

A Model for Transforming the Undergraduate Learning Experience in Colleges of Agriculture

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Abstract

Today's graduates of colleges of agriculture face many new and unique problems. The question arises, are they adequately prepared to solve these problems? Many critics would say no, and have called for changes in teaching in higher education. The push is on for a more student-centered approach to teaching with a greater emphasis on critical thinking, decision making, problem solving, and leadership. For almost a century secondary agricultural education has relied on a pedagogical model incorporating these ideas. Experiential learning is a foundation of secondary agricultural education and provides students the opportunity to be more engaged in their learning by giving students concrete experiences, which are essential to learning. Experiential learning also forces students to reflect on and generalize about their learning, thus making it more transferable. Students are able to build critical thinking and decision making skills through the hands-on problem based learning activities associated with experiential/constructivist epistemologies. The hands-on, experientially driven pedagogical methods inherent in secondary agricultural education provide a constructivist/experiential learning model for undergraduate education. Perhaps, colleges of agriculture should consider implementing the constructivist based, experiential pedagogical model presented to help transform the undergraduate learning experience.

Introduction

The United States has changed dramatically in the last 150 years. Knowledge and innovation have increased at exponential rates, making today's technology seemingly obsolete tomorrow. It is in this climate of change that colleges of agriculture in America's universities now find themselves operating. Recognizing this climate, in 2009 the National Research Council (NRC) called for a transformation in colleges of agriculture to meet changes caused by: global integration, new science, consumer influence, environmental concerns, and demographic and political shifts. The NRC stated colleges of agriculture need to "reform their undergraduate curricula and students' experience to meet the needs of a changing world" (p. 13). This problem is not unique to colleges of agriculture; there is a consensus

throughout higher education. A review of literature shows a recurring call for colleges and universities to change the way teaching and learning occurs (Barr and Tagg, 1995; Bok, 2006; Boyer Commission on Educating Undergraduates in the Research University, 1998; National Commission on the Future of Higher Education, 2006; National Research Council, 2009; Saroyan et al., 2004). According to the Association of American Colleges and Universities (2002), students are increasingly entering the workforce underprepared personally and professionally. Without changes, undergraduate education will continue to struggle to provide students with the tools for success. Colleges of agriculture are uniquely positioned to help fill the gap in undergraduate education and can provide a model for other disciplines to follow. According to the NRC (2009, p. 4), the "multi-dimensional and challenging nature of the agricultural disciplines" combines well with the basic and applied science disciplines such as technology, engineering, and mathematics.

To improve the undergraduate learning experience, the NRC (2009) called for an increase in transferable skills development that included abilities such as teamwork, working in diverse communities, working across disciplines, communication, critical thinking, ethical decision making, and leadership. The NRC also called for an increase in the use of case studies, problem-based learning, service learning, community engagement, cooperative learning, active learning, and developing learning communities. The NRC also recognized that non-formal learning activities like extracurricular organizations, undergraduate research, and study-abroad can be valuable pedagogical tools.

Education in the agricultural sciences is not limited to colleges and universities. For over 100 years, students have studied the agricultural sciences in high schools through programs originally referred to as vocational agricultural education (True, 1929). Recognizing the changing needs of students and society these programs have transformed into programs of agricultural science education and look much different than the original vo-ag programs (Phipps et al., 2008). As colleges of agriculture look to transform the undergraduate curricula, the practices adopted by secondary teachers of agriculture may provide a suitable model to examine.

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Purpose

The purpose of this article is to present a pedagogical model that answers the National Research Council's (2009) call to transform undergraduate agricultural education. This synthesis of research attempts to achieve this purpose by addressing the following objectives:

1. Define the epistemological and theoretical basis of secondary agricultural education;
2. Define the pedagogical model for secondary agricultural education and;
3. Create a transferable pedagogical model.

Findings

Epistemological and Theoretical Basis of Secondary Agricultural Education

The first objective was to define the epistemological and theoretical basis of secondary agricultural education. In order to understand why the secondary agricultural education model is worth examining, one must first consider the origins of agricultural education. Since the national inception of vocational agriculture through the Smith-Hughes Act of 1917, teaching and learning in agriculture has traditionally been hands-on and experientially based (Knobloch, 2003). Rufus Stimson, a pioneer in secondary agricultural education, is noted for bringing the idea of experiential learning to the forefront of agricultural education through the use of individual home-based projects (Moore, 1988). Learning through the use of individualized projects is still prevalent in secondary agricultural education (Roberts and Harlin, 2007). Another widely used pedagogical approach has been the problem-solving method where students must actively seek out answers to problems, thus generating critical thinking skills and creativity (Parr and Edwards, 2004). Additionally, secondary agricultural education has made extensive use of extracurricular activities through the National FFA Organization as a pedagogical tool. Knight (2008) stated, "The work of people like Rufus Stimson and many others were driven largely by a philosophy that was focused on creating environments that engaged students with their learning intellectually, physically, and emotionally" (p. 9).

One of the epistemological bases for secondary agricultural education is constructivism. Constructivism is an epistemological belief that knowledge is constructed in the mind of the learner through experiences (Doolittle and Camp, 1999).

Doolittle and Camp posited learners use prior knowledge and experiences to understand new material being learned. Byrnes (1996) helped clarify this with an analogy; he compared students' knowledge to a brick wall being built inside their minds. Byrnes stated constructivists believe teachers provide the bricks, but the student places the bricks in the appropriate place through cognitive processes. Byrnes argued sometimes students place the bricks in the wrong place (eg. lack of understanding), or they have not built up the wall enough for a certain type of brick (eg. abstract ideas). Piaget's (1952) idea of assimilation and accommodation explain how students correct misplacing bricks or inability to place bricks. When a student uses assimilation they search and find the proper place for their brick to be laid. Accommodation is used when a student changes the shape of their brick wall to make the new brick fit.

Varying views of constructivism exist; however three commonalities surface across all types of constructivism (Doolittle and Camp, 1999). First, learners must use active cognitive processes. Next, all types of constructivism require some degree of interpretation of reality. Third, they are all situation dependent, in that they all require an experience. This last point indicates the direct connection between constructivism and experiential learning.

Beard and Wilson (2006, p. 2) defined experiential learning as "the sense making process of active engagement between the inner world of the person and the outer world of the environment." Knobloch (2003) operationally defined experiential learning in agricultural education as "learning in real-life contexts that involves learners in doing tasks, solving problems, or conducting projects" (p. 26). Many

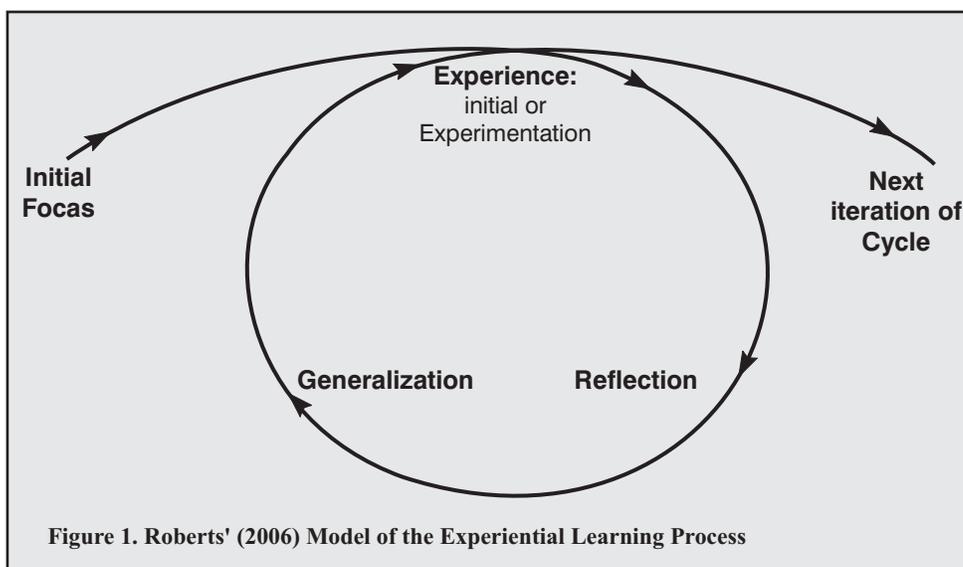


Figure 1. Roberts' (2006) Model of the Experiential Learning Process

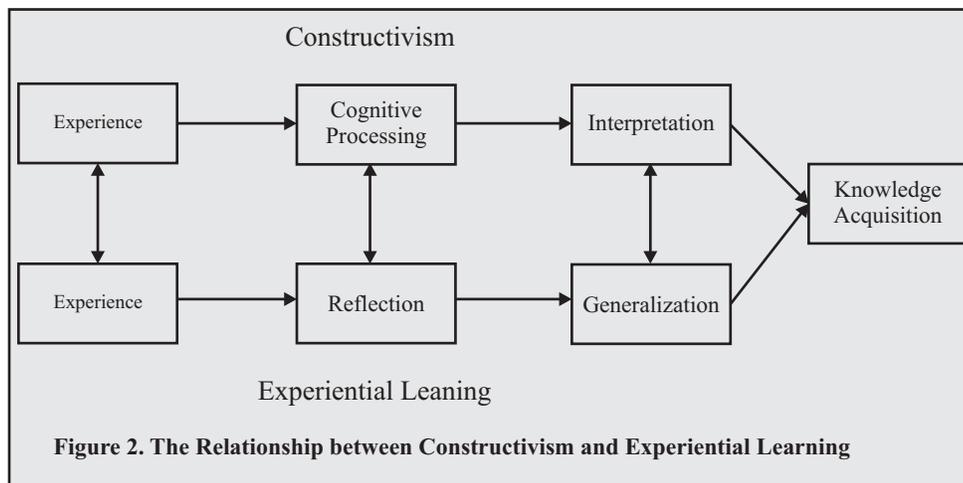
theorists including Dewey (1938), Joplin (1981), and Kolb (1984) have created models to explain experiential learning. Through an analysis of the literature, Roberts (2006) examined these three models and divided experiential learning into two categories; the

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process of experiential learning and the context in which it takes place. For the purpose of this study the researchers looked at the process of experiential learning.

Roberts (2006) synthesized a new model, the *model of the experiential learning process* by combining the like characteristics of the three aforementioned models. The model is cyclical and begins with an initial focus, followed by an experience (initial or experimentation), reflection, generalization, and experimentation (Figure 1). Due to its simplicity the Roberts Model is recommended.

Constructivist views and the experiential learning process align very well. Constructivist ideas of experience, active cognitive processing, and interpretation of reality agree with the experiential learning processes of experience, reflection, and generalization. This led the researchers to synthesize a model showing the relationship between these features (Figure 2). Although depicted in a linear fashion, learning is not a linear process; the intent of this model is to strictly show the relationship between the tenets of constructivism and experiential learning leading to knowledge acquisition.



Pedagogical Model for Secondary Agricultural Education

The second objective was to define the pedagogical model for secondary agricultural education. In the secondary agricultural education model, students receive instruction in classrooms and laboratories, enhance their knowledge through supervised agricultural experience projects (SAE), and then apply that knowledge through participation in a student organization (FFA). This creates a tripartite pedagogical model which provides students learning experiences through varying instructive approaches.

The first component of the secondary agricultural education model is classroom/laboratory instruction. Hughes and Barrick (1993) stated, “[secondary] agriculture teachers have used classroom and laboratory instruction to promote leadership skills, personal development, and technical competencies in order to prepare young people for

agricultural employment” (p. 64). Traditionally, this has been accomplished using a variety of hands-on teaching methods. Effective secondary agricultural instructors use active learning strategies, cooperative learning, and field trips among others. One of the more common teaching methods in secondary agricultural education is problem solving (Parr and Edwards, 2004). These types of pedagogical approaches allow students to construct their knowledge through classroom experiences.

Application of classroom learning through individualized projects in a real world setting is commonplace in secondary agricultural education (Barrick, 1989). The main purpose of SAE is for students to enhance their learning and develop a deeper understanding of the material learned in class (Roberts and Harlin, 2007). Secondary agricultural education students are required to conduct a SAE project. There are several categories of SAE ranging from entrepreneurship, which can include projects such as raising animals or crops, to work-based learning opportunities where students work in an agriculturally related job under the supervision of their instructor. A comprehensive SAE project for a

secondary agricultural education student should be a planned program consisting of supervision and evaluation by the instructor and the student should receive recognition for their work (Barrick et al., 1992). In addition, ideally, the student's SAE project should align with the classroom curriculum.

FFA is an integral part of the secondary agricultural education model. FFA provides outlets for students to apply learning in various ways. Career

development events (CDE) allow students to apply classroom learning in various industry related competitions. For example, if a student were preparing for a career in the horticulture industry he could take part in several competitions such as agronomy, floriculture, and/or nursery and landscape. This same student could be awarded for his SAE work through various proficiency awards such as diversified horticulture, landscape management, or nursery operations. These awards are based on the size, scope, and productivity of the student's SAEs. Additionally, the National FFA Organization hosts an agriscience fair where this same horticulture student could conduct agriculture related research and compete at various levels of competition. Lastly, FFA also provides sundry opportunities for students to develop leadership through workshops and conferences.

A Transferable Pedagogical Model

The pedagogies implemented in secondary agricultural education have many of the features that the NRC (2009) suggested be incorporated into undergraduate education, such as problem-based learning, service learning, community engagement, cooperative learning, active learning, and extracurricular organizations. All these strategies are framed around a common constructivist, experiential theoretical basis. A model for colleges of agriculture would include these same strategies. The researchers illustrated this with a Venn diagram (Figure 3), which best represents the model for colleges of agriculture because all areas of the model should be designed to work synergistically with one another.

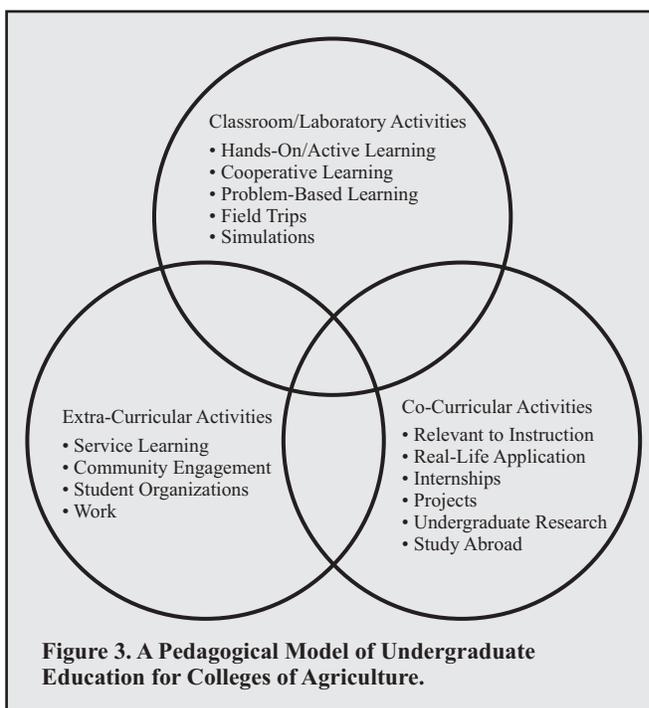
Classroom/laboratory instruction in colleges of agriculture should employ more hands-on, active learning strategies. The various disciplines in agriculture lend themselves well to utilizing these types of strategies (NRC, 2009). Many agricultural disciplines have classes which already include laboratory sections providing students with engaging learning activities; however implementation of active learning in the classroom could help students' knowledge acquisition. For example, in an animal science classroom this might take the form of students creating models representing metabolic pathways. This allows students to actively engage with learning the information.

Experiential learning should be implemented in college courses in agriculture. Students could gain a deeper understanding by applying the material in real-world contexts. Out-of-class experiential learning could include projects, internships, study abroad, and undergraduate research opportunities. For example, in a horticulture course a student might take an internship with a wholesale plant distributor for the summer. Coupled with specific learning objectives and supervision the internship could provide a beneficial learning experience for the student.

There are many ways extra-curricular activities could enhance the learning in colleges of agriculture. Colleges of agriculture have many student organizations already in place such as Block and Bridle, Young Farmers, Collegiate 4-H, and Alpha Zeta among others. Partnerships between instructors and these student organizations could lead to learning opportunities outside of class where students can utilize information learned in the classroom. One learning opportunity which could be utilized is service learning. Service learning helps students understand the importance of community engagement and can give students a way to apply concepts such as critical thinking and problem solving in different contexts.

The traditional secondary agricultural education model was designed to prepare students for careers in agriculture. Hughes and Barrick (1993) posited in addition to classroom/laboratory instruction and application components, agricultural education also

contains components of employment and/or additional education followed by a career, which is the "intended outcome[s] of an agriculture program" (p. 61). However, many students in secondary agricultural education programs will pursue postsecondary education as opposed to going into production agriculture. Since many students now pursue a bachelor's degree, perhaps some of the same practices proven beneficial at the secondary level can be used to advance undergraduate education.



Conclusions

The case for change in undergraduate education has been given, and the call has been made to colleges of agriculture to step to the forefront. A multifaceted approach to undergraduate education utilizing a variety of in and out-of-class learning experiences can help colleges of agriculture move towards meeting the NRC's (2009) goal of transforming agricultural education. Instructors in colleges of agriculture can apply constructivist principles in facilitating experiential learning through classroom and laboratory instruction, individualized projects, research, and extracurricular activities. This pedagogical model can help prepare graduates of colleges of agriculture prepare to work in an ever-changing world.

Saroyan et al. (2004) said there needs to be a "learning-centered" approach to teaching (p. 17). McLaughlin et al. (2005) echoed this notion and added learning takes place when students are cognitively engaged with appropriate subject matter knowledge. The hands-on, experientially driven pedagogical methods inherent in secondary agricultural education have been shown to be effective in helping students learn. Colleges of agriculture should consider implementing the constructivist based,

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experiential pedagogical model presented to help transform the undergraduate learning experience.

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