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USING AGRICULTURAL EDUCATION AS THE CONTEXT TO TEACH LIFE SKILLS

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Abstract

Over the years agricultural education has not done an adequate job of effectively defining or describing its meaning and purpose. As with the broad agricultural industry, the view of agricultural education varies between and among groups, within and outside of the profession, and has evolved according to global, regional, and local pressures including those originating from political, societal, and technological changes (National Research Council, 1988). This qualitative study investigated the perceptions held by individuals involved in agricultural education or the broadly defined agricultural industry as to how agricultural education can be promoted as a viable alternative for the instruction of academic and workplace skills, reducing some of the image problems associated with vocational education. Results indicate that participants believe agricultural education should remain a community-based program, and should incorporate more science-based instruction, but there is much confusion as to how traditional program goals such as FFA and SAE can be met with these changes. The conclusions and recommendations focus on a set of questions developed to guide future research on these issues.

Introduction and Conceptual Framework

Externally mandated bureaucratic changes such as state standards, standardized testing, and increased graduation requirements necessitate that agricultural educators be prepared and ready to articulate how their programs of study can meet established requirements for preparing youth to be future citizens and members of the workforce. This includes the notion of using agricultural education as a vehicle for the instruction of transferable skills—both academic and the "soft" skills identified as crucial for the workforce (SCANS, 1991) such as decision-making, communications and the ability to work within a group.

Meeting Traditional Program Goals and Reinforcing Workplace Skills

The basic core of agricultural education instruction consists of three intra-curricular components: 1) classroom instruction, 2) experiential learning through supervised experiences, and 3) leadership activities. When these three components are actualized through a well-designed integrated program, they provide a context for learning necessary content and life skills to prepare students for adulthood, regardless of their ideal career areas. The study of agriculture can also provide a context in which learners can explore key biological and mathematics concepts and skills. Research studies have demonstrated that learners fail to develop deep understandings of science and mathematics in traditional classrooms and therefore fail to apply this knowledge to settings outside of the particular classroom (Bailey & Merritt, 1997).

Supervised Agricultural Experiences (SAEs) were implemented in 1942 as a response by the agricultural education community to Dewey's call to base education on the personal experiences of the learner (Dyer & Osborne, 1996). SAEs bridge the gap between the classroom and work by providing students opportunities to apply what they have learned in the classroom and to transfer those knowledge and skills to a real-world situation (Swortzel, 1996).

Leadership activities conducted through the FFA provide opportunities for students to learn about teamwork, public speaking and debates, writing for communication of ideas, and other skills identified as important for the worker of the future (SCANS, 1991). In addition, the FFA Proficiency Awards Program enables students to use their technical agriculture knowledge and skills in such areas as floral design, machinery repair, livestock judging, and milk quality testing in a real-world setting; these activities are judged and evaluated by individuals practicing in the field. Combined with record books used with SAEs, students have the maximum opportunity to practice and demonstrate real-world problem solving, communication skills, and application of classroom knowledge to a new situation. In addition to these important opportunities for learning, most agricultural education programs engage in several community service activities per academic year, engaging students with their community and with citizens in need (Wade, 1998). These activities include tutoring younger students, providing lawn maintenance for senior citizens, stream clean up, playground equipment instruction, and others.

Reinforcement of Science and Mathematics Skills

From its inception in the 1700s, agricultural instruction in the United States has included instruction in science and mathematics. Agriculture by definition is an applied science that combines principles of the physical, chemical, and biological sciences in the process and production of food and fiber (Merriam Webster, 1988). The field of agriculture as an industry has also changed drastically since the inception of agricultural education. The small family farm that was the norm for American agricultural producers is now the exception. Agriculture today is a highly intensive, technologically sophisticated industry. These factors led the National Research Council to recommend that agricultural education programs must update and integrate more agricultural science into their course content, a contention echoed by Martin, Rajaeskaran, and Vold (1989). Nationally, the field of agricultural education has recognized a definite need for the integration of more scientific and mathematics principles into agricultural instruction.

Beyond the opportunities for learning and practice provided through SAEs and the FFA, students enrolled in agricultural education receive instruction and reinforcement of science and mathematics principles within the context of agriculture. Research has shown that using agriculture improves the acquisition of basic science and mathematics process skills of elementary students (Mabie & Baker, 1996). Students studying aquaculture in an agriculture program reported that their achievement in science and mathematics classes was higher as a result of their participation in agriculture based on comparisons with their past performances in those classes (Conroy & Walker, 1998). As one specific example, a secondary agriculture program in North Carolina reports using chemistry, biology and math in an integrated manner in their program using a closed aquaculture recirculation system, pond, and caged pond production methods (Mooring & Hoyle, 1994, as cited in Conroy & Walker, 1998). Another example of the interdisciplinary nature of agricultural education is a program that uses classroom aquariums to teach a curriculum that integrates aquaculture production and maintenance principles, technology, and sociology in an interdisciplinary model (Brody & Patterson, 1992).

Theoretical Framework

Lee (1999) defined transfer as the "ability to think and reason about new situations through using previous knowledge" (p. 1). Transfer can be either positive, where learning or problem solving is enhanced through the use of previous knowledge, or it can be negative, where previous knowledge actually hinders the learning process. Research on the transfer of general skills seems to be inconclusive, but it is evident that students have difficulty transferring information from one situation to another when the situations appear different to them (Hattie, Biggs & Purdue, 1996; Novak & Gowin, 1984; Robins, 1996). Transfer also is said to occur *within domains*, or performing similar task in the same domain or closely related subject area, or *across domains*, or where knowledge is acquired in one situation or subject area and then used in a second domain (Lee, 1999). Classroom learning and transfer can both be improved when instructional tasks reflect the contextual elements and reasoning complexity needed for addressing real-world problems (Choi & Hannafin, 1997).

The most recent theories of transfer are those espoused by Singley and Anderson (1989, as cited in Lee, 1999) and Pennington, Nicolich, and Rahm (1995). They involve the use of production rules, or a series of If-Then statements. Transfer should occur where production rules are similar between tasks, or where the numbers of shared production rules between tasks define similarity. Stating this in a more concrete way, common elements transfer. One example would be that the same rules that apply to driving a car should apply to driving a truck (Lee, 1999).

Novak and Gowin (1984) proposed the use of graphic/semantic tools such as concept mapping to assist children make linkages between prior knowledge (recall) and the new information being presented. Production rules, or the If-Then statements, are specific for any task that is learned, but environmental cues that are present when the recall is expected can result in faster recall. In addition, research has shown that knowledge or tasks in the first domain must be learned to a high level in order to transfer (Lee, 1999). Transfer is believed to occur along a continuum from "near transfer" that occurs within the same domains to "far transfer" that occurs across domains (Hattie et al, 1996). To build on this, the literature points to three keys to transfer:

1. Knowledge from the initial learning situation (first domain) is acquired prior to attempts to transfer that knowledge to another situation. In order for transfer to occur, the initial learning must be strong. There is also a relationship between transfer and the depth of learning as well as the creativity of the learning in the application of previous knowledge to a new situation.
2. The knowledge utilized in two situations must have overlapping production rules (The If-Then statements), which enables the individual to notice the similarities between the initial situation and the subsequent situation. If the individual lacks domain-specific knowledge to solve a problem in the second situation, he/she needs to be capable of recognizing the need for and seeking out this knowledge.
3. A person starts to apply previous knowledge to very new situations when he/she is highly skilled in the first domain. Research has not yet determined how much training and experience are needed for this transfer to begin (Blakey & Spence, 1990; Carey, 1986; Carr, 1988; Lee, 1999).

To simplify, this process can be visualized as a series of steps leading from one situation to the next, each step having similarities to the ones prior and subsequent to it. The ease of transition from step to step will depend on the amount and clarity of the similarities and the ability of the learner to make the connections.

Ways to improve transfer should improve intellectual functioning (Lee, 1999). Lee also contended that people develop reasoning strategies with in one context, but can fail to access these strategies for reasoning in another situation. The research she cited seems to indicate that training in memory strategies, memory monitoring strategies, and reflection on the strategies may promote a "liberation of the strategy from the domain and its subsequent availability for use in another domain" (p. 19). Lee's work supports that of Gersten and Baker (1998) that concluded that integration of explicit instruction in strategies of problem solving related to real world tasks would improve both retention and transfer of knowledge and skills.

In summary, agricultural education provides, at a minimum, hands-on, experiential, science and mathematics education that meet the demands for cross-curricular integration, and needs of students in the nontraditional settings. For example, SAEs and FFAs can incorporate current students and settings such as aquarium or gardening projects, or working in a small grocery store in inner city neighborhoods. Learning in context—such as that provided in the typical agriscience classroom--should assist students to learn, to depth, content in one or several related domains (e.g., science and mathematics). It should also enable them to recognize the social context in which problems are solved and to help them transfer this learning to different situations.

Purpose and Objectives of the Study

The major purpose of this study was to investigate perspectives held by various individuals working and/or interested in agricultural education on agricultural education as a vehicle for instruction in transferable skills. Specific research questions addressed were

1. What do individuals believe are the differences between vocational agriculture education and agriscience?
2. What is the perceived relationship of the agricultural education curriculum to transferability of academic and life (workplace) skills?

A secondary purpose of the study was to develop a set of research questions, based on the analysis of the interview data, to guide future research in teacher education in agriculture.

Procedures

This study is part of a larger study funded by the National Science Foundation (NSF) to examine the pedagogical competencies and the content necessary to teach agriculture as a science. Qualitative research design was used to assess participants' perceptions of the relationship of agricultural education and corresponding curricula to transferability of academic and life (workplace) skills. We conducted 20 interviews with attendees at the 1999 National FFA Convention in Louisville, KY, on October 28 and 29, 1999. The interview site was selected based on access to a national sample of individuals involved in agriculture and agricultural education. Each state of the union was represented at the site and the make up of participants included high school students, college students, college and university staff and faculty, industry representatives, and high school administrators.

Respondents were selected using maximum variation techniques to ensure a wide range in experience, geographical distribution, and job responsibilities. They included two high school students, six undergraduate agricultural education majors, three graduate students in agriculture education, one USDE representative, one USDA representative, three college/ university staff, and four university faculty. A total of 13 states, one U.S. territory, and the District of Columbia were represented. Six additional interviews were conducted in New York State in January 2000 with three high school teachers, one public school administrator, and two university faculty, all purposefully selected based on their willingness to participate.

Interviews were conducted using a semi-structured interview protocol (Patton, 1991). For this study, participant were asked the following open-ended questions:

1. What are your current opinions as to the differences between vocational agriculture, agricultural education, and agriscience?
2. What types of changes need to be implemented to teacher education programs so their graduates are better prepared to work in present-day and future school-based agricultural education programs?
3. Do you believe that agricultural education promotes transferability of content and skills to further education, future careers, and lifelong learning? If so, what are the elements that you believe can be/are transferred?

A recognized characteristic of qualitative research is that data collection and analyses proceed simultaneously. In this evaluation, taped interviews were transcribed and data sorted into domains or categories. Although most of the domains were guided by the evaluation objectives and interview questions, additional domains emerged as the data were collected and manipulated.

Cross-case analysis was used in the final analysis of the interview data. This involved grouping together answers from different people to common questions or analyzing different perspectives on central issues. Using this technique, similar and dissimilar domains or data categories were identified.

Qualitative data were largely presented in anecdotal form. Seidman (1991) stated, "recounting narratives of experience has been the major way throughout recorded history that humans have made sense of their experiences" (p. 2). The results were entered in Atlas t.i. for further sorting and analysis. Trustworthiness of the data was assured through a detailed audit trail and triangulation of the data from the two samples (Patton, 1991; Seidman, 1991).

Results

Participants believed that there are a lot of misconceptions held by others about agricultural education and agree that most children, students, and adults do not understand what agricultural education encompasses. They further believed that individuals outside the field of agricultural education lack understanding for the valuable skills incorporated in the program. Those interviewed agreed that agricultural education provides a unique learning experience for students as stated by one individual:

> Agricultural education is very versatile; you get a taste of everything, a wide variety of learning. I think that is pretty unique. I think it improves the learning by having the opportunity to learn a little facet of every field and every area out there.

According to participants, classroom themes—such as teamwork, collaborative learning, economics or management—can easily transfer to life applications. In a contextualized learning environment, such as the agricultural education classroom, students use knowledge learned in class (i.e. FFA, SAE projects, etc.), to transfer and apply in daily life. An educator stated, “They (students) can use the things they learn in the classroom in real life and see how to apply them, students can carry that over in every area of life.”

Agricultural education encourages transferable learning through work programs and cooperative training in agriculture. Hiring methods have changed, as employers seek staff with an affinity for personable skills (SCANS, 1991). A professor added, “They (employers) are beginning to hire people who have certain skills, across the board, and if you have a background in agriculture, it can certainly begin to help you.” The life experience gained through agricultural education programs also has become a marketable commodity in our workforce as cited by one participant:

> Learning this (the importance of transferable skills and life skills) early on helps you to focus later on your career and you will have learned from your mistakes and experience before hitting the job market. Agricultural education not only allows for that experience but also promotes it.

One industry representative shared views on transferability of classroom content to the workplace:

> The main purpose is getting students ready for life. I think high school academics are very important, but life skills and social skills are the most important thing you can get out of high school. Surely the skills that you learn in vocational or even agriscience are really important, but all in all, it’s making a well-rounded student that can get out in the world and be successful and survive.

The consensus was that agricultural education produces students who can be effective members of society, who have a high level of sufficiency in social skills, and possess content-rich information.

Many employers and educators now recognize that incidental learning is also an important component of the transition from childhood to the workforce (SCANS, 1991). Incidental learning includes those valuable life skills that may not be assessed, or taught directly, such as public speaking and other forms of communication, leadership, responsibility, and dedication. These are not skills typically taught in the academic classroom, and would also include incidental learning that is not part of the agricultural education curriculum. Agricultural education is not only linked to practicality, application and hands-on learning of content, but to incidental learning, as well, and students benefit from the incidental skills acquired during the transfer of life skills. According to one participant

> You learn things incidentally in agricultural education, and things change your attitudes, personal skills, communication, etc. It is through the agriculture program and the FFA that this change takes place and students are able to get involved in the community.

Those interviewed also agreed that the creation of relationships and partnerships with industry role models who are supportive of lifelong learning encourages the transfer of concepts and skills from academic setting to job placement and career.

Preparation for Academic Coursework and Higher Education

In addition to readiness for the workplace, agricultural education prepares students for higher education through facilitation of transfer of academic content and skills to other disciplines. More importantly, participants stated that it promotes learning for all students by effectively addressing various learning styles, techniques and approaches:

> One thing agricultural education programs do particularly, that no other program does, is that ANY student can be a success in the agricultural education program. You don't have to be an athlete or have any special talents; you simply have to have a good work ethic and a willingness to get involved.

> Instead of focusing on their strong skills academically, agricultural educators focus on everything.

Participants believed that curricular integration at the high school level is a major factor in the transfer of academic content and skills as stated by one teacher:

> We have a variety of projects that are innovative. We have a high school agriculture teacher partnering with a physics teacher—something that you would not expect to happen within a high school. So these are, I think, some examples that help not only students to connect or reconnect to agriculture, but also help the teachers reconnect and see the impact or the opportunities that are in agriculture besides production oriented careers, not to down play those, but to realize there are a broad range of opportunities.

Changes in the agriculture industry coupled with those in society and student interest will continue to force adaptations to agricultural education. These adaptations and changes in foci will likely require new methods of teaching, or a 'reinvention" of the old to address emerging trends. The increase of jobs requiring postsecondary technical education and teamwork are two important factors behind renewed emphases on integration and transferable academic—particularly science—and workplace skills. The issue of a more science-based curriculum emerged during the data collection process and provided us with an additional focus for questioning. We inquired as to how participants felt about the change to a more science-based curriculum, and the impact such a change would have on students, the programs, and the overall purpose of the agriculture program at the local level.

How Much Should the Focus Change to a Science-Based Curriculum?

Most participants believed that the experiential methods employed in the typical agriculture classroom couldn't be utilized for science-based instruction. They differed markedly, however, in their feelings about whether currently enrolled students would continue to embrace agricultural education if a shift towards a more science-based curriculum occurred. Some interviewees felt a science-based program would attract a new kind of student, and would strengthen the program, overall. They felt that encouraging "the best and brightest" students to become involved in agricultural education would result in advanced placement and college prep courses in agriculture. A university professor stated:

> If you look at the clientele that agricultural education has served over the years, it has served the average students and the below average students. It has not served so well, the students who are at the other end of the curve, the best and the brightest. They are the least well represented of all those categories. So I think with agriscience, we will be able to attract more and to serve more of the best and the brightest and literally tackle the waterfront on other issues.

Others felt that becoming more science-based would cause current clientele to lose interest—replacing the traditional curriculum with science-based learning might "shut out" current students who sought vocational and hands-on learning. We should note here that current state-of-the-art science methodologies would incorporate the same levels of inquiry, hands-on exploration, problem-based learning, and other teaching styles promoted through agricultural education. There was definitely a perception among participants, however, that a move to science-based instruction would not include these types of instructional techniques. Participants also viewed changes in agricultural education, such as move towards science-based instruction, as a reflection of changes occurring outside the classroom:

> Schools and our society put a lot of emphasis on moving towards the direction of college prep and that has placed pressures on vocational education to redefine itself. Part of this is the change of the technology within agriculture.

According to respondents, agricultural education is trying to remain competitive and current, while also attempting to stay viable and attractive to students. Participants noted changes or growth in agricultural education and movement towards a more science-based orientation as those items that may need research, review, and planning.

Discussion of emerging and anticipated changes in agricultural education caused participants to often reflect on challenges in dealing with these changes, as well. We asked the following question in order to assess their perceptions of the most critical challenges with which the profession must deal: "What are the greatest challenges facing agriculture education today?" According to those interviewed, the challenges facing agricultural education today include

1. Making people aware of the new changes agriculture has undergone and the importance of agriculture;
2. Recruitment and keeping students interested and involved in agriculture;
3. The promotion of agriculture and changing image (i.e. dispelling common misconceptions about agriculture); and
4. The shortage of qualified teachers in agricultural education.

It is interesting to note that, in particular, items 1, 2 and 3 have been issues since the publication of *New Directions* in 1988 and before. It appears to us as if the crises in recruitment, promotion, and the teacher shortage has shifted the focus of attention from pedagogical and curricular issues at a time when we believe it is most crucial to address them.

Over the years, it has been difficult to define or pinpoint the meaning and purpose of agricultural education. It has varied between groups, within and outside of the field, and has evolved according to global, political, societal, and technological issues as well. The content of agricultural education is not static, but is ever changing and we need teachers who can adjust to that change.

Conclusions and Recommendations

Qualitative data cannot be generalized to any persons beyond those interviewed. It is up to the reader(s) to determine if our findings and conclusions are applicable to their respective situations (Gall, Borg & Gall, 1996). Our bias, as agricultural educators, as well as that of the participants, should also not be overlooked. We were able; however, to develop some conclusions that warrant consideration.

First, agricultural education is a viable curriculum alternative for instruction and experiences leading to transfer of workplace skills. Learning technical and workforce skills is encouraged within the diversity of coursework and experiences in agricultural education, offering students an opportunity to learn a variety of skills. Agricultural education incorporates a combination of diverse teaching methodologies (i.e. hands-on learning, vocational skills training, academic concept development) and technical content (i.e. agriculture, business, science, marketing, economics), with intra-curricular experiential learning and leadership development.

Second, agricultural education provides students with transferable academic skills so as to prepare them to achieve in other courses, as well as preparing them for higher education. Participants in this study agreed that most agricultural education students are intrinsically motivated to understand and become involved in the learning process. They believed the encouraging environment that is typically found in the agricultural education classroom engages students and fosters interest to promote further education.

Third, all participants agree that the term "vocational agriculture" has negative impacts on the public image of the programs and that science-based instruction would help improve that image. There is not, however, universal agreement as to the degree that science should become the major focus of the high school agriculture curriculum, even when considering transfer of academic skills. Much of the disagreement is due to a lack of understanding of the appropriate techniques and methods of teaching agriculture as a science, while leaving the experiential learning and leadership components of the program intact.

We have come away from this experience with more questions than answers. From an investigation of the interview data, it is apparent that interview participants' perceptions and images of agricultural education are changing. Reflecting on the interview data leads to the following questions we pose to the field of teacher education in agriculture as recommendations for future research.

1. Due to the broad scope and nature of agricultural education, and the ever-increasing technology within the agriculture industry, it is difficult for educators to remain current in such a variety of areas. Should we be educating highly qualified agricultural educators in specialized fields rather than generalists? How would this impact programming at the local level? If this is not possible, what changes need to be made to inservice delivery given declining resources at the university and state levels?
2. Using experiential learning to teach transferable skills helps students develop lifelong learning skills, and the application of theory and concepts to real world problem solving. What theories of transfer need to be incorporated into our teaching methods courses?
3. Participants believe that an increase in science instruction will lead to a natural decrease in the time available for experiential and hands-on learning in the agriculture classroom. Is this true? What are the types of experiential learning currently promoted in science education and how can those be incorporated into teacher education in agriculture programs? Other science

methodologies? How can the experiential learning methodologies typically used in the agriculture classroom be incorporated into an agriculture class offered for science credit? How do these changes impact the planning, delivery, and assessment of instruction?
4. What is the set of transferable knowledge and skills taught in the agriculture classroom? Why are those skills the most transferable? How can this knowledge inform the instruction of other skills? What is the impact of this information on the planning, delivery, and assessment of instruction?

In summary, when participants were asked about the importance of the promotion of agricultural education within the context of transferability of academic and life (workforce) skills, they stated that one major purpose of agricultural education is "To develop a love and understanding for agriculture, educating students and adults as to its importance, and the promotion of literacy throughout educational and community systems." We believe this understanding will help ensure that we have informed individuals as decision-makers going to the polls and dealing with agricultural issues. It will also help prepare the next generation of agriculturists in leadership roles for future careers in the field.

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