at mmazurkewicz5@ufl.edu or 717-330-9563. I look forward to learning more about the work you are doing with your teaching farm.

Thank you,

Melissa Mazurkewicz

APPENDIX C
SECOND CONTACT

Dear Faculty or Staff Member:

On September 27th I sent you a request for syllabi from courses that you teach at the teaching farm at your institution. Your contribution to my study is important and will help get a better picture of what is occurring at teaching farms throughout the country. The reason you are being contacted is because you were identified by someone at your institution as someone that utilizes the teaching farm. If your institution does not have a teaching farm or you are not involved, please let me know. This study is being done as part of my Master’s thesis research at the University of Florida.

I appreciate any input you might have for my study. Please let me know if you have any question regarding how your syllabi will be used. Thank you for your time.

Sincerely,

Melissa Mazurkewicz

APPENDIX D
FINAL CONTACT

Dear Faculty or Staff Member:

Two weeks ago I sent out an email requesting syllabi for courses that use the teaching farm at your institution. I realize it is a busy time in the semester but your input will greatly benefit my study. If you do not use a teaching farm or do not have syllabi please let me know. I plan to stop collecting syllabi in the next two weeks. Please let me know if you have any questions regarding my study on teaching farms throughout the United States. Thank you very much for your time and input.

Sincerely,

Melissa Mazurkewicz

APPENDIX E
EXPERIENTIAL LEARNING INSTRUMENT

Concrete Experience:

	In Class	On Farm	Other Field Experience	Read Prior to Class
Direct Interaction "Hands on"				
Observation				

Reflective Observation:

Theme	**Evidence**
Refers to group/class discussion	
Assignments allow students to incorporate previous experiences/existing knowledge	
Assigned readings intended to help students internalize experience	
Explains the use of a field journal or similar tool	
Lab Report	

Abstract Conceptualization:

Theme	**Evidence**
Opportunities for students to develop models and make hypotheses	
Demonstrates opportunities for students to make generalizations	
Write reports with a discussion/synthesis component	
Students make plan for future action	

Active Experimentation:

Theme	**Evidence**
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	
- Activities require students to adapt to specific situations	

APPENDIX F
COURSE TITLES, DISCIPLINES, AND INSTITUTION TYPES

Syllabus #	Course Title	Discipline	Institution Type
1	Organic Crop Production Practices	Organic Agriculture	Land Grant
2	Introduction to Sustainable Agriculture	Sustainable Agriculture	Land Grant
6	Sustainable Agriculture	Sustainable Agriculture	Private
7	Assessment of Soil Resource Potentials	Soil Science	Land Grant
8	General Livestock Production	Livestock	Community College
9	Beef Production	Livestock	Community College
10	Sheep Production	Livestock	Community College
13	Fairs & Expositions	Livestock	Community College
14	Organic Farming Practicum	Organic Agriculture	Land Grant
15	Soil and Soil Fertility Management	Soil Science	Public
16	Growing Connections and Sustainable Foodways	Agriculture	Private
18	Equine Science	Livestock	Community College
22	Sheep (and Goat) Science	Livestock	Community College
23	Vet Practices	Livestock	Community College
24	Principles of Agroecology	Agroecology	Public
25	Agroecology Practices, Systems and Philosophies	Agroecology	Public
28	Introduction to Sustainable Agriculture Lab	Sustainable Agriculture	Community College
29	Field Experience in Agriculture	Agriculture	Community College
31	Agricultural Machine Systems	Agriculture	Community College
32	Weed Identification and Control	Horticulture-	Community College
34	The Urban Farm: Biology	Sustainable Agriculture	Land Grant
35	Fundamentals of Organic Agriculture	Organic Agriculture	Private
40	Towne's Harvest Practicum	Sustainable Agriculture	Land Grant
42	Feeds and Feeding	Livestock	Public
43	Technical Management of Dairy Cattle	Livestock	Public
44	Evaluation and Selection of Livestock	Livestock	Public
45	Reproduction and Artificial Insemination of Domestic Animals	Livestock	Public
46	Swine Production	Livestock	Public
47	Practice of Sustainable Agriculture	Sustainable Agriculture	Public
48	Student Organic Farm Planning, Growing and Marketing	Organic Agriculture	Land Grant
49	Principles and Practices of Sustainable Agriculture	Sustainable Agriculture	Private
50	Practicum in Agriculture I	Agriculture	Public
51	Orientation to Natural Resources and Park Management Practices	Natural Resources	Community College
52	Wildland Trees and Shrubs	Natural Resources	Community College
53	Permaculture Design I	Sustainable Agriculture	Private
54	Organic Gardening	Organic Agriculture	Private

Syllabus #	Course Title	Discipline	Institution Type
55	Horsemanship III	Livestock	Public
56	AGSC 160 Agricultural Techniques	Agriculture	Public
57	Horticulture	Horticulture	Public
58	Food, Agriculture and the Environment	Agriculture	Public
59	Introduction to Agricultural Systems	Agriculture	Public
60	Horsemanship I	Livestock	Public
61	Horsemanship II	Livestock	Public
62	Equine Reproduction Practicum	Livestock	Public
63	Horse Training Techniques	Livestock	Public
64	Plant Science Lab	Horticulture	Public
66	Urban Tree Management	Natural Resources	Public
67	The Urban Farm	Organic Agriculture	Public
68	Organic Farm Planning	Organic Agriculture	Land Grant
69	Organic Farm Practicum	Organic Agriculture	Land Grant
71	Introduction to Animal Science	Livestock	Land Grant
73	Swine Production	Livestock	Land Grant
74	Goat and Sheep Production	Livestock	Land Grant
75	Animal Breeding and Genetics	Livestock	Land Grant
76	Tropical Fruit and Nut Production	Horticulture	Land Grant
77	Sustainable Agriculture	Sustainable Agriculture	Land Grant
78	Principle of Horticulture	Horticulture	Land Grant
79	Vegetable Crop Production	Horticulture	Land Grant
80	Principle of Horticulture	Horticulture	Land Grant
81	Orchid Culture	Horticulture	Land Grant
82	Nursery Management	Horticulture	Land Grant
84	Hydroponics	Horticulture	Land Grant
86	Organic Crop Science	Organic Agriculture	Private
87	Commercial Vegetable Production	Horticulture	Private
88	Horticulture Techniques I	Horticulture	Private
89	Soils, Sustainable Ecosystems	Soil Science	Land Grant
95	Agronomy Laboratory	Agronomy	Public
96	Animal Science Laboratory	Livestock	Public
97	Agricultural Techniques	Agriculture	Public
98	Sustainable Agriculture	Sustainable Agriculture	Private
99	The Practice of Sustainable Agriculture	Sustainable Agriculture	Public
103	Introduction to Animal Science	Livestock	Public
104	Physiology of Farm Animals	Livestock	Public
105	Agroecology and Tohono O'odham crop production	Agroecology	Community College
106	Organic Farm Practicum	Organic Agriculture	Land Grant

Syllabus #	Course Title	Discipline	Institution Type
107	Fundamentals of Organic Agriculture	Organic Agriculture	Land Grant
108	Agriculture Techniques I	Agriculture	Public
110	Advanced Agroecology	Agroecology	Land Grant

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BIOGRAPHICAL SKETCH

Melissa Mazurkewicz had an interest in plants from a young age. She studied environmental science and biology at Messiah College for two years before transferring to Penn State University to study horticulture. Melissa was able to get experience many aspects of horticulture from native plant preservation, horticultural extension, tropical agriculture, and organic agriculture.

After graduation Melissa was able to gain experience working for the Penn State research farm learning about extended crop production using high tunnels, apple cultivation, and row crop cultivation. After gaining many experiences working with Cooperative Extension faculty Melissa realized she wanted to be able to educate people better about horticultural practices. She also gained a growing interest in international and tropical agriculture.

Melissa decided to pursue a master's degree at the University of Florida in Extension Education. During her time at the University of Florida Melissa was able to travel to Costa Rica and visit EARTH University. Melissa received her Master of Science at the University of Florida in the spring of 2011. She plans to seek a career in agricultural extension and development in an international setting.