A MIXED METHODS STUDY OF BEHAVIORAL CHANGES BASED ON A COURSE IN AGROECOLOGY

by

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This study described and evaluated student perceptions of a course in the area of agroecology. Specifically, this study was designed to determine if participants experienced changed perceptions and behaviors resulting from the Agroecosystems Analysis Course.

Research questions were addressed via a triangulation validating quantitative data mixed methods approach, with a written survey comprised of both quantitative and open-ended questions serving as the evaluation document. Qualitative data garnered from the 2001-2007 Agroecosystems Analysis daily evaluations were also analyzed to locate and categorize central factors essential for the development of an experiential learning environment (N=140).

Study participants consisted of students and instructors who participated in Agroecosystems Analysis. A matched study design method was utilized, with matched subjects serving as the control group to assist in the formation of baseline comparisons (N=66).

Quantitative responses were collected and analyzed statistically using item analysis and ANCOVA. Qualitative responses were coded in accordance with grounded theory research practices. Although there was no significant difference between the responses of the course participants and the control group, five causal conditions were

identified as playing a major role in creating an experiential environment more conducive to behavior change: hands-on experience, emotional response, human interaction, self-efficacy, and intensity of experience. These causal conditions formed the initial grounded theory model.

Based on the research conclusions, five additional causal conditions were added to create a more comprehensive, effective model for creating an agricultural environment more conducive to experiential learning: length of course, appropriateness and rigor of curriculum, learner-centered curriculum, ongoing education, and metacognitive processes. A revised grounded theory model was presented, and recommendations for future research were identified.

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CHAPTER I

Introduction

The world is constantly changing. Retreating sea ice, eroding coastal edges, shifting vegetation zones, and melting glaciers are just a few indicators of environmental change (Brigham, 2007). In addition, many individuals are faced with polluted air and water, contaminated soil, and soil erosion that impact their day-to-day lives. What forces are causing these changes? Faced with natural changes and human-enacted modifications, the world is left to make adaptations in response to these alterations. What role have agricultural systems played in these environmental changes? Are agricultural systems to blame for the degradation of the natural environment?

The purpose of this study is to evaluate and describe the impact of a summer travel course in agroecology. The Agroecosystems Analysis Course (AAC) (see Appendix A) was developed to provide students with an interactive environment for exploring the complex concepts of sustainability of agroecosystems. Students travel to farms and other agricultural sites of significance in Iowa, Nebraska, South Dakota, and Minnesota to explore the different aspects of an agroecosystem, including social, production, environmental, and economic factors (Wiedenhoeft et al., 2003). Throughout this chapter, current agricultural and environmental trends were explored, a need for increased agricultural and environmental literacy was covered, and an experiential learning environment for education in this content area was suggested to provide a context for this study. The researcher presents a summary of related literature in the areas of experiential learning, agroecology, models of agroecology, and the relationship

between agroecology and experiential learning to provide readers with a background for understanding main concepts presented throughout the study.

Background to the Study

According to Donald and Evans (2007), agriculture is a leading causal factor in the overall decline of ecological diversity and wildlife populations. Large land areas are being cleared for agricultural activity, causing disruption of ecological habitats, and leading to increased levels of environmental stress, particularly on soil and water resources and wildlife populations (Donald & Evans, 2007). Although agricultural production in some areas of developed nations is decreasing due to land loss, production levels in developing countries are on the rise, and currently represent 67% of the overall agricultural productivity of the world (Food and Agriculture Organization of the United Nations, 2007).

Despite the degrading effects of agriculture on the environment, food production is the primary focus of world agriculture production. With a growing world population, farmers continue their attempts to increase yields per acre. While the world population grew an average of 1.4% in 2006, world food production only increased by 0.9% (Food and Agriculture Organization of the United Nations, 2007). This discrepancy suggests the need for farmers to continue to strive for increasing yields. However, the state of ecosystems and the environment must be taken into account in this effort to increase agricultural productivity.

Agricultural Education

Education about these timely agricultural topics is a necessity in order to combat the negative effects of agricultural production and make strides in productivity and

overall food security (McCalla, 1998). However, in many agricultural areas around the world, a basic education is less readily available and illiteracy rates remain high when compared to urban populations. There is a general lack of appreciation in the general public about where food comes from and how it is produced. What contributes to this rural agricultural literacy gap?

Ackery (1999) suggests a number of broad factors that limits the dissemination of agricultural knowledge to rural populations, including a lack of global cooperation in education, restrictive educational nationalism, globalization of some educational content, and narrow disciplinary approaches. These factors are explored in an attempt to garner a worldwide understanding of a need for agricultural education, even if only at the local level.

Lack of Global Cooperation

In order to improve education on a global scale, cooperative efforts are a must. Physical distance between countries is a major limiting factor in the global cooperation of agricultural education institutions and other agencies (Ackery, 1999). In addition, fees associated with professional organization membership limits some farmers from becoming involved in potentially helpful and innovative industry groups (Ackery, 1999). Organization-specific missions associated with specific agricultural audiences can also contribute to the lack of global cooperation in the agricultural industry. For example, the Food and Agriculture Organization of the United Nations focuses a great deal of information on developing countries while the Organization for Economic Cooperation and Development works primarily with developed nations (Ackery, 1999). Language differences can also restrict cooperation. Electronic communication is a current force

that may counter some of these traditional limitations to information exchanges and understanding.

Educational Nationalism

National pride is a very powerful tool in building numerous aspects of a country. However, educationally speaking, nationalism can be more of a constraint than a helpful agent (Ackery, 1999). Countries must explore the most valid informational toolkits possible, despite their country of origin, moving from an inward approach to an outward quest for timely, sound, valid, and relevant agricultural information.

Globalization of Educational Content

Agriculture is a global industry. Based on this premise, developing a global view in regard to agricultural production, trade, and practices is necessary in attempts to create a more globally-oriented agricultural population. Global skills, perspectives, and an overall appreciation for global differences are prerequisites for individuals wanting to make a professional and personal impact in the diverse agricultural industry (Ackery, 1999). In turn, a more cooperative and open-minded agricultural education effort can be undertaken to create an educated world population.

Narrow Disciplinary Approaches

The agricultural industry is highly diverse. In order to develop an appreciation for global agriculture, one must develop a broader sense of the agricultural industry (Ackery, 1999). Agricultural production is heavily impacted not only by local weather, trade, and production factors but also by foreign agricultural occurrences. Producers must develop their global thinking skills while refining their local production techniques. If this is

done, it is possible to develop more complete, educated, and prepared agricultural thinkers.

It is clear that education is a key component in developing a higher rate of literacy in agricultural sustainability. However, how can these educational strategies be disseminated at the local level? In essence, what can be done to incorporate these larger, global concepts into the lives of all individuals?

Agricultural literacy is a key factor in breaking down large, global issues into bits that can be handled by farmers and everyday consumers, and it may help to reconnect them. According to Roth (1992), a commonly held societal belief is that the formal education system is responsible for educating students on the importance of environmental stewardship. As a result, teachers are primarily held responsible for teaching the basics of environmental education and must create a learning landscape conducive for the integration and application of environmental and agricultural sustainability practices. Basile (2000) suggests that this environmental education should begin in childhood, when individuals are first beginning to form opinions and make decisions regarding their actions in the natural environment. At this level, agricultural and environmental education should encompass all components and teaching strategies that encourage behavioral changes, cognitive development, increased motivation, and heightened problem-solving abilities in attempts to create lifelong learners in environmental and agricultural education (Poudel et al., 2005). The recent popular book *Last Child in the Woods* suggests that children today are increasingly isolated from their natural environment, and this does not bode well for future concern and care for the natural world (Louv, 2005).

Vaske and Kobrin (2001) suggest the need for a personal connection to an environmental setting when developing environmentally responsible behaviors. In creating this environment conducive to learning, the need for a more enriched, personal, and hands-on learning environment filled with real-life experiences is useful (Alroe, 2000). Often referred to as experiential learning, this strategy designed by educators is able to integrate current, real-life happenings backed by textbook frameworks in creating more meaningful opportunities conducive to behavior changes.

Experiential Learning

Increasing opportunities for cooperative, global, and sound agricultural education is the first step in developing educational tools to assist the global, rural population in learning more about food production. However, what educational practices will be used in applying these newly found agricultural production practices and their environmental knowledge to the real world? Kolb's model of experiential learning demonstrates the creation and use of learned knowledge as a result of direct experience (Kolb, 1984). Through this model, a learner moves from a concrete definition of a topic to an experiential application of the concept in various situations, all a result of direct experiences.

Through Kolb's model of experiential learning, one is able to transfer learned knowledge to applied knowledge. However, this application of agricultural and environmental content does not happen without an appropriate transport medium. Hungerford and Volk (1990) developed a list of requirements necessary to initiate the process of experiential learning specifically in environmental education settings. In order

to provide individuals with the opportunity to learn in an environmental setting, one must be:

- Provided with a curriculum to learn important environmental and agricultural knowledge;
- Provided with an instructional setting that promotes the application of learned skills and the development of self-efficacy;
- Taught environmentally pertinent concepts and their interrelationships with other environmental entities. In addition, farmers must be able to see the connection between themselves and specific environmental changes or actions;
- Provided with educational opportunities to achieve some sort of environmental sensitivity in attempts to enact a behavior change; and
- Provided with opportunities to explore and investigate timely issues and the opportunity to reflect on the application of skills learned from these issues (Hungerford & Volk, 1990).

Research Questions

This study described and evaluated student perceptions of one such vehicle for experiential learning in the field of agroecology. Specifically, this study was designed to answer the following research questions:

1. Do AAC experiences result in changed student a)perceptions and b)behaviors?
    - Null Hypothesis: Course participants will not experience changed perceptions or behaviors as a result of participating in the AAC.

2. What teaching/learning experiences present within the AAC are most likely to contribute to a positive learning environment conducive to attitudinal and behavioral changes?
3. To what extent do the qualitative daily evaluation responses completed during the summer course confirm the quantitative survey results?

Data Collection Methods

Research questions were addressed via a mixed methods approach, with a written survey comprised of both quantitative and open-ended questions serving as the evaluation document. Qualitative data garnered from the 2001-2007 Agroecosystems Analysis daily evaluations completed during the course were also analyzed to locate and categorize central factors essential for the development of an experiential learning environment. In this manner, participants were able to clearly assess the class in their own words, through the use of evaluations comprised of open-ended questions (Creswell & Plano Clark, 2007). This triangulation validating quantitative data model is best utilized when a researcher desires to strengthen quantitative data with written answers from open-ended questions (see Figure 6) (Creswell & Plano Clark, 2007).

Study participants consisted of all students and instructors who participated in Agroecosystems Analysis. A matched study design method was utilized, with matched subjects who were not participants serving as the control group to assist in the formation of baseline comparisons.

Significance of Study

This study was significant for a number of reasons. This study examined a particular course in agroecology to determine changed behaviors, if any, present within

students as a result of the class. Agricultural sustainability is important, as the main focus of agroecology is to create a balance of environmental, social, economic and production factors while continuing to supply food to the world population. In addition, if students experience positive changes in behavior, a stronger case can be presented in the area of the need and appropriateness of an experiential learning environment in agricultural sustainability.

This study examined a course in agroecology to determine if it is a viable model of experiential learning. Environmental education is best taught in a personal, hands-on, experiential environment (Alroe, 2000). Therefore, it is important to examine this specific course to determine if it serves as a viable model for teaching agricultural sustainability, thus providing the opportunity for Agroecosystems Analysis to serve as a model program that can easily be replicated in a variety of settings to increase agricultural literacy. If this intensive travel course proves to create perceived behavioral changes among participants through experiential education, the AAC will serve as a class worth replicating to increase agricultural sustainability awareness and education.

Furthermore, this study shed light on teaching and learning experiences that provide an environment more conducive to attitudinal and behavioral changes. Much research has been done on the different stages of experiential learning. However, this paper suggested different teaching and learning experiences that create a situation better suited for encouraging student changes while they participate in a course on agroecology. In this manner, these different teaching and learning experiences can be included in a variety of courses to create an environment more conducive to behavioral changes.

Currently, no comprehensive review of the AAC exits. As a result, this study looked to evaluate the course to provide helpful information in fine-tuning course experiences and activities to provide a more inclusive, interactive, and experientially-driven course. In this manner, instructors are turning to student experiences and perceptions to develop a more student-driven, instructor-facilitated class. If significant behavioral changes are perceived by participants, this study will emphasize the definite need for increased agricultural sustainability programming in a variety of environments. Based upon this need, the AAC can serve as a model course in teaching and creating positive behavior changes in agricultural sustainability.

In a field dominated primarily by quantitative research, this study is important because it utilized a mixed methods research design. Through this mixed methods research approach, quantitative survey results were enhanced and expanded with the collection and inclusion of more detailed qualitative data. The creation of a model identifying themes that assist in creating an environment more conducive to behavior change in the area of agroecology demonstrates this need for mixed methods research.

Definition of Terms

The following terms are defined to encourage unity in meaning and understanding throughout this study. Those terms not followed by a formal citation were developed by the author in accordance with current research and practices.

- *Agriculture*: a combination of ecosystems manipulated by humans to encourage the production of food and fiber products in response to human demands and current world issues (Olson & Francis, 1995b).

- *Agroecology*: a field of study that analyzes the combination of biological, chemical, physical, ecological, and cultural practices and their impacts on the productivity of the system (Gliessman, 2004).
- *Agroecosystem*: one unit of agroecology, where biological, chemical, physical, ecological, and cultural practices intersect and are analyzed according to productivity and other indicators.
- *Experiential Learning Theory*: a theory that combines direct experience, reflection, and application to aid in individual development (Priest & Gass, 1997).
- *Sustainability*: a term used to represent an agroecosystem that has remained stable throughout time despite various social, ecological, and economic pressures (Altieri, 1987).

This chapter outlined the need for increased agricultural and environmental education. Specifically, current agricultural and environmental trends were explored, a need for increased agricultural and environmental literacy was expressed, and an experiential learning environment for education in this content area was suggested to provide a framework for the outlined research questions. Chapter II provided a review of pertinent literature in the areas of experiential learning, agroecology, agroecology models, holonistic approaches to agroecology, and AAC History.

CHAPTER II

Literature Review

This review of literature established a background of experiential learning theories and practices and their relations to agroecology. It then analyzed different models of assessing the strengths and weaknesses of an agroecosystem. The review finally looked at the goals and history of a specific course in agroecology: Agroecosystems Analysis. To garner a better organizational overview of the literature review, refer to the following literature graphic organizer (see Figure 1).

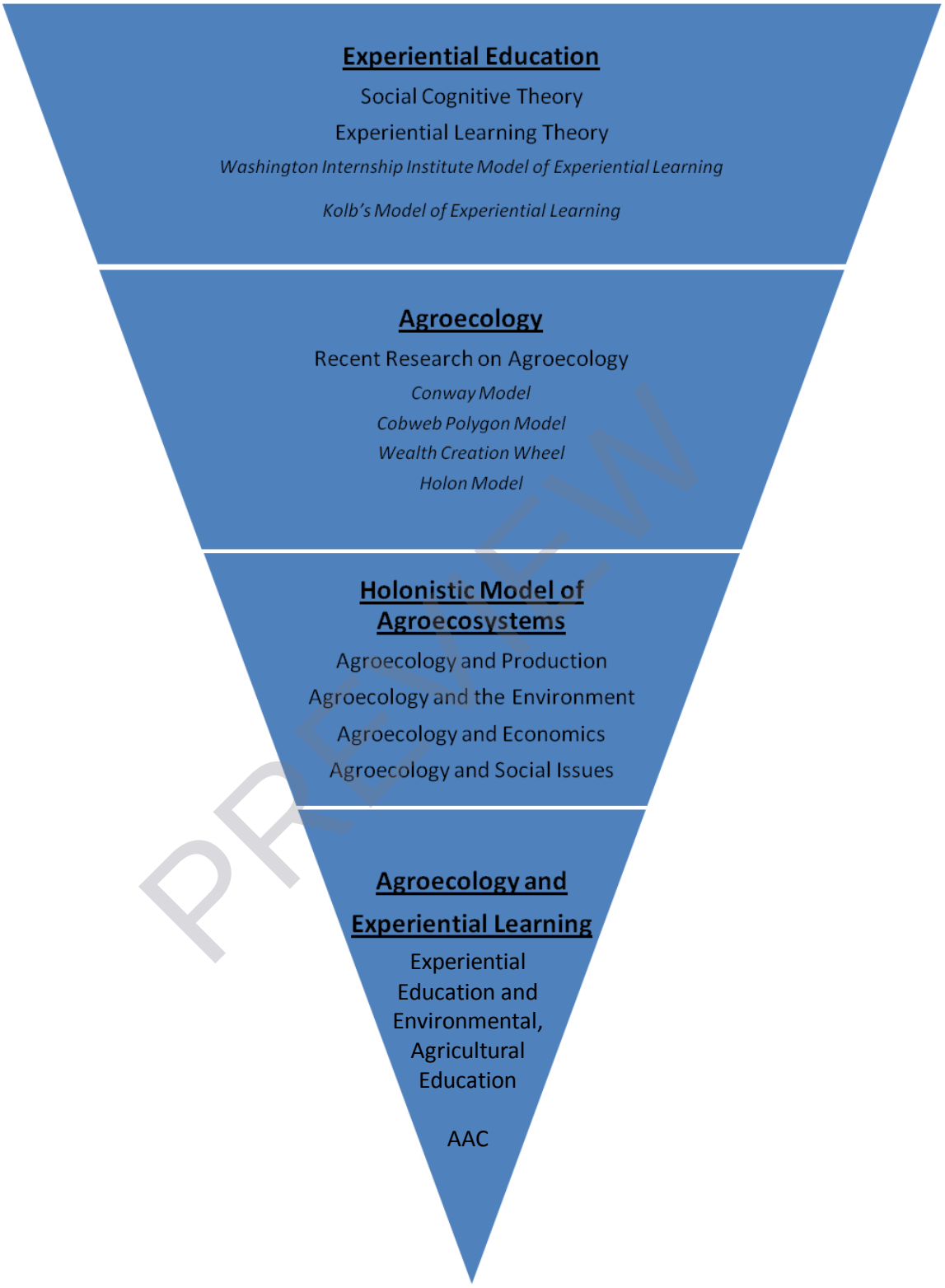

Figure 1. Literature Graphic Organizer.