

Foundations of Experiential Education as Applied to Agroecology¹

Shannon Moncure² and Charles Francis²
University of Nebraska – Lincoln
Lincoln, NE



Abstract

An overview of historical roots of experiential education provides insight from pioneer educators including John Dewey, Kurt Hahn, Paulo Freire, and David Kolb and how their innovations inform the design of contemporary learning landscapes. Clear definitions of experience, of learning, of reflection, and of systems approaches are needed to facilitate communication among people in different disciplines. The integration of production, economics, environmental, and social dimensions in an analysis of complex systems further complicates an already uncertain situation that is open to the influence of political and power structures at the local level and above. The applications of innovative experiential learning strategies in agroecology are explored, based on historical and multi-faceted perspectives. The goal is to create and immerse students in a learning environment that will develop their capabilities to work closely with instructors and clients in order to graduate as broad, articulate, and committed people who are dedicated to responsible action. Although the applications described are from agroecology, we maintain that this approach to education is relevant for other disciplines that are important to development of human activity systems where the challenges are biological, economic, and social.

Keywords: integrative education, systems learning, practical education, learning landscapes

Introduction

Experiential education is an effective method of holistic teaching, structured within a framework that promotes student autonomy, individual learning, and learning through doing. This strategy is consistent with the teachings of John Dewey (1897) more than a century ago. Experiential learning also provides a useful opportunity to examine power issues in education and in society, and to work toward a greater social justice (Freire, 1973). In summary, experiential education allows students to discover meaning in their own lives and in the world around them, helping them meet one of the key goals instructors often pursue in designing a learning landscape. This paper explores the historical foundations of experiential education as they apply to developing contemporary education programs in agroecology.

To many instructors who use constructivist or active learning methods, the roots of experiential education remain a mystery. Teachers often intuitively use these methods without really exploring the literature or recognizing this as a formal field of study in education. Many equate “experiential” with an outdoor experience, a farm field trip, or an instructional visit to a food processing facility, and may consider that these experiences need less pedagogical preparation and planning. More than an activity to get students into the fresh air or avoid detailed preparations for class, the experiential learning activity should have clear learning goals, structure to maximize the value of the event, and explicit reflection and evaluation. Learning more about the history of such education may help inform both the planning and success of this type of learning experience.

In some ways, experiential education is still its own field with a special set of theorists and practitioners, working sometimes alongside but more often outside the scope of conventional education. In agroecology, although we do use internships, shadowing professionals, and work-study as activities that contribute practical experience to what is learned in the classroom, and the combination of agriculture and ecology in our field means a number of active lessons are easily available to us in the form of field trips and labs. However, both the breadth and depth of this type of learning could be greatly expanded even within agroecology (Lieblein et al., 2005; Østergaard et al., 2010; Francis et al., 2010). As we prepare for experiential educational opportunities in agroecology, we base our planning on much of the literature reviewed here.

In order to more fully understand experiential education, in the study of agroecology and in general, it is useful to examine its basic foundations. What are the historical and theoretical influences and documented applications? How have university culture and public policy affected educators' general interest in using these methods? What, exactly, is experiential education ... and experiential learning? Finally, how can this learning strategy be used more effectively in agroecology, the study of the ecology of food systems that embraces the production, economic, environmental, and social complexity of this vital sector of human activity (Francis et al., 2003)?

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²Department of Agronomy and Horticulture

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A useful understanding of experiential education can be found by examining the educational research in this arena, considering the types of learning that have been explored, and determining what questions have been asked in the past and in the present context. Most useful to the agroecology instructor is a consideration of current issues where experiential learning can provide insight into design of contemporary learning landscapes. How could we use this historical information and present practice to do a better job of designing future learning environments?

Here we explore the historical perspective through examining contributions of John Dewey, Kurt Hahn, Paulo Freire, and David Kolb, as well as the experiences of several influential groups who currently use experiential learning methods. In defining experiential education, we explore the meanings of experience and reflection, as well as the roles of educators and students in meeting the explicit goals in an agroecology education program. Understanding how theory and research in the field have been translated into practice and experience is one of the most useful exercises for today's instructor, and deciding how we can evaluate the outcomes of experiential learning is crucial if we are to fit this into our current institutional framework. Although the paper is focused on higher education and specifically on agroecology, we believe the practical applications are equally important in secondary and primary educational settings, and in other practical fields of study. We conclude with reference to current issues in farming and food systems, and to how agroecology can effectively address the complexity and uncertainty of the future through experiential education by building on the foundations established in other fields.

Historical Influences in Experiential Education

Influence of John Dewey

We recognize that experiential learning has a long and rich tradition in most cultures, often associated with traditional gender roles, as boys learned herding and hunting from fathers and girls learned crops and cooking from mothers. One of the most influential thinkers in the modern academic incarnation of experiential education was John Dewey (Carver, 1996, 1997; Hopkins, 1994; Itin, 1999; Katula and Threnhauser, 1999; Trigg and Balliet, 1997). Dewey began his career in philosophy near the end of the 19th century, a time during which philosophy and psychology were closely related and were often intertwined in courses for training young minds. From his earliest writings, Dewey established himself firmly in the realm of the practical, as reflected in his pragmatic theory that “argued that thinking and acting should be considered as one coherent entity and not as separate endeavors” (Null, 2000). For example, in alignment with the U.S.

progressive education movement, Dewey not only believed that “education was ... the central part of preparation for participation in a community” (Itin, 1999), but on a larger scale, “was also concerned that students become active participants in American [sic, U.S.] democracy” (Katula and Threnhauser, 1999). Further, he believed that practical experience was the best preparation for young citizens.

Although Dewey had a high level of respect for individuality and experience, this was mixed with the pragmatism of need for organization and structure. In *Experience and Education* (Dewey, 1977), he addressed the educator's responsibility to make choices of the best experiences for the student as well as a structure that could best support the process. Dewey observed traditional school subject matter as rooted in choices made based on success of past students, while ignoring the needs of the students presently being educated. As a colleague at University of Nebraska said recently, “We need to teach the students who are in our classes, not those we wish were in our classes.” Rather than looking to the school system for a selection of subject matter, in which “the material to be learned was settled upon outside the present life experience of the learner” (Dewey, 1977), Dewey was convinced that subject matter should begin in each student's present situation. Thus each new learning experience is built on the student's current reality, and any new experience becomes part of the student's lived knowledge. For this reason, in agroecology we start each new group with a shared experience on the farm, helping to create common ground on which to build subsequent learning activities (Østergaard et al., 2010).

Dewey suggested that education should not be unrelated to the past, and stressed that the most important connection was that of the student and not the teacher. Integrating students' past experiences, even when those experiences are not directly connected to agroecology course syllabi, builds a stronger foundation for those students as they begin acquiring new field-specific knowledge and skills. “Policies framed simply upon the ground of knowledge of the present cut off from the past are the counterpart of heedless carelessness in individual conduct. The way out of scholastic systems that made the past an end in itself is to make acquaintance with the past as a means of understanding the present” (Dewey, 1977). Dewey suggested a dialectical process of learning, by “integrating experience and concepts, observations and action, learning and being taught” (Katula and Threnhauser, 1999). In his laboratory school at University of Chicago, both students and teachers learned through experience. We see this today as essential to experiential education in agroecology, when we use 'open-ended cases' – learning situations in which answers are not known by farmers, instructors, or students – where all are searching together to derive relevant questions and design potential scenarios for the future (Francis et al., 2009).

In this search for relevance, Dewey interpreted experience through his “principle of interaction” that depicts experience as a “result of the interaction between the student and the environment” (Carter, 1997), and his “principle of continuity” where experience “both takes up something from those which have gone before and modifies in some way the quality of those which come after” (Dewey, 1977). Thus each experience does not stand alone, but must be viewed within a framework constructed of all experiences that the student has had, and will have in the future. It is all part of an integrated whole, and nothing is isolated ... including academic, personal, or social learning. Today we call this learning in context, an essential part of phenomenon-based learning (Østergaard et al., 2010).

To expand on the importance of the holistic nature of learning, and in the spirit of Dewey's theories of learning, Carver (1997) suggested that the educational value of an experience “takes into consideration not only the explicit curriculum but also the lessons people acquire by participating in activities ... lessons acquired collaterally as well as formal curriculum are the substance of students' learning.” How students interact with the environment in which they are immersed, within an educational experience, and how the experience relates to past and future experiences determines the learning value of the experience. In the same vein, Dewey considered the role of habit in learning and distinguished “between habit, ‘the great flywheel of society’ that enables society to function predictably when faced with recurring challenges, and the habit that tyrannically traps us into behaving in a particular way without thinking of alternatives” (Beard and Wilson, 2002). Recently Barker (2001) described this as “paradigm paralysis,” in which certainty prevents the mind from opening to new possibilities. Dewey recognized the unconscious influence of habit on thinking and learning, and how prior assumptions and other cultural influences were important but not often discussed explicitly in most traditional educational situations. Taking on such influences opens new possibilities to support students' exploration of not only alternate habits but also futures, and the concrete planning (recently conceptualized as a ‘learning ladder’) necessary to make those futures real (Lieblein et al., 2007). In order to be able to work with students in this way, we must understand and incorporate into our planning those students' habits of learning, often highly influenced by their less open-ended educational experiences.

Outdoor Education and Kurt Hahn

Related to agroecology and farming systems is experiential learning in the natural environment. A near –mythical figure in the history of experiential education, especially outdoor or wilderness education, is Kurt Hahn, the designer of Outward Bound. For his first school in Germany, Hahn created a set of

principles in 1930 which were later expressed in Outward Bound as the Seven Laws of Salem (Salem School, n.d.):

1. Give children opportunities for self-discovery
2. Make the children meet with triumph and defeat
3. Give the children the opportunity of self-effacement in the common cause
4. Provide periods of silence
5. Train the imagination
6. Make games important but not predominant
7. Free the sons [sic] of the wealthy and powerful from the enervating sense of privilege

Although directed toward youth and children, the application to higher education and agroecology is apparent, as the principles relate to how we work in farms and communities and the ways we urge students to involve all their senses in embracing the real world environment.

Outward Bound's roots were influenced by Hahn's belief in preparing youth to “speak their convictions” (Smith, 2001) and by his previous educational experiences in Germany and England. “Concerned that society was crumbling, he designed Outward Bound to ‘protect youth against a diseased civilization’ in which there existed a lack of ‘care and skill,’ ‘enterprise and adventure,’ and ‘compassion’” (Carver, 1997). This combination of beliefs about the goals of education and opportunity resulted in what many experiential educators think of as the foundation of wilderness education – the most widely recognized form of experiential education. Encouraging growth in students' “care and skill, enterprise and adventure, and compassion” have direct applications in agroecology education. A solid program of agroecology study will explicitly incorporate ethics and values into the individual's learning journey in farming and food systems. (Lieblein et al., 2007).

Hahn's stated goals for education and his methods of reaching those goals reflect his belief that the “foremost task of education [is] to ensure the survival of these qualities: an enterprising curiosity, an undefeatable spirit, tenacity in pursuit, readiness for sensible self-denial, and above all, compassion” (HIOBS, 1990). James (1995) outlines Hahn's “four central elements ... to education”:

1. Using a ‘training plan’ in which students would contract around specific personal goals and a code of responsibility
2. Structuring the use of time to gently impel students into action
3. Placing difficult challenges before students that involved a perceived level of risk and adventure
4. Using the group to mirror a mini-community and using shared experiences to help them begin to work together

These aspects of Hahn's philosophy are clearly reflected in the writings and guiding tools of today's experiential educators. Our application in open-

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ended case projects on farms and in communities places students in socially and intellectually challenging situations that parallel the physical challenges of Outward Bound (Francis et al., 2009).

Social Change and Paolo Freire

A voice often connected with critical philosophy in experiential education is that of Paolo Freire, “a Brazilian educator whose theory of adult education [was] set within a larger framework of radical social change” (Merriam, 1987). Freire’s (1973) “conscientization” was designed to raise social issues imbedded in conventional educational systems, in order to provide alternatives that could improve the conditions of all, especially the less favored in society. As summarized by Burbules and Berk (1999), “Freedom, for Freire, begins with the recognition of a system of oppressive relations, and one’s own place in that system. The task of critical pedagogy is to bring members of an oppressed group to a critical consciousness of their situation as a beginning point of their liberatory praxis. Changes in consciousness and concrete action are linked.”

Praxis, as defined by Freire, is “the authentic union of action and reflection” (Burbules and Berk, 1999), with definite connections to the key elements of experiential education. An alignment between experiential educators and critical theory is constructed through Freire’s writings. Recognizing the key value of experience, he believed that “to attend to the experience of people is to empower them, to give them a voice, to challenge and disrupt established arrangements, to engage in dialogue and thus to evoke what Paulo Freire (1972) called ‘generative themes’ that point to change and reconstruction, whether in a classroom or in a society” (Hopkins, 1994). In experiential education, Freire’s work illustrates the power of experience, both in learning and in recognition of agency – the ability of people to act independently and make their own choices. Freire insisted that people learn the value of working with others, rather than doing things for (or to) others (Claus and Ogden, 1999). An awareness of social and cultural issues surrounding education and the importance of validating the strengths each individual brings to an educational experience has become more widely discussed and accepted in experiential education over the past few decades.

A key tenet of agroecology education is the involvement of students in the farming and larger community. Far from simply getting students out of the classroom, this involvement connects students with real-life issues and struggles of farmers and other community members, and prepares them for the work they will take on after their schooling is complete. It is imperative, in such situations, that students recognize Freire’s emphasis on the agency and perspective of the community members with which they work. Truly listening to clients and partners is a skill and collaboration tool, and cannot

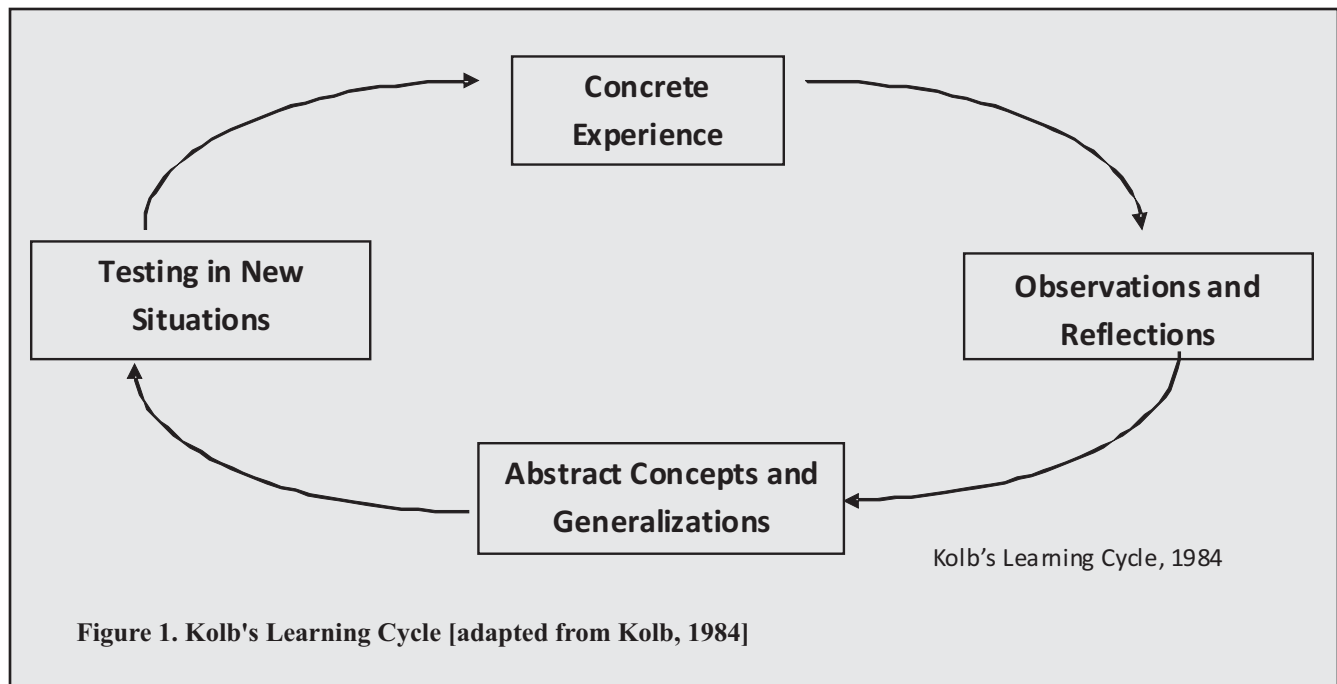
be neglected in the development of agroecology professionals. Further, Freire’s theory of praxis is exemplified in the experiential agroecology lesson, in which academic theory and the students’ and partners’ experience combine to create new understandings for all.

David Kolb’s Learning Cycle

Through the twentieth century, many educators have explored the role of experience in learning. Cognitive scientist Davis Kolb expanded on Dewey’s work, focusing on the realm of higher education, with a goal “to change the educational environment in this country [U.S.] to meet the needs of the new populations entering higher education: non-traditional students, minorities, and the poor, whose concrete experiences and socialization have not prepared them for traditional textbook approaches to learning” (Katula and Threnhauser, 1999). Kolb’s assertion is that experiential learning “allows for the development of a community-based body of knowledge to be construed from the multiplicity of experiences brought into the contemporary classroom” (Katula and Threnhauser, 1999), aligning with Dewey’s ideas about individualized approaches to subject matter and curriculum.

Kolb explicitly addressed the links between school and work, and between contemporary learning and competency testing. Kolb is most well-known for his experiential learning model, developed in 1975 (Kolb, 1984). The four main sections of the model are often depicted in a circle, though the learning cycle was first described as a spiral (Smith, 2001). Typically the cycle begins with a *concrete experience*, then moves through *observation and reflection*, *forming abstract concepts*, and *testing in new situations*, or experimentation (Kolb, 1984). “Knowledge results from the combination of grasping experience (concrete and experimental) and transforming it (conceptualization and reflection) ... for Kolb, learning actually begins with experience” (Katula and Threnhauser, 1999). An application of the approach is our use of shared student farm experiences, starting in the first week of class in agroecology (Lieblein et al., 2007). Kolb’s description of the use of his experiential learning cycle highlights his emphasis on work-school relationships:

The experiential learning model pursues a framework for examining and strengthening the critical linkages among education, work, and personal development. It offers a system of competencies for describing job demands and corresponding educational objectives and emphasizes the critical linkages that can be developed between the classroom and the ‘real world’ with experiential learning method. It pictures the workplace as a learning environment that can enhance and supplement formal education and can foster personal development through meaningful work and career development opportunities (Kolb, 1984).



The links to Dewey's ideas about linking learning with experience are obvious. Kolb's work diverged from Dewey in an exclusion of habit from both his experiential learning model and the underlying thinking behind the model. Kolb also did not include Dewey's more explicit connection of experiential learning to social interactions (Holman et al., 1997).

Kolb's experiential learning cycle, while highly popular with education practitioners and theorists, has been critiqued and discussed since its introduction (Anderson, 1988; Askew and Carnell, 1998; Holman et al., 1997; Hopkins, 1994; Miettinen, 2000). Common critiques include the contention that the model does not take into consideration the multiplicities of experiences that Kolb himself has purported to value – that the model is a product of and is workable only for western thinking (Anderson, 1988), that it does not truly reflect the nature of knowledge (Smith, 2001), and that it views the inner life of thinking, learning and knowledge as individual and mechanistic rather than as a social (Miettinen, 2000) or quasi-social phenomenon (Beard and Wilson, 2002). Nevertheless, Kolb's experiential learning cycle has become a starting point for many educational theorists' explorations of experiential education, as well as practitioners' plans in executing experiential learning. Kolb's cycle figures prominently in our design and implementation of active learning on the farm and in the community in courses in agroecology in the Nordic Region (Lieblein et al., 2010).

Other Historical Influences

A number of other historical influences and well-known initiatives have encouraged the growth of experiential education inside and outside of formal U.S. educational institutions. Government programs during the presidency of John F. Kennedy widened

the scope of U.S. humanitarian interaction worldwide, training “citizens of the world who could work in the world through venues such as the Peace Corps and VISTA” (Katula and Threnhauser, 1999). Study-abroad programs also began to proliferate after the close of the Cold War, further encouraging U.S. students to expand their life experiences.

Calls by many constituencies for accountability and stronger practical education emphasis in higher education have spurred these institutions to provide experiential programs in the form of study abroad, internships and cooperative learning experiences, field experiences, and service learning projects. The American Association of Higher Education (AAHE) has expressed a commitment to experiential learning; in 1995 the chair of the board of directors, Helen Astin, recognized the need of higher education institutions to “connect our research, teaching, and service to the needs of the communities and society at large” (Katula and Threnhauser, 1999). By 2002 this dedication had been realized in the AAHE (now AAHEA) Service Learning Project, consisting of a 21-volume monograph series, in which each volume “discusses how service-learning can be implemented within a specific discipline” (AAHEA, n.d.), and coalition-building meetings that were sponsored by the organization.

The National Society for Experiential Education (NSEE) also explored ways to promote and support experiential education across all disciplines and ages, and within and outside formal educational venues. In 1998, NSEE established its principles of good practice in order to “facilitate experiential education's goal of integrating the classroom and the out-of-classroom experience” (NSEE, in Katula and Threnhauser, 1999). Additionally, NSEE provides educators with resources, collaboration, and consulting services to support learning through experience for intellectual

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development, cross-cultural and global awareness, civic and social responsibility, ethical development, career exploration, and personal growth (NSEE, 1998).

The Association for Experiential Education (AEE) provides similar activities and resources, as well as awards, education-related jobs, and an accreditation specific to adventure programs. The accreditation provides guidelines for demonstrating excellence by making sure that a program “has an educational mission, clearly defined and appropriate objectives, maintains conditions under which those objectives may be achieved, and appears to be achieving them” (AEE, 2001). Successful completion of the accreditation process provides recognition by potential participants and employees, outside granting and monitoring sources, and public lands regulatory agencies.

These historical precedents and practical applications combined through the last century to create a new field dedicated to individuality, strengthening community, and experience. Throughout decades of waxing and waning financial support, experiential learning programs have continued in higher education. In 2002, Disney Corporation alone reported working with 8,000 interns and cooperative students, from 450 colleges and universities throughout the U.S. and Puerto Rico (Gold, 2002). In 1996, the Directory of College Cooperative Education Programs listed programs in 460 colleges through the U.S. (NCCE, 1996), and 99 U.S. undergraduate engineering and engineering technology college programs, for example offered a cooperative experience to their students in 2004 (Mathews, 2004). In 2008, the Corporation for National and Community Serviced reported: “at least a quarter of all higher education institutions and more than half of all community colleges [in the U.S.] have adopted service learning programs, (CNCS, 2010). Philosophers and practitioners are cited today by experiential researchers and educators in addressing the challenges of contemporary issues, including the never-ending questions surrounding definition of experiential education, experience, and sustainability. Grounded in the ideas of Dewey, Hahn, Freire, Kolb, and others plus the practical applications in the Peace Corps and now in educational programs in agroecology and active learning, a clearer picture of the potentials of experiential education is emerging.

Definitions in Experiential Learning

To put experiential learning into the present context it is useful to explore definitions of experiential education, of experience, of reflection, and of learning, as well as how we are redefining the roles of educators and placing more responsibilities on students.

What is experiential education?

Many confuse this term with experimental

education, while others think only of wilderness or Outward Bound experiences, which provide useful concepts and applications but are not inclusive of all the present uses of these methods. Others confuse experiential education with experiential learning, and may use the terms interchangeably as we have in this review. Because of the diversity and richness of definitions, it is important to define what is meant by the concept, and to make this explicit in any article or program.

The Association for Experiential Education (Luckmann, 1996) constructed what has become a well-known and accepted definition: *Experiential education is a process through which a learner constructs knowledge, skill, and value from direct experiences.*

Even with this publication, the editor of the Journal of Experiential Education expressed reservation about the concept, stating that “Hopefully, newcomers to the journal will pick up an issue and by reading what is published, begin to define and describe for themselves what is implied by the phrase “experiential education” (Luckmann, 1996). How appropriate that even the definition is subject to exploration and discovery! As derived from this process, a number of key principles emerge:

- Experiential learning occurs when carefully chosen experiences are supported by reflection, critical analysis, and synthesis.
- Experiences are structured to require the learner to take initiative, make decisions, and be accountable for the results.
- Throughout the experiential learning process, the learner is actively engaged in posing questions, investigating, experimenting, being curious, and solving problems, assuming responsibility, being creative and constructing meaning.
- Learners are engaged intellectually, emotionally, socially, soulfully, and/or physically. This involvement produces a perception that the learning task is authentic.
- The results of the learning are personal and form the basis for future experiences and learning.
- Relationships are developed and nurtured: learner to self, learner to others, and learner to the world at large.
- Because the outcomes of experience cannot be totally predicted, the educator and learner may experience success, failure, adventure, risk taking, and uncertainty.
- Opportunities are nurtured for learners and educators to explore and examine their own values.
- The educator's primary roles include setting suitable experiences, posing problems, setting boundaries, supporting learners, insuring physical and emotional safety, and facilitating the learning process.
- The educator recognizes and encourages spontaneous opportunities for learning.
- Educators strive to be aware of their biases,

judgments, and preconceptions and how they influence the learner

- Design of the learning experience includes the possibility to learn from natural consequences, mistakes, and successes.

- Priority or order in which each professional places these principles may vary (Luckmann, 1996).

This definition and list of principles is all-encompassing, yet the very length makes it less than simple to use. A breakdown of the attributes and synthesis into a more easily digested format appears desirable to most authors. Keeping in mind the basic definition from AEE (1994), “Experiential education is a process through which a learner constructs knowledge, skill, and value from direct experiences,” what can be said about “experience?”

What is Experience?

According to historical and philosophical foundations of experiential education, an experience is something that the student is actively involved in doing. The application of Dewey's philosophy of education required students to work, to move, to be active in their learning – in the literal sense – and required educators to provide learning opportunities based on the students' interests and previous experience (Dewey, 1897). Yet Dewey himself ironically expressed his imprecise grasp of the term: “Experience is a weasel word. Its slipperiness is evident in an inconsistency characteristic of many thinkers” (in Beard and Wilson, 2002).

Current writers in experiential education usually fall along the same lines – both in basic philosophy and in consternation with the concept – and some make the specific point of reiterating the statements of the foundational philosophers. Richard Hopkins (1994) invokes philosopher Charles Sanders Peirce: “Experience is our only teacher. And ... this action of experience ... takes place by a series of surprises.” Further, Hopkins asserts that “True interest, as a quality of attention, expresses itself actively through the body ... experiential learning requires that the learner be free to go out and go after knowledge, integrating the entire sensory apparatus into a unified, experiencing whole.” Direct experience, then, involves the whole learner, and cannot happen through abstract means such as lectures or while sitting quietly at computer desks, but only in authentically engaging and even surprising activities.

Part of the slipperiness of experience lies in its density, as described by Carver (1996): “Experience involves any combination of senses (e.g. touch, smell, hearing, sight, taste), emotions (e.g. pleasure, excitement, anxiety, fear, hurt empathy, attachment), physical conditions (e.g. temperature, strength, energy level), and cognition (e.g. constructing knowledge, establishing beliefs, solving problems).” An experience that takes most of all of these aspects into consideration is not planned lightly. Another concept of slipperiness in experience is its very

personal nature. As it is impossible to climb inside another to understand exactly how she or he experienced a situation or interaction, how can really know the nature of others' experiences? A multiplicity of experiences becomes part of the definition. This discussion underlines the difficulty in knowing how students are progressing in what could be called their internal learning ladder (Lieblein et al., 2007).

What is Reflection?

Since reflection is such an integral component of experiential learning, and is too often ignored in conventional design of learning environments, we invest substantial time here reviewing the concept and practices. Key is Dewey's idea of the intertwined nature, in experience, of thought and action. An experience is neither thought nor action alone, but a link between the two. “... Dewey was able to connect opposites or dualities, e.g. person and nature, subject and object, [and] in this way these polarities become connected and the concept of experience creates an organic whole of continuity, process and situation” (Beard and Wilson, 2002). Malinen (2000) further breaks down the action/thinking of authentic experience into two categories: “Immediate action happens in order to test new constructions, but delayed action indicates that a learner has engaged with what he [sic, she or he] knows.” In both immediate and delayed action, the learning is interested in what she or he is doing, is actively involved in the experience, and is combining action and thought about what is happening and what has happened.

This thinking combined with action in experience is what, in experiential education, may be termed reflection. It could be said that reflection, and its relationship with action, is the most highly recognized idea within experiential education. Certainly, experiential educators are quick to caution that success in experiential situations cannot happen with experience alone; reflection must be an explicit part of the process (Brooks-Harris and Stock-Ward, 1999; Itin, 1999; Kolb, 1984; Raffan and Barrett, 1989; Stremba, 1989).

Building on the spiral nature of Kolb's experiential learning cycle, it becomes evident that reflection may happen at any point during a learning experience. Some authors extol the use of reflection at the beginning of an exercise, in order to prepare students for learning, recall past experience and affirm present knowledge (Brooks-Harris and Stock-Ward, 1999). More often, reflection is suggested for the period immediately after an experience, in order to help students assimilate the experience into their working knowledge, thereby moving students into Kolb's cycle's third step of forming abstract conceptions.

For many experiential educators, especially those working with students over an extended period of time, reflection is a recurring or ongoing process, rather than an isolated event. Students are encour-

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aged to continually reflect, individually or socially, throughout their time together. Stremba (1989) and Raffan and Barrett (1989) both discuss the importance of ongoing reflection in outdoor adventure experiences. Stremba (1989) suggests the following uses for reflection: "... reflection and discussion about self, relationships with other group members, and about the adventure, enriches the entire experience and makes it more holistic," and "... reflection provides the participants with tools to take the experience back home with them." Both goals can be met with meetings, in pairs or in larger groups, to verbally discuss what has happened and what students are thinking about their experiences.

In addition, tools to support individual reflection are valuable: "Journals are a most effective tool for individuals to keep track of their feelings, experiences, insights and changes" (Stremba, 1989). Raffan and Barrett (1989) explored journal reflection more thoroughly by building a research project into a seven-week expedition in Canada's Northwest Territories. Participants' journals were analyzed for journal entry styles and the content of their reflections. Participants were asked to reflect in their journals on a daily basis throughout the expedition. Journal entry styles ranged from quick sketches; daily notations of location, weather, and emotions; and billboard pronouncements ("DEATH TO ALL BLACK FLIES", one participant exclaimed); to extensive prose, poetry, songs, and carefully executed drawings. Maps, free-writes, lists and letters also made appearances in journals as participants found that they fulfilled a particular need. During a U.S. Midwest travel course to farms and historical areas, one student was found in tears as she sat on a rock, writing in her journal, and reflecting on the pre-history of that spot where Native Americans once lived free and in balance with their environment ... and the tragedy of the dramatic transformation of that spot into today's industrial agriculture. Her integration and involvement of values and emotions into her learning will long be remembered by the instructors.

One surprise to Raffan and Barrett (1989) was the lack of theory-testing, or making generalizations to the larger world, that occurred in the journals. A possible explanation for this omission, according to the authors, was the many opportunities that participants had, during the expedition, for verbal theory testing. Additionally, we have also observed in most classes that university students have difficulty generalizing from specific information to the broader or more general application, and there is much to be done by us as instructors to better facilitate this process.

As for content: "...the journal appears to be a powerful tool for self-expression and for documenting personal growth on the trail. The journals allowed individuality to flourish" (Raffan and Barrett, 1989). After analyzing the journals' content, the authors

concluded both that they were safe places for thinking and musing on experience, and that they actually encouraged greater learning throughout the expedition. Trends found in the journal content that suggested this learning benefit included "The shift to visual entries, the trend toward drawing maps, and the gradual development of a sense of belonging on the land..." (Raffan and Barrett, 1989). Part of what made this possible was the integration of a journaling type of reflection throughout the experience, rather than only at the beginning, middle or end.

Dewey's classic definition of reflection has a definite rational slant: "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and further conclusions to which it leads...it includes a conscious and voluntary effort to establish belief upon a firm basis of evidence and rationality" (in Beard and Wilson, 2002, italics added). Other definitions have included more of the emotional side of thinking. Boud et al. (1985) rework Dewey's ideas in such a manner in their description of reflection:

- Returning to experience - that is to say recalling or detailing salient events;
- Attending to (or connecting with) feelings – this has two aspects: using helpful feelings and removing or containing obstructive ones; and
- Evaluating experience – this involves re-examining experience in the light of one's intent and existing knowledge, etc. It also involves integrating this new knowledge into one's conceptual framework (in Smith, 1999).

Most current examples of reflection reflect this type of definition. They can obviously take many typical forms, depending on the situation and the goals of the individual student in keeping a journal of reflections. These can include:

- Analyzing a problem
- Communicating to others outside the group
- Celebrating a success
- Awareness-raising
- Reconstructing an event
- Rehearsals
- Testing of theories
- Working through issues (individual, social, or other)
- Reviewing or assessing the experience (from Greenaway, 2002).

Some faculty are also active in journaling during educational activities, including the time for reflection between specific actions in the field or classroom and in the evening. Often, an instructor keeps detailed notes on activities, for future reference, or observations and reflections on what has been successful and what could be improved. There are as many options for reflection and journaling as there are people who use these techniques.

What is Learning?

Some educators make a distinction between experiential education and experiential learning. While the distinction is small, it can be important in clarifying our understanding of both concepts. Experiential learning can be thought of as individual: “the insight gained through the conscious or unconscious internalization of our own or observed interactions, which build upon our past experiences and knowledge” (Beard and Wilson, 2002). In this sense, learning “rests within the student and does not necessarily require a teacher” (Itin, 1999). Experiential education, while relying entirely on experiential learning as its foundation, “must include or make clear the transactive component between teacher and learner which is absent from the definition of experiential learning,” and “must consider the larger system level issues of education such as the socio-political-economic elements in the learning environment” (Itin, 1999). In this way, experiential education encompasses but is much larger in scope than experiential learning. Experiential education must be a social, and socially aware, undertaking. To implement these ideas requires a readjustment in roles of teacher/educator/instructor and those of the students.

How Do Learning Goals Change the Roles of Educators?

One unique aspect of experiential education is a set of explicit goals. The meaning that students take away from experiences is recognized as both individual and multiple in nature, and in agroecology our students are expected to come away from an experience with better appreciation of how to deal with complexity, diversity and uncertainty, and to learn how to ask relevant questions in the future (Lieblein et al., 2005, 2007; Østergaard et al. 2010). However, “Although the goals of experiential education typically focus on the development of the individual, implicit in this focus is the broader vision of individuals learning to contribute to the larger community and society” (Lindsay and Ewert, 1999), or what Lieblein and Francis (2007) call the capacity for responsible action. Experiential education is also typically planned around “specific physical skills and decision-making abilities” (Lindsay and Ewert, 1999), rather than skills and concepts traditionally viewed as academic.

Related to the dense nature of experience discussed above, the goals of experiential education tend to be holistic, with programs designed to embrace students “as thinking, feeling, physical, emotional, spiritual and social beings” (Carver, 1996); each student is also a teacher, in a sense, with much to contribute to the overall community learning experience. This holistic approach is affected by values that are implicit in experiential education programs: “caring, compassion, communication, critical thinking, respect for self and others, individu-

ality and responsibility” (Carver, 1996). These goals and values, having originally sprung in part from the wilderness and adventure beginnings of experiential education, now influence the many types of programs offered within this broad, varied type of learning experience, including:

- “Job training internships and apprenticeships
- Survival training and rescue training
- Service learning and program focused on advocacy
- Art education and production
- Media production
- Academic-oriented programs
- Community-based support programs
- Early education programs
- T-groups (training-groups; interpersonal dynamics workshops)” (Carver, 1996)

Thus, the values and goals that help define experiential education require a different type of educator or learning leader than those in traditional education programs. “The educator's primary roles include setting suitable experiences, posing problems, setting boundaries, supporting learners, insuring physical and emotional safety, and facilitating the learning process” (AEE, 2010). Lacking here are the traditional roles of the teacher, as purveyor of information or knowledge, or as enforcer, although some of these can still be necessary to encourage students in their journey through the learning landscape. Students are expected to be responsible for their own learning, and are encouraged and supported in their search for meaning. “... The philosophy of experiential education makes clear the context within which [teachers'] knowledge is disseminated ... the learner actively engages in co-creating with the teacher the educational process” (Itin, 1999). The open-ended cases used in agroecology are one example of this process (Francis et al., 2009).

Convincing students that they are in fact responsible for how they approach a topic, what outcomes will be most important to them, and even to participate in how their learning will be evaluated are not small tasks. People are accustomed to being told what to learn and what will be on the exams. Experiential learning as we apply the concept in agroecology represents a major shift in thinking that requires close attention by instructors to create the space for independent learning. At the same time, the challenge to convince instructors that their role as *sage on the stage* should be transformed into one of a *guide on the side* or a *learning leader* is an equally daunting task. As instructors, we have often been strongly influenced by great lecturers encountered in our past, and one could say that we self-selected ourselves to continue in that tradition. Experiential learning requires major changes in attitude and behavior of both students and instructors.

Putting Research into Practice and Evaluating Learning

With the basic definition of experiential education as a foundation, we can further examine the research on experiential education theories and programs. Educational programs, research and the application of results requires integration of foundational knowledge with understanding theoretical frameworks within which present day educational researchers operate. The critical process of evaluation as an integral and continuing component of education is explored. The applications we use in agroecology may serve as examples of the principles of experiential education as described above.

Theory Linked with Practice

Although experiential education is typically viewed as practice-based, and there has always existed a tension between theory and practice in the field (DeLay, 1996; Gass, 1992; Lindsay and Ewert, 1999), pockets of interesting research on experiential education programs and how they link theory with practice have surfaced over the past two decades. The tension around balance has been examined by researchers in the field, in a debate that has yet to be decided.

Michael Gass (1992), in his role of guest editor for AAE's flagship publication *The Journal of Experiential Education*, recognized the "maturation" of the field of experiential education and asked, "...have we positioned ourselves within respective professional communities to produce appropriate change? Or are we...working extremely hard at getting somewhere, but still wondering where it is we are trying to get to?" Gass' suggestion for more productive, professional work was a true integration of practice and theory. This kind of move has proved difficult for a group of educators dedicated to the experience, rather than the "thought experiment." Many have generally acknowledged that an integration of theory into practice, in a manner unique to experiential education's focus on action, will benefit the field as a whole. Constructivist and critical theories have both been suggested as possible candidates for this "synergistic approach."

Evaluating Experiential Education

The theory/practice tension is recognized in a summary of Conrad and Hedin's (1981) large study, the National Assessment of Experiential Education. The authors begin with the following disclaimer:

As experience is too immense, too complex, illusive, even too mysterious a phenomenon to fully comprehend, so also is it the case with what is learned from it. There is no pretense in this report that its tables and numbers have miraculously captured that "sensitivity" which has eternally eluded the poet. The report's more pedestrian aim has been to capture some small particles of experience, to reduce some part of the mystery to a size and form that can be grasped,

understood, manipulated, and from which conclusions may be drawn and lesson learned.

This study came at a time of increasing interest both in accountability in schools, and in meeting those requirements in creative ways. Accordingly, the authors mention support by funding through Spencer and Rockefeller Foundation grants, and the encouragement to begin the project from the Commission on Educational Issues, a group dedicated to assisting public and private secondary schools on cooperative projects.

A key element of the review was forming the methods around the recommendations of a panel of educators from within the 27 programs being studied, programs associated with both public and private schools. Key participants "were responsible for defining the issues to be studied, for helping to select and develop assessment tools, for implementing the research design, and for helping to interpret the data collected" (Conrad and Hedin, 1981). It is both impressive and appropriate that principal researchers of a large-scale study would give up so much power within the project, but perhaps more likely within a field so focused on knowing by doing and in accord with the empowerment of participants, just as we strive to empower and affirm the roles of students in experiential learning situations.

Programs were evaluated for student outcomes in three major areas: psychological, social, and intellectual/academic development, using self-administered survey assessments, as well as student interviews in the intellectual/academic portion of the study. Overall, it can be said that the experiential programs had a positive effect on learning by students in all three areas. The highest impact of experiences on psychological factors was associated with programs seen as "most intensive, most dissimilar from ordinary school activities and, in the case of increased moral reasoning, when there is a combination of action and systematic reflection" (Conrad and Hedin, 1981).

Social development, in this study, included personal and social responsibility, attitudes towards others (particularly adults), and increased interest and action in students' communities and their own career development. While general positive results of experiential programs were found, certain subgroups of programs seemed to have more specific effects. For instance, a strong seminar reflection component had measurable effect on social growth, suggesting that students made specific social gains based on their reflections with others.

While psychological and social benefits are usually a welcome part of any educational program, intellectual goals tend to be paramount in students' and the public's expectations; experiential programs sometimes find it difficult to support claims of intellectual or academic growth. This study, however, found a significant student-perceived gain in academic knowledge during their participation in

experiential programs, especially within three subgroups of programs or students: those programs that included a formal “seminar/reflective component,” and were longer in length, and also with those students who were considered likely to be “disenchanted” with regular classes (students enrolled in alternative programs).

The strongest effect by far was seen in students' personal reports of their individual experiences, rather than any external attribute of programs in general. If students felt that their experiences were “interesting,” that they were “appreciated for doing their work,” were given some amount of autonomy, and were treated as equals to adults in the program, they tended to both rate their experiences as “excellent” or “good,” and to have gains in all three areas measured. (Conrad and Hedin, 1981).

While this study provides a good framework for understanding the potential benefits of experiential education programs, its age and its lack of in-depth description of the programs studied allow it to only provide a general understanding of experiential education and its associated research.

The findings, however, are consistent with our recent experience using end-of-course individual reflection papers written by students in the Norway agroecology MSc program as well as by students in several courses at University of Nebraska. We ask each student to reflect on their own learning style, their role in group activities, and their growth as autonomous learners. What emerges is an intriguing snapshot of the learning process, an additional window for instructors on individual progress on the *internal learning ladder*, and a valuable set of reflections that can help guide the design of future learning activities (Lieblein et al., 2007). In one memorable final oral reflection session several years ago in Norway, we were amazed and saddened by the observation of one student from Italy: “I have been in school for over 20 years, and this is the first time that any instructor has asked my opinions about a course and how to improve it!” Although disturbed by the general testimony on our educational system, we were encouraged by this indication that a safe space had been created in which he was able to voice opinions without fear of judgment.

Applications in Experiential Learning in Agroecology

How do the historical perspectives of Dewey, the physical involvement promoted by Hahn in *Outward Bound*, the social consciousness of Freire, the learning cycle developed by Kolb, and the experiences of other educators impact our design of agroecology learning landscapes? The rich literature on experiential learning has informed the design of new educational programs in the Nordic Region and in the U.S. Midwest. Seven case studies in the application of principles of experiential learning are presented in a recent review (Francis et al., 2010), and they have been summarized in Table 1 to illustrate practical use of the concepts. Here we provide a window on the background that led to these applications.

Table 1. Open-ended cases using experiential learning strategies in the U.S. Midwest and the Nordic Region (from Francis et al., 2010).

Location	Educational Program	Description
Norway	UMB Agroecology Courses	Semester-long modules on farming and food systems using open-ended case study methods to evaluate systems and provide future alternative scenarios
U.S. Midwest	Agroecosystems Analysis Course	Summer travel course to farms, with student groups evaluating production, economic, environmental and social perspectives of farming systems
U.S. Minnesota	Ecology of Agricultural Systems	Course examining interconnections of agriculture and basic life support systems of food, water, energy and land use that includes action learning components
Sweden	Swedish Test Pilots	Course focused on student team evaluation of farming systems in Sweden and VietNam, including both biological and social science research methods
U.S. Minnesota	African Agroecology Systems Evaluation	Adventure learning about agroecosystems on a transect from Cairo to Capetown through eight countries using distance learning and on-the-ground experiences
U.S. Iowa State	Learning Communities	Curricular learning communities with clustered classes during an academic term, focused on an interdisciplinary theme, with linked classes across departments
Nordic Region	On-Line Agroecology Course	Web-based course offered globally from four Nordic universities (Norway, Sweden, Denmark, Finland) using a team approach and case study of a Danish farm

What is Agroecology?

Evolution of the term *agroecology* has been summarized by Gliessman (1998) and more recently by Wezel et al. (2009). Current applications of an integrative strategy to combining ecology and agriculture grew from the popular books of Altieri (1983) and Gliessman (1984). It is noteworthy that practical applications of knowledge of natural systems in design of agricultural production were not unusual a century ago when researchers were working in the early stages of application of science to agriculture. Yet the disciplines of agronomy and ecology diverged, with agricultural scientists pursuing a mechanistic evaluation of components of food crop production and utilitarian approach to study of production systems, while field biologists embraced the new field of ecology and specialized primarily in natural ecosystems. After a century, we are recognizing common goals in development of environmentally sound and economically productive integrated crop and crop/animal systems, and the need to apply

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methods from a range of currently specialized disciplines.

Agroecology was defined as the *ecology of food systems* by Francis et al. (2003), a perspective embraced by Gliessman (2007) in the second edition of his widely-used textbook, *Agroecology: the Ecology of Sustainable Food Systems*. This was a subtle but important advance from the more mechanistic focus of the first edition, *Agroecology: Ecological Processes in Sustainable Agriculture* (Gliessman, 1998). Frequent misunderstandings of the emerging field of agroecology may be based on use of the term to describe a science, a set of practices or systems, or a movement (Wezel et al., 2009). In Germany, there has been a tradition of agroecology as a science, while in France the term has been more synonymous with agronomy and has referred to farming practices. In the U.S. and Brazil, the term has been used to describe all three activities. It is important to be explicit in definition to assure successful communication to students and colleagues. We have found in the Norway MSc program that students are attracted to the course and degree program for different reasons, often related to their own interpretation of the term *agroecology*, and this diversity of expectations creates special challenges in course design and implementation.

Systems Thinking – an Essential Strategy for Learning

Central to planning educational strategies in agroecology, from recommended literature to design of field projects to reporting and reflection on results, is our focus on a holistic, systemic approach. The key article by Richard Bawden (1991), *Systems Thinking and Practice in Agriculture*, builds on his faculty team's experience at University of Sidney at Hawkesbury in New South Wales. Students in that program worked directly with farmers in evaluation and analysis of their farming and ranching systems, and devised improvements based on science that they implemented jointly with farmers. An important text by Kathleen Wilson and George Morren (1990) on systems approaches in research and education is often used as a reference for students, since this provides an excellent overview and applications of the combination of biological (“hard”) and social (“soft”) systems methodologies. Their book builds in part on pioneering work on *soft systems methods* (e.g., Checkland, 1981; Checkland and Scholes, 1990) that include interviews, focus groups, surveys, and personal observations to help understand human decision making in farming and food systems.

The combination of natural science and social science methods has been used successfully by several of our agroecology students in Norway in developing thesis research projects. A Norwegian student surveyed both vendors and consumers across nine locations in the first year of farmers' markets in his country, and learned that vendors traveled

greater distances than consumers and both were concerned about communication and promotion of local foods (Åsebø et al., 2007). Importance of involving stakeholders in decision making was assessed in three communities in different regions of Norway (Gillebo and Francis, 2006). The widely-known system of cow/calf grazing systems in the Pampas of Argentina was assessed using a life-cycle analysis and energy evaluation of efficiency, and the results used to recommend national policy changes related to agriculture (Rótolo et al., 2007). Bakewell-Stone et al. (2008) evaluated two contrasting organic farming development strategies in Tanzania, cashews for export and vegetables for local use, to determine their effectiveness in improving family incomes and nutritional status of children. The attitudes and actions of farmers related to nature conservation were reviewed in terms of how this affects decisions about farming practices (Ahnström et al., 2008). Organic farming and marketing systems for vegetable crops were evaluated in Sri Lanka, and alternatives provided to increase farmer incomes (Fernando et al., 2009). Numerous current projects are presently being conducted by MSc student in a number of countries. These provide examples of how the experiential learning in agroecology is leading to a systems approach to study of real-world challenges and potential solutions for the future.

Development of Competencies

One of the major objectives of experiential learning in agroecology is to develop key competencies in our graduates, with the capabilities and motivation to make meaningful and responsible change in their future positions in the public or private sector (Lieblein and Francis, 2007). In practice, this means designing educational programs that are focused on developing the graduate agroecologist and not on specific courses or even the curriculum (Lieblein et al., 2005). As described above, it is essential that graduates have a practical, working knowledge of how systems function and the methods used to evaluate those systems and set priorities among the many research questions that one could pose. We provide a summary of some of the important competencies for agroecologists in a list that is comprehensive but certainly not all inclusive [developed in two workshops in Ames, Iowa and Nodebø, Denmark in 2010, Lieblein et al., 2010a, 2010b]:

- Critical observational skills that include appreciation of the production, economic, environmental, and social dimension of farming and food systems.
- Ability to work in multidisciplinary teams, using communication skills that transcend the language and methods of individual specialties, and negotiate differences with others.
- Knowledge of systems structure and function, and the important interactions among components that can be manipulated through management.
- Understanding the holistic and systemic nature of

inquiry, including knowledge of system boundaries, hierarchies of scale, and multidisciplinary strategies.

- Appreciation of the importance of biological and social science methods, how and where they are applicable, and the ability to design research using integrated approaches.

- Understanding the value and relevance of multiple sources of information, including that derived from science as well as from experiences of clients on farm and in the community.

- Basic statistical skills needed to analyze biological and social data from farms and communities and to evaluate and interpret results for their practical applications.

- Ability to move from evaluation of systems and client goals to development of relevant potential future scenarios that will help clients meet those goals.

- Capacity to sort among client goals and pose appropriate questions to discern priorities among the myriad goals, especially with multiple clients in a community food system.

- Practice the a priori testing of alternative scenarios using available information to determine the impacts of implementation of development plans based on those scenarios.

- Develop professional competence in one of more specific disciplines that will be adequate to secure a position that uses that capacity and provides a platform for systems studies.

We recognize clearly that development of competencies in systems observation, analysis and evaluation comes with an opportunity cost of not developing an in-depth capacity to deal with any single narrow discipline or field of specialization, but the need for systems thinkers is growing as challenges facing humanity become more complex. By immersion in the current context and reality of the farm and community, and building on experiences, each student can bring their skills to a team that is becoming prepared to deal with uncertainty and risk, with complexity, and with multi-objective client groups where the challenges are not simple and may be revealed through continuous interaction with the clients and the local biological, economic, and social environment. The phenomenological approach is clearly within the realm of Dewey's experience-based learning, and the strategy can be understood by study of the steps of Kolb's learning cycle. Social implications of various development strategies and the influence of the political and power structure of the community and of society are better understood when viewed through the lens of Freire's perspective on democracy and decision making.

Emergence of Integrative Ecology

It is becoming apparent that conventional learning systems are less than adequate for dealing with the complex and difficult challenges facing society in our agricultural and food systems. For this

reason, an emerging meta-discipline called integrative ecology has been described by Jordan et al. (2008), one that deals with the intimate interconnections of agriculture and its essential support systems including food, water, energy, and land use. Considered a sub-set of sustainability science (Clark, 2006), integrative ecology embraces what has been discussed above in agroecology and in addition seeks to bring together production, conservation, and continuous adaptation to build resilient systems in the face of what Batie (2008) calls "wicked problems." These are situations where the challenges are seen and defined differently by a range of participants in the systems, and "there may be strong controversy and biocomplexity, in which production, conservation and adaptation are affected by the interplay of biophysical and social factors that are spatially, organizationally, and historically complex" (Francis et al., 2010).

Using this perspective, agriculture and food systems are viewed as complex and coupled "human activity systems," and obviously are coupled human-natural systems (Liu et al., 2007). One key application of this concept has grown out of the strategies of community-based learning and the service learning that has been implemented in courses at University of Minnesota by Nick Jordan and colleagues (Jordan et al., 2005). The students work in teams to develop models as well as activities within the agri-food landscape and embed their work into ongoing efforts of public and private agencies and institutions. This practical application of systems theory is similar to the agroecology courses offered in Norway (Lieblein et al., 2010a) and in the U.S. Midwest (Wiedenhoef et al., 2003), two of the examples listed in Table 1.

Open-Ended Case Learning Strategy

The open-ended case approach to learning has proven especially valuable in agroecology courses in the Nordic Region and the U.S. Midwest (Francis et al., 2009). In contrast to conventional case studies where the results are known well to the instructor and to the client (farmer, marketer, food system professional, or other), in open-ended cases a real-world, often complex situation is presented and the student or team is confronted with discovering the major issues and defining the boundaries of the case. Since the "correct answers" are not known to instructor or client, the students join in a search for what is relevant in the situation, working together with the instructor(s) and client(s).

Students often start with exploring the philosophies, goals, and world views of their client or clients, in order to best frame their further questions. By walking the fields and exploring a community, the teams learn about the current farming or community food system, including details about the local resource base, current economic situation, concerns about environmental impacts, and social ramifications of the food system. Rather than seek and

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provide solutions or definitive recommendations, students and teams are advised to design a series of potential scenarios and to evaluate *a priori* the potential impacts of each. Thus they determine how likely each of the scenarios will be in helping the client(s) reach their stated goals. Several examples that have proven successful are summarized in Table 1, and these are described in more detail in a review article by Francis et al. (2010). In accord with Dewey (1977) the students bring their prior experiences and integrate new observations and knowledge, and pursue the well-known steps of the Kolb (1984) learning cycle to observe, analyze and evaluate, create future visions, and test those to the extent possible in the time available. The outcomes beyond the scenarios for clients are students who are curious, good observers, and capable of entering a new situation and using both biological and social science methods to achieve their team goals.

Conclusions

Historical foundations of experiential education are explored as they contribute to our general understanding of this strategy for learning. The seminal contributions of such luminaries as John Dewey in relating learning to personal experience, Kurt Hahn in outdoor education, Paulo Freire in relating education to social conscience and activism, and David Kolb in his structured learning cycle are summarized as they relate to agroecology education. We conclude that each of these educators has provided a part of the framework on which we currently build practical, experiential learning landscapes that produce competent, field-oriented graduates who are primed for practical and responsible action in their future careers.

In order to communicate about experiential learning it is important to have clear definitions of experiential education, experience, reflection, and learning. As programs are developed and implemented, it is useful to clearly define the evolving roles of instructors and students in this innovative learning landscape. Critical to assessment of learning and improvement of learning strategies are understanding the role of reflection and the importance of an embedded and ongoing evaluation component of any program. Connections between theory and practice can be made explicit through the preparation of students for this learning environment; students can then adjust their expectations as experience leads the learning community to shared goals and understandings related to system boundaries, identification of key players in the system, and expected outcomes.

In the applications of theory to the practice of designing education in agroecology, we are compelled to focus not on the specific lectures, courses, or curriculum but rather on the capabilities of graduates who complete the program. What skills and knowledge do they have? What are they prepared to

do through responsible action? What are their attitudes toward the tasks at hand and their relationships with clients? How do their personal ethics inform individual and team decisions as they approach experiential learning?

Shared understanding of experiential agroecology education is complicated by the possible interpretation of agroecology as a science, as a set of environmentally sound practices, or as a social movement further complicated shared understanding. It is important to choose and share explicit definitions of the goals and outcomes of a learning program. Although this could be said of any learning situation, the uncertain boundaries and outcomes of the study of agroecology make this even more important in facing current challenges in the food system.

The multiple and complex dimensions of agroecological analysis of a farm or a local food system takes into account the natural resource endowment, the current and potential productivity of farms, the economics of farming and local food systems alternatives, the environmental impacts of these activities, and the socio-cultural milieu in which the system operates (Rickerl and Francis, 2004). The interwoven challenges among these different dimensions of the food system and the larger environment in which they are embedded plus the uncertainties of weather and economics clearly throw these challenges into the arena of what Batie (2008) calls “wicked problems,” those that are perceived differently by different clients in the food system. The emerging strategy of integrative ecology (Jordan et al., 2008) and the learning provided by open-ended cases (Francis et al., 2009) are central to what we now perceive as part of the foundation for designing learning landscapes that will provide compelling educational experiences for students now and in the future.

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