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SECONDARY AGRICULTURAL SCIENCE AS CONTENT AND CONTEXT FOR TEACHING

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Abstract

The purpose of this philosophical article was to examine the role of agriculture in agricultural education. This philosophical argument, in many ways, reexamines the very discussions pondered by Dewey and Snedden almost a century ago. In secondary agricultural education classes today, is agriculture the content learned, or the context in which learning occurs? In exploring this issue, theoretical bases and conceptual models for agriculture as content and context are presented. It was concluded that there are theoretical bases for viewing agriculture both as content and context for teaching agriculture at the secondary level. Accordingly, a model is proposed that acknowledges that agriculture provides a rich context in which learning can occur. Today's agricultural educators teach both agricultural content and knowledge from other domains, yielding integrated curriculum. Learning occurs in complex social environments with teacher-to-learner and learner-to-learner interactions. Agricultural education has dual outcomes: a skilled agricultural workforce and successful citizens that are agriculturally literate contributors in a democratic society. The two aforesaid outcomes are not mutually exclusive, and former students (and lifelong learners) may move in and out of gainful employment in the agricultural industry throughout their lifetime.

Introduction

During the late 18th and early 19th centuries, the United States of America experienced a period of rapid technical advances and industrialization, often referred to as the industrial revolution. These advances led to significant changes in American society and culture. One such change was that the demand for skilled labor increased dramatically, while the demand for unskilled labor decreased (Roberts, 1957). The effect of this particular sociological shift was felt throughout society, including education.

A national interest in preparing skilled labor led to the establishment of federally-funded vocational education with the passage of the Smith-Hughes Act of 1917. This groundbreaking event resulted in a two-dimensional paradigm shift in education: (a) education with a purpose of career preparation, as opposed to a more liberal focus, and (b) federal involvement in less than college-age education, which had previously been primarily a state affair (Roberts, 1957).

Although the need for vocational education was widely acknowledged, the purpose of such education was not universally accepted. In 1914 and 1915, John Dewey and David Snedden engaged in a battle of words over the purpose of vocational education (Dewey, 1914-1915/1977; Drost, 1977; Snedden, 1914/1977; Snedden & Dewey, 1915/1977). Snedden supported content-centered curricula focused on specific skill acquisition, based on established industry standards, and delivered separate from general academic content. Snedden's philosophy has been described as one of social efficiency with roots in an apprenticeship model borrowed from Germany (Drost). In contrast, Dewey argued for an integrated approach in which

vocational skills and academic content were blended and delivered in a context-rich environment with a purpose of developing transferable life skills. Snedden's philosophy resonated with policy makers and he, along with his protégé Charles Prosser, were instrumental in crafting the Smith-Hughes Act, thus laying the groundwork for nearly a century of vocational education, now referred to as career and technical education (CTE).

American society is changing again. Beyond the industrial revolution and industrial age, Americans are now living in the information age, in a global society, and in a transitioning economy (Friedman, 2005). These modern times are characterized by incomprehensible amounts of information that grow exponentially each year (Gardner, 2006). Labor projections continue to forecast a growth in professional, service, and information-related careers and a decrease in production-related and agriculturally related careers (United States Department of Labor, 2005). Much of the projected employment growth will be in jobs that require college degrees (Kirsch, Braun, Yamamoto, & Sum, 2007), and changing jobs throughout a career (i.e., career mobility) is relatively common (Brown, 1998). In short, just as the industrial revolution had profound impacts on American society and education a century ago, today's economic and employment climates will have an impact on society and education. How will agricultural education respond to the changes? What roles can agricultural education play in educating the students of tomorrow?

Purpose

The purpose of this philosophical article is to examine the function of agriculture in agricultural education. This philosophical argument, in many ways, reexamines the very discussions pondered by Dewey and Snedden almost a century ago but is herein applied only to agricultural education in contemporary times. In secondary agricultural education classes today, is agriculture the content learned, or the context in which learning occurs? In exploring this issue, theoretical bases for agriculture as content and agriculture as context are presented, conclusions are drawn, and recommendations and implications are given.

Theoretical Framework

Agriculture as Content

From a content perspective, it is helpful to examine the foundation of CTE, namely the federal legislation that formed vocational education, which was the Smith-Hughes Act of 1917. This landmark legislation stated that "the controlling purpose of such education [agricultural education] shall be to fit for useful employment …[those] who have entered upon or who are preparing to enter upon the work of the farm or of the farm home" (Roberts, 1957, p. 615). The most recent federal framework is provided by the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Perkins IV), which had the purpose to "develop more fully the academic and career and technical skills of secondary education students and postsecondary education students who elect to enroll in career and technical education programs" (p. 683). Although the latter had a broader purpose, from a legislative perspective, the purpose of CTE is to develop the knowledge and skills required for successful employment in a given industry.

In congruence with federal legislation, Pratzner (1985) purported that the traditional implementations of CTE focus on content designed to meet the needs of the labor market. In other words, students enrolled in CTE programs "are seen as training for work" (p. 9). Rojewski (2002) further asserted that content-centered CTE addresses narrowly defined skills that are job-specific, which supported Pratzner's earlier contention that content-centered CTE focuses on "entry-level skill development for specialized jobs" and "serves the interests of employers/jobs/society" (p. 8). Therefore, as a part of CTE and from a content-centered perspective, the purpose of agricultural education is to develop the knowledge and skills required for successful employment in the agricultural industry (Phipps & Osborne, 1988).

From a theoretical perspective, education with the purpose of acquiring knowledge and skills in preparation for a job aligns with behaviorism, in that learning leads to an observable change in behavior (Schunk, 2000; Skinner, 1953; Thorndike, 1932). Although Doolittle and Camp (1999) made an eloquent argument that cognitive constructivism can provide a theoretical framework for CTE, they acknowledged that behaviorism was the dominant learning theory applied in CTE. Further supporting a behavioral framework for content-centered CTE, Doolittle and Camp explained that curricula composed of knowledge and skills derived from industry standards are externally imposed on the learner. Behaviorism as the theoretical framework for content-centered agricultural education is also supported by examining contemporary teaching methods texts in agricultural education (Newcomb, McCracken, Warmbrod, & Whittington, 2004; Talbert, Vaughn, Croom, & Lee, 2007), which advocated instruction guided by objectives that view learning in terms of observable student behavior (Mager, 1997). In other words, successful learning in agricultural education yields students with an observable set of skills that can be used for successful employment.

Using a behaviorist framework for content-centered agricultural education warrants a more in-depth look at skill acquisition. Schunk (2000) differentiated between specific and general skills. Specific skills are those abilities that apply to certain disciplines, whereas general skills are applicable in a variety of settings. From an examination of some of the earliest agricultural education curricula, it was obvious that the focus of the curricula was on specific skills (Stimson, 1920). However, over the decades, it is fair to say that the curricula expanded to include more general skills and a broader focus (Newcomb et al., 2004).

Ohlsson (1996) advanced skill acquisition theory by examining the role of learning from errors. According to Ohlsson, most performance errors are caused by inappropriately applying general knowledge or skills in situations that require domain-specific knowledge or skills. In turn, learning occurs as the learner experiences a conflict between what they expected to happen and what was actually observed. This incongruence causes the learner to adjust his or her schema or "knowledge structures." As learners progress through this process, they move from being a novice to being an expert through what Schunk (2000) called the novice-to-expert model: "1) identify the skill to be learned; 2) find an expert … and a novice…; and 3) determine how the novice can be moved to the expert level as efficiently as possible" (p. 260). In other words, if a learner wishes to gain expertise in a specific skill, he or she should study someone who already demonstrates expertise in that discipline.

In agricultural education, the teacher serves the role of expert under which the novice will study. The importance of teacher expertise in agricultural education as it differs from teacher expertise in other discipline areas is echoed by Swanson (1971), who said that "the teacher must have extensive training and expertise in the occupation or technology which he teaches. Very little compromise can be made in the skills of the teacher if effective instruction is to take place" (p. 23). Specifically referring to vocational agriculture teachers, Roberts (1957) purported that "the many technological changes that are constantly occurring in agriculture require that a teacher of vocational agriculture possess a high degree of technical knowledge and skill acquired both in school and through experience" (p. 198). He further ascribed that teachers should have at least 2 years of on-farm experience. In summary, the teacher must be competent in industry-validated knowledge and skills (Prosser & Allen, 1925; Talbert et al., 2007).

Synthesizing the above-discussed aspects in viewing agriculture as the content in agricultural education yields a conceptual model (Figure 1) that explains the relationships between concepts. It begins with the agricultural industry, which provides the basis for the curricula taught and for teacher preparation. In turn, teachers utilize the curricula to provide industry-relevant instruction that results in observable skill acquisition. The end result is skilled workers that are ready for successful employment in the agricultural industry.

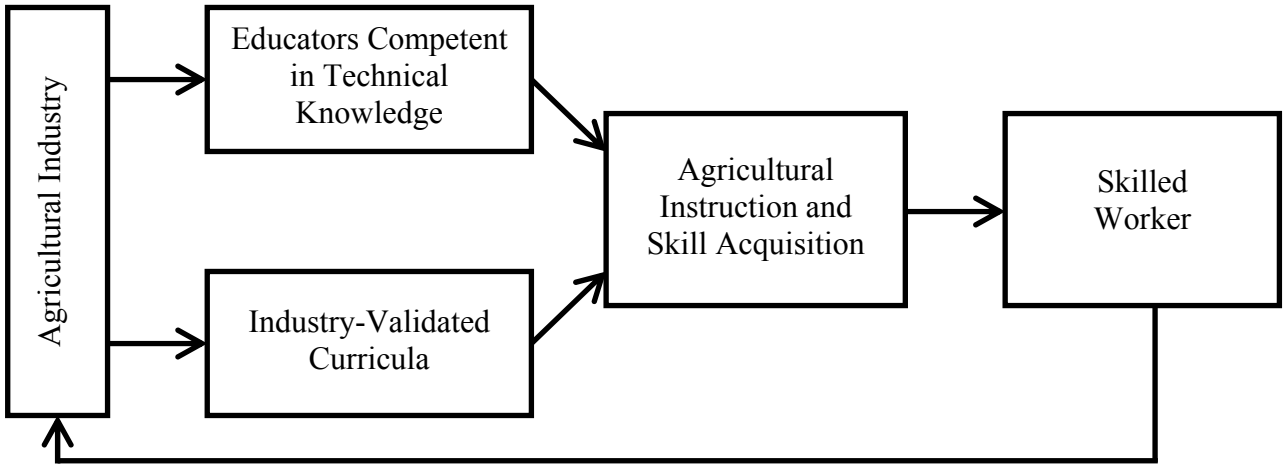

Figure 1. A content-based model for teaching agriculture.

Agriculture as Context

Current paradigm shifts in the purpose and philosophy of education as well as the nature and purpose of knowledge suggest a framework for thinking about agriculture as a valid context for secondary agricultural sciences education. The changes brought about with an increasingly global and rapidly advancing body of science and technology at the turn of the third millennium suggest a new paradigm for education as cultivating habits of mind (Gardner, 2006), specifically, (a) the disciplined mind (or specialized thinking within a particular discipline), (b) the synthesizing mind (ability to make sense of large amounts of information from disparate sources), (c) the creative mind (ability to be ground breaking or innovative), (d) the respectful mind (the ability to understand different groups of people on their own terms), and (e) the ethical mind (the ability to understand self and work within the perspective of a greater societal good). Thus, it has been asserted that the foundational charge of formal education systems and subsequently the policy makers, who shape education in modern times, shift from a paradigm of education for social efficiency to education as cultivating the habits of mind that will be imperative for success and survival in the third millennium (Gardner).

Although not labeled as such, John Dewey's assertions of developing habits of mind have served as a foundation of agricultural education. Dewey (1938) purported that education should transcend beyond content and develop an attitude for lifelong learning among learners as well as prepare learners to be broadly educated contributors as a critical element in the foundation of a democratic society. The need for social efficiency through a highly skilled labor force at the turn of the 20th century superseded the need for a liberally educated society of Americans with the passage of the Smith-Hughes Act. Yet Dewey's foundations for education as a context or a basis for learning through experience has informed the philosophical foundation for agricultural education programs (Knobloch, 2003).

The conceptual model for secondary agricultural education programs as learning

through classroom/laboratory instruction, supervised agricultural experience, and participation in the FFA organization further support the notion of agriculture as a context for learning in agricultural education. This three-circle Venn diagram illustrates the overlap between and among learning in the classroom, through supervised experience, and participation in youth programs and suggests a holistic view of education which aims toward education of the total person. In holistic education, the outcomes are the development and growth of the total student, and learning occurs within a particular context (Forbes & Martin, 2004). Although the three-circle conceptual model for secondary agricultural education did not originate with holistic education in mind, the current structure of agricultural education programs aligns with most of the basic principles of holistic education, and thus, at least in the conceptual sense, one might argue that educators in secondary agricultural education programs ultimately view education from a context-rich perspective.

Agriculture as a context for learning is anchored theoretically in constructivism. Constructivism began not as a learning theory, but rather as a philosophical perspective regarding the nature of learning (Schunk, 2004). Modern tenants of constructivism, forming a post-structuralist psychological theory (Fosnot, 1996), describe learning as,

> an interpretive, recursive, building process by active learners interacting with the physical and social world. It is a psychological theory of learning that describes how structures and deeper conceptual understanding come about rather than one that characterizes the structures and stages of thought or that isolates behaviors learned through reinforcement. (p. 30)

In particular, dialectical or social constructivists assume that knowledge is a derivative of the interactions between people and their environment (Schunk, 2004). Social cognitive theory (Bandura, 1986) and socio-cultural theory (Vygotsky, 1962) both support and contribute to modern notions of constructivism. Constructivist pedagogy then asserts the following (Doolittle & Camp, 1999): learning should occur in authentic settings; learning should incorporate social interactions; content should be relevant to learners; content should be incorporated with the learner's prior knowledge, conceptions, and misconceptions in mind; formative assessments should guide the design of future learning; students should become self-regulated learners in the process; the role of the teacher is that of a facilitator; and teachers should encourage and allow for learners to represent content and learning in a diversity of ways. Although CTE was not theoretically grounded in constructivist theories, it has been noted that scholarship, reform efforts, and policy and structural changes to CTE in recent years have at least indirectly relied on constructivist principles (Doolittle & Camp; Lynch, 2000; Pratzner, 1985).

Experiential learning has specifically been noted theoretically (Cheek, Arrington, Carter, & Randell, 1994; Hughes & Barrick, 1993; Roberts, 2006) and empirically in agricultural education (Wullf-Risner & Stewart, 1997) as an underpinning of secondary agricultural education programs and has been noted as a sound psychological framework for learning in secondary agricultural education (Knobloch, 2003). Under this framework, agriculture forms the context for learning in that learning involves the construction of knowledge, engages students in an inquiry into the content, and demonstrates an overall value beyond school (Newmann & Associates, 1996 as cited in Knobloch, 2003). The integration of agriculture content into science curricula (Balschweid, 2002) and the integration of science principles into agriculture curricula (Enderlin, Petra, & Osborne, 1993) are two empirically-based applications for a model of agriculture as a context for learning in secondary agricultural education. Additional research has examined integration of math content into agricultural mechanics curricula (Parr, Edwards, & Leising, 2006, 2008). These examples tested the model of a contextual approach to learning and, empirically, both student achievement (Enderlin et al.; Parr et al., 2006, 2008) and

perceptions of the learning environment (Balschwied; Enderlin et al.), and general understanding of the integrated content increased (Balschwied).

A synthesis of the philosophical and theoretical paradigms as well as findings from the empirical literature described previously indicates a model for agriculture as a context for secondary agricultural education programs (Figure 2). In this model, knowledge in and about agriculture, across traditional technical agriculture content areas or sciences and other traditional academic areas, guides but is also a construct of the interactions between and among the learners and the teacher. Teaching and learning is an interactive exchange in an authentic, experiential environment, and the outcomes of learning are a productive group of citizens equipped to think and solve problems as lifelong learners contributing holistically to the aims of a democratic society, in particular one comprised of agriculturally literate citizens.

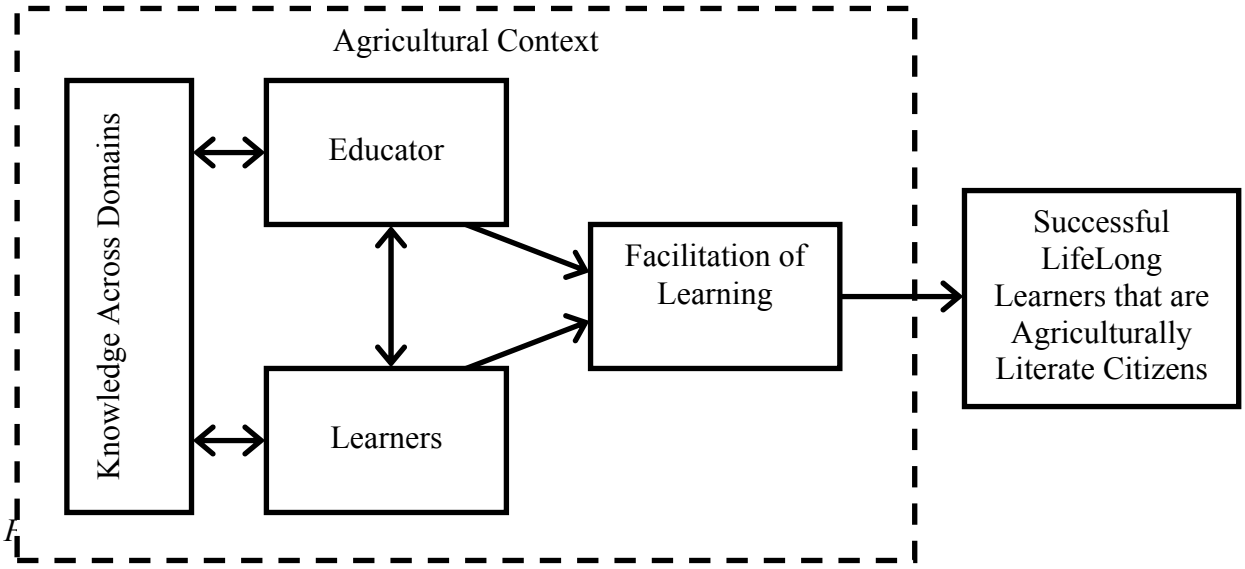

Figure 2. A context-based model for teaching agriculture.

Conclusions

Based on the philosophical discussion presented previously, it was concluded that there are theoretical bases for viewing agriculture both a content and context for teaching agriculture at the secondary level. Conceptual models were created that propose relationships between variables in content-centered (Figure 1) and context-based (Figure 2) learning environments. The authors posit that both models are relevant and appropriate for contemporary agricultural education and that this duality has existed for some time. Synthesizing the theoretical frameworks and models presented previously yielded a comprehensive model that can serve to explain the benefits of conceptualizing agricultural subject matter as both the content and context for teaching (Figure 3). This model can further serve to advance the discussion of the philosophical foundations of agricultural education among educators, researchers, and philosophers.

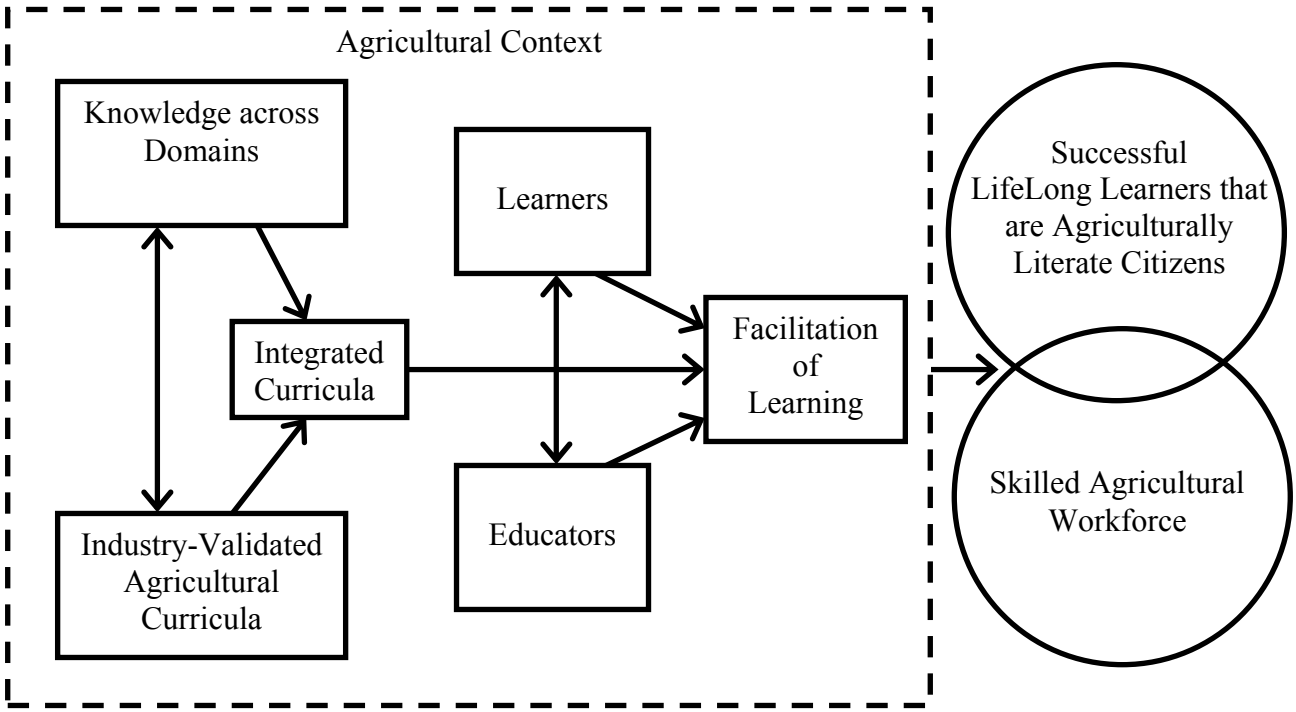

Figure 3. Conceptual model for agricultural subject matter as a content and context for teaching.

The model first acknowledges that agriculture provides a rich context in which learning can occur. The model then recognizes that today's agricultural educators teach both agricultural content and knowledge from other domains. The two aforementioned knowledge bases are interrelated, thus yielding integrated curriculum. The model also embraces the constructivist nature of learning, in which learning occurs in complex social environments with teacher-to-learner and learner-to-learner interactions. Finally, the model concedes dual outcomes from agricultural education: (a) a skilled agricultural workforce and (b) successful citizens that are agriculturally literate contributors in a democratic society. The model further recognizes that the two aforesaid outcomes are not mutually exclusive and that former students (and lifelong learners) may move in and out of gainful employment in the agricultural industry throughout their lifetime.

As portrayed in the model, it is important to note that the dual nature of agricultural education programs and the dual purposes they historically served should not be considered an "either/or" argument, as posited by Dewey and Snedden. The polarizing argument of whether programs were either behaviorist or constructivist by design has really served no end. As a profession, it is time to stop this polarization and begin examining, in a very inclusive and holistic sense, the communicated purpose, intended goals, and actual implementations of agricultural education programs and how those align. In reality, today's programs (as depicted in the model) are grounded in an epistemology that oscillates between cognitive and social constructivism based on the needs of individual learners (Doolittle & Camp, 1999).

Implications and Recommendations

It would appear that over the last 90 years the focus of agricultural education has transitioned from a rigid application of the model proposed by Snedden (1977) to also embrace the holistic vision opined by Dewey (1977, 1990). Although data are not presented to substantiate this assertion, the model (Figure 3) and theoretical framework presented previously provide a basis for

acknowledging the duality in function of contemporary agricultural education programs. The transformation of agricultural education should not come as a surprise to proponents of community-based program planning (Phipps, Osborne, Dyer, & Ball, 2007). As communities have grown and evolved, the role of the respective agricultural education programs has subsequently transitioned. Further, as the educational climate oscillated towards a school-wide emphasis on core academic knowledge (i.e., math, language, science, etc.), agricultural education programs have also adjusted. The apparent adaptability of programs should prove beneficial when the educational pendulum inevitably swings in a different direction.

Furthermore, the authors assert that although many agricultural education programs have adjusted, at least anecdotally, to the changing climate of schooling, students, and educational needs, many agricultural education programs have been slow to adjust curricula to align with one particular model or the other. For example, if a program asserts that it views agriculture as content for teaching secondary agricultural education, it must then examine whether it aligns itself with current agricultural education content as based on industry standards and occupations. For example, teaching the breeds of livestock, a viable production-based content area of the 1960s, might not be a current knowledge base for current employment in animal industries.

This assertion seems plausible but is empirically void of data substantiating which of the proposed models are applied in contemporary agricultural education programs or how they are applied. Therefore, it is recommended that research be conducted to assess the role(s) of agriculture in agricultural education programs across the country. It is further recommended that an examination of former agricultural education students be conducted to see how they are applying the knowledge learned in agricultural education programs.

The dual-purpose model presented previously (Figure 3) can be applied at a macro level for a community or school. It can also be applied at a micro level for an individual student. In fact, from a constructivist, learner-centered perspective, educators should place emphasis of the entire educational process at the student level. It is nearly impossible to accurately predict how students might apply concepts learned in an agricultural education classroom. For example, suppose that Maria and Julia are classmates who learned the fundamentals of mammalian reproduction as part of a lesson on dairy cattle management. If Maria eventually becomes a reproductive specialist at a dairy, the lesson served as content. If her friend Julia chooses a vastly different career path but applies the principles learned to understand her own pregnancy, the lesson provided both a transferable content and context. Agricultural educators do not have the luxury of defining how students apply what is learned; that falls on each student. Further complicating things, high school students likely do not know how they might apply something in the future.

The authors posit that agricultural educators have long recognized the divergent paths on which former students embark. However, the extent to which agricultural educators have embraced the notion of using agriculture as a context in which to teach life's lessons is unknown. Empirical evidence in constructivism has supported contextual learning for a number of years, not only as a viable mechanism for meaningful learning but also as one in which a rich diversity of students can be reached. Agricultural educators should reflect on philosophical beliefs that guide their practice. From an empirical perspective, it is recommended that an assessment of agricultural educators' philosophies be gathered and further analyses be conducted regarding the extent to which these philosophies guide existing program structures. In short, what do agricultural educators espouse as the conceptual framework for their programs? If they conceptualize agriculture as content for teaching, is the content they are teaching relevant to the knowledge, skills, and habits of mind required for an agriculturalist in the new Millennium? Further, if agricultural educators espouse agriculture as a context for teaching, do they teach by using

constructivist paradigms? Is contextual and experiential learning a solid foundation of their practice? Are they relevant to a rich diversity of students embedded in a meaningful learning environment? The authors recommend that agricultural educators first examine, at very real levels, the conceptual framework they explicate for agricultural education as well as the methods they emulate in carrying forth that framework.

The proposed dual-purpose model also has implications for policy makers. Recent federal legislation for CTE (Perkins IV) acknowledges the potential contribution of agricultural education (and other CTE programs) to helping students learn academic content. However, the current legislation and policy do not fully embrace an outcome not connected with gainful employment related to a CTE area. If evidence is found that many "successful" agricultural education programs operate by using agriculture as the context (i.e., Figures 2 or 3) with large portions of former students gainfully employed outside the agricultural industry, policy makers and educators should collectively reexamine how legislation and practice relate. In other words, if policy is more Snedden-like and practice is more Dewey-like, why does such a disconnect exist? Perhaps legislation could be constructed that provides greater flexibility in program planning, acceptable outcomes, and funding.

The dual-purpose agricultural education model also has implications for teacher-educators. Existing preservice curricula should be examined to determine whether it appropriately acknowledges the multiple roles of agriculture in agricultural education programs. If needed, coursework and experiential activities may need to be reconceptualized to more accurately align with the dual-purpose model. Teacher-educators should also consider placing student-teaching interns in schools that demonstrate an effective use of agriculture as content and context.

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