IDENTIFYING ENTRY-LEVEL SKILLS EXPECTED BY AGRICULTURAL INDUSTRY EXPERTS AND DETERMINING TEACHERS' PERCEPTIONS ON WHETHER THEY ARE BEING LEARNED THROUGH STUDENTS' PARTICIPATION IN THE SUPERVISED AGRICULTURAL EXPERIENCE COMPONENT OF THE SECONDARY AGRICULTURAL EDUCATION PROGRAM: A TWO-PANEL DELPHI STUDY

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CHAPTER I

INTRODUCTION

Agriculture has been on the world stage for millennia; history records civilizations that have grown from the soil and owe their early success to those that could plant and then harvest a sustainable living from the earth. Wars have been fought to determine control of natural resources that would be used to feed the masses. Laws have been passed and scholars have examined the innovations of modern science so that agricultural sectors of nations could be constant and plentiful.

Agriculture is an enduring discipline that will have relevance for future generations of citizens well beyond our present understanding of time and history. Insuring that future generations are agriculturally literate and they are taught about the importance of agriculture was a seminal finding of the National Research Council's (NRC) Report (1988), "Understanding Agriculture: New Directions for Education." Achieving the goal of agricultural literacy will produce informed citizens who are able to participate in establishing policies that support a competitive agricultural industry in the United States and abroad. Citizens who are agriculturally literate have an understanding of their food and fiber system that includes the history of agriculture and its importance to the economic, social, and environmental aspects of society (NRC, 1988).

Teaching agriculture was formalized in secondary public schools in 1917 with the passage of the Smith-Hughes or National Vocational Education Act (P.L. #64-347). This federal legislation provided for teaching agriculture subjects such as plant science, animal science, and farm economics. The curriculum was production-oriented and focused on primary skill acquisition so students could return to the farm and be successful. That model of vocational agriculture was embraced for seventy-odd years. However, the National Research Council's report called for a shift in the purpose of agricultural education. This new focus would embrace a much broader agriculture industry, including career opportunities in sophisticated biological, chemical, mechanical, and electronic technologies as well as preparing students for higher education. Currently, an integrated offering of relevant concepts and principles, leadership practices, and experiential learning (National Research Agenda, 2007) serves secondary agricultural education students. This model of agricultural education focuses on the classroom and laboratory, youth development (FFA), and experiential learning (SAE) components of the program (Talbert, Vaughn, Croom, & Lee, 2007).

Historically, the aforementioned approach to teaching agriculture accommodated multiple learning styles and had a significant focus on "learning by doing." The hallmark of this approach to teaching is best realized through the experiential learning opportunities that exist in all three components of the agricultural education model. The flexibility of this model has also allowed for the changing market demand in agricultural occupations. According to the National FFA Organization, more than 300 career opportunities in the food, fiber, and natural resources industry exist (2008-2009 Official FFA Manual). The instructional component of this model provides learning experiences that prepare students for

various entry points into the agricultural sector. Moreover, the experiential learning aspects of the program provides hands-on opportunities that reinforce the skill acquisition targeted by most agricultural education curriculum.

These targeted experiences are operationalized acutely in the agricultural education model as Supervised Agricultural Experiences (SAE). Supervised experiences are designed to provide opportunities for hands-on learning in skills and practices that lead to successful personal growth and future employment in an agricultural career (Talbert et al., 2007). These skills and practices are designed to prepare students for the world of work, particularly in the agricultural industry. Through dedication and effort, students who excel in their supervised agricultural experience programs can be recognized for their efforts through the model's youth development component, FFA. This recognition works as a form of extrinsic motivation and assists in building students' self-esteem (Talbert et al., 2007).

The success of the agricultural education model has been evident for the past 81 years. However, a recent report indicated a decline in the implementation of and student involvement in the SAE component of the model. In the Annual Report for Agricultural Education (2005-2006), it was reported that in a recent survey, 91% of the respondents (i.e., students) indicated they did not have an SAE. This finding was not surprising entirely because some scholars and practitioners of agricultural education have reported empirically and anecdotally that the SAE component of the model was perhaps losing ground in many agricultural education programs (Dyer & Osborne, 1995; Wilson & Moore, 2006). The decline in delivery of this facet of the model has implications regarding agricultural education's role in the preparation of students for entry-level jobs in the agricultural industry. In some instances, the learning experiences being taught in the secondary agricultural

education program may not be congruent with today's agricultural industry standards. This incongruence may be a contributing factor to the decline in students who actively participate in SAEs. This study is designed to determine if the SAE component of the secondary agricultural education program is preparing agricultural education students for entry-level careers in the agricultural industry as perceived by a select group of agricultural professionals who served as panelists for a three round Delphi panel during 2009.

Statement of the Problem

Historically, the development of agricultural education has been shaped by federal legislative acts. Federal legislation in 1862, i.e., the Morrill Act (or the Land Grant College Act) established the importance of practical arts education to the welfare and economic prosperity of the United States (Phipps, Osborne, Dyer, & Ball, 2008). Additional legislative initiatives have influenced the delivery and focus of agricultural education. Phipps et al. (2008) suggested the Smith-Hughes Act of 1917 was the legislative act that bonded aspects of vocational education together on a national level and provided funds to support the delivery of vocational education at the secondary level in the United States. Funding through the Smith-Hughes Act was restricted to providing monies to educational programs that 1) prepared students for useful employment, 2) were less than college grade, and 3) were designed for students more than 14 years of age who were working or preparing to work on the home farm or in the farm home (Phipps et al., 2008). These provisions were formalized by vocational agricultural education as directed or supervised practice in agriculture (P.L. #64-347). This early initiative provided the framework for the experiential hallmark of the tripartite model of agricultural education known as SAE (see Figure 1).

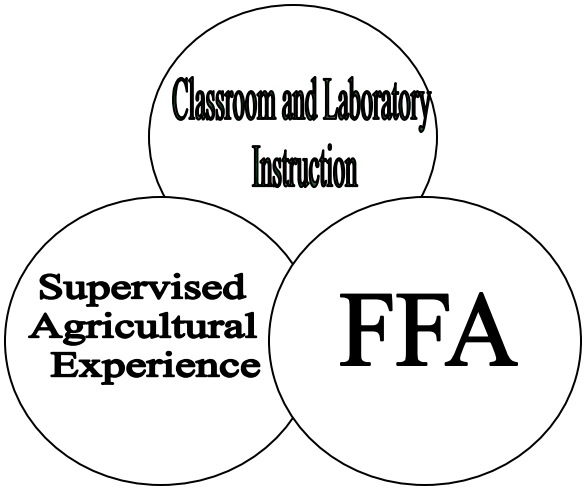

Figure 1. Comprehensive Model of Agricultural Education (Taken from Talbert et al., 2007)

The importance of experiential learning through agricultural education has been widely reported (Camp, Clarke, & Fallon, 2000; Cheek, Arrington, Carter, & Randell, 1994; Dyers & Williams, 1997; Roberts, 2006; Stone, 1994). Dewey (1938) believed all true learning is based on experiences, and to continue learning one must continually question and evaluate his or her own experiences. Kolb (1984) reported various forms of experiential learning, including internships, field placements, work/study assignments, and structured exercises, all of which are available in the context of agriculture and can be delivered via students' SAEs (Arnold, Warner, & Osborne, 2006). To insure that the student can see the relevance and potential transfer of the relationship between the curriculum and the situation or context, educators must create experiences with thoughtful consideration of the knowledge and skills at hand and help students make connections between experience and their education successfully (Arnold et al., 2006).

Hosts of researchers have reported on the benefits of students' SAEs. Dyer and Williams (1997), in their synthesis of research on the benefits of SAE, reported that SAEs were beneficial to students. Pals (1988) identified benefits perceived by parents, employers, and vocational agriculture instructors as 1) promoted an acceptance of responsibility, 2) developed self-confidence, 3) provided an opportunity to learn on their own, 4) developed independence, and 5) students learned to work with others. Benefits of SAEs are more general in nature than specific technical competencies, according to Dyer and Williams (1997). Parents and employers are aware of the secondary agricultural education program's benefits to the students; however, they could not attribute them readily to the three components of the program model: classroom and laboratory instruction, FFA, or SAE (Pals, 1989).

The benefits of SAE can be categorized in a variety of areas but of particular interest to this study are the technical competencies that hold potential for being transferred from students' SAEs to the work-site. This transfer of skills acquired by students through experiential learning is an important theme associated with secondary agricultural education, i.e., preparing students for entry-level careers in the agricultural industry.

According to Rogers (2003), an unanticipated consequence is a "change due to an innovation that is neither intended nor recognized by the members of the social system" (p. 448). The authors of the Vocational Education Act of 1963 intended to "strengthen and improve the quality of vocational education and to expand vocational education opportunities in the nation" (Phipps et al., 2008, p. 29). Specifically, the authors wrote, "such education [i.e., agricultural education] may be provided without directed or supervised practice on the farm" (as cited in Wilson & Moore, 2006, p. 2). This statement resulted in an unanticipated

consequence which was interpreted by some educators to mean that supervised practice was no longer restricted to just farm work; however, others interpreted this to mean that supervised practice was no longer required at all, according to Boone, Doerfert, and Elliot.(as cited in Wilson & Moore, 2006). These “interpretations” combined with additional provisions of the act have contributed to a steady erosion of supervised experience in agriculture (Wilson & Moore, 2006).

Nonetheless, the importance of SAE has been well documented and much has been written in support of SAEs (Camp, Clark & Fallon, 2000; Dyer & Osborne, 1995; Dyer & Williams, 1997). The literature also provides evidence of incongruence as it relates to theory versus practice. Steele (1997) reported that agricultural educators espoused SAE in theory, but in the state of New York, actual quality and quantity of experiential learning programs was declining. Dyer and Osborne (1995) reported a lack of focus, direction, and definition of SAE programs. Baggett-Harlin and Weeks (2000) reported inconsistencies among Oklahoma agricultural education programs regarding level of student SAE participation. Minimization of this experiential learning component of the secondary agricultural education model should be of interest to the profession. A primary purpose of the secondary agricultural education program is to prepare students for entry-level careers in the agricultural industry (Phipps et al., 2008 p. 3). But how can such preparation occur if what may be a declining or “minimized” focus on SAE by secondary agricultural education teachers exists? This and related questions are worthy of systematic inquiry and investigation.

Purpose of the Study

The two-fold purpose of this study was to 1) describe the perceptions of a select group of agricultural professionals (industry experts and secondary agricultural education teachers) regarding the entry-level technical skills expected by the agricultural industry and the acquisition of these skills by students through their participation in the SAE component of secondary agricultural education in Oklahoma; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' Supervised Agricultural Experiences.

Objectives

1. Describe selected personal and professional characteristics of participants who comprised the two panels of agricultural experts: selected agricultural industry experts and secondary agricultural education teachers in Oklahoma.
2. Describe the perceptions of selected agricultural industry experts regarding the Supervised Agricultural Experience (SAE) component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for entry-level positions in the agricultural industry in Oklahoma, using the seven career pathways as a framework.
3. Describe the perceptions of selected Oklahoma agricultural education teachers regarding the technical skills learned by students who participate in the Supervised Agricultural Experience (SAE) component of secondary agricultural education in Oklahoma, using the seven career pathways as a framework.

4. Compare the perceptions of agricultural industry experts and secondary agricultural education teachers regarding the entry-level technical skills students should learn through participation in Supervised Agricultural Experiences (SAEs) in Oklahoma, using the seven career pathways as a framework.

5. Suggest components that could be used to develop a model for use by Oklahoma secondary agricultural education teachers to guide their practice when planning, facilitating, assessing, and evaluating students' SAEs such that the job preparedness of students entering the agricultural industry in Oklahoma is enhanced.

Scope of the Study

This study included two panels of experts: One panel represented the agricultural industry in Oklahoma and the other included secondary agricultural education teachers who were leaders of the Oklahoma Agricultural Education Teachers Association (OAETA) during the time of the study. Ninety experts representing agricultural cooperatives, livestock production, livestock marketing, small grain production, small grain marketing, as well as other ancillary agribusiness entities comprised the population from which the agricultural industry panelists were drawn. Twenty-two active teachers who held offices in Oklahoma's state level professional organization for secondary agricultural education teachers provided members of the teacher panel.

Assumptions

The following assumptions were made in conducting this study:

1. All agricultural industry experts were familiar with the entry-level skills required for the sector of the industry they represented; and, they either were or had been responsible for hiring entry-level employees.

2. All secondary agricultural education teachers used supervised agricultural experiences as a means for students to learn entry-level skills needed in the agricultural industry.

3. The Delphi panelists would provide what they perceived to be appropriate and accurate responses to all items, questions, statements, or other objects to which they were asked to respond.

Delimitations of the Study

This study was delimited to 90 agricultural industry experts and 22 secondary agricultural education teachers in Oklahoma for the purpose of populating two distinct Delphi panels. Further, individuals who were selected to serve as panelists were required to ensure the researcher that they had consistent and reliable access to the Internet for the purpose of receiving the study's instruments and related correspondence and sending their responses to the researcher.

Limitations of the Study

The following were limitations of the study:

1. Significant variability between the entry-level technical skills required for different sectors of the agricultural industry may exist.

2. The study was limited to selected industry experts as Delphi panelists who may not have been representative of the entire agricultural industry in the state of Oklahoma.

3. The teachers selected as panelists for the study were elected by their peers to serve in leadership roles. However, significant variability may have existed in how selected teachers operationalized the role of experiential learning in secondary agricultural education and their use of SAEs as a learning context for students to learn entry-level technical skills.

Significance of the Study

The purpose of secondary agricultural education has focused on (a) preparing people for entry or advancement in agricultural occupations and professions, (b) job creation and entrepreneurship, and (c) agricultural literacy (Phipps et al., 2008). The delivery of agricultural education in secondary schools is facilitated by offering a comprehensive program model that emphasizes experiential learning, including classroom and laboratory instruction, youth development through student participation in the FFA organization, and supervised agricultural experiences (Talbert et al., 2007). Supervised agricultural experience is the part of agricultural education that allows students to practice in a work setting (placement) or an entrepreneurial (ownership) environment what they have learned in the

classroom or laboratory (Talbert et al., 2007). These work-based learning experiences are a component of agricultural education that sets it apart from many other programs or subjects in most secondary schools.

The importance of SAE has been well documented and much has been written in support of it as an essential component of the secondary agricultural education model (Camp et al., 2000; Dyer & Osborne, 1995; Dyer & Williams, 1997). However, some researchers have provided evidence of incongruence as it relates to theory versus practice (Baggett-Harlin and Weeks 2000; Dyer and Osborne 1995; Steele, 1997) i.e., the actual implementation or operationalization of SAEs as a primary component of the secondary agricultural education model in some programs. This study sought to identify the perceptions of two panels of experts regarding the role of the supervised agricultural experience (SAE) component of the secondary agricultural education model in facilitating students learning technical skills needed for entry-level employment in the agricultural industry.

The results of this study could serve to inform a plethora of agricultural education stakeholders, e.g., state leaders of agricultural education, teacher educators, pre-service teachers, and in-service teachers, about possible pre-service preparation courses, in-service topics, curriculum opportunities, and resource allocation needs in relation to implementing the SAE component of secondary agricultural education effectively.

Operational Terms and Definitions

Agricultural Education- a systematic program of instruction in and about agriculture and related subjects commonly offered in secondary schools, through some elementary and middle schools and some postsecondary institutes/community colleges (Talbert et al., 2007)

Agricultural Industry- the broad industry engaged in the production of plants and animals for food and fiber, the provision of agricultural supplies and services, and the processing, marketing, and distribution of agricultural products (Herren & Donahue, 2000)

Agricultural Literacy- an understanding of the food and fiber system that includes the history and current economic, social, and environmental significance agriculture has to all Americans (National Research Council, 1988)

Career Clusters- a grouping of occupations and broad industries with similar characteristics; it provides an organizing structure for schools and academics; it has both a career and college study focus (Phipps et al., 2008)

Career Pathways- programs of academic and technical study that integrate classroom and real-world learning organized around industry (Hoachlander, 2008)

Classroom and Laboratory Instruction- one of three components of a complete school- based agricultural education program; it is designed to develop conceptual knowledge and understanding (Phipps et al., 2008)

Constructivism- the view that students learn by constructing their own meaning and understanding of the topic under investigation rather than receiving information from another source in an already organized form (Phipps et al., 2008)

Delphi Technique- a communication process that is structured to produce a detailed examination of a topic/problem and discussion from the participating group (i.e., expert panel), but not one that forces a quick compromise (Linstone & Turoff, 1975)

Employability Skills- broad academic and workplace skills (Secretary's Commission on Achieving Necessary Skills, 1990)

Entry-level Employment- employment obtained by entry-level employees; this group of persons is characterized as "employees who are recent high school graduates hired as new entrants into the workforce at an entry-level wage in a beginning level position" (Richens, 1999, p. 9)

Entry-level Skills- industry or discipline specific workplace skills necessary for entry-level employment (Richens, 1999)

Experiential Learning- an experience-based approach to learning in which students experience a direct encounter with the phenomenon under study, reflect on that experience, draw general conclusions, and test their newly acquired knowledge through subsequent performance (Phipps et al., 2008)

Expert- a person with specialized knowledge or skill (Webster's, 21st Century Dictionary, 1993)

FFA- a dynamic youth organization that is a part of agricultural education programs at middle and high schools (Official FFA Manual, 2008-2009)

Proficiency Award- a FFA award program that recognizes FFA members at the local, state and national levels for exceptional accomplishments and excellence in a Supervised Agricultural Experience (SAE) program (Official FFA Manual, 2008-2009)

Placement SAE- Placement programs involve the placement of students on farms and ranches, in agricultural businesses, in school laboratories, or in community facilities to provide a "learning by doing" environment. Ideally, this environment will enable students to develop competencies that permit entry and/or advancement into their chosen occupational field (National Council for Agricultural Education [1992]. Experiencing Agriculture: A Handbook on Supervised Agricultural Experience)

Secondary Agricultural Education Program- formal agricultural education programs offered in the public schools (as opposed to non-formal agricultural education programs offered by business or other nonschool agencies) (Phipps et al., 2008)

Secondary Agricultural Education Teacher- a person teaching agriculture and natural resources and related topics to youth or adults in formal or non-formal settings (Phipps et al., 2008)

Supervised Agricultural Experience (SAE)- all the practical agricultural activities of educational value conducted by students outside of class and laboratory instruction or on school-released time for which systematic instruction and supervision are provided by teachers, parents, employers, or others (Phipps et al., 2008)

Team Ag Ed- composed of several groups and organizations, Team Ag Ed is a united effort to promote local program success (Phipps et al., 2008)

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this chapter is to present a review of the related literature supporting this study. This review will investigate the utility of the experiential learning component of the secondary agricultural education model, particularly, as it is related to the preparation of agricultural education students for entry-level careers in agriculture. The review is divided into the following sections: (1) Historical Purpose of Secondary Agricultural Education; (2) The Secondary Agricultural Education Model; (3) Constructivism as a Conceptual Basis for Experiential Learning; (4) The Evolution of Supervised Agricultural Experience; (5) Career Clusters and Career Pathways; (6) Use of the Delphi Method in Agricultural Education; and (7) Summary.

Historical Purpose of Secondary Agricultural Education

"Education, in order for it to accomplish its ends both for the individual learner and for society, must be based on experience-which is always the actual life experience of some individual." John Dewey (1938)

Man discovered early that if he was to rise from savagery he must work (Roberts, 1971). The nature of work and how we learn to work can include accidental discovery, trial and error, and imitation, all of which are costly and inefficient (Roberts, 1971). Planned experiences became an efficient method of learning to work; these early planned experiences became known as apprenticeships and were the recognized pathway into a vocation or career (Roberts, 1971). Apprenticeships were the forerunner of Vocational Education in the United States; as the United States engaged in the Civil War and the Industrial Revolution accelerated, the resulting population shifts made training American workers and introducing youth to potential careers increasingly important (Roberts, 1971).

In the last decades of the 19th century, President Theodore Roosevelt came to look upon the American farmer as his last hero. Roosevelt's realization that the United States was "one year away from starvation" and that conditions for the farmer were so terrible that if steps were not taken to make the production of excellent citizens on the farm a priority it could mean ruin for agriculture and farming in the United States (Ellsworth, 1960). Roosevelt's *Country Life Commission* in 1908 was the result of his recognition of the need for agricultural reform in rural America.

According to Roberts (1971), the decreased demand for unskilled labor and the increased interest in preparing skilled labor combined with influence from the National

Society for the Promotion of Industrial Education, The National Education Association, Office of Experiment Stations, and the American Federation of Labor all led to the establishment of federally funded vocational education.

The Morrill Acts (1862/1890) provided land to each of the states for the construction of a university designed to provide practical education for the purpose of improving peoples' daily lives (Phipps et al., 2008). The Nelson Amendments to the Morrill Act (1907) provided the first federal monies to support the preparation of agriculture teachers in the United States (National Research Council [NRC], 1988). During that time, vocational agricultural education began to develop the philosophy and traditions that characterize its' descendant today. Even at its inception, "agricultural education" was much broader in scope than the occupational programs designed for business and other industries (NRC, 1988). In 1900, about 400 high schools offered instruction in agriculture or its applications to botany, chemistry, or zoology. A single teacher in each school was usually responsible for agricultural education. Most of those teachers had been employed to teach science (True, 1929).

In terms of identifying what was to be considered vocational education, many states turned to the appointment of state commissions and study committees that focused on identifying the needs of vocational education. These early commissions included instruction in agriculture; in 1902, the Association of Agricultural Colleges and Experiment Stations recommended that the teaching of agriculture be introduced into the public schools as well as special agricultural schools (Roberts, 1971). These efforts cumulated in what would become Vocational Education programs in public schools in the United States.

The passage of the Smith-Hughes Act in 1917 (P.L. #64-347; National Vocational Education Act) created a paradigm shift that affected the way secondary education was provided: (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 that had previously been primarily a state function. Specifically, students in vocational agricultural education were required to engage in a supervised practice program for a minimum of six months each year (Roberts, 1971).

Teaching agriculture was formalized in secondary public schools in 1917 with the passage of the Smith-Hughes Act (P.L. #64-347). This federal legislation provided for teaching agriculture subjects such as plant science, animal science, and farm economics. The curriculum was production-oriented and focused on primary skill acquisition so students could return to the farm with knowledge of how and when to use agricultural innovations and which soil and animal husbandry practices might overcome longstanding problems (NRC, 1988).

This vocational focus on skill acquisition was not without critics nor did the idea escape rigorous debate by educational philosophers and leaders. Several individuals who are noted for their contributions to vocational education were Rufus Stimson, John Dewey, David Snedden, and Charles Prosser. According to Drost (1977), the robust debates between Snedden and Dewey provided a voice for the paradigm shift that was occurring in education. Snedden supported content-centered curricula, focused on specific skill acquisition, based on established industry standards, and delivered separate from general academic content. Snedden was a proponent of the social efficiency philosophy that had roots in the apprenticeship model used in Germany (Drost, 1977). In opposition to this view, Dewey

promoted an integrated approach in which vocational skills and academic content were blended, delivered in a context-rich environment for the purpose of developing transferable life skills. Snedden's views resonated with legislators; accordingly, Snedden along with Charles Prosser were instrumental in writing the Smith-Hughes Act that laid the groundwork for a century of vocational education in the United States, including secondary agricultural education (Roberts & Ball, 2009).

The Smith-Hughes Act made specific provision for students in vocational agricultural education to engage in supervised practice programs for a minimum of six months each year (Roberts, 1971). The director of the Smith Agricultural School, Rufus Stimson, is credited with developing the “Project Method” of teaching (Moore, 1988; NRC, 1988). According to Deyoe (1943) and Thayer (1928), little doubt exists that Stimson’s work served as the model for the supervised practice aspect of the legislation (as cited in Moore, 1988; NRC, 1988).

This new method of teaching agriculture allowed every student to apply the technical content and related principles taught in the classroom to a project that was located on the home farm. This approach enabled students to gain the hands-on experience that has become the hallmark of secondary agricultural education (Moore, 1988; NRC, 1988).

Stimson was a student of classic educational philosophers: Froebel, Herbart, Pestalozzi, Rousseau, and Socrates (as cited in Moore, 1988); as such, he appreciated the holistic view of education that was central to the argument espoused by Dewey (Moore, 1988). Dewey wrote about the project method as being a distinct teaching method and found Stimson’s approach to teaching agriculture “harmonious” with his educational beliefs and ideas (as cited in Moore, 1988).

Stimson's development of the project method was based on a sound philosophical basis. Today, little difference exists between how the project method is being implemented in secondary agricultural education and how Stimson envisioned it originally. Although the essence of the project method has remained the same, the terminology used to identify the project method has gone through much evolution. According to Phipps et al. (2008), the words that have been used to describe the "home project" program first proposed by Stimson have gone through a complete metamorphosis. Some of the variations include the *Home-School Cooperation Plan* (1908), *Farming Project* (1919), *Productive Farm Enterprises* (1926), *Supervised Farm Practice Program* (1938), *Supervised Farming Program* (1943), *Supervised Occupational Experience Program* (1972), and *Supervised Agricultural Experience Program* (1992) (Phipps et al., 2008).

The value of experiential learning in agricultural education was a central theme used by Rufus Stimson when he convinced the Smith School of Agriculture's Board of Trustees to sell the school farm and allow students to use projects on their home farms to apply the theories taught in the classroom (Moore, 1988). However, this is but one component of secondary agricultural education. Secondary agricultural education has three main program components: classroom and laboratory instruction, supervised experience, and FFA or youth leadership development (see Figure 1). Each of these components is critical if students are to receive the full educational benefits afforded by a secondary agricultural education program (Talbert, et al., 2007).

So, what is the purpose of secondary agricultural education? Numerous students, teachers, policymakers, and scholars have asked this question since passage of the Smith-Hughes Act in 1917 (P.L. #64-347). Agricultural education has been delivered systematically

at the elementary, middle school, secondary and postsecondary or adult levels for over seventy years. According to Phipps et al. (2008), the purpose of agricultural education has focused on (a) preparing people for entry or advancement in agricultural occupations and professions, (b) job creation and entrepreneurship, and (c) agricultural literacy.

However, Leising and Zilbert (1994) recognized that nearly 90% of the U.S. population was two or three generations removed from direct contact with food and fiber production. As such, it is important to ensure that future generations are agriculturally literate and they are taught about the importance of agriculture (NRC, 1988). According to Phipps et al., that is a component of agricultural education's purpose.

Achieving the goal of agricultural literacy would assist in educating informed citizens who are able to participate appropriately in establishing policies that support a competitive and sustainable agricultural industry in the United States and abroad. Agriculturally literate citizens have an understanding of their food and fiber system that includes the history of agriculture and its importance to the economic, social, and environmental aspects of society (NRC, 1988).

The notion of preparing people for entry-level job placement in agricultural occupations and professions is the essence of this study. Of particular interest is the role of supervised agricultural experience (SAE) in students acquiring the skills necessary for attaining entry-level jobs in the agricultural industry.

The industry of agriculture has evolved since the initial call to expand the scope and purpose of secondary agricultural education and SAE was made in the NRC report published in 1988. The NRC's charge was for agricultural educators to look beyond secondary

agricultural education's theretofore largely production-oriented focus and to include agricultural sciences, agribusiness, marketing, management, and food production and processing as it moved forward. The NRC asserted that this shift would create opportunities for students to acquire supervised experience in land laboratories, agricultural mechanics laboratories, greenhouses, nurseries, and other facilities provided by schools (NRC, 1988). In support, the agricultural industry offers 52,000 job opportunities annually in areas such as sales and marketing, specialty veterinary medicine, food safety/biosecurity, forest ecosystem management, precision agriculture, biomaterials engineering, landscape horticulture, plant and animal genetics, specialty crops production and nutrition services (Goecker, Gilmore, Smith & Smith, 2005).

The model of vocational agriculture was embraced for more than 70 years. However, the NRC's report encouraged a shift in the purpose of agricultural education, i.e., to focus on a much broader agricultural industry, including career opportunities for high school graduates in sophisticated biological, chemical, mechanical, and electronic technologies as well as preparing students for higher education.

The Secondary Agricultural Education Model

Historically, the development of agricultural education was shaped by federal legislative acts. Legislation in 1862, i.e., the Morrill Act or the Land Grant College Act, established the importance of practical arts education to the welfare and economic prosperity of the United States (Phipps et al., 2008). Additional legislative initiatives have influenced the delivery and focus of agricultural education writ large as well as its secondary education program. Phipps et al. (2008) suggested the Smith-Hughes Act of 1917 was the legislative act

that bonded vocational education on a national level and provided funds to support the delivery of vocational education at the secondary level in the United States. Funding through the Smith-Hughes Act was restricted to providing funds to educational programs that (a) prepared students for useful employment, (b) were less than college grade, and (c) were designed for students older than 14 years of age who were working or preparing to work on the home farm or in the farm home (Phipps et al., 2008). These provisions were formalized by vocational agricultural education as directed or supervised practice in agriculture (see P.L. #64-347). This early initiative provided the framework for the experiential hallmark of the tripartite model of agricultural education known as supervised agricultural experience (SAE).

Roberts and Ball (2008) conducted a philosophical examination of the function of agriculture in secondary agricultural education. Their examination investigated the utility of agriculture as the *content* that is learned as well as the *context* in which the learning occurs. This primer reflects the discussions that took place between Dewey and Snedden nearly a century ago and portends much about the way that secondary agricultural education is viewed in the 21st century.

The Smith-Hughes Act of 1917 was the origin of federally funded legislation that would influence vocational education during the 20th century. The most recent federal legislation to provide support to vocational education or "career and technical education," as it is now called is the *Carl D. Perkins Career and Technical Education Improvement Act of 2006* (Perkins IV). The purpose of Perkins IV was 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" (Carl D. Perkins Career and Technical Education Improvement Act of 2006, p. 683).

Pratzner (1988) describes vocational education as a paradigm that is comprised of six components. In his model, the most important subject matter should include needs and interests of the labor market. In other words, the skills required to work in the agricultural industry should inform the curriculum taught in secondary agricultural education (Pratzner, 1988).

Regarding the purpose of preparing students for useful employment, the acquisition of specific skills must be considered. Schunk (2000) differentiated between specific and general skills. Specific skills are those abilities that apply to only certain disciplines; however, general skills are applicable in a wide variety of settings. Roberts and Ball (see Figure 2) reported that a review of early secondary agricultural education curricula (i.e., Stimson, 1920) revealed the focus of curricula was on the development of specific skills. This behaviorist framework for content-centered secondary agricultural education has been the foundation for much of its curriculum (Phipps et al., 2008; Talbert, et al., 2007), which has focused on preparing skilled workers for the industry of agriculture.

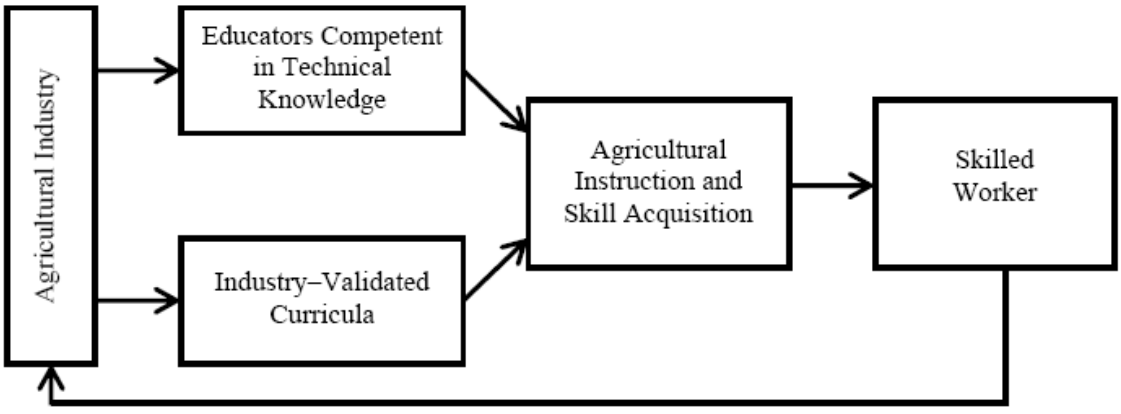

Figure 2. A content-based model for teaching agriculture (Taken from Roberts & Ball, 2009)

The content-based model of teaching agriculture would resonate with the early proponents of vocational education. Stimson's project method of teaching and Prosser's focus on industry specific training can be found in both the industry-validated curricula and the emphasis placed on agricultural instruction and skill acquisition. Regarding a model of secondary agricultural education that focuses on the "melding" or integrating of classroom and laboratory instruction, youth development, and experiential learning, an observer can identify easily the opportunity for skill acquisition occurring through secondary agricultural education's hallmark experiential learning component, supervised agricultural experience (SAE) (see Figure 1).

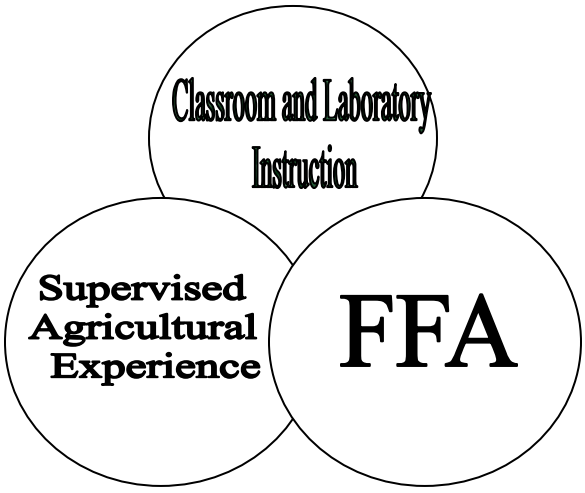

Figure 1. A model of secondary agricultural education (Taken from Talbert et al., 2007)

This three-circle, Venn diagram shown above (see Figure 1) demonstrates the holistic approach to which secondary agricultural education programs should aspire. Students learn through classroom and laboratory instruction with opportunities for application and

reinforcement of theory through their supervised agricultural experiences and by participating in FFA activities and events (Roberts & Ball, 2009).

Roberts and Ball also examined using agriculture as a *context* for learning. The phrase "hands on/minds on" (as cited in Parr & Edwards, 2004) has been used to communicate the increased focus of critical thinking and the importance of working in a technologically advanced society, which has relevance for student learning through SAE. In addition, John Dewey's belief that developing habits of mind should be the primary focus of education has served as a foundation for secondary agricultural education. Dewey (1938) was a strong advocate of education moving beyond content and that an individual should cultivate a sense of lifelong learning so that he or she could become an educated contributor to society. The model of secondary agricultural education that includes the classroom/laboratory, supervised agricultural experience, and participation in the FFA organization is a holistic approach that supports the growth and development of students, according to the principles espoused by Dewey (Roberts & Ball, 2009).

An integrated offering of relevant concepts and principles, leadership practices, and experiential learning opportunities (Phipps et al., 2008) serves secondary agricultural education students in the first decade of the 21st century. This model of agricultural education focuses on classroom and laboratory, youth development (i.e., FFA), and experiential learning (i.e., SAE) as the primary components of the secondary agricultural education program (Talbert et al., 2007).

Historically, the aforementioned approach to teaching agriculture accommodated multiple learning styles and had a significant focus on "learning by doing" (NRC, 1988). The

three integral components of the agricultural education model work together to prepare students for future careers in agriculture (2008-2009 Official FFA Manual). The flexibility of this model has also allowed it to accommodate the impact of changing market demands for agricultural occupations and related job opportunities. According to the National FFA Organization, more than 300 career opportunities in the agricultural science, food, fiber, and natural resources industry exist currently (2008-2009 Official FFA Manual). The model overall is intended to provide learning experiences that prepare students for various entry points into the agricultural sector, including "hands-on" learning opportunities that reinforce the knowledge and skill acquisition targeted by most agricultural education curricula (Roberts & Ball, 2009).

Frequently, these "targeted experiences" are operationalized in the agricultural education model as Supervised Agricultural Experiences (SAE), which are designed to provide students opportunities to learn skills and practices leading to successful personal growth and future employment in agricultural careers (Talbert et al., 2007). These experiences are intended to prepare students for the world of work, particularly, in the agricultural industry. Through dedication and effort, students who excel in their supervised agricultural experiences, can be recognized for their efforts through the model's youth development component, FFA. This recognition works as a form of extrinsic motivation and assists in enhancing student self-esteem (Talbert et al., 2007).

The current structure of agricultural education programs aligns with most of the basic principles of a holistic education; thus, conceptually, it can be argued that secondary agricultural education teachers ultimately view education from a context-rich perspective (Roberts & Ball, 2009; see Figure 3).

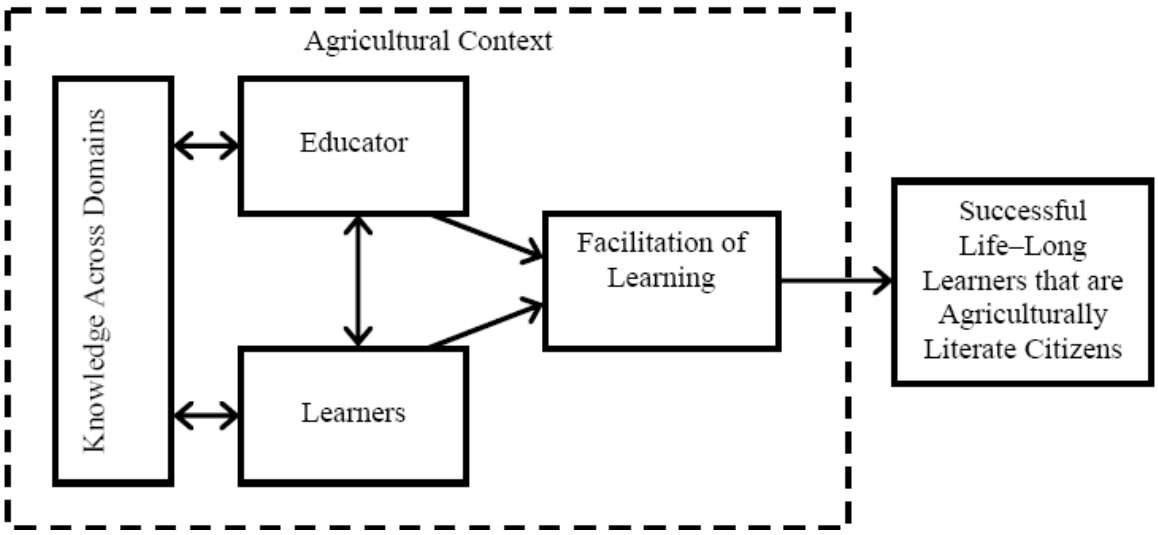

Figure 3. A context–based model for teaching agriculture (Taken from Roberts & Ball, 2009)

The success of the secondary agricultural education model has been evident for many years (Phipps et al., 2008 & Talbert et al., 2007) However, a recent report indicated a decline in the implementation of and involvement in the supervised agricultural experience component of the model (Team Ag Ed, 2007). Team Ag Ed, a consortium that supports agricultural education, conducted a survey to inform their annual report on agricultural education. In the study, the National FFA Organization's database was analyzed and cross-referenced with other pertinent national data to reveal potential avenues for growth. In addition, a questionnaire was administered to collect data from schools not in the FFA database. Its purpose was to gauge the level of agricultural education opportunities afforded students in schools with no FFA chapter.

In Team Ag Ed's annual report on agricultural education, the question, "Does your school provide a supervised agricultural experience program (SAE) outside of class for students, that is; is there a program or activity that provides hands-on application of concepts

and principles learned in an agricultural education classroom?",was asked. Among the non-FFA schools (9%) responding that they did have SAE programs, 9.10 SAEs per school were reported. However, it was reported that 91% of the respondents (i.e., schools that offered an agricultural education program without an FFA Chapter) indicated their students did not participate in SAEs (Team Ag Ed Annual Report, 2007).

This finding was not surprising entirely given two components of the comprehensive secondary agricultural education program were absent. The exclusion of FFA and SAE may account for the significant absence of hands-on application of concepts and principles learned in the secondary agricultural education programs surveyed by the Team Ag Ed study.

However, some scholars and practitioners of secondary agricultural education have reported empirically and anecdotally that the experiential learning component of the model is perhaps losing ground in local school programs (e.g., Dyer & Osborne, 1995; Wilson & Moore, 2006). Significant decline in delivery of this facet of the secondary agricultural education model has implications regarding its role in the preparation of students for entry-level jobs in the agricultural industry. In addition, the learning experiences being taught in the secondary agricultural education program may not be congruent with today's agricultural industry standards, at least in some instances. This incongruence may be a contributing factor to the decline in students participating actively in SAEs.

Constructivism as a Conceptual Basis for Experiential Learning

Preparation of workers for entry into and advancement in the workplace requires an educational program that provides not only job skills, but also learning opportunities involving higher order thinking, problem solving, and collaborative work skills (Doolittle &

Camp, 1999). The established theoretical framework, which guides career and technical education (CTE), is based on the work of David Snedden and Charles Prosser (Camp & Hillison, 1983; Doty & Weissman, 1984) from the early1900s. Both Snedden and Prosser were concerned principally with the short-term needs of industry and the political policy issues of the day; they gave little consideration to a learning theory appropriate for supporting their vision of career and technical education (Doolittle & Camp, 1999).

The early 20th century roots of CTE can be found in the theories proposed by Snedden and Prosser, who suggested that the public schools were an arm of the social system of our society and, thereby, had an inherent mission to further the good of society by contributing to its social efficiency. Then called vocational education, CTE offered a means of preparing well-trained, compliant workers for that efficient society (Berns & Erickson, 2001). At the same time, an emerging teaching and learning theory, behaviorism, was proposed in which E. L. Thorndike suggested that learning resulted from links formed between stimuli and responses through the application of rewards. Accordingly, schools could teach students the "right" or correct work and moral habits (Berns & Erickson, 2001).

Historically, the basic teaching and learning model for CTE has been behaviorism (Doolittle & Camp, 1999). It continues to be prevalent in performance objectives, criterion-referenced measures, task lists as a source of curriculum, and specific, predetermined skills demonstrated to industry standards (Doolittle & Camp, 1999).

John Dewey, philosopher and leading representative of pragmatism in American education, offered his theory of "constructive occupations" (Knoll, 1997). In this teaching and learning model, students construct their own knowledge by testing ideas based on prior

knowledge and experience, applying these ideas to new situations, and integrating the new knowledge gained with preexisting intellectual constructs. Rooted in the theories of John Dewey (1900), constructivism calls for active participation in problem solving and critical thinking regarding an authentic learning activity that students find relevant and engaging (Briner, 1999).

Traditionally, teaching and learning approaches in CTE have included both direct instruction (usually, individual, drill-and-practice exercises based on behaviorism) and projects (sometimes, group activities that may or may not exhibit the characteristics of constructivism). An example of direct instruction in secondary agricultural education would be a teacher demonstrating to students in a animal science class how to ear notch newborn pigs properly, followed by students individually ear notching their own litter of pigs with the instructor monitoring and providing feedback as the students practiced (Berns & Erickson, 2001).

In contrast, Doolittle and Camp (1999) identified the power of constructivism, which acknowledges the learner's active role in the personal creation of knowledge, the importance of experience (both individual and social) in the knowledge creation process, and the realization that the knowledge created will vary in its degree of validity as an accurate representation of reality.

These essential factors of constructivist pedagogy hold high relevance as a theoretical basis for teaching and learning in secondary agricultural education. To that end, Doolittle and Camp (1999) asserted that the essential factors of constructivist pedagogy include (a) learning should take place in authentic and real-world environments, (b) learning should

involve social negotiation and mediation, (c) content and skills should be made relevant to the learner, (d) content and skills should be understood within the framework of the learner's prior knowledge, (e) students should be assessed formatively, serving to inform future learning experiences, and, (f) students should be encouraged to become self-regulatory, self-mediated, and self-aware.

Experiential learning has been an integral component of secondary agricultural education since its' beginning (Stewart & Birkenholtz, 1991; Zilbert & Leske, 1989). Cheek, Arrington, Carter, and Randell (1994) posited that,

> The value of experiential learning in agricultural education has long been recognized as an important part of the educational process. Through practice and experience students apply what they have learned in real situations, thus the material becomes understandable and usable. Moreover, in the process of gaining experience, new problems and situations arise causing learners to seek additional information and new ways of applying what they have learned. (p. 1)

Regarding Doolittle and Camp's first essential factor, learning should occur in authentic and real-world environments, Zilbert and Leske (1989) posited that "agricultural education has always had a strong orientation toward learning by doing, or experiential learning" (p. 1). "Learning to do" in agricultural education provides students opportunities to use principles learned in class and apply them in real life situations (Cheek et al., 1994). Kolb (1984) reported that various forms of experiential learning can be effective, including internships, field placements, work/study assignments, and structured exercises. All of the

aforementioned are available in the context of agriculture and can be delivered via students' SAEs (Arnold et al., 2006).

The second essential factor of constructivist pedagogy (Doolittle & Camp, 1999) states learning should involve social negotiation and mediation. Through students' involvement in team-oriented activities and membership in youth leadership organizations, social negotiation can be addressed. Moreover, researchers have found a direct positive relationship between FFA membership and SAE participation (Retallick & Martin, 2005; Talbert & Balschweid, 2004).

Constructivist pedagogy also emphasizes the importance of content and skills being relevant to the learner. To insure that the student comprehends the relevance and potential transfer of the relationship between the curriculum and a given situation or context, educators must create experiences with thoughtful consideration of the skill and help students make successful connections between the experience and their learning (Arnold et al., 2006; Roberts & Ball, 2009).

Content and skills should be understood within the framework of the learner's prior knowledge. Students who complete SAEs may learn more, in part, because of their need to learn and the opportunity to practice what is taught. In the secondary agricultural education program, supervised experiences often serve as interest approaches to instruction, sources of problems, and application for student learning (Newcomb, McCracken, Warmbrod, & Whittington, 2004).

Students should be assessed formatively to better inform them regarding their future learning needs and choices of experiences. Assessments are valuable when they represent

real-life experiences as much as possible, thus encouraging the integration of vocational and general education (Herrick, 1996). SAEs serve as authentic learning experiences for students in secondary agricultural education and provide opportunities for self-as well as instructor-provided assessments through an experiential learning approach (Dyers & Osborne, 1996).

The last essential factor for constructivist pedagogy focuses on students becoming self-regulatory, self-mediated, and self-aware. To that end, Dailey, Conroy, and Tolbert (2001) opined that SAEs provide contexts for the development of life skills and the transfer of knowledge and skills to real-world situations and problems.

Doolittle and Camp also identified the role of the teacher as a guide or facilitator of learning. Regarding SAE quality, the teacher plays an important role in the overall success of students' SAEs (Harris & Newcomb, 1985). High teacher expectations were reported to affect students' attitudes and achievement positively (Ingvalson, 1983). Teachers should also provide multiple perspectives and representations of content. Talbert et al. (2007) emphasized that SAE expands the boundaries of the classroom to include the entire community. They suggested that SAEs aid in increasing student understanding of agriculture and in developing skills and abilities related to career development.

Roberts and Ball (2009) offered a conceptual model that is based on using agriculture as a context for teaching. They contended that agriculture as a context for learning is anchored theoretically in constructivism. To that end, experiential learning has long been an integral component of secondary agricultural education (Stewart & Birkenholtz, 1991). Knoblock (2003) reported that experiential learning is a sound psychological framework for learning in secondary agricultural education. In this light, agriculture forms the context for

learning. It involves the construction of knowledge, engages students in inquiry into the content, and demonstrates an overall value outside of the formal school environment (as cited in Knoblock, 2003).

Knoll (1997) credited Rufus Stimson with the "popularization" of the home project plan. Through Stimson's efforts, teachers of academic subjects became familiar with the project idea for the first time (Knoll, 1997). CTE teachers, including agricultural education instructors, used the project method as the template for what is known today as SAE (Dyer & Osborne, 1996).

Supervised experience in the agricultural education program embodies the elements of experiential learning theory: (a) learning in real life contexts, (b) learning by doing, (c) learning through projects and, (d) learning by solving problems (Knoblock, 2003). Comparatively, the tenets of constructivist pedagogy, as described by Doolittle and Camp (1999), are readily transparent in the design, delivery, and evaluation of the supervised agricultural experience component of secondary agricultural education.

The Evolution of Supervised Agricultural Experience

The evolution of this experiential learning component of the secondary agricultural education model, i.e., how it is identified, described, and implemented by teachers of agriculture, has been "in flux" or transition since Rufus Stimson first implemented the "project method" at the Smith Agriculture School (Moore, 1988). The decades of the 1980s and 1990s saw much change in secondary agricultural education; one such change was the shift from Supervised Occupational Experience (SOE) programs to what is now known as Supervised Agricultural Experience (SAE) programs. This change was much deeper than the

adoption of a new acronym. In terms of content versus context, it was, perhaps, the last bastion or remnant of what theretofore had been described as vocational education, but what is known now as career and technical education, including the teaching of secondary agricultural education. Zurbrick (1989) described the change this way:

> Some still equate SOE to 'home projects' and/or 'supervised farming operations!' Others have accepted the definition in a literal sense and use it to encompass ownership and placement experience so long as the experience involves development of agricultural knowledge, skill, and/or attitudes of an occupation orientation. (p. 3)

Regarding comparison to SAE, Zubrick opined, "those who have not blindly accepted SAE as a new name for SOE will argue long and vehemently that the two experiences are not the same" (p. 3). Zubrick further contended that SAE included everything that SOE was and more, which caused the concern for using supervised agricultural experiences in an educational program with a vocational purpose. Zubrick acknowledged that it is possible for a student to select an SAE of an academic nature and not have any occupational experience, e.g., conducting research on an agricultural topic. In essence, Zubrick was making the case that SOE focused on teaching *in* agriculture and SAE was more appropriate for teaching *about* agriculture. This aligns with recommendations found in the NRC's report of 1988.

The importance of experiential learning through secondary agricultural education has been widely reported (Camp et al., 2000; Cheek et al., 1994; Dyers & Williams, 1997; Roberts, 2006; Stone, 1994). Dewey (1938) believed all true learning is based on experiences, and to continue learning, the individual must continually question and evaluate his or her own experiences. Kolb (1984) reported various forms of experiential learning,

including internships, field placements, work/study assignments, and structured exercises, all of which are available in the context of agriculture and can be delivered via students' SAEs (Arnold, et al., 2006). To insure that students comprehend the relevance and potential transfer of the relationship between curricula and a given situation or context, educators must create experiences with thoughtful consideration of the skill and help students make successful connections between the experience and their learning (Arnold et al., 2006).

Desirable occupational and educational attitudes and work values, and SAE record keeping skills have been reported as benefits students gain through SAEs (Dyer &Williams 1997). SAE benefits as perceived by parents, employers, and vocational agriculture instructors included: "(a) promoted an acceptance of responsibility; (b) developed self-confidence; (c) provided an opportunity to learn on their own; (d) developed independence; and (e) learned to work with others" (Pals, 1988, p. 38). Benefits of SAE were more general in nature than specific technical competencies, according to Dyer and Williams (1997).

The benefits of SAE can be described in a variety of ways or categories but of particular interest to this study are the technical competencies that hold potential for being transferred from the supervised agricultural experience to the worksite, especially at the entry-level. A Placement SAE involves the placement of students on farms and ranches, in agricultural businesses, in school laboratories, or in community facilities to provide a "learning by doing" environment. Ideally, this environment enables students to develop competencies that permit entry and/or advancement in their chosen occupational field (National Council for Agricultural Education, 1992).

This transfer of skills, i.e., skills acquired through experiential learning activities or episodes, is an important theme to the role of secondary agricultural education in preparing students for entry-level careers in the agricultural industry (see Figure 2). Regarding SAEs, the learning opportunities are presumed to be embedded in the part of Roberts' and Ball's (2009) model labeled "Agricultural Instruction and Skill Acquisition"

The authors of the Vocational Education Act of 1963 intended to "strengthen and improve the quality of vocational education and to expand vocational education opportunities in the nation" (Phipps et al., 2008, p. 29). Specifically, the authors wrote, "such education [i.e., secondary agricultural education] may be provided without directed or supervised practice on the farm" (Wilson & Moore, 2006, p. 2). Some practitioners' interpreted "without directed or supervised practice on the farm" to mean that the supervised experience was no longer a required component of secondary agricultural education. These "interpretations" combined with additional provisions of the act contributed to a steady erosion of supervised experience in agriculture (Wilson & Moore, 2006).

Supervised agricultural experience (SAE) is often looked to as the nexus for experiential learning opportunities in the secondary agricultural education model (see Figure 1). However, evidence exists describing a decline in the quality and quantity of student learning through SAEs (Baggett-Harlin & Weeks, 2000; Dyer & Osborne, 1995 Steele, 1997).

Minimization of this experiential learning component of the secondary agricultural education model should be of interest to the profession. A primary purpose of the secondary agricultural education program is to prepare students for entry-level jobs in the agricultural

industry (Phipps et al., 2008). In Oklahoma, the Agriculture, Food, and Natural Resources Career Cluster is operationalized by seven career pathways designed to introduce students to careers in the agricultural industry (ODCTE, 2009). However, can such preparation be achieved if a declining or "minimized" focus on SAE by secondary agricultural education teachers is occurring?

Career Clusters and Career Pathways

Perkins IV legislation called for the development of "programs of study" at both the secondary and the post-secondary levels that are aligned with industry-recognized standards. Aligning occupational programs with local or statewide industry standards is important in preparing students for careers (*CenterGram*, 2008). Moreover, as the vision for CTE becomes more career-focused and intended to combine academics and employability skills with occupational knowledge and skills, career clusters are becoming the "answer"; they organize both academic and occupational knowledge skills into a coherent course sequence (Ruffing, 2006).

Hoachlander (2008) reported that, "career pathways are programs of academic and technical study that integrate classroom and real-world learning organized around industry" (p. 22). Pathways can take various forms and be offered through a variety of delivery systems. However, there are four guiding principles that are inherent to pathways: "(a) pathways prepare students for both postsecondary education and a career; (b) pathways connect academics to real-world applications; (c) pathways lead to the full range of postsecondary opportunities; and (d) pathways improve student achievement" (Hoachlander, 2008, p. 23-24).

The curriculum structure for secondary agricultural education in Oklahoma is based on the Agriculture, Food, and Natural Resources Career Cluster. This career cluster is described as "including the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources" (ODCTE, 2009).

The organization and structure of the curriculum in Oklahoma organizes the Agriculture, Food, and Natural Resources career cluster into seven pathways (ODCTE, 2009). The seven career pathways for Oklahoma Agricultural Education include (a) Food Products and Processing, (b) Plant and Soil Science, (c) Animal Science, (d) Agricultural Power, Structures and Technology, (e) Agribusiness and Management, (f) Agricultural Communications, and (g) Natural Resources and Environmental Science. In a recent study conducted in Oklahoma, 48 entry-level skills were recommended for the animal science pathway (Slusher, Robinson, & Edwards, in press). In the present study, the researcher sought to investigate selected agricultural professionals' perceptions regarding all seven career pathways in the Agriculture, Food, and Natural Resources Career Cluster with relevance to students' SAEs. These pathways provided an important conceptual context for this study, i.e., expert panelists were asked to identify entry-level technical skills that should be learned through student participation in the supervised agricultural education component of the agricultural education model using the seven career pathways as a framework for their responses.

Use of the Delphi Method in Agricultural Education Research

In agricultural education, the Delphi technique has been accorded a reasonable degree of acceptance. Martin and Frick (1998) conducted a review of literature that examined the use of the Delphi technique as reported in three peer-reviewed journals spanning a 10-year period. That review identified 19 articles that used the Delphi technique as the research methodology. The focus of those articles included a wide variety of topics that related to agricultural education. Examples of research topics reported by Martin and Frick (1998) included elements of curriculum development (e.g., Camp & Sutphin, 1991; Chizari & Taylor, 1991; Frick, 1993; Frick, Kahler, & Miller, 1991; Sutphin & Camp, 1990). Several researchers have used the method to describe Delphi panelists' perceptions on agricultural education (e.g., Blezek & Dillon, 1991; McCampbell & Stewart, 1992; Tavernier & Hartley, 1994).

Identifying research needs in agricultural education provided the focus for three more studys using the Delphi technique (i.e., Branan & Rohs, 1991; Buriak & Shinn, 1989, 1993). The identification of technical competencies was another area where the Delphi technique has found application (e.g., Johnson & Schumacher, 1989; Ruhland, 1993). The Delphi technique was also used to identify critical resources (Hinton, 1994; Kittridge, 1992), establish program objectives (Smith & Kahler, 1987), identify barriers to effective programming (Rennekamp & Gerhard, 1992), provide a review of the Delphi technique (Gamon, 1991), and to accomplish technological forecasting (Vamadore & Iverson, 1991).

The Delphi technique has continued to be a viable methodology for researchers in agricultural education. A review of the *Journal of Agricultural Education* from 2000 to 2006

revealed eight articles that relied on the Delphi technique to evaluate a variety of topics of importance to agricultural education researchers. In 2000, Camp et al. (2000) used the Delphi technique to examine the efficacy and structure of SAE for the 21st century. Seagle and Iverson (2002) explored the characteristics of turf grass programs through a Delphi study, and Ackers, Vaughn and Lockaby (2001) identified high school agricultural communications competencies using experts from industry, high school agricultural education teachers, and university faculty. The challenges of recruiting students into agricultural education programs was the focus of a study conducted by Dyer and Breja (2003). Covington and Dobbins (2004) conducted a national Delphi study that investigated the student teaching experience in agricultural education. In 2004, 2005, and 2006, a series of independent studies emerged that focused on characteristics, problems, and perceptions of agricultural education teachers. Roberts and Dyer (2004) used the Delphi technique to identify characteristics of effective agricultural education teachers. Myers, Dyers, and Washburn (2005) identified problems facing beginning agricultural education teachers using the technique. In addition, in 2006, Martin, Fritzsche, and Ball sought teachers' and other professionals' perceptions regarding the impact of No Child Left Behind Legislation on secondary agricultural education programs.

Finally, Martin and Frick (1998) reported significant evidence of the use of the Delphi technique in agricultural education, and a review of literature for this study revealed its use by many agricultural education researchers in the last 10 years (e.g., Ackers et al., 2001; Camp et al., 2000; Covington & Dobbins, 2004; Dyer & Breja, 2003; Martin et al., 2006; Myers et al., 2005; Roberts & Dyer, 2004; Seagle & Iverson, 2001). Accordingly, the Delphi technique served as the methodological approach for this study.

Summary

Learning to work and the type of work required in society today has evolved dramatically. The shift from unskilled to skilled workers in the practical arts of industry, agriculture, and business (Roberts, 1971) and how those skilled workers were to be trained led to a new type of education that became known as vocational education during the 20th century.

The vision of education philosophers and leaders–general and vocational–developed an educational system that focused on skill acquisition needed in the different industrial sectors of the United States. The idea of gaining and using experience has been a central theme throughout the evolution of vocational education. Rufus Stimson's project method was the precursor to what is known today as supervised agricultural experience (NRC, 1988).

Dewey promoted an integrated approach in which vocational skills and academic content were blended and delivered in a context-rich environment, for the purpose of developing transferable life skills (Dewey, 1938; Knoll 1997). This approach has been operationalized as the conceptual three-circle model of secondary agricultural education that we know today (see Figure 1).

The supervised agricultural experience component of secondary agricultural education is one of the model's critical dimensions. The benefits of this critical component of the program have been touted by agricultural education researchers because it includes acceptance of responsibility, development of self-confidence, opportunity to learn independently, development of independence, and learning to work with others as student learning experiences (Pals, 1988). Regarding students developing favorable work attitudes, Dyer and Williams (1997) spoke to the knowledge and skills students acquire through

placement SAE opportunities particularly. However, in secondary agricultural education programs that did not have FFA chapters, 91% of students reported that opportunities to apply the concepts and principles learned in the classroom through SAEs were not available (Team Ag Ed Annual Report, 2007).

The decline in delivery of this facet of the model has implications regarding agricultural education's role in the preparation of students for entry-level positions in the agricultural industry. For example, the learning experiences being taught may not be congruent with today's agricultural industry standards. This discrepancy may be contributing to a decline in students participating in SAEs. However, little is known about that "decline," especially from an empirical perspective, whether the sources of data are industry experts or agricultural educators.

The workplace of the 21st century reflects the many changes that have occurred over the past century, from the information age to the shift to a global economy, the workplace place requires a different set of skills (Ruffing, 2006). The career cluster for Agriculture, Food and Natural Resources (AFNR) consists of seven career pathways that can be used to facilitate students acquiring the skills needed for entry-level employment in the 21st century (ODCTE, 2009; Ruffing, 2006). Lawmakers, through authorization of Perkins IV legislation, called for the development of "programs of study" at both the secondary and post-secondary levels that would be aligned with industry-recognized standards. These "career pathways are programs of academic and technical study that integrate classroom and real-world learning organized around industry" Hoachlander (2008, p. 23).

This study sought to identify the entry-level technical skills that should be learned through students' SAEs. A modified Delphi technique was used: Two panels of agricultural

experts, representing industry and secondary agricultural education, were employed to identify entry-level technical skills. Both panels used the career cluster for AFNR and its seven career pathways as the context for identifying said skills. The Delphi technique has been recognized as a useful research tool in agricultural education (Martin & Frick, 1998). Investigators have used the Delphi technique to study a variety of topics that ranged from forecasting research needs in agricultural education (e.g., Branan & Rohs, 1991; Buriak & Shinn, 1989, 1993) to recruiting students for secondary agricultural education (Dyer & Breja, 2003). This study focused on the SAE component of the comprehensive model for agricultural education and its potential for facilitating students learning entry-level technical skills through the career pathways of the AFNR career cluster.

If a primary purpose of secondary agricultural education is to prepare students for entry-level careers in the agricultural industry (Phipps et al., 2008), how can such preparation occur effectively if the importance of SAE may be declining in the eyes of secondary agricultural education teachers or other stakeholders?

Historically, secondary agricultural education has provided a systematic program in which students acquired knowledge and skills necessary for their entry into agricultural careers (Moore 1988; NRC, 1988; Roberts, 1977). Accordingly, this study sought to describe the perceptions of a select group of agricultural professionals in Oklahoma (i.e., industry experts and secondary agricultural education teachers) regarding the entry-level technical skills expected by the agricultural industry and the acquisition of those skills by students through their participation in the SAE component of secondary agricultural education.

CHAPTER III

METHODOLOGY

Purpose

The two-fold purpose of this study was to 1) describe the perceptions of a select group of agricultural professionals (industry experts and secondary agricultural education teachers) regarding the entry-level technical skills expected by the agricultural industry and the acquisition of these skills by students through their participation in the SAE component of secondary agricultural education in Oklahoma; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills “needed” versus technical skills “learned” through students’ Supervised Agricultural Experiences.

Institutional Review Board

Federal regulations and Oklahoma State University policy require review and approval of all research studies that involve human subjects before investigators can begin their research. The Office of University Research and the Institutional Review Board at Oklahoma State University conducted the aforementioned review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with this policy, this study received the proper surveillance and was granted permission to be executed. The institutional review board code for this study was AG095 and a copy of the approval form is presented in Appendix A.

The Office of University Research and the Institutional Review Board at Oklahoma State University required the researcher to obtain informed consent prior to each round of the Delphi study (Appendix B). In accordance with the Office of University Research and the Institutional Review Board, the researcher also requested and received approval for round two (Appendix C) and round three (Appendix D) of the study prior to delivery of research instruments to the subjects involved.

Objectives

1. Describe selected personal and professional characteristics of participants who comprised the two panels of agricultural experts: selected agricultural industry experts and secondary agricultural education teachers in Oklahoma.
2. Describe the perceptions of selected agricultural industry experts regarding the Supervised Agricultural Experience (SAE) component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for

entry-level positions in the agricultural industry in Oklahoma, using the seven career pathways as a framework.

3. Describe the perceptions of selected Oklahoma agricultural education teachers regarding the technical skills learned by students who participate in the Supervised Agricultural Experience (SAE) component of secondary agricultural education in Oklahoma, using the seven career pathways as a framework.
4. Compare the perceptions of agricultural industry experts and secondary agricultural education teachers regarding the entry-level technical skills students should learn through participation in Supervised Agricultural Experiences (SAEs) in Oklahoma, using the seven career pathways as a framework.
5. Suggest components that could be used to develop a model for use by Oklahoma secondary agricultural education teachers to guide their practice when planning, facilitating, assessing, and evaluating students' SAEs such that the job preparedness of students entering the agricultural industry in Oklahoma is enhanced.

Research Design

This study was descriptive in nature and employed a survey research design utilizing the Delphi technique (Sackman, 1975). The Delphi technique was developed in the 1950's by two research scientists working at the Rand Corporation, Olaf Helmer and Norman Dalkey. They developed the procedure as a tool for forecasting future events using a series of intensive questionnaires interspersed with controlled-opinion feedback (McCampbell & Hemler, 1993). Participants were solicited experts on the issues related to national defense.

The Delphi technique is widely accepted method for achieving convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas (Hsu & Sandford, 2007). Linstone and Turoff offered this description of the Delphi technique; it is a research design that includes four phases. The first phase explores the subject and allows the participants to contribute information that they deem appropriate. The second phase seeks to determine an understanding of how the entire group views an issue. If significant disagreement is determined, the third phase is used to explore the disagreement and determine reasons for differences. The fourth phase is a final evaluation of all the information gathered.

Linstone and Turoff (1975) characterized the Delphi technique as a communication process that is structured to produce a detailed examination of a topic/problem and discussion from the participating group (i.e., expert panel), but not one that forces a quick compromise. The purpose of the Delphi technique is to gather responses from an expert panel or panels and combine the responses into one useful statement or "position" (Stitt-Gohdes & Crews, 2004). In agricultural education, the Delphi technique has been accorded a reasonable degree of acceptance; in particular, the technique has been used in the area of curriculum planning and the identification of personal qualities of student leaders (Martin & Frick, 1998).

Population and Sample

The population of this study was composed of all secondary agricultural education teachers and State FFA Proficiency Award sponsors in the state of Oklahoma. Purposeful sampling was used to select members for the two expert panels. Creswell defined purposeful sampling as "a qualitative sampling procedure in which researchers intentionally select

individuals and sites to learn or understand the central phenomenon" (p. 359). According to Stitt-Gohdes and Crews (2004), "careful selection of the panel of experts is the keystone to a successful Delphi study" (p. 60). This design allows for development of consensus on a number of issues without face-to-face confrontation (Helmer, 1966). Delphi operates on the principle that "several heads are better than one in making subjective conjectures about the future . . . and that experts will make conjectures based upon rational judgment rather then merely guessing" (Weaver, 1971, p. 267).

Delbecq, Van de Ven, and Gustafson (1975) reported that a higher proportion of quality acceptable solutions are produced when the group is more heterogeneous rather than homogeneous. For this study, two panels of state experts, one in agricultural education (n = 20) and one in the agricultural industry (n = 17), were used. (Immediately after the round one instrument was sent to panelists, one teacher removed themselves from the study; therefore, the total number of teacher panelists was 19.) When an expert panel has at least fifteen members and is truly representative of the expert community, the Delphi method is reliable (Dalkey, Rourke, Lewis, & Snyder, 1972). This study sought to determine the entry-level technical skills expected by the agricultural industry and the acquisition of these skills by students through participation in the SAE component of secondary agricultural education.

The panel representing state experts in the agricultural industry in Oklahoma was comprised of experts representing agricultural cooperatives, livestock production, livestock marketing, small grain production, small grain marketing, as well as other ancillary agribusiness entities. All agricultural industry experts were familiar with the entry-level technical skills expected for the sector of the industry they represented; and, they either were

or had been responsible for hiring entry-level employees. In addition, selected panelists were business and industry sponsors of the Oklahoma FFA Proficiency Award program. So, this panel included commodity group as well as other agricultural sector leaders who represented the seven career pathways for agricultural education in Oklahoma. The career pathways for Agriculture, Food, and Natural Resources (referred to as Agricultural Education in Oklahoma) include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science (ODCTE, 2009) (see Table 1).

Table 1

Agricultural Industry Representation by Career Pathway

Industry Sectors	Career Pathways
Dairy Production	Food Products and Processing
Creamery (Dairy Processing)	Food Products and Processing
Retail Greenhouse	Plant and Soil Science
Small Grain Commodity Group	Plant and Soil Science
Livestock Market	Animal Science
Corporate Swine Farm	Animal Science
Livestock Association	Animal Science
Implement Dealership	Agricultural Power, Structures and Technology
Agricultural Lending Association	Agribusiness and Management
Electric Cooperatives	Agricultural Communications
Farm Cooperatives	Agricultural Communications
Soil and Water Conservation Service	Natural Resources and Environmental Science

The second panel consisted of secondary agricultural education teachers. To ensure statewide representation, service on the Oklahoma Agricultural Education Teachers Association's Board of Directors served as the criteria for selection as a panelist: president, past president, president-elect, secretary, treasurer-reporter, district vice-presidents, and one- and two-year directors. Ninteen active agricultural education teachers who held offices in Oklahoma's state level professional organization for agricultural education teachers were members of the teacher panel. Each office is filled through a nomination process and a majority vote of teachers representing each agricultural education district in the state of Oklahoma. The panel selection process was used to determine the sample "because the success of the Delphi relies on the informed opinion" of recognized experts (Wicklein, 1993, p. 1050) and not the use of random selection.

To motivate panelists to remain active and complete all rounds of the study, Stitt-Gohdes and Crews (2004) asserted, ". . . it is important that participants understand the goal of the study and feel they are a part of the group" (p. 61). Initially, the researcher provided an explanation of the study and invitation to participate to both the industry and educator panelists via telephone; a script for the educator panel (Appendix E) and a script for the industry panel (Appendix F) was used to insure a consistent description of the study.

Instrumentation

The Delphi technique exists in two forms or approaches: the conventional paper-pencil form and Delphi Conference form (Linstone & Turoff, 1975). The conventional paper-pencil Delphi technique involves sending a round of questions (or statements) to the expert panel, and based on their responses, developing a second questionnaire to be sent to the same

panel of experts. This procedure continued until group consensus is reached on the items presented. The Delphi Conference approach uses a computer program to collect the expert panelists' responses and shortens the response time (Linstone & Turoff, 1975). In recent years, researchers have used a modified Delphi technique; a modification in this study consisted of using three rounds instead of four. Custer, Scarcella, and Stewart (1999) reported that three iterations (i.e., rounds) are often sufficient to collect the needed information and to reach "consensus of agreement" in most cases. An additional modification was the use of two panels of experts instead of one, using two panels allowed the researcher to compare the items that reached "consensus of agreement" within the two panels. Accordingly, this study used a modified Delphi technique.

The researcher invited experts to participate in this study via the telephone call described above. According to Dillman (2000), open-ended questions receive more complete answers with the use of electronic questionnaires (or instruments) than with paper forms. Panel members received an electronic notice from the researcher containing a hyperlink to access the instrument for each round (Appendix G). The initial instruments for the educator panel (Appendix G) and the industry panel (Appendix H) were developed by the researcher using Microsoft Office Word 2007®.

Validity is the most important characteristic a test or measuring instrument can have or exhibit. Validity is the degree to which a test measures what it purports to measure and, consequently, permits appropriate interpretation of scores (Gay, Mills, & Airasian, 2006). Specifically, the investigator was interested in the face and content validity of the instrument. Face validity refers to the degree that a test or instrument "appears" to measure what it claims to measure and content validity can be determined by expert judgment (Gay et al., 2006).

Accordingly, a panel of experts of agricultural education faculty members at Oklahoma State University established both face and content validity for the initial instruments used in this study.

Gay et al. (2006) defined reliability as "the degree to which a test consistently measures whatever it is measuring" (p. 139). Early work by one of the original research scientists who developed the Delphi technique stated that reliability of .7 or greater could be achieved when the expert panel consists of 11 members or more (Dalkey, 1969). After further use of the Delphi technique, Dalkey et al. (1972) indicated that a group size of 13 was needed for reliability with a correlation coefficient of .9. Therefore, she recommended a group size of twelve to fifteen panelists. Sutphin suggested that the sample should be large enough to obtain the amount of expertise necessary to conduct the study effectively. However, the sample size should be held to a minimum to reduce cost and an over abundance of data which becomes cumbersome and yields little additional information for the study. The inclusion of 17 industry and 19 educator members on each panel contributed to the reliability of the multiple round modified Delphi procedure used in this study.

Data Collection

The Delphi technique "uses rounds of written questionnaires [or instruments] and guaranteed anonymity with summarized information and controlled feedback to produce a group consensus on an issue" (Beech, 1999, p. 283). It is accepted that supervised agricultural experience (SAE) is an integral component of the secondary agricultural education program. This study sought to identify the technical skills that were valued by industry representatives (i.e., potential employers of entry-level job seekers), and determine

if those skills were being learned through student participation in the SAE component of the agricultural education program, as perceived by teachers who lead and deliver these programs. The following requests and prompts were included on the round one instruments (Appendixes G & H) to elicit responses from panelists.

Round One

In round one, personal and professional characteristics were investigated (Appendix I). Personal and professional characteristics unique to each panel of experts were collected; personal characteristics that included gender, age, years of professional experience, and highest degree earned were targeted by the researcher. Regarding SAEs (or similar 4-H projects), as it related to each panel of experts, the type, intensity of involvement, and panelists' perceptions of benefits to themselves and their children was also of particular interest to the researcher.

Agricultural Industry Expert Request and Prompt (see Appendix G)

- Using the seven career pathways for agricultural education as a context, identify entry-level technical skills that should be learned through student participation in the supervised agricultural education component of the agricultural education model. Specifically, identify the technical skills in the following career pathways that best represents your area of expertise. For example: An expert from the Agricultural Power and Maintenance industry may not be comfortable identifying entry-level technical skills valued in the Food Products and Processing career pathway. However, he or she could easily identify technical

skills valued in the Agricultural Power, Structures, and Technology career pathway that students should be learning through participation in SAEs.

In addition, the following explanatory paragraph was included on the round one instrument for the agricultural industry panelists.

The Oklahoma Department of Career and Technology Education defines SAE programs as teacher-supervised, individualized, hands-on, student developed projects that give students real-world experience in agriculture and/or agriculture related areas (ODCTE, 2009). The seven career pathways for Oklahoma Agricultural Education include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science. Please, focus only on the career pathways that best fit your area of industry expertise and, please, list as many skills as you can.

Agricultural Education Teacher Request and Prompt (see Appendix H)

- What are the technical skills (e.g., demonstrating the correct way to propagate a plant using a leaf or stem cutting) that are acquired through student participation in a SAE? Please consider the seven career pathways identified in Oklahoma as a framework to guide your responses.

In addition, the following explanatory paragraph was included on the round one instrument for the agricultural education teacher panelists.

The seven career pathways for Oklahoma include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science. Please, list as many skills as you can.

Electronic follow-up messages were sent to panelists approximately one week prior to the assigned due date for the return of round one responses (Appendixes J & K). From round one, 555 educator panel statements (n = 19; 100% response rate) and 140 industry panel statements (n = 12; 70.5% response rate) were provided by the Delphi panelists; the researcher analyzed each statement. Similar or duplicate knowledge statements were combined or eliminated while compound statements were separated (Shinn, Wingenbach, Briers, Lindner, & Baker 2009). From 555 original educator panel statements, the researcher retained 260 statements for presentation in round two. From 140 original industry panel statements, the researcher retained 105 statements for presentation in round two. Accordingly, the round two instruments were developed using Microsoft Office Word 2007®.

Round Two

The round two instruments (Appendixes L & M) asked panelists to rate their level of agreement on entry-level technical skills, i.e., those skills they had identified in round one of the data collection exercise. The educator panelists were asked to rate their level of agreement for 260 entry-level technical skills that they perceived should be learned through student participation in the SAE component of the agricultural education program. The industry panelists were asked to rate their level of agreement for 105 entry-level technical skills that they perceived were expected for employment in entry-level jobs associated with

the seven career pathways used by Oklahoma agricultural education. Panelists were asked to use a six-point response scale to rate the entry-level technical skills: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, 6 = Strongly Agree (Jenkins, 2009; Shinn et al., 2009). Items that received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% of the respondents were considered items for which consensus was reached (Shinn et al., 2009). Items for which less than 51% of the respondents scored the item a "5" ("Agree") or "6" ("Strongly Agree") were removed from further investigation. So, in round two, consensus began to form. Electronic follow-up messages were sent to panelists approximately one week prior to the assigned due date for the return of round two responses (Appendixes N & O).

Qualitative Data Collection, Round Two

Round two also afforded panelists the opportunity to re-structure or re-phrase items or state their rationale regarding ratings and priorities among items (Jacobs, 1996).

Round Three

Round three sought to establish consensus within the two panels. Buriak and Shinn (1989) described the third round of a Delphi as developing consensus. The third round instruments (Appendixes P & Q) focused on developing consensus for the remaining items: 86 educator items and 27 industry items. The panelists were asked to rate their level of agreement for those items that at least 51% but less than 75% of panelists had selected "agree" or "strongly agree" in round two for said items. The round three instruments included the percentage of panelists who indicated "5" ("Agree") or "6" ("Strongly Agree") for that skill in round two. However, compared to the previous round, only a slight increase in the degree of consensus was expected (Anglin, 1991; Dalkey et al., 1972; Jacobs, 1996;

Weaver, 1971). Electronic follow-up messages were sent to panelists approximately one week prior to the assigned due date for the return of round three responses (Appendixes R & S).

Qualitative Data Collection, Round Three

In round three, an additional opportunity was provided to panelists to make further clarifications to the skill items and their relative importance. In addition, a final opportunity for panelists to share their thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program was provided.

Data Analysis

The data were analyzed using Microsoft Office Excel® 2007. Nominal data, e.g., personal and professional characteristics of the Delphi panelists, were analyzed using frequencies and percentages. For each skill item in rounds two and three, the frequency distribution valid percentage was used to determine if the item reached consensus or was "unstable" and should be removed from the study (Buriak & Shinn, 1989).

The Delphi technique is well suited as a means and method to seek consensus among a panel of experts (Dalkey, 1969; Dalkey & Helmer, 1963; Linstone & Turoff, 1975). To that end, in round two, 140 educator skill items (n = 16; 84.2% response rate) and 54 industry skill items (n = 12; 70.5% response rate) received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% of the respondents and were considered items for which consensus was reached (Jenkins, 2009). Moreover, 34 educator items and 24 industry items, for which less than 51% of the respondents scored the item a "5" ("Agree") or "6" ("Strongly Agree") were removed from further investigation (Hsu & Sandford, 2007; Jenkins, 2009).

The qualitative data from round two was limited. However, the researcher sought to identify themes or categories that could be used to clarify the entry-level technical skills and connections to career pathways the skills represented (described in Chapter 4).

Round three of the study included 86 educator items and 27 industry items for which greater than 50% but not more than 75% of panelists had indicated “5” (“Agree”) or “6” (“Strongly Agree”) for said skills in round two. To that end, in round three, 38 educator skill items (n = 14; 73.6% response rate) and six industry skill items (n = 12; 70.5% response rate) received a score of “5” (“Agree”) or “6” (“Strongly Agree”) by 75% of the respondents and were considered items for which consensus was reached. The remaining skill items, i.e., 48 educator skill items and 21 industry items failed to reach the established level of agreement, i.e., consensus.

Panelists provided some limited comments in round three. Their additional comments, including panelists’ thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program, were analyzed for themes (described in Chapter 4).

CHAPTER IV

FINDINGS

Purpose

The two-fold purpose of this study was to 1) describe the perceptions of a select group of agricultural professionals (industry experts and secondary agricultural education teachers) regarding the entry-level technical skills expected by the agricultural industry and the acquisition of these skills by students through their participation in the SAE component of secondary agricultural education in Oklahoma; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' Supervised Agricultural Experiences.

Objectives

The following objectives guided this study:

1. Describe selected personal and professional characteristics of participants who comprised the two panels of agricultural experts: selected agricultural industry experts and secondary agricultural education teachers in Oklahoma.

2. Describe the perceptions of selected agricultural industry experts regarding the Supervised Agricultural Experience (SAE) component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for entry-level positions in the agricultural industry in Oklahoma, using the seven career pathways as a framework.
3. Describe the perceptions of selected Oklahoma agricultural education teachers regarding the technical skills learned by students who participate in the Supervised Agricultural Experience (SAE) component of secondary agricultural education in Oklahoma, using the seven career pathways as a framework.
4. Compare the perceptions of agricultural industry experts and secondary agricultural education teachers regarding the entry-level technical skills students should learn through participation in Supervised Agricultural Experiences (SAEs) in Oklahoma, using the seven career pathways as a framework.
5. Suggest components that could be used to develop a model for use by Oklahoma secondary agricultural education teachers to guide their practice when planning, facilitating, assessing, and evaluating students' SAEs such that the job preparedness of students entering the agricultural industry in Oklahoma is enhanced.

The objectives served as a guide for presenting the findings of the study. Findings regarding each objective will be presented in separate sections in this chapter.

Sources of Data: Delphi Panelists

The respondents who provided the findings presented in this chapter consisted of agricultural industry experts and secondary agricultural education teachers from selected agricultural industry sectors and secondary schools in the state of Oklahoma.

Selected Personal and Professional Characteristics of the Delphi Panelists

Secondary Agricultural Education Teacher Panelists

Secondary agricultural education teachers were asked to respond to questions that described selected personal and professional characteristics. This information was summarized and reported to provide a profile of the secondary agricultural education teachers who participated in this study.

Of the 19 secondary agricultural education teachers who completed the instrument, 94.7% were male, and 5.3% elected not to specify their gender (see Table 2).

Regarding age ranges reported by the secondary agricultural education teachers, 14 of 19 (73.6%) teachers reported their age to be between 20 and 49 years of age. Four of 19 (26.0%) teachers reported their age to be 50 years or older (see Table 2).

Regarding teacher ethnicity or race, 89.4% reported that they were Caucasian, 5.3% were Native American, and 5.3% reported being Hispanic.

Education and agricultural work experience of the panelists were also of interest to the researcher. Accordingly, 63.2% of teachers reported a Bachelor's degree as their highest educational degree earned, and 36.8% of teachers held a Master's degree. Full-time employment and full-time temporary employment in agriculture was reported by 73.6% of

the teachers; 21.0% of teachers reported part-time employment and employment that was "mostly avocational." The remaining 5.4% did not indicate their agricultural work experience (see Table 2).

Table 2

Selected Personal and Professional Characteristics: Secondary Agricultural Education Teacher Panelists (N = 19)

Characteristics	*f*	%
Gender		
Male	18	94.7
Female		
No response	1	5.3
Age		
20 to 29	3	16.0
30 to 39	7	37.0
40 to 49	4	21.0
50 to 59	4	21.0
60 and older	1	5.0
Race/Ethnicity		
Caucasian	17	89.4
Native American	1	5.3
Hispanic	1	5.3
Other		
Highest Educational Degree Earned		
Doctorate		
Master's	7	36.8
Bachelor's	12	63.2
Agricultural Work Experience		
Full-time employment	7	36.8
Full-time temporary employment	7	36.8
Part-time employment	1	5.3
Mostly avocational	3	15.8
None	1	5.3

When questioned about their level of involvement in agricultural youth organizations, secondary agricultural education teachers reported a range of involvement (see Table 3). Eighty four percent of the teachers indicated involvement in FFA. Other youth organizations in which teachers reported involvement included 4-H, Youth Livestock Associations, and the

American Farmers and Ranchers Organization (see Table 3); 5.2% of panelists' reported involvement in these organizations, respectively.

Five or more years of participation was reported by 68.4% of teachers involved in an agricultural youth organization, 26.3% reported four years of participation, and 5.3% reported two years of participation (see Table 3).

When questioned about their "level of involvement" in selected agricultural youth organizations, 78.9% of the teachers indicated they were "very involved" in an agricultural youth organization, 15.8% reported "above average involvement," and 5.3% of teachers reported "average involvement," respectively (see Table 3).

Table 3

Secondary Agricultural Education Teacher Panelists' Involvement in Selected Agricultural Youth Organizations (N = 19)

Characteristics	*f*	%
Agricultural Youth Association		
FFA	16	84.4
4-H	1	5.2
Youth Livestock Association	1	5.2
American Farmers and Ranchers Organization	1	5.2
Other		
Years of Participation		
None		
One		
Two	1	5.3
Three		
Four	5	26.3
Five or more	13	68.4
Level of Involvement		
Very involved	15	78.9
Above average involvement	3	15.8
Average involvement	1	5.3
Somewhat involved		
No involvement		

Of the 19 secondary agricultural education teachers who completed the instrument, 94.7% reported participation in a SAE/4-H project, and 5.3% did not respond to the question (see Table 4)

The SAE/4-H projects teachers reported participating in included "exhibiting livestock" (84.2%), "worked in an agriculturally related job" (73.6%), "raised livestock" (73.6%), "raised crops" (47.3%), and "conducted agricultural research/experiments" (15.7%) (see Table 4).

When asked if participation in SAE/4-H projects led to entry-level technical skill acquisition 18 of 19 (94.7%) teachers reported "yes," and one (5.3%) teacher did not respond (see Table 4).

Table 4

Secondary Agricultural Education Teacher Panelists' Involvement with a Supervised Agricultural Experience or 4-H Project (N = 19)

Characteristics	*f*	%
Participation in SAE/4-H Project		
Yes	18	94.7
No		
No response	1	5.3
SAE/4-H Projects*		
Exhibited livestock	16	84.2
Worked in an agriculturally related job	14	73.6
Raised livestock	14	73.6
Raised crops	9	47.3
Conducted agricultural research/experiments	3	15.7
Participation in SAE/4-H Project led to Entry-level Technical Skill Acquisition		
Yes	18	94.7
No		
No Response	1	5.3

Note. *For the item, "Indicate the SAE or 4-H Project with which you had the **most** experience," panelists were asked to mark all that apply.

The secondary agricultural education teacher panelists' were also asked about their children's involvement in an agricultural youth organization. Secondary agricultural education teachers reported a range of involvement for their children: 42.1% of the teachers indicated that their children were involved in FFA (see Table 5). Other youth organizations in which teachers reported their children being involved were "Youth Livestock

Associations" (5.3%). However, 52.6% of the teachers reported that their children did not participate in an agricultural youth organization (see Table 5).

When questioned about their children's level of involvement in selected agricultural youth organizations, 42.1% of the teachers indicated that their children were "very involved" in an agricultural youth organization, 5.3% reported "average involvement," and 52.6% of the teachers reported no involvement (i.e., the item was "not applicable") in an agricultural youth organization (see Table 5).

When secondary agricultural education teachers were asked if their children acquired entry-level technical skills through their participation in an agricultural youth organization, selected responses included "Feeding-nutrition, Welding, Livestock selection, Livestock management."

Table 5

Secondary Agricultural Education Teacher Panelists' Children's Involvement in an Agricultural Youth Organization (N = 19)

Characteristics	*f*	%
Agricultural Youth Organization		
FFA	8	42.1
4-H		
Youth Livestock Association	1	5.3
American Farmers and Ranchers Organization		
Other		
None	10	52.6
Level of Involvement		
Very involved	8	42.1
Above average involvement		
Average involvement	1	5.3
Somewhat involved		
Not applicable	10	52.6

Agricultural Industry Panelists

Agricultural industry panelists were asked to respond to questions that described selected personal and professional characteristics. This information has been summarized and reported to provide a profile of the agricultural industry panelists who participated in this study.

Of the 12 agricultural industry panelists who completed the instrument, 83.4% were male and 16.6% were female (see Table 6).

Regarding age ranges reported by the agricultural industry panelists, eight of 12 (66.7%) agricultural industry panelists reported their age to be between 20 and 49 years of

age. Four of 12 (33.4%) agricultural industry panelists reported their age to be 50 years or older (see Table 6).

Regarding agricultural industry panelist's ethnicity or race, 83.4% of the panelists reported they were Caucasian, and 16.6% reported being Native American (see Table 6).

Education and agricultural work experience of the agricultural industry panelists were also of interest to the researcher. Accordingly, 66.6% of agricultural industry panelists reported a Bachelor's degree as the highest educational degree earned, 25.0% of agricultural industry panelists held a Master's degree, and 8.4% of the panelists reported High School as their highest level of education. Regarding agricultural work experience, 100.0% of the agricultural industry panelists indicated "Full-time employment" in agriculture (see Table 6).

Table 6

Selected Personal and Professional Characteristics: Agricultural Industry Panelists (N = 12)

Characteristics	*f*	%
Gender		
Male	10	83.4
Female	2	16.6
Age		
20 to 29	2	16.7
30 to 39	3	25.0
40 to 49	3	25.0
50 to 59	2	16.7
60 and older	2	16.7
Race/Ethnicity		
Caucasian	10	83.4
Native American	2	16.6
Highest Educational Degree Earned		
Doctorate		
Masters	3	25.0
Bachelors	8	66.6
High School	1	8.4
Agricultural Work Experience		
Full-time employment	12	100.0
Full-time temporary employment		
Part-time employment		
Mostly avocational		
None		

When questioned about their level of involvement in agricultural youth organizations, agricultural industry panelists reported a range of involvement: 75.0% of the panelists indicated involvement in FFA. Other youth organizations in which agricultural industry panelists reported involvement included 4-H (16.7%) and "Other" (e.g., Oklahoma Junior Cattleman's Association), 8.3% (see Table 7).

Five or more years of participation was reported by 75.1% of agricultural industry panelists involved in an agricultural youth organization (see Table 7). The remaining 12 agricultural industry panelists (8.3%) reported four, three and two years of participation in an agricultural youth organization, respectively (see Table 7).

When questioned about their level of involvement in selected agricultural youth organizations, 83.4% of the agricultural industry panelists indicated they were “very involved” in an agricultural youth organization, 8.3%, reported “somewhat involved,” and 8.3% of the agricultural industry panelists reported “no involvement” in an agricultural youth organization (see Table 7).

Table 7

Agricultural Industry Panelists' Involvement in Selected Agricultural Youth Organizations (N = 12)

Characteristics	*f*	%
Agricultural Youth Association		
4-H	2	16.7
FFA	9	75.0
Youth Livestock Association	0	
American Farmers and Ranchers Organization	0	
Other (Oklahoma Junior Cattlemen's Association)	1	8.3
Years of Participation		
None		
One	1	8.3
Two	1	8.3
Three		
Four	1	8.3
Five or more	9	75.1
Level of Involvement		
Very involved	10	83.4
Above average involvement		
Average involvement		
Somewhat involved	1	8.3
No involvement	1	8.3

Of the 12 agricultural industry panelists who completed the instrument, 83.4% reported participation in an SAE/4-H project, and 16.6% reported no participation (see Table 8).

The SAE/4-H projects in which agricultural industry panelists reported participating included "exhibited livestock" (83.4%), "worked in an agriculturally related job" (58.3%), "raised livestock" (83.4%), and "raised crops" (50.0%) (see Table 8).

When asked if participation in SAE/4-H projects led to entry-level technical skill acquisition, eight of 12 (66.7%) agricultural industry panelists reported "yes" and four of 12 (33.3%) indicated "no" (see Table 8).

Table 8

Agricultural Industry Panelist's Involvement with a Supervised Agricultural Experience or 4-H Project (N = 12)

Characteristics	*f*	%
Participation in SAE/4-H Project		
Yes	10	83.4
No	2	16.6
No response		
SAE/4-H Projects*		
Exhibited livestock	10	83.4
Worked in an agriculturally related job	7	58.3
Raised livestock	10	83.4
Raised crops	6	50.0
Conducted agricultural research/experiments		
Participation in SAE/4-H Project led to Entry-level Technical Skill Acquisition		
Yes	8	66.7
No	4	33.3

Note. *For the item, "Indicate the SAE or 4-H Project with which you had the **most** experience," panelists were asked to mark all that apply.

The agricultural industry panelists' children's involvement in an agricultural youth organization was also of interest to the researcher. Agricultural industry panelists reported a range of involvement for their children: 8.3% of the agricultural industry panelists indicated that their children were involved in 4-H (see Table 9). Other youth organizations in which agricultural industry panelists reported their children were involved included "FFA (8.3%), Youth Livestock Associations" (8.3%), and "Other" (e.g., Oklahoma Junior Cattleman's

Association) (16.7%) (see Table 9). However, 58.4% of the agricultural industry panelists reported that their children did not participate in an agricultural youth organization (see Table 9)

When questioned about their children's level of involvement in selected agricultural youth organizations, 16.7% of the agricultural industry panelists indicated they were "very involved" in an agricultural youth organization, 16.7% reported "above average involvement," and 8.3% reported that their children were "somewhat involved" (see Table 9). Fifty-eight percent of the agricultural industry panelists reported no involvement(i.e., "not applicable") in an agricultural youth organization by their children (see Table 9).

When agricultural industry panelists were asked if their children acquired entry-level technical skills through their participation in an agricultural youth organization, selected responses included, "basic health care, basic reproduction understanding and live animal evaluation."

Table 9

Agricultural Industry Panelists' Children's Involvement in an Agricultural Youth Organization (N = 12)

Characteristics	*f*	%
Agricultural Youth Organization		
4-H	1	8.3
FFA	1	8.3
Youth Livestock Association	1	8.3
American Farmers and Ranchers Organization		
Other		
Oklahoma Junior Cattlemen's Association	2	16.7
None	7	58.4
Level of Involvement		
Very involved	2	16.7
Above average involvement	2	16.7
Average involvement		
Somewhat involved	1	8.3
Not applicable	7	58.3

Delphi Panel, Round One Findings: Secondary Agricultural Education Teachers

Round one of this Delphi study sought to identify entry-level technical skills that are learned through student participation in the supervised agricultural education component of the agricultural education model. In Oklahoma, agricultural education divides instruction in agriculture, food, and natural resources into seven career pathways (ODCTE, 2009). The seven career pathways for Oklahoma include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science (ODCTE, 2009).

Using the Career Pathways as a conceptual framework, panelists were asked to identify entry-level technical skills that should be learned through student participation in the supervised agricultural education component of the agricultural education model. The teacher panelists were asked to provide skill items for the pathway(s) that best represent the area(s) for which they had experience regarding students' SAEs.

In round one, the secondary agricultural education teacher Delphi panelists provided 555 entry-level technical statements (i.e., skills). Similar or duplicate knowledge statements were combined or eliminated while compound statements were separated by the researcher (Shinn et al., 2009). From the 555 original secondary agricultural education teacher statements, the researcher reconfigured, as described above, and retained 260 statements for presentation in round two of the study (see Table 10).

The skills provided by secondary agricultural education teachers ranged from "General Safety" to "Identify Wholesale Cuts of Meat." The number of skills identified by agricultural education teachers by pathway were Food Products and Processing (FPP, 35), Plant and Soil Science (PSS, 54), Animal Science (ANSI, 35), Agricultural Power, Structures and Technology (APST, 42), Agribusiness and Management (AGBMGT, 29), Agricultural Communications (AGCM, 35), and Natural Resources and Environmental Science (NRES, 30) (see Table 10).

Table 10

Entry-level Technical Skills Identified by the Secondary Agricultural Education Teacher Panelists During Round One of the Delphi Study using the Oklahoma Career Pathways for Agriculture, Food, and Natural Resources as a Context (N = 260)

Entry-Level Technical Skills, Round One
Career Pathway: Food Products & Processing (FPP)
General safety
Food handling safety
Food processing safety
Safe use of pesticides
Bacteria analysis
Food preparation (temperature codes)
Food supply control
Sanitation (food service)
Processing procedures for poultry
Processing procedures for grains
Processing procedures for meat products
Processing procedures for milk
Processing procedures for nuts
Grain grading
Identify retail cuts of meat
Grades of meat
Grades of animals
Meat evaluation
Equipment operation
Selection of products
Evaluation of products
Selection of equipment
Marketing (agriculture products)
Communication
People skills
Advertizing
Responsibility
Decision making
Interpreting data (enterprise income, expenses, and production output)
Maintaining data (enterprise income, expenses, and production output)
Recording data (enterprise income, expenses, and production output)
Product development
How to read and understand a nutrition label

Entry-Level Technical Skills, Round One	
Basic knowledge and application of food products	
Identify wholesale cuts of meat	
Total Skill Items for Food Products & Processing Pathway (FPP)	35

Career Pathway: Plant & Soil Science (PSS)

Plant identification
Proper handling of plants for sale
Proper planting techniques
Reproduction of plants
Basic anatomy of plants
Seed identification
Crop identification
Minimum tillage methods
Reproduction of tree species
Parts of a plant
Nutritional requirements of plants
Plant life cycles
Hay storage
Harvest operations
Seed germination
Crop storage
Alternative crops
Green manure crops
Crop rotations
Particular plants' macronutrients requirements
Soil testing
How to take a soil sample
Soil preparation for particular crops
How to change soil after reading analysis
Soil media
Soil quality
Soil uses
Soil parts
Soil requirements
Soil formations
Proper tillage and land preparation
Soil types
Land judging
Land capability classes

Entry-Level Technical Skills, Round One	
Identify beneficial insects	
Identify harmful insects	
Chemical safety	
Weed control	
Use of pesticides	
Positive environmental impacts on soil	
Negative environmental impacts on soil	
Positive environmental impacts on plants	
Negative environmental impacts on plants	
Soil conservation	
Soil erosion controls	
Greenhouse management	
Greenhouse operations	
Watering (greenhouse plants)	
Surveying	
Hay equipment operation	
Servicing equipment	
Farm Safety	
Irrigation	
Soil preparation for particular trees	
Total Skill Items for Plant and Soil Science Pathway (PSS)	54

Career Pathway: Animal Science (ANSI)

Docking (animal)	
Proper livestock handling	
Castration	
Basic veterinary practices	
Deworming	
Vaccination (animal)	
Disease identification (animal)	
Ear notching	
Dehorning	
Diagnosis of health problems in livestock	
Administering medications	
Use of a squeeze chute	
Haltering livestock	
Reproductive process (reproductive process)	
Birthing process	
Proper care of newborn animals	

Entry-Level Technical Skills, Round One	
Artificial insemination	
Embryo transfer	
Genetics (animal)	
Timing of animal breeding	
Proper marketing of animals	
Role of agricultural animals in the 'big picture' of the economy and world	
Record keeping	
Livestock selection	
Animal anatomy	
Breeds of livestock	
Breed development	
Pedigrees (animal)	
Feed rations	
Animal feeding	
Animal digestion	
Native and improved pastures	
Fertilization and herbicide application on pastures	
Carcass evaluation	
Signs of nutritional deficiencies in animals	
Total Skill Items for Animal Science Pathway (ANSI)	35

Career Pathway: Ag Power, Structures & Technology (APST)

Fire safety	
Shop safety skills	
Basic geometry	
Power equipment usage	
Equipment repair (problem solving)	
Equipment maintenance	
How to use measuring devices	
Bill of materials	
Basic math	
How to read a tape measure	
How to use a framing square	
How to use a portable grinder	
How to use an abrasive cut-off saw	
How to use a portable drill	
How to use a drill press	
Tool identification	
Blue print reading	
Fabrication (layout for projects)	

Project construction
Types of metal
Flux core arc welding troubleshooting
Flux core arc welding comprehension
Flux core arc welding parts
Flux core arc welding operation
SMAW troubleshooting
GMAW parts
Oxy acetylene welding
SMAW comprehension
SMAW operation
SMAW parts
GMAW operation
Plasma cutting
GMAW troubleshooting
Brazing
Oxy acetylene cutting
Types of fuel gasses and uses
Engine repair
Small gas engine principles
Erosion control
Basic electrical skills
Applying sheet metal to a structure
Make minor repairs valuable in the agriculture industry
Total Skill Items for Ag Power, Structures & Technology (APST) 42

Career Pathway: Agribusiness & Management (AGBMGT)

Developing a budget
Income and expenses
Spread sheets
Cash flows
Net worth
Checking accounts
Savings accounts
How to manage an inventory
Understand a balance sheet
Tax management
Depreciation
Knowledge of markets and how they work
Current market trends

Entry-Level Technical Skills, Round One	
Futures market	
Business plan	
Contracting (in agribusiness)	
Board of trade (agriculture)	
Time management	
Using an adding machine	
Risk management	
Pricing (in agribusiness)	
Calculating breakeven analysis	
Banking	
Managing credit	
Time value of money (investments/retirement)	
Insurance	
Capital-debt to asset ratio	
Basic money management	
Simple interest	
Total Skill Items for Agribusiness & Management (AGBMGT)	29

Career Pathway: Agricultural Communications (AGCM)

Public speaking	
Contacting local newspapers and radio stations	
Designing flyers	
Chapter publicity	
Presenting ideas and reports	
Body language	
Non response language	
How to build a marketing plan	
Proper language usage	
Media resources	
Proper writing styles	
Editing	
Writing news releases	
Preparing speeches	
News reporting	
News writing	
Article writing and communication	
Inverted pyramid	
Computer skills	
Using powerpoint presentations	
Photography	

Entry-Level Technical Skills, Round One	
Web design	
Basic graphic design	
Photo editing	
Use of word processing equipment	
Time on task skills	
How to build a resume	
How to interview for a job	
Telephone skills	
Using information	
Manage an activity budget	
Overall knowledge of agriculture in general	
Parliamentary procedure	
How to plan and conduct a banquet	
Problem solving	
Total Skill Items for Agricultural Communications (AGCM)	35

Career Pathway: Natural Resources & Environmental Science (NRES)

Non point source pollution	
Understand the impact of globalization on natural resources	
Basic knowledge, appreciation for the environment	
Recycling and managing waste	
Land assessment/classification	
Land use	
Air pollution and concerns	
Understand environmental impacts locally as well as downstream land areas	
Water safety and concerns	
Water run-off management	
Fish identification	
Wildlife population assessment	
Wildlife conservation	
Wildlife habitat recognition	
Animal concerns	
Wildlife management	
Wildlife identification	
Oklahoma hunting and fishing regulations	
Animal tagging	
Timber cruising	
Forestry knowledge and skills	
Tree identification	
Spraying of chemicals and related concerns	

Entry-Level Technical Skills, Round One	
Recognition of government regulations	
Legal land description	
Map reading (GPS)	
Role of Natural Resource Conservation Service and the landowner	
Work skills	
Identification of all things related to SAE	
Understand the impact of globalization on the economy	
Total Skill Items for Natural Resources and Environmental Science (NRES)	30
Total Number of Skill Items for all Pathways	260

Delphi Panel, Round Two Findings: Secondary Agricultural Education Teachers

In round two, the secondary agricultural education teacher panelists were asked to rate their level of agreement on 260 entry-level technical skills, i.e., those skills they had identified in round one of the study.

The secondary agricultural education teacher panelists were asked to indicate their level of agreement on entry-level technical skills that they perceived should be learned through student participation in the SAE component of the secondary agricultural education program. Panelists were asked to use a six-point response scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree. One-hundred and forty skill items received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the panelists (Jenkins, 2009; Shinn et al., 2009); therefore, the researcher determined that "consensus of agreement" was reached on these items (see Table 11).

The number of items reaching "consensus of agreement," as reported by pathway, were Food Products and Processing (FPP, 15), Plant and Soil Science (PSS, 26), Animal

Science (ANSI, 23), Agricultural Power, Structures and Technology (APST, 25), Agribusiness and Management (AGBMGT, 13), Agricultural Communications (AGCM, 29), and Natural Resources and Environmental Science (NRES, 9) (see Table 11).

Table 11

Secondary Agricultural Education Teacher Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" during Round Two of the Study (N = 140)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Responsibility	FPP	100.0%
Decision making	FPP	100.0%
General safety	FPP	100.0%
People skills	FPP	100.0%
Communication	FPP	100.0%
Overall knowledge of agriculture in general	AGCM	100.0%
How to use measuring devices	APST	100.0%
Administering medications	ANSI	100.0%
Livestock selection	ANSI	100.0%
Disease identification (animal)	ANSI	100.0%
Work skills	NRES	93.8%
Public speaking	AGCM	93.8%
Computer skills	AGCM	93.8%
Chemical safety	PSS	93.8%
How to read a tape measure	APST	93.8%
Tool identification	APST	93.8%
Power equipment usage	APST	93.8%
Savings accounts	AGBMGT	93.8%
Problem solving	AGCM	93.8%
Vaccination (animal)	ANSI	93.8%
Using powerpoint presentations	AGCM	93.8%
Soil conservation	PSS	93.8%
Deworming	ANSI	93.8%
Breeds of livestock	ANSI	93.8%
Time on task skills	AGCM	93.8%
Weed control	PSS	93.8%
How to use an abrasive cut-off saw	APST	87.5%
How to use a portable drill	APST	87.5%
How to interview for a job	AGCM	87.5%
Time management	AGBMGT	87.5%
How to build a resume	AGCM	87.5%
How to use a portable grinder	APST	87.5%
How to use a drill press	APST	87.5%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Record keeping	ANSI	87.5%
Telephone skills	AGCM	87.5%
Oxy acetylene cutting	APST	87.5%
Identification of all things related to SAE	NRES	87.5%
Safe use of pesticides	FPP	87.5%
Basic math	APST	87.5%
Basic electrical skills	APST	87.5%
Income and expenses	AGBMGT	87.5%
Simple interest	AGBMGT	87.5%
Contacting local newspapers and radio stations	AGCM	87.5%
Chapter publicity	AGCM	87.5%
News reporting	AGCM	87.5%
Recording data (enterprise income, expenses, and production output)	FPP	87.5%
Proper livestock handling	ANSI	87.5%
Project construction	APST	87.5%
Time value of money (investments/retirement)	AGBMGT	87.5%
Insurance	AGBMGT	87.5%
Designing flyers	AGCM	87.5%
Types of fuel gasses and uses	APST	87.5%
Animal anatomy	ANSI	87.5%
Writing news releases	AGCM	87.5%
Role of agricultural animals in the 'big picture' of the economy and world	ANSI	87.5%
Equipment maintenance	APST	87.5%
Processing procedures for milk	FPP	87.5%
Crop identification	PSS	87.5%
Feed rations	ANSI	87.5%
Using information	AGCM	87.5%
Manage an activity budget	AGCM	87.5%
Proper planting techniques	PSS	87.5%
Use of word processing equipment	AGCM	87.5%
Shop safety skills	APST	81.3%
Checking accounts	AGBMGT	81.3%
Preparing speeches	AGCM	81.3%
Soil testing	PSS	81.3%
Proper care of newborn animals	ANSI	81.3%
Banking	AGBMGT	81.3%
Photography	AGCM	81.3%
Identify retail cuts of meat	FPP	81.3%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Interpreting data	FPP	81.3%
Plant identification	PSS	81.3%
How to take a soil sample	PSS	81.3%
Diagnosis of health problems in livestock	ANSI	81.3%
Bill of materials	APST	81.3%
Developing a budget	AGBMGT	81.3%
Basic money management	AGBMGT	81.3%
Proper language usage	AGCM	81.3%
Map reading (GPS)	NRES	81.3%
Maintaining data (enterprise income, expenses, and production output)	FPP	81.3%
Positive environmental impacts on plants	PSS	81.3%
Basic veterinary practices	ANSI	81.3%
Birthing process	ANSI	81.3%
SMAW operation	APST	81.3%
Body language	AGCM	81.3%
Parliamentary procedure	AGCM	81.3%
Soil uses	PSS	81.3%
Soil types	PSS	81.3%
Animal feeding	ANSI	81.3%
GMAW parts	APST	81.3%
Presenting ideas and reports	AGCM	81.3%
Land use	NRES	81.3%
Processing procedures for meat products	FPP	81.3%
Reproduction of plants	PSS	81.3%
Soil preparation for particular crops	PSS	81.3%
Editing	AGCM	81.3%
Basic knowledge, appreciation for the environment	NRES	81.3%
Basic anatomy of plants	PSS	81.3%
Soil parts	PSS	81.3%
Parts of a plant	PSS	81.3%
Fire safety	APST	75.0%
Use of pesticides	PSS	75.0%
How to use a framing square	APST	75.0%
Identify wholesale cuts of meat	FPP	75.0%
How to manage an inventory	AGBMGT	75.0%
Understand a balance sheet	AGBMGT	75.0%
Managing credit	AGBMGT	75.0%
Servicing equipment	PSS	75.0%
Proper writing styles	AGCM	75.0%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Water safety and concerns	NRES	75.0%
Land capability classes	PSS	75.0%
Identify harmful insects	PSS	75.0%
Ear notching	ANSI	75.0%
SMAW troubleshooting	APST	75.0%
Engine repair	APST	75.0%
Proper tillage and land preparation	PSS	75.0%
Negative environmental impacts on plants	NRES	75.0%
Soil erosion controls	PSS	75.0%
Dehorning	ANSI	75.0%
Pedigrees (animal)	ANSI	75.0%
Fabrication (layout for projects)	APST	75.0%
GMAW operation	APST	75.0%
News writing	AGCM	75.0%
Web design	AGCM	75.0%
Photo editing	AGCM	75.0%
Grades of meat	FPP	75.0%
Equipment operation	FPP	75.0%
Castration	ANSI	75.0%
Proper marketing of animals	ANSI	75.0%
Small gas engine principles	ANSI	75.0%
Legal land description	NRES	75.0%
Breed development	ANSI	75.0%
Role of Natural Resource Conservation Service and the landowner	NRES	75.0%
Crop storage	PSS	75.0%
How to change soil after reading analysis	PSS	75.0%
Nutritional requirements of plants	PSS	75.0%
Plant life cycles	PSS	75.0%
Article writing and communication	AGCM	75.0%
Plasma cutting	APST	75.0%

Note. * "Consensus of Agreement" was reached if 75% or more of the panelists selected "Agree" (5) or "Strongly Agree" (6) for that item (Jenkins, 2008; Shinn et al., 2009).

In round two, at least 51% but less than 75% of the secondary agricultural education teacher panelists selected “5” (“Agree”) or “6” (“Strongly Agree”) for 86 skill items (see Table 12).

Those skill items, as reported by pathway, were Food Products and Processing (FPP, 13), Plant and Soil Science (PSS, 18), Animal Science (ANSI, 13), Agricultural Power, Structures and Technology (APST, 12), Agribusiness and Management (AGBMGT, 13), Agricultural Communications (AGCM, 5), and Natural Resources and Environmental Science (NRES, 12) (see Table 12).

Table 12

Secondary Agricultural Education Teacher Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that did not reach "consensus of agreement" in Round Two of the Study but did achieve 51% Agreement or Higher (N = 86)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Farm Safety	PSS	68.8%
Spraying of chemicals and related concerns	NRES	68.8%
Understand the impact of globalization on the economy	NRES	68.8%
Knowledge of markets and how they work	AGBMGT	68.8%
Using an adding machine	AGBMGT	68.8%
Watering (greenhouse plants)	PSS	68.8%
Reproductive process (reproductive process)	ANSI	68.8%
Applying sheet metal to a structure	APST	68.8%
Tax management	AGBMGT	68.8%
Oklahoma hunting and fishing regulations	NRES	68.8%
Land judging	PSS	68.8%
How to plan and conduct a banquet	AGCM	68.8%
Land assessment/classification	PSS	68.8%
Soil media	PSS	68.8%
Soil requirements	PSS	68.8%
Negative environmental impacts on soil	PSS	68.8%
Timing of animal breeding	ANSI	68.8%
Fertilization and herbicide application on pastures	ANSI	68.8%
Blue print reading	APST	68.8%
Erosion control	APST	68.8%
Make minor repairs valuable in the agriculture industry	APST	68.8%
Wildlife conservation	NRES	68.8%
Grades of animals	FPP	68.8%
Meat evaluation	FPP	68.8%
Soil quality	PSS	68.8%
Positive environmental impacts on soil	PSS	68.8%
Wildlife habitat recognition	NRES	68.8%
Non point source pollution	NRES	68.8%
Recognition of government regulations	NRES	68.8%
Food handling safety	FPP	62.5%
Net worth	AGBMGT	62.5%
Non response language	AGCM	62.5%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Current market trends	AGBMGT	62.5%
Food processing safety	FPP	62.5%
Advertizing	FPP	62.5%
Alternative crops	PSS	62.5%
Surveying	PSS	62.5%
Understand environmental impacts locally as well as downstream land areas	NRES	62.5%
Crop rotations	PSS	62.5%
Types of metal	APST	62.5%
Spread sheets	AGBMGT	62.5%
Capital-debt to asset ratio	AGBMGT	62.5%
Recycling and managing waste	NRES	62.5%
Product development	FPP	62.5%
Use of a squeeze chute	ANSI	62.5%
Artificial insemination	ANSI	62.5%
Embryo transfer	ANSI	62.5%
Animal digestion	ANSI	62.5%
Business plan	AGBMGT	62.5%
Air pollution and concerns	NRES	62.5%
Wildlife management	NRES	62.5%
Evaluation of products	FPP	62.5%
Seed identification	PSS	62.5%
Haltering livestock	ANSI	62.5%
Oxy acetylene welding	APST	62.5%
GMAW troubleshooting	APST	62.5%
Brazing	APST	62.5%
Basic graphic design	AGCM	62.5%
Animal concerns	ANSI	62.5%
Selection of products	FPP	62.5%
Signs of nutritional deficiencies in animals	ANSI	62.5%
Media resources	AGCM	62.5%
Inverted pyramid	AGCM	62.5%
Risk management	AGBMGT	62.5%
Sanitation (food service)	FPP	62.5%
Equipment repair (problem solving)	APST	62.5%
Calculating breakeven analysis	AGBMGT	56.3%
Futures market	AGBMGT	56.3%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
How to read and understand a nutrition label	FPP	56.3%
Native and improved pastures	ANSI	56.3%
Flux core arc welding operation	APST	56.3%
Pricing (in agribusiness)	AGBMGT	56.3%
Basic knowledge and application of food products	FPP	56.3%
Proper handling of plants for sale	PSS	56.3%
Identify beneficial insects	PSS	56.3%
Genetics (animal)	ANSI	56.3%
SMAW comprehension	APST	56.3%
Board of trade (agriculture)	AGBMGT	56.3%
Soil formations	PSS	56.3%
Docking (animal)	ANSI	56.3%
Basic geometry	APST	56.3%
Tree identification	NRES	56.3%
Greenhouse management	PSS	56.3%
Food supply control	FPP	56.3%
Processing procedures for poultry	FPP	56.3%
Seed germination	PSS	56.3%

Note. *Items for which at least 51% but less than 75% of panelists selected Agree (5) or Strongly Agree (6). These items were included in round three of the study.

The 34 items for which less than 51% of the panelists indicated either “5” (“Agree”) or “6” (“Strongly Agree”) were not included in round three of the study; see Table 13 below for a listing of those items. Those skill items, as reported by pathway, were Food Products and Processing (FPP, 7), Plant and Soil Science (PSS, 9), Animal Science (ANSI, 2), Agricultural Power, Structures and Technology (APST, 4), Agribusiness and Management (AGBMGT, 4), and Natural Resources and Environmental Science (NRES, 8) (see Table 13)

Table 13

Secondary Agricultural Education Teacher Panelists: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that did not reach 51% "Consensus Agreement" during Round Two of the Study (N = 34)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Depreciation	AGBMGT	50.0%
Green manure crops	PSS	50.0%
Carcass evaluation	ANSI	50.0%
Flux core arc welding troubleshooting	APST	50.0%
Flux core arc welding comprehension	APST	50.0%
Flux core arc welding parts	APST	50.0%
Marketing (agriculture products)	FPP	50.0%
Wildlife population assessment	NRES	50.0%
Wildlife identification	NRES	50.0%
Particular plants' macronutrients requirements	PSS	50.0%
Greenhouse operations	PSS	50.0%
Irrigation	PSS	50.0%
How to build a marketing plan	AGBMGT	50.0%
Food preparation (temperature codes)	FPP	50.0%
Processing procedures for nuts	FPP	50.0%
Hay storage	PSS	50.0%
Minimum tillage methods	PSS	50.0%
Water run-off management	NRES	50.0%
SMAW parts	APST	50.0%
Forestry knowledge and skills	NRES	43.8%
Hay equipment operation	PSS	43.8%
Cash flows	AGBMGT	43.8%
Animal tagging	ANSI	43.8%
Fish identification	NRES	37.5%
Contracting (in agribusiness)	AGBMGT	37.5%
Soil preparation for particular trees	PSS	37.5%
Understand the impact of globalization on natural resources	NRES	37.5%
Harvest operations	PSS	37.5%
Reproduction of tree species	NRES	37.5%
Timber cruising	NRES	37.5%
Selection of equipment	FPP	31.3%
Processing procedures for grains	FPP	31.3%
Grain grading	FPP	31.3%

Bacteria analysis	FPP	25.0%

*Note.**Items for which less than 51% of the panelists selected Agree (5) or Strongly Agree (6). These items were not included in round three of the study.

Delphi Panel, Qualitative Data: Secondary Agricultural Education Teachers

Round two of the Delphi study provided an opportunity for panelists to share comments they perceived would provide more information, detail, or clarification regarding a particular entry-level technical skill. In addition, at the end of the instrument, space was provided for the panelists to share additional skills they perceived might have been overlooked in round one.

Two secondary agricultural education teacher panelists provided comments on 66 of the 260 technical skills considered in round two of the study (see Table 14).

Table 14

Secondary Agricultural Education Teacher Panelists: Comments on Entry-level Technical Skills Provided during Round Two of the Delphi Study using the Oklahoma Career Pathways for Agriculture, Food, and Natural Resources as a Context (N = 66)

Entry-level Technical Skills	Comments[a]	Pathway
General safety	extremely important	FPP
Food handling safety	not for all SAEs	FPP
Food processing safety	not for all SAEs	FPP
Safe use of pesticides	not for all SAEs	FPP
Bacteria analysis	not for all SAEs	FPP
Food preparation (temperature codes)	not for all SAEs	FPP
Food supply control	not for all SAEs	FPP
Sanitation (food service)	not for all SAEs	FPP
Processing procedures for poultry	yes, for poultry SAE	FPP
Processing procedures for grains	yes, for grain prod	FPP
Processing procedures for meat products	not for all SAEs	FPP
Processing procedures for milk	not for all SAEs	FPP
Processing procedures for nuts	not for all SAEs	FPP
Grain grading	yes, for grain prod. SAE	FPP
Identify retail cuts of meat	yes, for food processing	FPP
Grades of meat	yes, for food processing	FPP
Grades of animals	not for all SAEs	FPP
Meat evaluation	yes, for food processing	FPP
Communication	this skill comes with time and SAE experience	FPP
People skills	this skill comes with time and SAE experience	FPP
How to read and understand a nutrition label	not for all SAEs	FPP
Basic knowledge and application of food products	not for all SAEs	FPP
Identify wholesale cuts of meat	not for all SAEs	FPP
Plant identification	not for all SAEs	PSS
Proper planting techniques	not for all SAEs	PSS
Reproduction of plants	not for all SAEs	PSS
Basic anatomy of plants	not for all SAEs	PSS
Crop identification	Corn is good	PSS
Crop storage	yes, for grain prod. SAE	PSS

Entry-level Technical Skills	Comments[a]	Pathway
Alternative crops	yes for grain prod. SAE	PSS
Green manure crops	yes for grain prod. SAE	PSS
Crop rotations	yes for grain prod. SAE	PSS
Particular plants' macronutrients requirements	yes for grain prod. SAE	PSS
Identify harmful insects[b]	Fiddleback Spiders	PSS
Chemical safety	yes, for grain prod. SAE	PSS
Greenhouse management	yes, for hort. SAE	PSS
Hay equipment operation	possibly, for forage SAE	PSS
Soil preparation for particular trees	yes, nursery prod	PSS
Docking (animal)	yes, sheep prod	ANSI
Proper livestock handling	yes, livestock SAE	ANSI
Use of a squeeze chute	yes livestock SAE	ANSI
Haltering livestock	yes livestock SAE	ANSI
Reproductive process (reproductive process)	yes livestock SAE	ANSI
Birthing process	yes livestock SAE	ANSI
Livestock selection	yes, livestock SAE	ANSI
Shop safety skills	yes, if they are working in shop	APST
News writing	Why? only in ag comm	AGCM
Article writing and communication	Why? only in ag comm	AGCM
Inverted pyramid	most people outside of ag comm don\'t know what this is	AGCM
Web design	this comes later	AGCM
Basic graphic design	Why? only in ag comm	AGCM
Photo editing	Why? only in ag comm	AGCM
How to build a resume	this comes later	AGCM
Parliamentary procedure	I love parli pro but why in a beginning SAE?	AGCM
How to plan and conduct a banquet	Why in a beginning SAE?	AGCM
Fish identification	not in every SAE	NRES
Wildlife population assessment	not in every SAE	NRES
Wildlife conservation	not in every SAE	NRES
Wildlife habitat recognition	not in every SAE	NRES
Animal concerns	not in every SAE	NRES
Wildlife management	not in every SAE	NRES

Entry-level Technical Skills	Comments[a]	Pathway
Wildlife identification	not in every SAE	NRES
Oklahoma hunting and fishing regulations	not in every SAE	NRES
Animal tagging	not in every SAE	NRES
Timber cruising	not in every SAE	NRES
Forestry knowledge and skills	in forestry, yes	NRES

Note. [a]Comments are direct quotes derived from panelists' responses. [b]This item, "Identify harmful insects," received comments from two different panelists; all other comments were provided by one teacher panelist.

Delphi Panel, Round Three Findings: Secondary Agricultural Education Teachers

In round three, the secondary agricultural education teacher panelists were asked to rate their level of agreement on 86 entry-level technical skills.

The secondary agricultural education teacher panelists were asked to indicate their level of agreement on entry-level technical skills that they perceived should be learned through student participation in the SAE component of the secondary agricultural education program. Panelists were asked to use a six-point response scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree. Twenty-one items received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the panelists (Jenkins, 2009; Shinn et al., 2009); therefore, the researcher determined that "consensus of agreement" was reached on these items (see Table 15).

The number of items reaching "consensus of agreement," as reported by pathway, were Food Products and Processing (FPP, 4), Plant and Soil Science (PSS, 3), Animal Science (ANSI, 5), Agricultural Power, Structures and Technology (APST, 4), Agribusiness

and Management (AGBMGT, 1), and Natural Resources and Environmental Science (NRES, 4) (see Table 15).

Table 15

Secondary Agricultural Education Teacher Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" during Round Three of the Study (N = 21)

Entry-level Technical Skills, Round Three	Pathway	% Agreement*
How to read and understand a nutrition label	FPP	100.0%
Farm Safety	PSS	92.9%
Oxy acetylene welding	APST	92.9%
Animal concerns	ANSI	92.9%
Selection of products	FPP	92.9%
Equipment repair (problem solving)	APST	92.9%
Positive environmental impacts on soil	PSS	85.7%
Wildlife habitat recognition	NRES	85.7%
Food handling safety	FPP	85.7%
Wildlife management	NRES	85.7%
GMAW troubleshooting	APST	85.7%
Timing of animal breeding	ANSI	78.6%
Make minor repairs valuable in the agriculture industry	APST	78.6%
Wildlife conservation	NRES	78.6%
Net worth	AGBMGT	78.6%
Animal digestion	ANSI	78.6%
Signs of nutritional deficiencies in animals	ANSI	78.6%
Native and improved pastures	ANSI	78.6%
Basic knowledge and application of food products	FPP	78.6%
Identify beneficial insects	PSS	78.6%
Tree identification	NRES	78.6%

Note. * *"Consensus of Agreement"* was reached if 75% or more of the panelists selected "Agree" (5) or "Strongly Agree" (6) for that item (Jenkins, 2008; Shinn et al., 2009).

Sixty-five skill items did not reach "consensus of agreement" in round three. Those skill items, as reported by pathway, were Food Products and Processing (FPP, 9), Plant and

Soil Science (PSS, 14), Animal Science (ANSI, 8), Agricultural Power, Structures and Technology (APST, 9), Agribusiness and Management (AGBMGT, 12), Agricultural Communications (AGCM, 5), and Natural Resources and Environmental Science (NRES, 8) (see Table 16).

Table 16

Secondary Agricultural Education Teacher Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that did not reach "Consensus of Agreement" during Round Three of the Study (N = 65)

Entry-level Technical Skills, Round Three	Pathway	% Agreement*
Negative environmental impacts on soil	PSS	71.4%
Non point source pollution	NRES	71.4%
Recognition of government regulations	NRES	71.4%
Food processing safety	FPP	71.4%
Advertizing	FPP	71.4%
Types of metal	APST	71.4%
Product development	FPP	71.4%
Business plan	AGBMGT	71.4%
Evaluation of products	FPP	71.4%
Media resources	AGCM	71.4%
Risk management	AGBMGT	71.4%
Calculating breakeven analysis	AGBMGT	71.4%
Proper handling of plants for sale	PSS	71.4%
Genetics (animal)	ANSI	71.4%
Soil formations	PSS	71.4%
Understand the impact of globalization on the economy	NRES	64.3%
Knowledge of markets and how they work	AGBMGT	64.3%
Reproductive process (reproductive process)	ANSI	64.3%
Understand environmental impacts locally as well as downstream land areas	NRES	64.3%
Spread sheets	AGBMGT	64.3%
Recycling and managing waste	NRES	64.3%
Artificial insemination	ANSI	64.3%
Pricing (in agribusiness)	AGBMGT	64.3%
Basic geometry	APST	64.3%
Seed germination	PSS	64.3%
Using an adding machine	AGBMGT	57.1%
Applying sheet metal to a structure	APST	57.1%
Fertilization and herbicide application on pastures	ANSI	57.1%
Erosion control	APST	57.1%
Meat evaluation	FPP	57.1%
Soil quality	PSS	57.1%
Current market trends	AGBMGT	57.1%

Entry-level Technical Skills, Round Three	Pathway	% Agreement*
Crop rotations	PSS	57.1%
Air pollution and concerns	NRES	57.1%
Seed identification	PSS	57.1%
Basic graphic design	AGCM	57.1%
Flux core arc welding operation	APST	57.1%
SMAW comprehension	APST	57.1%
Greenhouse management	PSS	57.1%
Food supply control	FPP	57.1%
Spraying of chemicals and related concerns	NRES	50.0%
Watering (greenhouse plants)	PSS	50.0%
Oklahoma hunting and fishing regulations	NRES	50.0%
How to plan and conduct a banquet	AGCM	50.0%
Soil media	PSS	50.0%
Soil requirements	PSS	50.0%
Alternative crops	PSS	50.0%
Capital-debt to asset ratio	AGBMGT	50.0%
Use of a squeeze chute	ANSI	50.0%
Embryo transfer	ANSI	50.0%
Sanitation (food service)	FPP	50.0%
Futures market	AGBMGT	50.0%
Tax management	AGBMGT	42.9%
Land assessment/classification	PSS	42.9%
Blue print reading	APST	42.9%
Grades of animals	FPP	42.9%
Surveying	APST	42.9%
Haltering livestock	ANSI	42.9%
Brazing	APST	42.9%
Board of trade (agriculture)	AGBMGT	42.9%
Land judging	PSS	35.7%
Non response language	AGCM	35.7%
Docking (animal)	ANSI	35.7%
Processing procedures for poultry	FPP	28.6%
Inverted pyramid	AGCM	14.3%

*Note.**Items for which less than 75% of panelists selected Agree (5) or Strongly Agree (6) in round three of the study.

The total number of entry-level technical skills that reached “consensus of agreement” for the secondary agricultural education teacher panel was 161 (see Table 17). The distribution of skills by career pathway was, Food Products and Processing: 19; Plant and Soil Science: 29; Animal Science: 28; Agricultural Power, Structures and Technology: 29; Agribusiness and Management: 14; Agricultural Communications: 29; and Natural Resources and Environmental Science: 13 (see Table 17).

Table 17

Secondary Agricultural Education Teacher Panelists: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" after Three Rounds of the Delphi Study (N = 161)

Entry-level Technical Skills	Pathway	% Agreement
Savings accounts	AGBMGT	93.80%
Time management	AGBMGT	87.50%
Income and expenses	AGBMGT	87.50%
Simple interest	AGBMGT	87.50%
Time value of money (investments/retirement)	AGBMGT	87.50%
Insurance	AGBMGT	87.50%
Checking accounts	AGBMGT	81.30%
Banking	AGBMGT	81.30%
Developing a budget	AGBMGT	81.30%
Basic money management	AGBMGT	81.30%
How to manage an inventory	AGBMGT	75.00%
Understand a balance sheet	AGBMGT	75.00%
Managing credit	AGBMGT	75.00%
Net worth	AGBMGT	78.60%
Total Number of Skills for the Pathway	14	
Overall knowledge of agriculture in general	AGCM	100.00%
Public speaking	AGCM	93.80%
Computer skills	AGCM	93.80%
Problem solving	AGCM	93.80%
Using powerpoint presentations	AGCM	93.80%
Time on task skills	AGCM	93.80%
How to interview for a job	AGCM	87.50%
How to build a resume	AGCM	87.50%
Telephone skills	AGCM	87.50%
Contacting local newspapers and radio stations	AGCM	87.50%
Chapter publicity	AGCM	87.50%
News reporting	AGCM	87.50%
Designing flyers	AGCM	87.50%
Writing news releases	AGCM	87.50%
Using information	AGCM	87.50%
Manage an activity budget	AGCM	87.50%
Use of word processing equipment	AGCM	87.50%

Entry-level Technical Skills	Pathway	% Agreement
Preparing speeches	AGCM	81.30%
Photography	AGCM	81.30%
Proper language usage	AGCM	81.30%
Body language	AGCM	81.30%
Parliamentary procedure	AGCM	81.30%
Presenting ideas and reports	AGCM	81.30%
Editing	AGCM	81.30%
Proper writing styles	AGCM	75.00%
News writing	AGCM	75.00%
Web design	AGCM	75.00%
Photo editing	AGCM	75.00%
Article writing and communication	AGCM	75.00%
Total Number of Skills for the Pathway	29	
Administering medications	ANSI	100.00%
Livestock selection	ANSI	100.00%
Disease identification (animal)	ANSI	100.00%
Vaccination (animal)	ANSI	93.80%
Deworming	ANSI	93.80%
Breeds of livestock	ANSI	93.80%
Record keeping	ANSI	87.50%
Proper livestock handling	ANSI	87.50%
Animal anatomy	ANSI	87.50%
Role of agricultural animals in the 'big picture' of the economy and world	ANSI	87.50%
Feed rations	ANSI	87.50%
Proper care of newborn animals	ANSI	81.30%
Diagnosis of health problems in livestock	ANSI	81.30%
Basic veterinary practices	ANSI	81.30%
Birthing process	ANSI	81.30%
Animal feeding	ANSI	81.30%
Ear notching	ANSI	75.00%
Dehorning	ANSI	75.00%
Pedigrees (animal)	ANSI	75.00%
Castration	ANSI	75.00%
Proper marketing of animals	ANSI	75.00%
Small gas engine principles	ANSI	75.00%
Breed development	ANSI	75.00%
Animal concerns	ANSI	92.90%

Entry-level Technical Skills	Pathway	% Agreement
Timing of animal breeding	ANSI	78.60%
Animal digestion	ANSI	78.60%
Signs of nutritional deficiencies in animals	ANSI	78.60%
Native and improved pastures	ANSI	78.60%
Total Number of Skills for the Pathway	28	
How to use measuring devices	APST	100.00%
How to read a tape measure	APST	93.80%
Tool identification	APST	93.80%
Power equipment usage	APST	93.80%
How to use an abrasive cut-off saw	APST	87.50%
How to use a portable drill	APST	87.50%
How to use a portable grinder	APST	87.50%
How to use a drill press	APST	87.50%
Oxy acetylene cutting	APST	87.50%
Basic math	APST	87.50%
Basic electrical skills	APST	87.50%
Project construction	APST	87.50%
Types of fuel gasses and uses	APST	87.50%
Equipment maintenance	APST	87.50%
Shop safety skills	APST	81.30%
Bill of materials	APST	81.30%
SMAW operation	APST	81.30%
GMAW parts	APST	81.30%
Fire safety	APST	75.00%
How to use a framing square	APST	75.00%
SMAW troubleshooting	APST	75.00%
Engine repair	APST	75.00%
Fabrication (layout for projects)	APST	75.00%
GMAW operation	APST	75.00%
Plasma cutting	APST	75.00%
Oxy acetylene welding	APST	92.90%
Equipment repair (problem solving)	APST	92.90%
GMAW troubleshooting	APST	85.70%
Make minor repairs valuable in the agriculture industry	APST	78.60%
Total Number of Skills for the Pathway	29	
Responsibility	FPP	100.00%
Decision making	FPP	100.00%

Entry-level Technical Skills	Pathway	% Agreement
General safety	FPP	100.00%
People skills	FPP	100.00%
Communication	FPP	100.00%
Safe use of pesticides	FPP	87.50%
Recording data (enterprise income, expenses, and production output)	FPP	87.50%
Processing procedures for milk	FPP	87.50%
Identify retail cuts of meat	FPP	81.30%
Interpreting data	FPP	81.30%
Maintaining data (enterprise income, expenses, and production output)	FPP	81.30%
Processing procedures for meat products	FPP	81.30%
Identify wholesale cuts of meat	FPP	75.00%
Grades of meat	FPP	75.00%
Equipment operation	FPP	75.00%
How to read and understand a nutrition label	FPP	100.00%
Selection of products	FPP	92.90%
Food handling safety	FPP	85.70%
Basic knowledge and application of food products	FPP	78.60%
Total Number of Skills for the Pathway	19	
Work skills	NRES	93.80%
Identification of all things related to SAE	NRES	87.50%
Map reading (GPS)	NRES	81.30%
Land use	NRES	81.30%
Basic knowledge, appreciation for the environment	NRES	81.30%
Water safety and concerns	NRES	75.00%
Negative environmental impacts on plants	NRES	75.00%
Legal land description	NRES	75.00%
Role of Natural Resource Conservation Service and the landowner	NRES	75.00%
Wildlife habitat recognition	NRES	85.70%
Wildlife management	NRES	85.70%
Wildlife conservation	NRES	78.60%
Tree identification	NRES	78.60%
Total Number of Skills for the Pathway	13	
Chemical safety	PSS	93.80%
Soil conservation	PSS	93.80%

Entry-level Technical Skills	Pathway	% Agreement
Weed control	PSS	93.80%
Crop identification	PSS	87.50%
Proper planting techniques	PSS	87.50%
Soil testing	PSS	81.30%
Plant identification	PSS	81.30%
How to take a soil sample	PSS	81.30%
Positive environmental impacts on plants	PSS	81.30%
Soil uses	PSS	81.30%
Soil types	PSS	81.30%
Reproduction of plants	PSS	81.30%
Soil preparation for particular crops	PSS	81.30%
Basic anatomy of plants	PSS	81.30%
Soil parts	PSS	81.30%
Parts of a plant	PSS	81.30%
Use of pesticides	PSS	75.00%
Servicing equipment	PSS	75.00%
Land capability classes	PSS	75.00%
Identify harmful insects	PSS	75.00%
Proper tillage and land preparation	PSS	75.00%
Soil erosion controls	PSS	75.00%
Crop storage	PSS	75.00%
How to change soil after reading analysis	PSS	75.00%
Nutritional requirements of plants	PSS	75.00%
Plant life cycles	PSS	75.00%
Farm Safety	PSS	92.90%
Positive environmental impacts on soil	PSS	85.70%
Identify beneficial insects	PSS	78.60%
Total Number of Skills for the Pathway	29	
Total Number of Skills all Pathways	161	

Delphi Panel, Qualitative Data: Secondary Agricultural Education Teachers

In round three, an additional opportunity was provided to panelists to make further clarifications to the skill items and their relative importance. In addition, a final opportunity for panelists to share their thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program was provided.

However, no additional comments were provided by secondary agricultural education teacher panelists' in round three.

Delphi Panel, Round One Findings: Agricultural Industry Experts

Round one of this Delphi study for this panel sought to identify the technical skills that were valued by industry representatives (i.e., potential employers of entry-level job seekers), and determine if those skills were being acquired through student participation in the SAE component of the agricultural education program. In Oklahoma, agricultural education divides instruction in agriculture, food, and natural resources into seven career pathways (ODCTE, 2009). The seven career pathways for Oklahoma include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science (ODCTE, 2009).

Using the Career Pathways as a conceptual framework, agricultural industry panelists were asked to identify entry-level technical skills that should be learned through student participation in the supervised agricultural education component of the secondary agricultural

education model, especially as it related to entry-level employment. Panelists were encouraged to address only those pathways that they identified as an area of expertise.

In round one, the agricultural industry panelists provided 140 entry-level technical skills. Similar or duplicate knowledge statements were combined or eliminated while compound statements were separated (Shinn et al., 2009). From 140 original agricultural industry panelists' statements, the researcher reconfigured, as described above, and retained 105 skill statements (see Table 18).

The skills provided by agricultural industry experts ranged from "Hygiene" to "Bread Making." The number of skills identified by agricultural industry panelists by pathway were Food Products and Processing (FPP, 13), Plant and Soil Science (PSS, 16), Animal Science (ANSI, 37), Agricultural Power, Structures and Technology (APST, 12), Agribusiness and Management (AGBMGT, 6), Agricultural Communications (AGCM, 19), and Natural Resources and Environmental Science (NRES, 2) (see Table 18)

Table 18

Entry-level Technical Skills Identified by the Agricultural Industry Panelists during Round One of the Delphi Study using the Oklahoma Career Pathways for Agriculture, Food, and Natural Resources as a Context (N = 105)

Entry-level Technical Skills, Round One	
Career Pathway: Food Products & Processing (FPP)	
Hygiene (as related to handling food)	
Food borne pathogens	
Basic livestock anatomy	
Species of livestock	
Wheat quality parameters	
Cuts of meat	
Meat preparation (cooking)	
Milling skills	
Baking skills	
Harvesting (livestock)	
Processing (livestock)	
Handling (livestock)	
Bread making	
Total Skill Items for Food Products & Processing Pathway (FPP)	13
Career Pathway: Plant & Soil Science (PSS)	
Yield potential	
Test weights	
Marketing (agriculture products)	
Overall yields	
Plant structure	
Anatomy of plants	
Breeding (plants)	
Diseases (plants)	
Plant types	
Physiology of plants	
P.H.	
Soil types	
Nutrient deficiency	
Seed identification	
Plant identification	
Weed identification	
Total Skill Items for Plant & Soil Science Pathway (PSS)	16

Entry-level Technical Skills, Round One

Career Pathway: Animal Science

Identify bloat	
Proper vaccination sites	
Animal breeding	
Animal reproduction	
Birthing assistance	
Basic animal nutrition	
Disease treatment (animals)	
Processing of newborns	
Animal health	
Vaccination of animals	
Marketplace sale trends	
Consumer expectations	
Basic math	
Budgets	
Inventory	
Balancing a checkbook	
Live animal evaluation	
Different classes of livestock	
Differences between major breeds of livestock	
Know proper terminology regarding gender (livestock)	
First hollow stem (wheat pasture management)	
Tannin production (ruminant digestibility)	
Waste management	
Nutrient utilization	
State regulations (regarding agriculture)	
Confined Animal Feeding Operations	
Licensed Managed Feeding Operations	
Air quality (animal confinement)	
Safety awareness	
Bio-security	
People skills	
Basic first aid	
Basic electrical wiring	
Operating a welder	
Construction principles	
Plumbing	
Small gas engines maintenance	
Total Skill Items for Animal Science Pathway (ANSI)	37

Entry-level Technical Skills, Round One	
Career Pathway: Ag Power, Structures & Technology (APST)	
Characteristics of a gas engine	
Characteristics of a diesel engine	
Properly inflate a tire	
Change a tire	
Function of a spark plug	
Change oil	
Basic computer skills	
Tool identification	
Differentiate between metric and standard wrenches	
Soil compaction	
No-till (soil preparation)	
Sensing technology	
Total Skill Items for Ag Power, Structures & Technology Pathway (APST)	12
Career Pathway: Agribusiness & Management (AGBMGT)	
Assets and liabilities	
Balance sheets	
Simple interest	
Business math	
Applied statistics	
Trends analysis	
Total Skill Items for Agribusiness & Management Pathway (AGBMGT)	6
Career Pathway: Agricultural Communications (AGCM)	
Speaking (oral communication)	
Writing news releases	
Policy position papers	
Writing letters to the editor	
Writing letters to elected, appointed, and career officials	
Web site design	
Lobbying skills	
Dependability	
Consistency	
Determination	
Confidence	
Organization	
Self-motivation	
Empathy	
Reliability	
Commitment	

Entry-level Technical Skills, Round One	
Trust	
Loyalty	
Team-player	
Total Skill Items for Agricultural Communications Pathway (AGCM)	19
Career Pathway: Natural Resources and Environmental Science (NRES)	
Carbon issues	
Water quality	
Total Skill Items for Natural Resources and Environmental Science Pathway (NRES)	2
Total Number of Skill Items for all Pathways	105

Delphi Panel, Round Two Findings: Agricultural Industry Experts

In round two, the agricultural industry panelists were asked to rate their level of agreement on 105 entry-level technical skills, i.e., those skills they had identified in round one of the study.

The agricultural industry panelists were asked to indicate their level of agreement on entry-level technical skills that they perceived should be learned through student participation in the SAE component of the secondary agricultural education program, especially as it relates to entry-level employment. Panelists were asked to use a six-point response scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree. Fifty-four items received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the panelists; therefore, the researchers determined that "consensus of agreement" was reached on these items (Jenkins, 2008; Shinn et al., 2009) (see Table 19).

The number of items reaching “consensus of agreement” as reported by pathway were Food Products and Processing (FPP, 2), Plant and Soil Science (PSS, 5), Animal Science (ANSI, 29), Agricultural Power, Structures and Technology (APST, 2), Agribusiness and Management (AGBMGT, 3), Agricultural Communications (AGCM, 13), no skill items from the Natural Resources and Environmental Science (NRES) pathway reached “consensus of agreement” in round two of the study (see Table 19).

Table 19

Agricultural Industry Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" during Round Two of the Study (N = 54)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Hygiene (as related to handling food)	FPP	100.0%
People skills	ANSI	100.0%
Dependability	AGCM	100.0%
Reliability	AGCM	100.0%
Trust	AGCM	100.0%
Speaking (oral communication)	AGCM	100.0%
Self-motivation	AGCM	100.0%
Loyalty	AGCM	100.0%
Know proper terminology regarding gender (livestock)	ANSI	100.0%
Consistency	AGCM	100.0%
Determination	AGCM	100.0%
Confidence	AGCM	100.0%
Organization	AGCM	100.0%
Animal health	ANSI	100.0%
Basic math	ANSI	100.0%
Commitment	AGCM	100.0%
Different classes of livestock	ANSI	100.0%
Balancing a checkbook	ANSI	92.3%
Basic first aid	ANSI	92.3%
Proper vaccination sites	ANSI	92.3%
Safety awareness	ANSI	92.3%
Balance sheets	AGBMGT	92.3%
Basic animal nutrition	ANSI	92.3%
Basic livestock anatomy	ANSI	92.3%
Marketplace sale trends	ANSI	92.3%
Birthing assistance	ANSI	92.3%
Team-player	AGCM	84.6%
Food borne pathogens	FPP	84.6%
State regulations (regarding agriculture)	ANSI	84.6%
Assets and liabilities	AGBMGT	84.6%
Simple interest	AGBMGT	84.6%
Handling (livestock)	ANSI	84.6%
Budgets	ANSI	84.6%
Species of livestock	ANSI	84.6%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Plant identification	PSS	84.6%
Vaccination of animals	ANSI	84.6%
Inventory	ANSI	84.6%
Live animal evaluation	ANSI	84.6%
Plant types	PSS	84.6%
Basic computer skills	APST	76.9%
Marketing (agriculture products)	PSS	76.9%
Disease treatment (animals)	ANSI	76.9%
Consumer expectations	ANSI	76.9%
Weed identification	PSS	76.9%
Animal reproduction	ANSI	76.9%
Business math	ANSI	76.9%
Animal breeding	ANSI	76.9%
Processing of newborns	ANSI	76.9%
Bio-security	ANSI	76.9%
Writing letters to elected, appointed, and career officials	AGCM	76.9%
Identify bloat	ANSI	76.9%
Change a tire	APST	76.9%
No-till (soil preparation)	PSS	76.9%
Differences between major breeds of livestock	ANSI	76.9%

Note. * "Consensus of Agreement" was reached if 75% or more of the panelists selected "Agree" (5) or "Strongly Agree" (6) for that item (Jenkins, 2008; Shinn et al., 2009).

In round two, at least 51% but less than 75% of the secondary agricultural industry panelists selected "5" ("Agree") or "6" ("Strongly Agree") for 27 skill items (see Table 18). Those skill items, as reported by pathway, were Food Products and Processing (FPP, 1), Plant and Soil Science (PSS, 5), Animal Science (ANSI, 11), Agricultural Power, Structures and Technology (APST, 7), Agribusiness and Management (AGBMGT, 1), Agricultural Communications (AGCM, 1), and Natural Resources and Environmental Science (NRES, 1) (see Table 20).

Table 20

Agricultural Industry Panel: Entry-level Technical Skills Students Should Learn through their Participation in SAEs that did not reach "Consensus of Agreement" in Round Two of the Study but did achieve 51% Agreement or Higher (N = 27)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Empathy	AGCM	69.2%
Seed identification	PSS	69.2%
Nutrient deficiency	PSS	69.2%
Waste management	ANSI	69.2%
Confined Animal Feeding Operations	ANSI	69.2%
Properly inflate a tire	APST	69.2%
Tool identification	APST	69.2%
Harvesting (livestock)	FPP	69.2%
Soil types	PSS	69.2%
Water quality	NRES	69.2%
Construction principles	ANSI	69.2%
Licensed Managed Feeding Operations	ANSI	69.2%
Air quality (animal confinement)	ANSI	61.5%
P.H.	PSS	61.5%
Soil compaction	APST	61.5%
Anatomy of plants	PSS	61.5%
Function of a spark plug	APST	61.5%
Change oil	APST	61.5%
Processing (livestock)	ANSI	53.8%
Nutrient utilization	ANSI	53.8%
First hollow stem (wheat pasture management)	ANSI	53.8%
Basic electrical wiring	ANSI	53.8%
Sensing technology	APST	53.8%
Plumbing	ANSI	53.8%
Differentiate between metric and standard wrenches	APST	53.8%
Trends analysis	AGBMGT	53.8%
Small gas engines maintenance	ANSI	53.8%

Note. *Items for which at least 51% but less than 75% of panelists selected Agree (5) or Strongly Agree (6). These items were included in round three of the study.

The 24 items for which less than 51% of panelists indicated either a “5” (“Agree”) or “6” (“Strongly Agree”) were not included in round three of the study; see Table 21 below for a listing of those items. The skill items, as reported by pathway, were Food Products and Processing (FPP, 6), Plant and Soil Science (PSS, 7), Animal Science (ANSI, 2), Agricultural Power, Structures and Technology (APST, 2), Agribusiness and Management (AGBMGT, 1), Agricultural Communications (AGCM, 5), and Natural Resources and Environmental Science (NRES, 1) (see Table 21).

Table 21

Agricultural Industry Panelists: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that did not Reach 51% “Consensus of Agreement” during Round Two of the Study (N = 24)

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Physiology of plants	PSS	46.2%
Meat preparation (cooking)	FPP	46.2%
Diseases (plants)	PSS	46.2%
Lobbying skills	AGCM	46.2%
Test weights	PSS	46.2%
Writing news releases	AGCM	46.2%
Policy position papers	AGCM	46.2%
Writing letters to the editor	AGCM	46.2%
Characteristics of a diesel engine	APST	46.2%
Cuts of meat	FPP	38.5%
Yield potential	PSS	38.5%
Overall yields	PSS	38.5%
Tannin production (ruminant digestibility)	ANSI	38.5%
Operating a welder	ANSI	38.5%
Applied statistics	AGBMGT	38.5%
Carbon issues	NRES	38.5%
Characteristics of a gas engine	APST	38.5%
Wheat quality parameters	FPP	30.8%
Plant structure	PSS	30.8%
Breeding (plants)	PSS	30.8%
Milling skills	FPP	30.8%

Entry-level Technical Skills, Round Two	Pathway	% Agreement*
Baking skills	FPP	23.1%
Web site design	AGCM	23.1%
Bread making	FPP	15.4%

*Note.**Items for which less than 51% of the panelists selected Agree (5) or Strongly Agree (6). These items were not included in round three of the study.

Delphi Panel, Qualitative Data: Agricultural Industry Experts

Round two of the Delphi study provided an opportunity for panelists to share comments they perceived would provide more information, detail, or clarification regarding a particular entry-level technical skill. In addition, at the end of the instrument, space was provided for panelists to share additional skills they perceived might have been overlooked in round one.

One agricultural industry panelist provided two general comments on the 105 technical skills considered in Round two (see Table 22).

Table 22

Agricultural Industry: A Panelist's General Comments on Entry-level Technical Skills during Round Two of the Delphi Study using the Oklahoma Career Pathways for Agriculture, Food, and Natural Resources as a Context

Comments
Only generic comment is I believe that a lot of the above depends on the size of the system in which they are being taught. If there is more than one instructor, can have options. If a smaller system, then having options on what the students learning desire would be appropriate in my opinion.
Some of these skills need only some basic understanding of the concept not complete mastery at the entry level. Others need to be mastered for entry level

Delphi Panel, Round Three Findings: Agricultural Industry Experts

In round three, the agricultural industry panelists were asked to rate their level of agreement on 27 entry-level technical skills.

The agricultural industry panelists were asked to indicate their level of agreement on entry-level technical skills that they perceived should be learned through student participation in the SAE component of the secondary agricultural education program, especially as it related to entry-level employment. Panelists were asked to use a six-point response scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree. Six items received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the panelists (Jenkins, 2009; Shinn et al., 2009); therefore, the researcher determined that "consensus of agreement" was reached on those items (see Table 23).

The number of items reaching "consensus of agreement," as reported by pathway, were Food Products and Processing (FPP, 1), Plant and Soil Science (PSS, 1), Animal Science (ANSI, 2), Agricultural Power, Structures and Technology (APST, 2) (see Table 23).

Table 23

Agricultural Industry Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" during Round Three of the Study (N = 6)

Entry-level Technical Skills, Round Three	Pathway	% Agreement*
Harvesting (livestock)	FPP	83.3%
Air quality (animal confinement)	ANSI	83.3%
Seed identification	PSS	75.0%
Tool identification	APST	75.0%
Change oil	APST	75.0%
Processing (livestock)	ANSI	75.0%

Note. * "Consensus of Agreement" was reached if 75% or more of panelists selected "Agree" (5) or "Strongly Agree" (6) for that item (Jenkins, 2009; Shinn et al., 2009).

Twenty-one skill items did not reach "consensus of agreement" in round three. Those skill items, as reported by pathway, were Plant and Soil Science (PSS, 5), Animal Science (ANSI, 9), Agricultural Power, Structures and Technology (APST, 4), Agribusiness and Management (AGBMGT, 1), Agricultural Communications (AGCM, 1), and Natural Resources and Environmental Science (NRES, 1) (see Table 24).

Table 24

Agricultural Industry Panelists: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that did not reach "Consensus of Agreement" during Round Three of the Study (N = 21)

Entry-level Technical Skills, Round Three	Pathway	% Agreement*
Empathy	AGCM	66.7%
Nutrient deficiency	PSS	66.7%
Properly inflate a tire	APST	66.7%
Construction principles	ANSI	66.7%
Licensed Managed Feeding Operations	ANSI	66.7%
P.H.	PSS	66.7%
Function of a spark plug	APST	66.7%
Nutrient utilization	ANSI	66.7%
Basic electrical wiring	ANSI	66.7%
Differentiate between metric and standard wrenches	APST	66.7%
Waste management	ANSI	58.3%
Confined Animal Feeding Operations	ANSI	58.3%
Soil types	PSS	58.3%
Water quality	NRES	58.3%
Soil compaction	PSS	58.3%
Anatomy of plants	PSS	58.3%
Small gas engines maintenance	ANSI	58.3%
First hollow stem (wheat pasture management)	ANSI	50.0%
Sensing technology	APST	50.0%
Trends analysis	AGBMGT	50.0%
Plumbing	ANSI	41.7%

*Note.**Items for which less than 75% of panelists selected Agree (5) or Strongly Agree (6) in round three of the study.

The total number of entry-level technical skills that reached "consensus of agreement" for the agricultural industry panel was 60 (see Table 25). The distribution of entry-level technical skills by career pathway was Food Products and Processing: 3; Plant and Soil Science: 6; Animal Science: 31; Agricultural Power, Structures and Technology: 4;

Agribusiness and Management: 3; Agricultural Communications: 13, no skills from the Natural Resources and Environmental Science pathway reached “consensus of agreement” among these panelists (see Table 25).

Table 25

Agricultural Industry Panel: Entry-level Technical Skills Students Should Learn through Their Participation in SAEs that reached "Consensus of Agreement" after Three Rounds of the Delphi Study (N = 60)

Entry-level Technical Skills	Pathway	% Agreement
Balance sheets	AGBMGT	92.30%
Assets and liabilities	AGBMGT	84.60%
Simple interest	AGBMGT	84.60%
Total Number of Skills for the Pathway	3	
Dependability	AGCM	100.00%
Reliability	AGCM	100.00%
Trust	AGCM	100.00%
Speaking (oral communication)	AGCM	100.00%
Self-motivation	AGCM	100.00%
Loyalty	AGCM	100.00%
Consistency	AGCM	100.00%
Determination	AGCM	100.00%
Confidence	AGCM	100.00%
Organization	AGCM	100.00%
Commitment	AGCM	100.00%
Team-player	AGCM	84.60%
Writing letters to elected, appointed, and career officials	AGCM	76.90%
Total Number of Skills for the Pathway	13	
People skills	ANSI	100.00%
Know proper terminology regarding gender (livestock)	ANSI	100.00%
Animal health	ANSI	100.00%
Basic math	ANSI	100.00%
Different classes of livestock	ANSI	100.00%
Balancing a checkbook	ANSI	92.30%
Basic first aid	ANSI	92.30%
Proper vaccination sites	ANSI	92.30%
Safety awareness	ANSI	92.30%
Basic animal nutrition	ANSI	92.30%
Basic livestock anatomy	ANSI	92.30%
Marketplace sale trends	ANSI	92.30%

Entry-level Technical Skills	Pathway	% Agreement
Birthing assistance	ANSI	92.30%
State regulations (regarding agriculture)	ANSI	84.60%
Handling (livestock)	ANSI	84.60%
Budgets	ANSI	84.60%
Species of livestock	ANSI	84.60%
Vaccination of animals	ANSI	84.60%
Inventory	ANSI	84.60%
Live animal evaluation	ANSI	84.60%
Disease treatment (animals)	ANSI	76.90%
Consumer expectations	ANSI	76.90%
Animal reproduction	ANSI	76.90%
Business math	ANSI	76.90%
Animal breeding	ANSI	76.90%
Processing of newborns	ANSI	76.90%
Bio-security	ANSI	76.90%
Identify bloat	ANSI	76.90%
Differences between major breeds of livestock	ANSI	76.90%
Air quality (animal confinement)	ANSI	83.30%
Processing (livestock)	ANSI	75.00%
Total Number of Skills for the Pathway	31	
Basic computer skills	APST	76.90%
Change a tire	APST	76.90%
Tool identification	APST	75.00%
Change oil	APST	75.00%
Total Number of Skills for the Pathway	4	
Hygiene (as related to handling food)	FPP	100.00%
Food borne pathogens	FPP	84.60%
Harvesting (livestock)	FPP	83.30%
Total Number of Skills for the Pathway	3	
Plant identification	PSS	84.60%
Plant types	PSS	84.60%
Marketing (agriculture products)	PSS	76.90%
Weed identification	PSS	76.90%
No-till (soil preparation)	PSS	76.90%
Seed identification	PSS	75.00%

Entry-level Technical Skills	Pathway	% Agreement
Total Number of Skills for the Pathway	6	
Total Number of Skills all Pathways	60	

Delphi Panel, Qualitative Data: Agricultural Industry Experts

In round three, an additional opportunity was provided to panelists to make further clarifications to the skill items and their relative importance. In addition, a final opportunity for panelists to share their thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the secondary agricultural education program was provided.

Two panelists provided general comments at the conclusion of round three: One panelist offered; “I think that it is essential to add technical skills to the SAE component of the agricultural education program, and “technical skills are a vital part of everyday life.”A different panelist stated, “it appears that the responses from round two were heavily livestock slanted.” No other general or specific comments regarding entry-level technical skills were offered in round three.

Summary

The personal and professional characteristics of the secondary agricultural education teachers revealed that the majority of panelists who completed the instrument were male (94.7%) and Caucasian (89.4%). Fourteen (73.6%) of the teachers reported their age to be between 20 and 49 years of age. Regarding education and agricultural work experience, a majority of teachers reported holding a bachelor’s degree (63.2%) as their highest

educational degree earned; 36.8% of teachers held a master's degree. Prior to their employment in secondary public schools, a majority (73.6%) of teachers reported their employment in agriculture as either "full-time employment" or "full-time temporary employment" (see Table 2).

The personal and professional characteristics of the agricultural industry panelists revealed that a majority of panelists who completed the instrument were male (83.4%) and Caucasian (83.4%); 16.6% of the panelists reported their ethnicity as Native American. Eight (66.7%) of the agricultural industry panelists reported their age to be between 20 and 49 years of age; the remaining four (33.3%) panelists reported their age to be 50 years or older. Regarding education and agricultural work experience, a majority of industry panelists indicated that a bachelor's degree (66.6%) was their highest educational degree earned; 25% of the industry panelists held a master's degree. Concerning agricultural work experience, 100% of the agricultural industry panelists indicated "full-time employment" in agriculture (see Table 6).

The Delphi panelists' were also asked to report their level of involvement in selected agricultural youth associations. The majority of teachers (84.4%) (Table 3) and industry (75.0%) (Table 7) panelists identified FFA as the agricultural youth association in which they were most involved as youth. In terms of years of participation, a majority of each panel (68.4% of teachers and 75.1% of industry experts) reported five or more years of participation in a agricultural youth associations. Regarding the level of participation in a agricultural youth associations, 78.9% of the teacher panelists, and 83.4% of the industry panelists reported they had been, "very involved" in the associations identified (see Tables 3 & 7).

Panelists' participation in a SAE or 4-H project was also investigated. Ninety-four percent of teachers and 83.4% of industry panelists reported participation in a SAE or 4-H project. The majority of the SAE or 4-H projects reported by each panel were entrepreneurial (i.e., "exhibited livestock, raised livestock or raised crops"). A majority of panelists on each panel identified that their participation in SAE or 4-H projects led to entry-level skill acquisition (see Tables 4 & 8).

Panelists were also asked to indicate their children's participation in a agricultural youth associations, if applicable. Forty-two percent of the teacher panelists and 8.3% of the industry panelists indicated that their children participated in either FFA or 4-H (see Tables 5 & 9). A majority of the industry panelists (58.4%) reported that their children were not involved in an agricultural youth association, and one-third of the teachers' children did not participate in agricultural youth associations. Panelists, on each Delphi panel, who reported their children were involved in agricultural youth associations, indicated that they were "very involved" and they had acquired some entry-level technical skills from their participation (e.g., the industry panelists listed "livestock management and evaluation, welding and basic understanding of livestock reproduction" as specific skills) (see Tables 5 & 9).

The educator panelists were asked to identify the entry-level technical skills that they perceived should be learned through student participation in the SAE component of the agricultural education program. The industry panelists were asked to identify the entry-level technical skills that they perceived were expected for entry-level employment in the agricultural industry in Oklahoma. Both panels were asked to use the Oklahoma Career Pathways as a context. The career pathways included 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and

Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science (ODCTE, 2009).

As a result of round one of the study, the Delphi panelists provided 555 educator statements (skill items) and 140 industry statements. From the 555 original educator panelists' statements, the researcher retained and restructured 260 statements (Table 10). From the 140 original industry panelists' statements, the researcher retained and restructured 105 statements (Table 18).

Secondary agricultural education teachers and agricultural industry experts, respectively, identified entry-level technical skills in each of the seven career pathways: Food Products and Processing (35, 13); Plant and Soil Science (54, 16); Animal Science (35, 37); Agricultural Power, Structures and Technology (42, 12); Agribusiness and Management (29, 6); Agricultural Communications (35, 19); and Natural Resources and Environmental Science (30, 2). These skill items were presented to their respective panels during round two of the study (see Figure 4)

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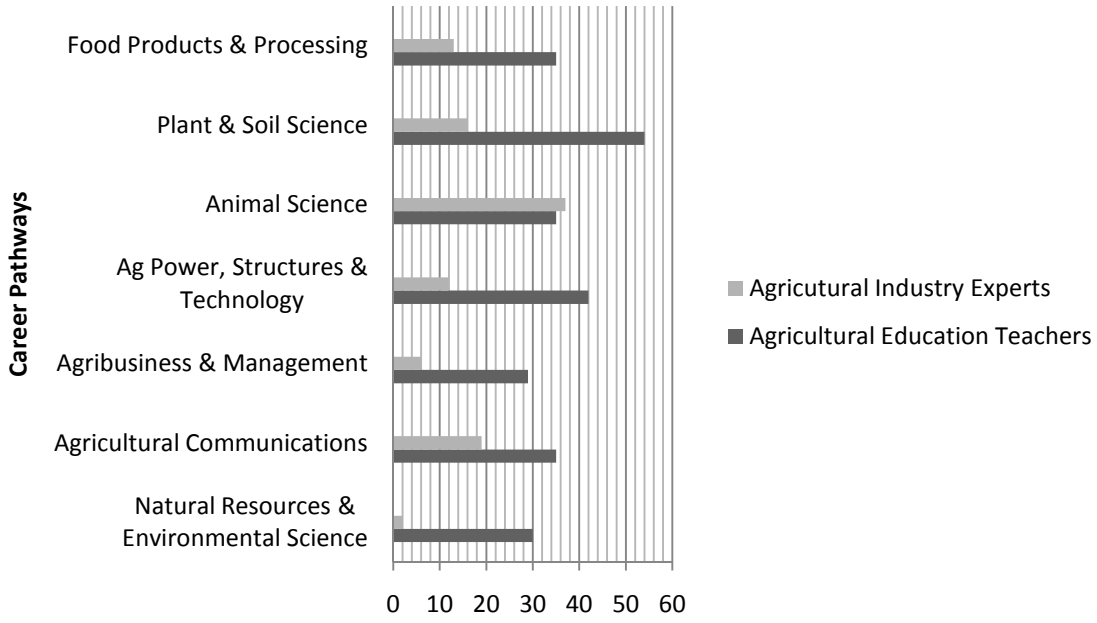

Figure 4. Entry-level Technical Skills Identified in Round One by Career Pathway, Both Panels.

In round two, each panel was asked to rate their level of agreement on entry-level technical skills, i.e., those skills they had identified in round one of the data collection exercise. The secondary agricultural education teachers reached "consensus of agreement" on 140 items (i.e., 75% or more of the panelists selected agree or strongly agree) (see Table 11), and the agricultural industry experts reached agreement on 54 items (see Table 19). By career pathway, the number of skills reported by each panel were (teachers and industry respectively) Food Products and Processing (15, 2); Plant and Soil Science (26, 5); Animal Science (23, 29); Agricultural Power, Structures and Technology (25, 2); Agribusiness and Management (13, 3); Agricultural Communications (29, 13); and Natural Resources and Environmental Science (9, 0) (see Figure 5)

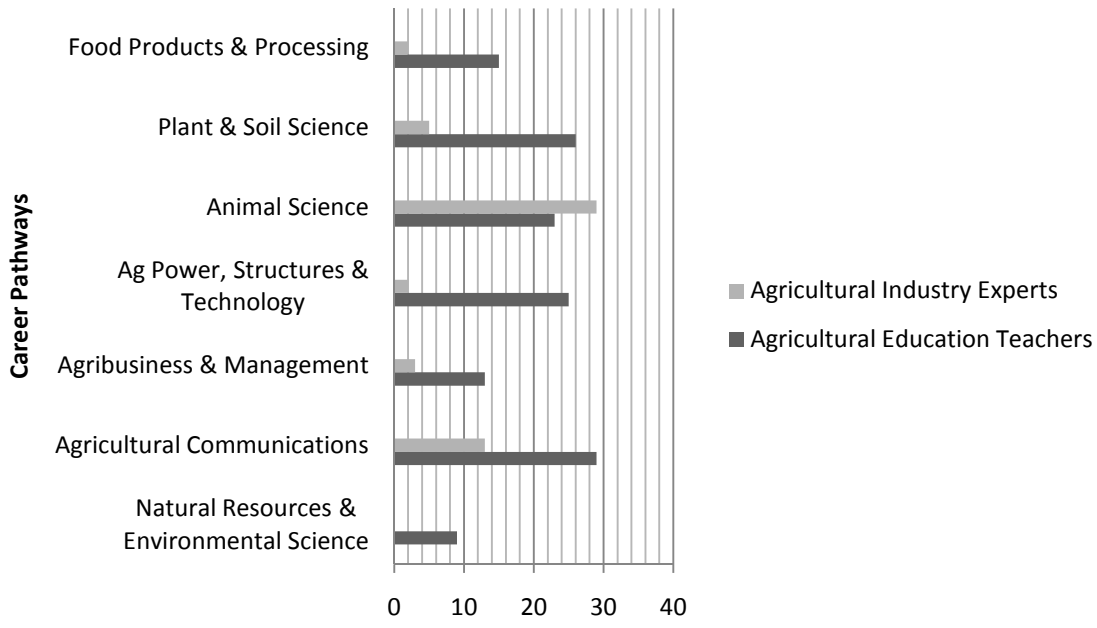

Figure 5. Entry-level Technical Skills Reaching "Consensus of Agreement" as Identified by Career Pathway per Round Two, Both Panels.

During round three of the study, those items that reached more than 50% but less than 75% "agreement" during round two were returned to the two groups of panelists respectively. For the secondary agricultural education teachers this meant 86 items (see Table 12) were included in their round three instrument, and 27 items (see Table 20) were returned to the agricultural industry panelists. The remaining items, i.e., 34 items from the teacher panel and 27 items from the industry panel, were deemed by the researcher to require no further investigation.

Qualitative analysis in round two revealed that two of the secondary agricultural education teacher panelists provided 66 comments on selected entry-level technical skills (see Table 14). The panelists' comments were general and reflected their perceptions as to through what type of SAEs the entry-level technical skills would be learned best (e.g., for the

entry-level technical skill *Processing procedures for grains,* one panelist stated, “yes, for grain production SAE”).

Agricultural industry panelists did not provide comments regarding specific entry-level technical skills during round two of the study; however, one panelist did respond to the researcher’s solicitation for general comments with this statement: “Some of these skills need only some basic understanding of the concept not complete mastery at the entry level. Others need to be mastered for entry level.”

As a result of round three, secondary agricultural education teacher panelists reached “consensus of agreement” on 21 additional skill items (see Table 15), and agricultural industry panelists reached “consensus of agreement” on six additional skill items (see Table 23).

Secondary agricultural education teachers and agricultural industry experts, respectively, identified additional entry-level technical skills in each of the seven career pathways: Food Products and Processing (4, 1); Plant and Soil Science (3, 1); Animal Science (5, 2); Agricultural Power, Structures and Technology (4, 2); Agribusiness and Management (1, 0); and Natural Resources and Environmental Science (4, 0) (see Table 15 & 23). No “consensus of agreement” was reached by either panel on additional skills from the Agricultural Communications pathway, as a result of round three (see Figure 6).

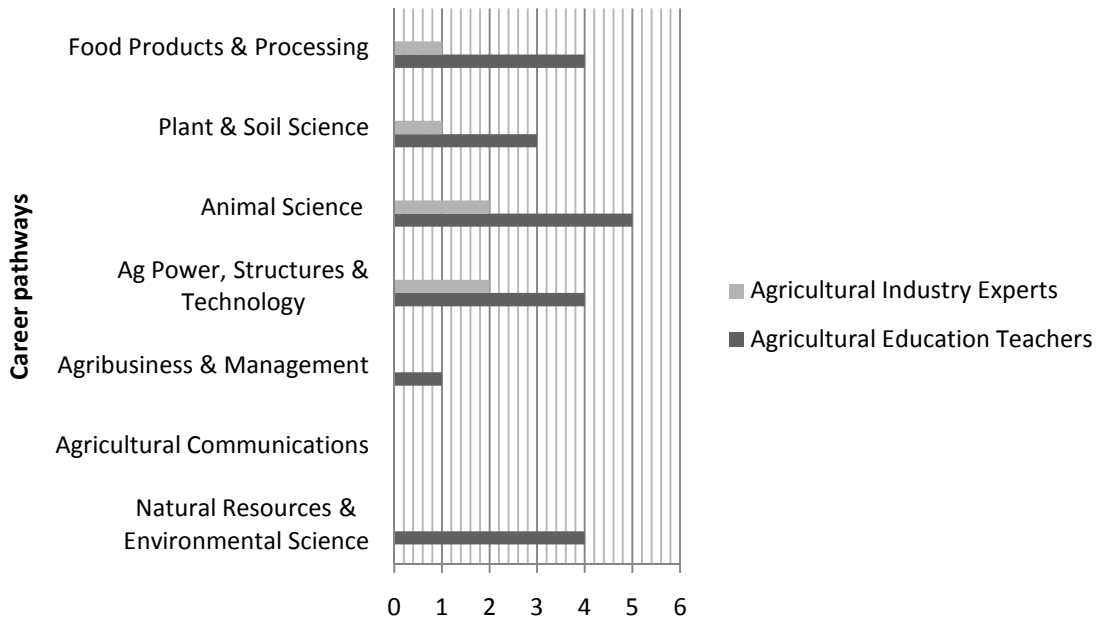

Figure 6. Entry-level Technical Skills Reaching "Consensus of Agreement" as Identified by Career Pathway per Round Three, Both Panels.

The remaining items that did not reach "consensus," i.e., 65 items from the teacher panel and 21 items from the industry panel, were deemed by the researcher to require no further investigation.

In round three, an additional opportunity was provided to panelists to make further clarifications to the skill items and their relative importance. In addition, a final opportunity for panelists to share their thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program was provided.

No additional comments were provided by secondary agricultural education teachers in round three. However, two industry panelists provided general comments at the conclusion of round three: One panelist offered; "I think that it is essential to add technical skills to the SAE component of the agricultural education program, and "technical skills are a vital part of

everyday life."A different panelist stated, "it appears that the responses from round two were heavily livestock slanted." No other general or specific comments regarding entry-level technical skills were offered in round three.

After completion of three rounds of the Delphi study, the teacher panelists reached "consensus of agreement" on 161 entry-level technical skills; the industry expert panelists reached "consensus of agreement" on 60 entry-level technical skills (see Tables 17 & 25). The distribution of entry-level technical skills by career pathway was (i.e., teacher and industry experts, respectively) Food Products and Processing: 19, 3; Plant and Soil Science: 29, 6; Animal Science: 28, 31; Agricultural Power, Structures and Technology: 29, 4; Agribusiness and Management: 14, 3; Agricultural Communications: 29, 13; and Natural Resources and Environmental Science: 13, 0 (see Figure 7).

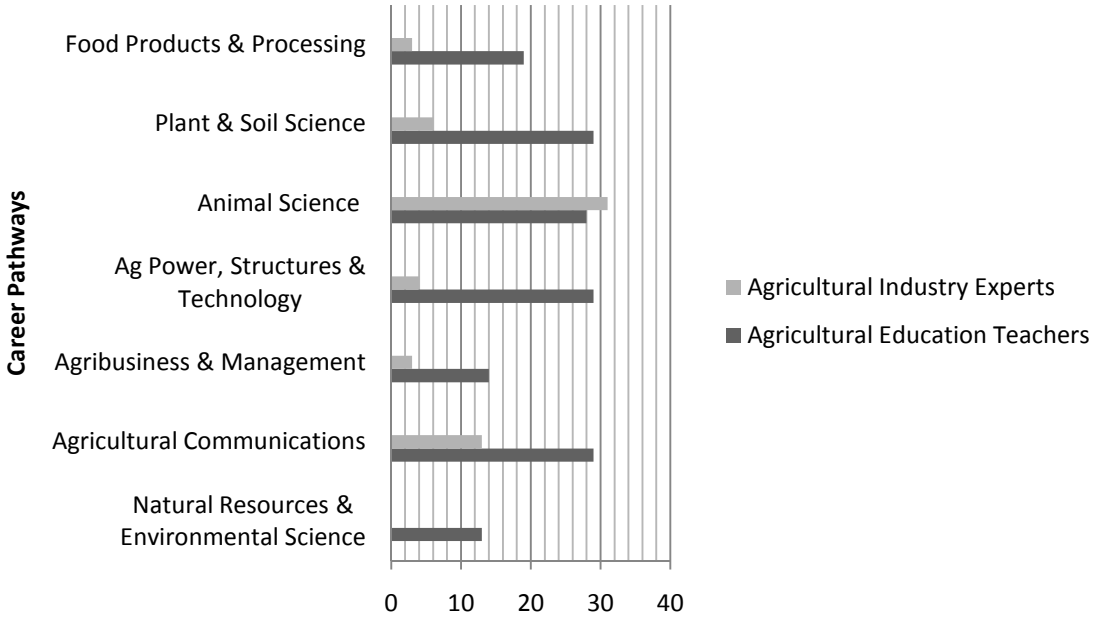

Figure 7. Total Number of Entry-level Technical Skills Reaching "Consensus of Agreement" as Identified by Career Pathway at Conclusion of the Study, Both Panels.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, IMPLICATIONS AND DISCUSSION

Purpose

The two-fold purpose of this study was to 1) describe the perceptions of a select group of agricultural professionals (industry experts and secondary agricultural education teachers) regarding the entry-level technical skills expected by the agricultural industry and the acquisition of these skills by students through their participation in the SAE component of secondary agricultural education in Oklahoma; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' Supervised Agricultural Experiences.

Objectives

1. Describe selected personal and professional characteristics of participants who comprised the two panels of agricultural experts: selected agricultural industry experts and secondary agricultural education teachers in Oklahoma.

2. Describe the perceptions of selected agricultural industry experts regarding the Supervised Agricultural Experience (SAE) component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for entry-level positions in the agricultural industry in Oklahoma, using the seven career pathways as a framework.
3. Describe the perceptions of selected Oklahoma agricultural education teachers regarding the technical skills learned by students who participate in the Supervised Agricultural Experience (SAE) component of secondary agricultural education in Oklahoma, using the seven career pathways as a framework.
4. Compare the perceptions of agricultural industry experts and secondary agricultural education teachers regarding the entry-level technical skills students should learn through participation in Supervised Agricultural Experiences (SAEs) in Oklahoma, using the seven career pathways as a framework.
5. Suggest components that could be used to develop a model for use by Oklahoma secondary agricultural education teachers to guide their practice when planning, facilitating, assessing, and evaluating students' SAEs such that the job preparedness of students entering the agricultural industry in Oklahoma is enhanced.

Significance of the Study

The purpose of secondary agricultural education has focused on (a) preparing people for entry or advancement in agricultural occupations and professions, (b) job creation and entrepreneurship, and (c) agricultural literacy (Phipps et al., 2008). The delivery of agricultural education in secondary schools is facilitated by offering a comprehensive program model (see Figure 1) that emphasizes experiential learning, including classroom and

laboratory instruction, youth development through student participation in the FFA organization, and supervised agricultural experiences (Talbert et al., 2007). Supervised agricultural experience is the part of agricultural education that allows students to practice in a work setting (placement) or an entrepreneurial (ownership) environment what they have learned in the classroom or laboratory (Talbert et al., 2007). These work-based learning experiences are a component of secondary agricultural education that sets it apart from many other programs or subjects in most schools.

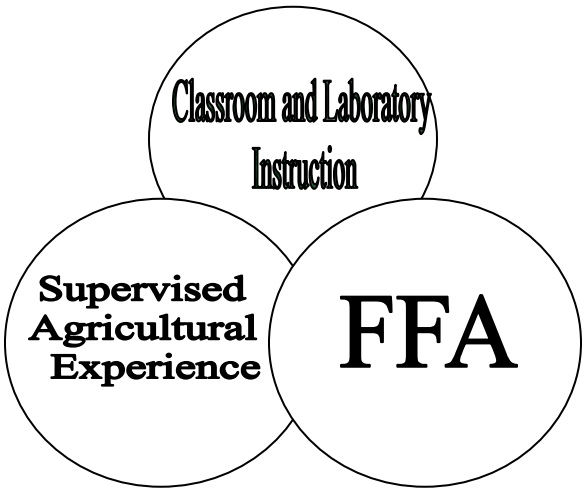

Figure 1. Comprehensive Model of Agricultural Education (Taken from Talbert et al., 2007)

The importance of SAE has been well documented and much has been written in support of it as an essential component of the secondary agricultural education model (Camp et al., 2000; Dyer & Osborne, 1995; Dyer & Williams, 1997). However, some researchers have provided evidence of incongruence (e.g., Baggett-Harlin & Weeks, 2000; Dyer & Osborne, 1995; Steele, 1997), as it relates to theory versus practice, i.e., the actual

implementation or operationalization of SAEs as a primary component of the secondary agricultural education model in some programs. This study sought to identify the perceptions of two panels of experts regarding the role of supervised agricultural experiences in facilitating students learning the technical skills needed for entry-level employment in the agricultural industry in Oklahoma. The panelists were asked to indicate their perceptions about entry-level technical skills using the seven career pathways identified in the Agriculture, Food, and Natural Resources Career Cluster as a framework (ODCTE, 2009).

The results of this study could serve to inform a plethora of agricultural education stakeholders, e.g., state leaders of agricultural education, teacher educators, pre-service teachers, and in-service teachers, about possible pre-service preparation courses, in-service topics, curriculum opportunities, and resource allocation needs required to implement the SAE component of the secondary agricultural education program effectively.

Population and Sample

The population of this study was composed of all secondary agricultural education teachers and State FFA Proficiency Award sponsors in the state of Oklahoma. Purposeful sampling was used to select members for the two expert panels. For this study, two panels of state experts, one in agricultural education (n = 19) and one in the agricultural industry (n = 17), were used.

Nineteen active agricultural education teachers who held offices in Oklahoma's state level professional organization for agricultural education teachers were members of the teacher panel. Each office is filled through a nomination process and a majority vote of teachers representing their respective agricultural education districts in the state of Oklahoma. A purposeful selection process was used to determine the sample "because the

success of the Delphi relies on the informed opinion" of recognized experts (Wicklein, 1993, p. 1050) and not the use of random selection.

The panel representing the agricultural industry in Oklahoma was comprised of experts associated with agricultural cooperatives, livestock production, livestock marketing, small grain production, small grain marketing, as well as other ancillary agribusiness entities. In addition, selected panelists were business and industry sponsors of the Oklahoma FFA Proficiency Award program; their or their employers' sponsorship constituted the "frame" from which the industry panelists were selected. So, this panel included commodity group as well as other agricultural sector leaders who represented the seven career pathways for agricultural education in Oklahoma. The career pathways for Agriculture, Food, and Natural Resources (referred to as Agricultural Education in Oklahoma) include 1) Food Products and Processing, 2) Plant and Soil Science, 3) Animal Science, 4) Agricultural Power, Structures and Technology, 5) Agribusiness and Management, 6) Agricultural Communications, and 7) Natural Resources and Environmental Science (ODCTE, 2009).

Research Design

This study was descriptive and employed a survey research design utilizing the Delphi technique (Sackman, 1975). Linstone and Turoff offered this description of the Delphi technique: it is a research design that includes four phases. The first phase explores the subject and allows the participants to contribute information that they deem appropriate. The second phase seeks to determine an understanding of how the entire group views an issue (in the case of this study, two groups or panels were surveyed). If significant disagreement is determined, the third phase is used to explore the disagreement and

determine reasons for differences. The fourth phase is a final evaluation of the information and data gathered.

Linstone and Turoff (1975) characterized the Delphi technique as a communication process that is structured to produce a detailed examination of a topic/problem and discussion from the participating group (i.e., expert panel), but not one that forces a quick compromise. The purpose of the Delphi technique is to gather responses from an expert panel or panels and combine the responses into one useful statement or "position" (Stitt-Gohdes & Crews, 2004). In agricultural education, the Delphi technique has been accorded a reasonable degree of acceptance; e.g., the technique has been used in the areas of curriculum planning and the identification of personal qualities of student leaders (Martin & Frick, 1998). Some other researchers in agricultural education whom have used the Delphi technique include Camp et al. (2000), Jenkins (2009), Myers et al. (2005), and Shinn et al. (2009).

Data Collection

Data collection for this study began in the spring of 2009. Initially, the researcher provided an explanation of the study and invitation to participate to both the teacher and industry panelists via telephone; a script for the teacher panel (Appendix E) and a script for the industry panel (Appendix F) was used to insure a consistent description of the study. On May 16, 2009, members of both panels received an electronic notice from the researcher containing a hyperlink to access the instrument for round one of the study (Appendixes G & H). The initial instruments for the teacher panel (Appendix G) and the industry expert panel (Appendix H) were developed by the researcher using Microsoft Office Word 2007®.

Follow-up reminders were sent two weeks after the initial contact (Appendixes J & K). As a result of round one, the researcher reviewed 555 original teacher panel statements (i.e., entry-level technical skills) and 140 original industry expert panel statements (i.e., entry-level technical skills). Similar or duplicate skill statements were combined or eliminated while compound statements were separated (Shinn et al., 2009). From 555 original teacher panel statements, the researcher retained 260 statements for presentation in round two. From 140 original industry panel statements, the researcher retained 105 statements (or skills) for presentation in round two. Panelists were also asked to provide select personal and professional characteristics in round one of the study.

Round two of the study was initiated on July 17, 2009; the round two instruments (Appendixes L & M) asked panelists to rate their level of agreement on entry-level technical skills, i.e., those skills they had identified in round one of the data collection exercise. Panelists were asked to use a six-point response scale to rate the entry-level technical skills: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree.

Follow-up reminders were sent two weeks after the initial contact (Appendixes N & O). Items (i.e., skill statements) that received a score of “5” (“Agree”) or “6” (“Strongly Agree”) by 75% of the respondents were considered items for which “consensus of agreement” was reached. Items for which less than 51% of the respondents scored the item a “5” (“Agree”) or “6” (“Strongly Agree”) were removed from further investigation. Data collection for round two was concluded on August 31, 2009. As a result of round two, “consensus of agreement” began to form in both panels. Round two also provided panelists the opportunity to provide comments on individual skill items.

Round three of the study was sent to panelists on September 25, 2009. Round three sought to establish consensus within the two panels for those items that failed to reach "consensus of agreement" during round two (i.e., less than 75% but more than 50% of the panelists had indicated a "5" ["Agree"] or "6" ["Strongly Agree"]). Buriak and Shinn (1989) described the third round of a Delphi as developing consensus. The round three instruments (Appendixes P & Q) included the percentage of panelists who indicated "5" ("Agree") or "6" ("Strongly Agree") for that skill in round two. According to Anglin (1991), Dalkey et al., (1972), Jacobs (1996), and Weaver (1971), only a slight increase in the degree of consensus was expected as a result of round three. Follow-up reminders were sent to the panelists approximately two weeks after the initial contact for round three (Appendixes R & S). Data collection for round three was concluded on October 9, 2009.

The purpose of the Delphi technique is to gather responses from an expert panel or panels and combine the responses into one useful statement or "position" (Stitt-Gohdes & Crews, 2004). In this study, from round one, 260 teacher panel statements (n = 19; 100% response rate) and 105 industry panel statements (n = 12; 70.5% response rate) were provided by the Delphi panelists (see Tables 10 & 18); the researcher analyzed each statement and reconfigured such as needed (Shinn et al., 2009).

In round two of the study, 140 teacher skill items (n = 16; 84.2% response rate) and 54 industry expert skill items (n = 12; 70.5% response rate) (see Tables 11 & 19) received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% of the respondents and were considered items for which "consensus of agreement" was reached (Jenkins, 2009; Shinn et al. 2009).

Round three included 86 teacher items and 27 industry expert items for which more than 50% but less than 75% of panelists had indicated "5" ("Agree")" or "6" ("Strongly Agree") for said skills in round two. To that end, in round three, 21 additional teacher skill items (n = 14; 73.6% response rate) and six more industry skill items (n = 12; 70.5% response rate) (see Tables 15 & 23) received a score of "5" ("Agree") or "6" ("Strongly Agree") by 75% or more of the respondents and were considered items for which "consensus of agreement" was reached.

Data Analysis

Personal and professional characteristics of the Delphi panelists were analyzed using frequencies and percentages. For each skill item presented to panelists in rounds two and three, the frequency distribution valid percentage was used to determine if the item 1) reached consensus, 2) should be returned to panelists for additional rating in round three, or 3) should be excluded from further study. Data were analyzed using Microsoft Office Excel® 2007.

Results

Analysis of personal and professional characteristics of the Delphi panelists revealed that the majority of panelists who completed the instrument were male (94.7%, secondary agricultural education teachers; 83.4%, industry experts) and Caucasian, 89.4% and 83.4%, respectively. An additional ethnic group reported by industry panelists' included Native American (16.6%). The majority of panelists identified their age range as 20 to 49 (73.6%, secondary agricultural teachers; 66.7%, industry experts). Regarding education and agricultural work experience, a majority of panelists reported holding a bachelor's degree:

teachers, 63.2% and industry experts, 66.6%. Excluding their formal education, or in the case of secondary agricultural education teachers, their work in education, each group of panelists reported that a majority of their employment in agriculture was either "full-time employment" or "full-time temporary employment," i.e., 73.6% of teachers and 100% of the industry experts (see Tables 2 & 6).

The Delphi panelists' were also asked to report their level of involvement in selected agricultural youth associations. A majority of teacher (84%) (see Table 2) and industry (75%) (see Table 6) panelists identified FFA as the agricultural youth association in which they were most involved as youth. Regarding years of participation, a majority of each panel, 68.4% of teachers and 75.1% of the industry experts, reported five or more years of participation in an agricultural youth association. Describing their levels of participation in agricultural youth associations, 78.9% of the teacher panelists and 83.4% of the industry panelists, who had been involved in such programs, reported they had been "very involved" in the associations identified (see Tables 3 & 7).

Panelists' participation in SAEs or 4-H projects was also investigated. Ninety-four percent of teachers and 83.4% of industry panelists reported participation in SAEs or 4-H projects. A majority of the SAEs or 4-H projects reported by each panel were entrepreneurial (i.e., "exhibited livestock," "raised livestock," or "raised crops"). A majority of respondents on each panel indicated that their participation in SAEs or 4-H projects led to entry-level skill acquisition (see Tables 4 & 8).

Forty-two percent of the teacher panelists and 16.7% of the industry panelists indicated that their children participated in either FFA or 4-H (see Tables 5 & 9). Panelists,

on each Delphi panel, who reported their children were involved in agricultural youth associations, indicated that they were "very involved," and they had acquired some entry-level technical skills from their participation (e.g., some of the industry panelists listed "livestock management and evaluation, welding and basic understanding of livestock reproduction" as specific skills) (see Tables 5 & 9).

From round one, the researcher derived 260 skill statements from the teacher panel and 105 skill statements from the industry panel for return to the panelists in round two of the study. Regarding career pathways, panelists identified the following number of entry-level technical skills in each of the seven career pathways: (i.e., teachers and industry experts, respectively) Food Products and Processing (35, 13); Plant and Soil Science (54, 16); Animal Science (35, 37); Agricultural Power, Structures and Technology (42, 12); Agribusiness and Management (29, 6); Agricultural Communications (35, 19); and Natural Resources and Environmental Science (30, 2) (see Tables 10 & 18 and see Figure 4). These skill items were presented to their respective panels during round two of the study.

As a result of round two, the secondary agricultural education teachers reached "consensus of agreement" on 140 items (i.e., 75% or more of the panelists selected "5" ["Agree"] or "6" ["Strongly Agree"]) (see Table 11), and the agricultural industry experts reached "consensus of agreement" on 54 items (see Table 19).

By career pathway, the number of items (i.e., skill statements) reaching "consensus of agreement" per round two, as reported by teacher panelists and industry experts, respectively, were Food Products and Processing: 15, 2; Plant and Soil Science: 26, 5; Animal Science: 23, 29; Agricultural Power, Structures and Technology: 25, 2; Agribusiness and Management:

13, 3; Agricultural Communications: 29, 13; and Natural Resources and Environmental Science: 9, 0 (see Tables 11 & 19 and Figure 5).

Round three included 86 teacher items and 27 industry expert items for which more than 50% but less than 75% of panelists had indicated “5” (“Agree”) or “6” (“Strongly Agree”) for said skills in round two. As a result of round three, secondary agricultural education teacher panelists reached “consensus of agreement” on an additional 21 skill items (see Table 15), and agricultural industry panelists reached “consensus of agreement” on an additional six skill items (see Table 23). Those skill items for each panel, as reported by career pathway (i.e., teachers and industry experts, respectively), were Food Products and Processing: 4, 1; Plant and Soil Science: 3, 1; Animal Science: 5, 2; Agricultural Power, Structures and Technology: 4, 2; Agribusiness and Management: 1, 0; and Natural Resources and Environmental Science: 4, 0 (see Tables 15 & 23 and see Figure 6).

The total number of entry-level technical skills that reached “consensus of agreement” for the teacher panel was 161, and the industry panel total was 60 (see Tables 17 & 25). The distribution by career pathway was as follows (i.e., teacher and industry experts, respectively): Food Products and Processing: 19, 3; Plant and Soil Science: 29, 6; Animal Science: 28, 31; Agricultural Power, Structures and Technology: 29, 4; Agribusiness and Management: 14, 3; Agricultural Communications: 29, 13; and Natural Resources and Environmental Science: 13, 0 (see Figure 7).

Qualitative analysis of round two responses revealed that two of the secondary agricultural education teacher panelists provided 66 comments on selected entry-level technical skills (see Table 14). The panelists’ comments reflected generally their perceptions

regarding through what type of SAEs entry-level technical skills could be learned best by students.

No additional comments were provided by secondary agricultural education teachers in round three. However, two industry panelists provided general comments at the conclusion of round three: One panelist offered, “I think that it is essential to add technical skills to the SAE component of the agricultural education program”; and “technical skills are a vital part of everyday life.” A different panelist stated, “It appears that the responses from round two were heavily livestock slanted.” No other general or specific comments regarding entry-level technical skills were offered in round three by members of either panel.

Conclusions

The analysis of data regarding each of the study’s objectives formed the basis for the following conclusions:

Objective #1

Describe selected personal and professional characteristics of participants who comprised the two panels of agricultural experts: selected agricultural industry experts and secondary agricultural education teachers in Oklahoma.

Concerning objective one, this study found that within this particular sample a majority of secondary agricultural education teachers who served as Delphi panelists were Caucasian males who ranged in age from 20 to 49 years of age. A majority of agricultural industry panelists, who represented the seven career pathways for agricultural education in Oklahoma, were Caucasian males who ranged in age from 20 to 49 (see Tables 2 & 6).

The Delphi panelists' reported their level of involvement in selected agricultural youth associations. A majority of teachers and industry panelists identified FFA as the agricultural youth association in which they were most involved as youth (see Tables 3 & 7). Regarding years of participation, a majority of each panel (68.4% of teachers and 75.1% of industry experts) reported five or more years of participation in a agricultural youth associations; the panelists' level of participation in agricultural youth associations was reported as "very involved" in the associations identified (see Tables 3 & 7).

Ninety-four percent of teachers and 83.4% of industry panelists reported participation in SAEs or 4-H projects during their youth. A majority of the SAEs or 4-H projects reported by each panel were entrepreneurial. A majority of panelists on each panel identified that their participation in SAEs or 4-H projects had led to entry-level skill acquisition (see Tables 4 & 8).

Forty-four percent of the teacher panelists and 16.6% of the industry panelists indicated that their children participated in either FFA or 4-H (see Tables 5 & 9). Panelists, on each Delphi panel, who reported their children were involved in agricultural youth associations, indicated that they were "very involved" and had acquired some entry-level technical skills from their participation.

Objective #2

Describe the perceptions of selected agricultural industry experts regarding the Supervised Agricultural Experience (SAE) component of the secondary agricultural education model as related to the technical skill acquisition of students preparing for

entry-level positions in the agricultural industry in Oklahoma, using the seven career pathways as a framework.

Concerning objective two, agricultural industry experts reached "consensus of agreement" on 60 entry-level technical skills that should be learned through students participating in supervised agricultural experiences. Accordingly, it was concluded that students' acquisition of these entry-level technical skills could facilitate their preparation for entry-level positions in the agricultural industry.

The agricultural industry panelists reached "consensus of agreement" on the highest number of entry-level technical skills from two career pathways: Animal Science (31) and Agricultural Communications (13) (see Table 25). So, it was concluded that, based on the industry panelists' perceptions, supervised agricultural experiences held the most potential for students acquiring entry-level technical skills related to the career pathways of Animal Science and Agricultural Communications.

Some of the industry experts commented on the need for technical skill acquisition through students' SAEs, and that technical skills could be gained through students experiencing that component of the secondary agricultural education model.

Objective #3

Describe the perceptions of selected Oklahoma agricultural education teachers regarding the technical skills learned by students who participate in the Supervised Agricultural Experience (SAE) component of secondary agricultural education in Oklahoma, using the seven career pathways as a framework.

Regarding objective three, secondary agricultural education teacher panelists reached "consensus of agreement" on 161 entry-level technical skills that should be learned through students participating in the supervised agricultural experience component of the secondary agricultural education program in Oklahoma (see Table 17).

The secondary agricultural education teacher panelists identified Plant and Soil Science, Animal Science, Agricultural Power, Structures and Technology, and Agricultural Communications as career pathways having the most entry-level technical skills that reached "consensus of agreement," 29, 28, 29, and 29 skills, respectively (see Table 17). So, it was concluded that, based on the teacher panelists' perceptions, supervised agricultural experiences held the most potential for students acquiring entry-level technical skills related to the career pathways of Plant and Soil Science, Animal Science, Agricultural Power, Structures and Technology, and Agricultural Communications.

Secondary agricultural education teacher panelists provided 66 comments on selected entry-level technical skills (see Table 13). The panelists' comments reflected generally their perceptions regarding through what types of SAEs entry-level technical skills could be learned best by students.

Objective #4

> Compare the perceptions of agricultural industry experts and secondary agricultural education teachers regarding the entry-level technical skills students should learn through participation in Supervised Agricultural Experiences (SAEs) in Oklahoma, using the seven career pathways as a framework.

Regarding objective four, secondary agricultural education teachers identified Plant and Soil Science (29), Animal Science (28), Agricultural Power, Structures and Technology (29), and Agricultural Communications (29) as career pathways having the highest number of entry-level technical skills, i.e., with the potential for students learning said skills (115 of 161 total skill items) (see Table 17 and Figure 7). Comparatively, agricultural industry experts identified Animal Science (31) and Agricultural Communications (13) as their career pathways holding the most abundant entry-level technical skills (44 of 60 total skill items) (see Table 25 and Figure 7).

The panels were most similar regarding the highest number of skills reaching "consensus of agreement" by career pathways for Animal Science, 28 and 31 and Agricultural Communications 29 and 13, teachers and industry panelists, respectively (see Tables 17 & 25 and Figure 7). So, it was concluded that, when comparing the views of both panels, the supervised agricultural experience component of the secondary agricultural education model held the most potential for facilitating students learning of entry-level technical skills in the career pathways Animal Science and Agricultural Communications. Notably, teacher panelists also perceived that many additional skills could be learned by students related to the career pathways of Plant and Soil Science and Agricultural Power, Structures and Technology through their participation in SAEs (see Tables 17 & 25 and Figure 7).

Objective #5

Suggest components that could be used to develop a model for use by Oklahoma secondary agricultural education teachers to guide their practice when planning,

facilitating, assessing, and evaluating students' SAEs such that the job preparedness of students entering the agricultural industry in Oklahoma is enhanced.

Concerning objective five, this study identified the career pathways that selected teachers and industry experts perceived as having entry-level technical skills that should be learned by students who participate in the supervised agricultural experience component of the secondary agricultural education model in Oklahoma. These findings support Roberts and Ball (2009) content-based model of teaching agricultural education. Specifically, the identification of entry-level technical skills per the seven career pathways for the Agriculture, Food and Natural Resources Career Cluster informs the *Agricultural Instruction and Skill Acquisition* component of the content-based model proffered by Roberts and Ball (see Figure 2).

Recommendations

Recommendations for Future Research

Teacher panelists identified entry-level technical skills in all seven pathways; however, they reached "consensus of agreement" on significantly fewer entry-level technical skills representing the Food Products and Processing, Agribusiness and Management, and Natural Resources and Environmental Science pathways. If these pathways represent important agricultural employment sectors in Oklahoma (GCWED, 2005), why did teacher panelists not view SAE as a program component through which students could learn more entry-level technical skills, especially when compared to the four career pathways that garnered the most skill statements? Accordingly, investigations should be conducted to determine the perceptions of agricultural education teachers regarding their adoption of

career pathways as a context for planning and delivering the secondary agricultural education program.

Pals (1988) reported that employers recognized the benefits of SAEs to students. Results of this study supports Pals' conclusion. However, inquiries should be conducted to determine the appropriate role of industry participation in the supervised agricultural experience component of the secondary agricultural education program in Oklahoma. Continued investigation of the agricultural industry representatives' perceptions regarding the SAE component of the secondary agricultural education model is needed. For example, what are industry representatives' views on how best they could collaborate with secondary agricultural teachers regarding planning and facilitating students' SAEs such that opportunities for learning entry-level technical skills are optimized (e.g., through worksite placements)? Concomitantly, how are agricultural industry experts being used by secondary agricultural education teachers currently (e.g., as advisory group members) to better inform the relevance of their programs, including students' SAE? Moreover, what is the role of the agricultural industry in Oklahoma regarding state-level decision making on the direction and future of secondary agricultural education, including all significant programmatic aspects such as students' supervised agricultural experiences?

Additional studies should be conducted to determine further the components needed to provide a SAE model for teachers that would enhance the job preparedness of students entering the agricultural industry in Oklahoma. Concomitantly, special attention should be paid to Roberts' and Ball's model (see Figure 2) such that the complementariness of any future research is additive. Although select entry-level technical skills viewed through the contextual prism of the Agriculture, Food, and Natural Resources Career Cluster have been

identified; more understanding is needed to inform the development of a robust and mature model pertaining to students' SAEs.

Systematic inquiry into the views of teacher educators regarding technical skill acquisition and SAEs should be performed. The seminal purpose of agricultural education and the strong vocational emphasis expected by legislative funding measures, such as the Carl D. Perkins Act (or Perkins IV), support the continued training and preparation of pre-service teachers regarding implementation of high quality SAEs. However, little is known about the views of contemporary teacher educators of agricultural education regarding the unique and evolving role of the SAE component of secondary agricultural education in the 21st century; research is needed about this aspect of the phenomenon.

What are the views of cognizant school officials, e.g., superintendents and principals, as well as community leaders and patrons, such as school board members, regarding the role of students' SAEs and their acquisition of entry-level technical skills? Planning, implementing, facilitating, and advising students' SAEs is a resource commitment by secondary agricultural education teachers, and, thus, requires tangible support from the local school and community to do that effectively.

A similar study should be implemented in other states, especially other mid-western states that border Oklahoma (i.e., Arkansas, Colorado, Kansas, Missouri, New Mexico, and Texas). The similarity of significant agricultural enterprises (e.g., beef and wheat) and, thus, possible entry-level employment opportunities for secondary agricultural education graduates, as well as the increasing reality of many individuals who are seeking jobs while

being increasingly transient, supports the need for additional systematic inquiry in other states.

Recommendations for Future Practice

Teacher educators of agricultural education should make the Agriculture, Food, and Natural Resources Career Cluster and the representative career pathways more transparent to pre-service students during their teacher preparation program. The integration of SAE opportunities throughout the seven career pathways and the link that exists between agricultural industry representatives' views and expectations (i.e., potential employers) and the entry-level technical skill acquisition of secondary agricultural education students should be emphasized.

State staff who are responsible for facilitating the secondary agricultural education program should consider facilitating internship opportunities that allow teachers to experience industry environments and expectations for entry-level workers. According to Luft (1999), externships help teachers make their instruction more relevant in preparing students for the world of work. Work-based learning experiences are important for teachers as well as students enrolled in agricultural education. Teachers could use contextual examples from their externship experiences when planning and facilitating students' SAEs.

Teacher attitudes and expectations influence strongly student participation in SAEs (Dyer & Osborne, 1995). Camp et al. (2000) reported that SAE, as structured currently, is a vital component of a comprehensive program of secondary agricultural education. This study found that both Oklahoma secondary agricultural education teachers and selected agricultural industry experts perceived students should learn entry-level technical skills related to their

employability in the agricultural industry, especially in the career pathways of Animal Science and Agricultural Communications (see Tables 17 & 25). So, teachers, teacher educators, and state program leaders should continue to facilitate and promote the SAE component of the secondary agricultural education program. In particular, teachers should increase their collaboration with industry partners to provide worksite placement SAE (National Council for Agricultural Education, 1992) opportunities for students.

State leaders, who are responsible for directing secondary agricultural education in Oklahoma, and teacher educators of agricultural education should make the Agriculture, Food, and Natural Resources Career Cluster and its career pathways (ODCTE, 2009) a priority target for the professional development of secondary agricultural education teachers. Emphasis should be placed on those career pathways for which fewer skill statements reached "consensus of agreement" in this study (i.e., Food Products and Processing, Agribusiness Management, and Natural Resources and Environmental Science).

State staff, industry representatives, teacher professional organizations (i.e., OAETA/National Association of Agricultural Educators [NAAE]), and teacher educators should work together to inform teachers' practices regarding planning, facilitating, assessing, and evaluating students' SAEs in the context of career pathways and acquisition of entry-level technical skills. Moreover, a collaborative effort between state leaders, industry representatives, teacher professional organizations, and teacher educators could provide knowledge and resources (e.g., skill up-dates, guest speakers, and information about new technologies) that in-service teachers and pre-service students of agricultural education could use to facilitate students' SAEs better.

Implications and Discussion

Phipps et al. (2008) described the purpose of agricultural education as preparing people for entry or advancement in agricultural occupations and professions, job creation, and agricultural literacy. The National FFA Organization reported that more than 300 career opportunities in the agricultural science, food, fiber, and natural resources industry exist (2008-2009 Official FFA Manual). A comprehensive program model consisting of classroom and laboratory instruction, FFA, and supervised agricultural experience is used to deliver experiential learning opportunities to students enrolled in secondary agricultural education (Dyers & Osborne, 1995; Roberts & Ball, 2009, see Figure 2; Talbert et al., 2007). In Oklahoma, secondary agricultural education uses the Agriculture, Food, and Natural Resources Career Cluster's seven career pathways to operationalize instruction (ODCTE, 2009).

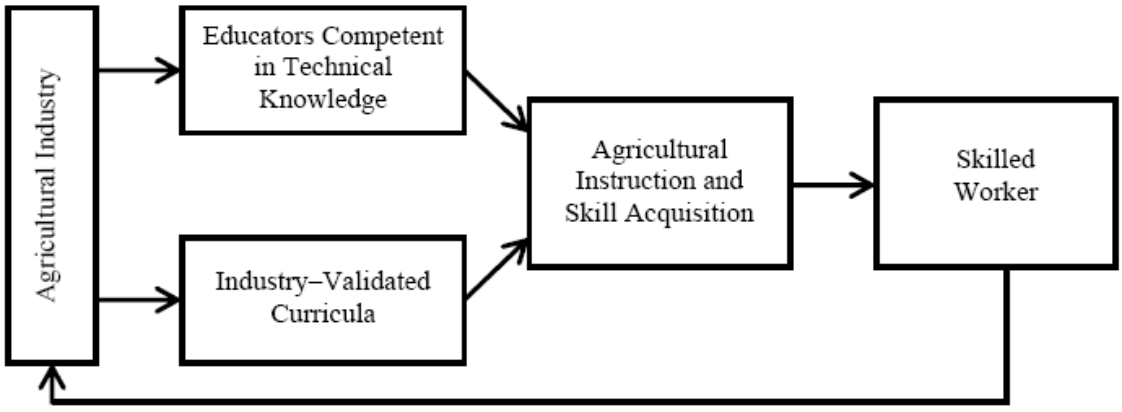

Figure 2. A content-based model for teaching agriculture (Taken from Roberts & Ball, 2009)

This study supports using the supervised agricultural experience component of secondary agricultural education to assist students in learning entry-level technical skills. However, not all career pathways were viewed by the Delphi panelists—teachers or industry

experts—as holding or promoting the same number of entry-level technical skills. So, it is not known to what degree supervised agricultural experiences are used for entry-level skill acquisition by students in the career pathways that were under-represented (i.e., Food Products and Processing, Agribusiness and Management, and Natural Resources and Environmental Science for teachers, and Food Products and Processing, Plant and Soil Science, Agricultural Power, Structures and Technology, Agribusiness and Management, and Natural Resources and Environmental Science for the industry panelists).

To that end, Oklahoma's Governor's Council for Workforce and Economic Development (GCWED) report, *Understanding the Knowledge and Skill Gaps Impacting the State's Key Industry Sectors* (2005), identified the agriculture and food processing sector, such as production of agricultural products, animal food manufacturing, dairy product manufacturing, animal processing, beverage manufacturing, industrial machine manufacturing, and numerous others, as one of six targeted industries that were at risk. Per the report, "at risk" meant those critically important industry sectors that will experience gaps in availability of workers with the necessary technical skills needed to sustain the industry in Oklahoma.

Manufacturing is one of the top five industries in Oklahoma that account for two-thirds of the state's jobs. Oklahoma's manufacturing industry is driven by processed meat, tire manufacturing, oil and gas field machinery and equipment, air conditioning and heating equipment, and poultry processing (GCWED, 2005).

Moreover, of the top 10 agricultural knowledge requirements, "Mechanical" and "Food Production" were identified as the first and second knowledge items needed in the

agriculture and food processing industry in Oklahoma (GCWED, 2005). To that end, the findings of this study are incongruent with the needs identified by the GCWED report.

Industry experts reached "consensus of agreement" on only three entry-level technical skills for the Food Products and Processing pathway and only four skills in the career pathway Agricultural Power, Structures and Technology (see Tables 17 & 25 and Figure 7). These are career pathways that should prepare students for entry-level positions in the Mechanical and Food Production sectors of the agriculture and food processing industry in Oklahoma. Teachers' views on applicable skills being learned by students through their SAEs were somewhat more congruent or aligned than the industry panelists perceptions (see Table 17).

The *Occupational Outlook Quarterly* (2006) identified occupations and their viability from 2004 through 2014. Regarding the seven career pathways identified by Oklahoma Agricultural Education (ODCTE, 2009) and selected findings from this study (i.e., teachers and industry panelists, respectively), the pathways of Food Products and Processing (19 items, 3 items), Natural Resources and Environmental Science (13 items, 0 items), and Agribusiness and Management(14 items, 3 items) will show "average growth" in the time frame represented by the *Occupational Outlook Quarterly* report.

Therefore, jobs are available and could provide future opportunities for students seeking entry-level employment in those areas either during high school (e.g., worksite placement SAEs) or after graduation. Perhaps, future investigations should be conducted to determine the perceptions of secondary agricultural education teachers regarding the Placement category of supervised agricultural experience and its role in students' skill

acquisition vis-a-vis the seven career pathways, especially for those areas that may offer the greatest potential for employment.

Antecedently, are teacher educators of agricultural education confident, and justifiably so, the technical course content their pre-service students receive is preparing them to facilitate SAEs that will provide secondary students with sufficient opportunities to learn entry-level technical skills (Edwards & Thompson, in press; Roberts & Ball, 2009)? This question may also require additional study and dialogue by agricultural education professionals.

This study identified entry-level technical skills that industry and teacher experts asserted should be learned through the SAE component of the secondary agricultural education model. However, future studies should be conducted to determine if barriers exist that limit a teacher's ability to learn the skills required by a 21st century agricultural industry. Accordingly, Roberts and Ball (2009) proffered a content-based model (see Figure 2) relying on industry-relevant instruction that results in observable skill acquisition by students. But how should in-service teachers acquire industry-relevant content knowledge and skills so they, in turn, can facilitate SAEs such that their students learn and practice entry-level technical skills sufficiently? Is Luft's (1999) view on "externships" an appropriate answer? What may be others? These questions also require further study and dialogue by agricultural education professionals.

The model for content-based teaching of agriculture posited by Roberts and Ball in 2009 (see Figure 2) provided a formative structure to begin considering and describing the components of a model to assist teachers in facilitating students' SAEs. However, it can be

argued that more research is needed to inform development and maturation of the SAE aspects of their model. Currently, those aspects are only implied (see Figure 2).

Finally, regarding "consensus of agreement," "only a slight increase in the degree of consensus can be expected" in round three of a Delphi study (Anglin, 1991; Dalkey et al., 1972; Jacobs, 1996; Weaver, 1971). The industry panel in this study was much more "stable" in this regard, i.e., fewer additional skill items (6) (see Table 23) reached the level or standard for "consensus of agreement" as the result of their round three ratings. However, in the case of the teacher panel, 21 additional items (see Table 15) reached consensus per round three. Do secondary agricultural education teachers possess an attribute that makes them more available to being influenced if they are made knowledgeable of their peers' views about a given object or phenomenon? Or, was the occurrence merely coincidental, i.e., a singular aberration? For those agricultural education researchers, who may be interested in methodological procedures and nuances, especially regarding use of the Delphi technique with secondary agricultural education teachers, this finding may warrant consideration and inquiry.

Major Contributions of this Study

Contribution to Theory

Roberts and Ball (2009) posited a model (see Figure 2) of secondary agricultural education that "melds" or integrates aspects of the comprehensive program model (see Figure 1), including supervised agricultural experience (SAE), such that skilled workers are produced for the agricultural industry. This study provided support for further theory development, e.g., Animal Science and Agricultural Communications were identified as the

career pathways holding the most abundant entry-level technical skills. Accordingly, these career pathways provide a context for teachers to use when planning and facilitating the skill acquisition component of Roberts' and Ball's content-based model for teaching agriculture.

Further, this study supports Slusher et al. (in press) recommendation to investigate all seven career pathways and their findings regarding select animal science entry-level skills identified by industry experts who participated in that study. The model for content-based teaching helps to operationalize supervised agricultural experience as a rich context for skill development, which is fundamental to what is considered as one of the primary purposes of agricultural education i.e., preparing students for entry-level careers in the agricultural industry.

Contribution to Literature

The importance of experiential learning through secondary agricultural education has been widely reported (Camp, et al., 2000; Cheek, et al., 1994; Dyers & Williams, 1997; Roberts, 2006; Stone, 1994). However, little research has been done recently regarding the supervised agricultural experience component of the secondary agricultural education model. This study sought to contribute to the literature regarding the potential for entry-level skill acquisition through students' SAEs. Hoachlander (2008) reported that, "career pathways are programs of academic and technical study that integrate classroom and real-world learning organized around industry" (p. 22). Scant research is available regarding the Agriculture, Food and Natural Resources Career Cluster and the seven career pathways that informs the curriculum for Oklahoma Agricultural Education vis-à-vis students' SAEs. Findings from this study may begin to fill that void.

Contribution to Practice

This study relied on the career pathways for Oklahoma Agricultural Education as a conceptual framework, findings from this study could serve as a baseline for the skills and competencies that should be targeted by agricultural education teachers when planning, facilitating, and evaluating the SAE component of the secondary agricultural education model.

In addition, this study makes a case for the value of students learning entry-level technical skills through their SAEs. Agricultural industry experts identified 60 entry-level technical skills and secondary agricultural education teachers identified 161 entry-level technical skills that could be learned through students' SAEs. This study holds potential for informing teachers at the secondary level, including cooperating teachers, agricultural industry representatives, and teacher educators regarding the SAE-related needs of pre-service teachers.

Teacher educators should look for opportunities to involve industry representatives in the teacher preparation program, particularly, as it relates to assisting pre-service teachers with the facilitation of students' Placement SAE experiences and planning related in-service education opportunities for practicing teachers.

This study also holds potential for secondary agricultural education teachers and administrators in public school settings who are charged with implementing and supervising the agricultural education program. Specifically, in the area of industry partnerships and the role of advisory councils, i.e., advisory councils could assist in strengthening industry linkages (Gonzales & Dormody, 1992). This study reflects the promise of industry

contributing to the skill acquisition of students through their SAEs. So, renewed efforts should be made to employ fully the use of advisory councils to support local secondary agricultural education programs.

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APPPENDIXES

APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

Oklahoma State University Institutional Review Board

Date: Friday, February 27, 2009

IRB Application No AG095

Proposal Title: Identifying entry-level skills required in the agricultural industry and determining whether they are being acquired through students' participation in the supervised agricultural experience component of the agricultural education program

Reviewed and Processed as: Exempt

Status Recommended by Reviewer(s): Approved **Protocol Expires: 2/26/2010**

Principal Investigator(s):

✓ Jon Ramsey
457 Ag Hall
Stillwater, OK 74078

Michael Craig Edwards
448 Ag Hall
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section **45** CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

As the round 2 and round 3 are developed, they will each need to be submitted for IRB review as a modification to the approved protocol.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North(phone: 405-744-5700, beth.mcternan@okstate.edu).

Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

INFORMED CONSENT

Oklahoma State University

457 Agricultural Hall

Stillwater, OK 74078

(405) 744-4260

jon.ramsey@okstate.edu

Identifying Entry-Level Skills Required in the Agricultural Industry and Determining Whether They Are Being Achieved Through Students' Participation in the Supervised Agricultural Experience (SAE) Component of the Agricultural Education Program

Directions: Please read to the bottom of this page. This web page is designed to provide you with an overview of the research study, what is expected of you as a participant, and your rights as a participant. After you have read the entire page, you may accept or decline to participate in this study. If you have any questions regarding this study, please, submit your questions via e-mail to jon.ramsey@okstate.edu or contact me by telephone at 405-744-4260. Thank you!

PURPOSE:

This study, which is research conducted for a doctoral dissertation, is being conducted through Oklahoma State University. The two-fold purpose of this study is to 1) describe the perceptions of a select group of agricultural professionals (secondary agricultural education teachers and industry experts) regarding the entry-level technical skills required by the agricultural industry and the acquisition of these skills by students through participation in the SAE component of secondary agricultural education; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' supervised agricultural experiences. The Delphi technique for collecting data will be used with both panels of experts.

PROCEDURES:

The study will involve the completion of three questionnaires. The first questionnaire will ask for demographic information such as your gender, age, ethnicity, formal education, current occupation, and position, area of specialization within the agricultural industry and experience in agricultural education. In addition, you will be asked to list all the entry-level

technical skills that agricultural education students should learn/acquire through participation in supervised agricultural experiences (SAE). The seven career pathways used by Oklahoma agricultural education will be used as a framework for the technical skills.

The second round questionnaire will ask you to rate your level of agreement on entry-level technical skills generated in round one that you believe are required for employment within the seven career pathways used by Oklahoma agricultural education, specifically, entry-level technical skills that are learned/acquired through student participation in the SAE component of the program. The third round questionnaire will focus on developing consensus by asking you to rate your level of agreement on those items for which at least 51% but less than 75% of panelists selected agree or strongly agree in round two.

You will be given the opportunity to provide comments for your selections in rounds two and three. The study is designed to last over the course of approximately 90 days. If at any time you do not wish to continue with the study, you may end your participation without explanation.

RISKS OF PARTICIPATION:

There are no risks associated with this project, such as stress, psychological, social, physical, or legal risk which are greater, considering probability and magnitude, than those ordinarily encountered in daily life. If, however, you begin to experience discomfort or stress in this project, you may end your participation at any time.

BENEFITS OF PARTICIPATION:

There are no expected personal benefits from you participating in this research study. However, this study seeks to contribute to the body of knowledge regarding the importance and value of the Supervised Agricultural Experience (SAE) component of the agricultural education model. An investigation into the technical skills acquired through student participation in SAE and the application of those skills in the agricultural industry could potentially better inform agricultural educators at the local, state, and national levels regarding curriculum development, changes in pre-service teacher professional development, new teacher induction, and in-service teacher professional development.

CONFIDENTIALITY:

All information about you will be kept confidential and will not be released. Questionnaires and record forms will have identification numbers, rather than names. Research records will be stored securely in Room 457 Agricultural Hall and only researchers and individuals responsible for research oversight will have access to the records. This information will be saved as long as it is scientifically useful; typically, such information is kept for five years

after publication of the results. Results from this study may be presented at professional meetings or in publications. You will not be identified individually.

COMPENSATION:

No compensation will be received for participating in this research study.

CONTACTS:

You may contact any of the researchers at the following addresses and telephone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Mr. Jon Ramsey, Teaching Associate, 457 Agricultural Hall, Dept. of Agricultural Education, Communications and Leadership, Oklahoma State University, Stillwater, OK 74078, (405) 744-4260, jon.ramsey@okstate.edu; Dr. M. Craig Edwards, 456 Agricultural Hall, Dept. of Agricultural Education, Communications, and Leadership, Oklahoma State University, Stillwater, OK 74078, (405)744-8141, craig.edwards@okstate.edu. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, (405)744-1676 or irb@okstate.edu

PARTICIPANTS RIGHTS:

Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time, without penalty.

By clicking the **ACCEPT** button you have been fully informed about the procedures listed here. You are aware of what you will be asked to do and the benefits of your participation.

If you choose not to participate in this study, please click the **DECLINE** button.

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

ROUND TWO

Oklahoma State University Institutional Review Board

Date: Wednesday, July 15, 2009 **Protocol** Expires: 2/26/2010

IRB Application No: AG095

Proposal Title: Identifying entry-level skills required in the agricultural industry and determining whether they are being acquired through students' participation in the supervised agricultural experience component of the agricultural education program

Reviewed and Processed as: Exempt

Modification

Status Recommended by Reviewer(s) **Approved**

Principal

Jon Ramsey
457 Ag Hall
Stillwater, OK 74078

Michael Craig Edwards
448 Ag Hall
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

The final versions of any printed recruitment, consent and assent documents bearing the IRS approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The addition of the second round questionnaires to this Delphi study is approved.

Signature :

Shelia Kennison, Chair, Institutional Review Board

APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

ROUND THREE

Oklahoma State University Institutional Review Board

Date:	Monday, September 21, 2009	Protocol Expires: 2/26/2010
IRB Application No:	AG095	
Proposal Title:	Identifying entry-level skills required in the agricultural industry and determining whether they are being acquired through students' participation in the supervised agricultural experience component of the agricultural education program	
Reviewed and Processed as: **Modification**	Exempt	

Status Recommended by Reviewer(s) **Approved**

Principal Investigators

Jon Ramsey	Michael Craig Edwards
457 Ag Hall	448 Ag Hall
Stillwater, OK 74078	Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is compietei,All approved .projects are subject to monitoring by the IRB.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The request to add the round three questions for this delphi study is approved.

Signature :

Shelia Kennison, Chair, Institutional Review Board

APPENDIX E

TEACHER TELEPHONE SCRIPT

Telephone Script: Teacher Panelists

Hello, my name is Jon Ramsey; I am a teaching associate in the Department of Agricultural Education, Communications and Leadership. I am conducting a study that is focused on identifying the entry-level technical skills that are valued by industry representatives (i.e., potential employers of entry-level job seekers) and determine if those skills are being acquired through student participation in the SAE component of the agricultural education program. Your leadership position in the Oklahoma Agricultural Education Teachers Association was used to identify you as a potential panelist.

Your participation in this study will require you to complete a minimum of three questionnaires over the course of the next three to four months. Your response will be used to identify the entry-level technical skills that students acquire through participation in the supervised agricultural experience (SAE) component of the agricultural education program.

In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. You will be asked to identify the pathway(s) that best represent your program and your students SAEs and identify those entry-level technical skills that students acquire through participation in an SAE.

Your participation in this study will better inform leaders at all levels of agricultural education in Oklahoma, thank you for considering my request. Will you agree to serve as a teacher representative for this study?

If yes, you will receive an e-mail message from me with instructions regarding a round #1 questionnaire.

If you choose not to participate in the study, thank you for taking my call and for your support of Ag Ed in Oklahoma.

APPENDIX F

INDUSTRY EXPERT TELEPHONE SCRIPT

Telephone Script: Ag Industry Panelists

Hello, my name is Jon Ramsey; I am a teaching associate in the Department of Agricultural Education, Communications and Leadership. I am conducting a study that is focused on identifying the entry-level technical skills that are valued by industry representatives (i.e., potential employers of entry-level job seekers) and determine if those skills are being acquired through student participation in the SAE component of the agricultural education program. Your state sponsorship of an Oklahoma FFA Proficiency Award is the criteria that was used to identify you as an agricultural industry representative.

Your participation in this study will require you to complete a minimum of three questionnaires over the course of the next three to four months. Your responses will be used to better understand the entry-level technical skills needed by employees in the sector of the agricultural industry you represent that could be acquired by students through their SAEs.

In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. You will be asked to identify the pathway(s) that best represent your expertise and identify those entry-level technical skills that agricultural education students should possess, as associated with their involvement with SAEs.

Your participation in this study will better inform leaders at all levels of agricultural education in Oklahoma. Thank you for considering my request. Will you agree to serve as an industry representative for this study?

If yes, you will receive an e-mail message from me with instructions regarding a round #1 questionnaire.

If you choose not to participate in the study, thank you for taking my call and for your support of Ag Ed in Oklahoma.

Good bye.

APPENDIX G

INDUSTRY EXPERT ROUND ONE INSTRUMENT

Agricultural Industry Panelists

Thank you for taking the time from your busy schedule to complete this survey. You are being asked to identify **entry-level technical skills** that should be learned through student participation in the supervised agricultural education component of the agricultural education model. In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. It would be very helpful if your responses are received by **May 8, 2009**. You may submit your responses by postal mail, fax or email by using the following contact information. However, e-mail is preferred.

Jon W. Ramsey, Teaching Associate
Oklahoma State University
457 Agricultural Hall, Stillwater, OK 74078-6032
Office: 405.744.4260
Fax: 405.744.5176
E-mail: jon.ramsey@okstate.edu

The agricultural education program includes three distinct components: classroom and laboratory instruction, supervised agricultural experience (SAE) (experiential learning) and FFA (youth development). This study is focused on the SAE component of the model, which ideally provides the "real world" application for the student learning that occurs in the classroom and laboratory.

The Oklahoma Department of Career and Technology Education (2008) defines SAE programs as **teacher-supervised, individualized, hands-on, student developed projects**

that give student's real-world experience in agriculture and/or agriculture related areas. In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. The seven career pathways for Agricultural Education in Oklahoma include:

1) Food Products and Processing

2) Plant and Soil Science

3) Animal Science

4) Agricultural Power, Structures and Technology

5) Agribusiness and Management

6) Ag Communications

7) Natural Resources & Environmental Science

Please focus only on the career pathway(s) that best fits your area of industry expertise and please list as many skills as you can.

In the space below, please provide your response to the following question.

- Using the seven career pathways (see above) for agricultural education as a context, what are the **entry-level technical skills** that should be learned by students through their participation in the supervised agricultural education (SAE) component of the agricultural education model? Specifically, list the technical skills that would be desirable for entry-level employees in **your areas of expertise to possess**.

For example: An expert from the **Agricultural Power and Maintenance industry** may not be comfortable identifying entry-level technical skills valued in the Food Products and Processing career pathway. However, he or she could easily identify technical skills valued in the Agricultural Power, Structures and Technology career pathway that students should be learning through participation in SAEs to prepare for an entry-level job in that sector of the agricultural industry.

Career Pathway #1 #2 #3 #4 #5 #6 #7 **(Select one and Circle)**

Entry-level technical skills

1
2
3
4
5
6
7
8
9
10
11
12
13
14

15
16
17
18
19
20

Please, list any additional entry-level skills even if they exceed 20.

If you have expertise in an **additional pathway,** please list those entry-level technical skills below.

Career Pathway #1 #2 #3 #4 #5 #6 #7 **(Select one and Circle)**

<u>Entry-level technical skills</u>

1
2
3
4
5

6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Please, list any additional entry-level skills even if they exceed 20.

APPENDIX H

TEACHER ROUND ONE INSTRUMENT

Agricultural Education Teacher Panelists

Thank you for taking the time from your busy schedule to complete this survey. You are being asked to identify **entry-level technical skills** that are acquired through student participation in the supervised agricultural education component of the agricultural education model. In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. It would be very helpful if your responses are received by **May 8, 2009**. You may submit your responses by postal mail, fax or email by using the following contact information. However, e-mail is preferred.

Jon W. Ramsey, Teaching Associate
Oklahoma State University
457 Agricultural Hall, Stillwater, OK 74078-6032
Office: 405.744.4260
Fax: 405.744.5176
E-mail: jon.ramsey@okstate.edu

The agricultural education program includes three distinct components: classroom and laboratory instruction, supervised agricultural experience (SAE) (experiential learning) and FFA (youth development). This study is focused on the SAE component of the model, which ideally provides the "real world" application for the student learning that occurs in the classroom and laboratory.

The Oklahoma Department of Career and Technology Education (2008) defines SAE programs as **teacher-supervised, individualized, hands-on, student developed projects**

that give student's real-world experience in agriculture and/or agriculture related areas. In Oklahoma, agricultural education divides instruction in agriculture, food and natural resources into seven career pathways. The seven career pathways for Agricultural Education in Oklahoma include:

1) Food Products and Processing

2) Plant and Soil Science

3) Animal Science

4) Agricultural Power, Structures and Technology

5) Agribusiness and Management

6) Ag Communications

7) Natural Resources & Environmental Science

Please focus only on the career pathway(s) that best fits your experience as an agricultural education teacher and represents the SAEs in which your students are involved. Please list as many skills as you can.

In the space below, please provide your response to the following question.

- Using the seven career pathways (see above) for agricultural education as a context, what are the **entry-level technical skills** that are acquired through student participation in the supervised agricultural education (SAE) component of the agricultural education program?
- For Example: A student learns how to correctly propagate a plant using a leaf or stem cutting as an outcome of his or her SAE involving horticulture or a student

learns how to correctly administer an intramuscular injection as an outcome of his or her SAE involving an animal.

Career Pathway #1 #2 #3 #4 #5 #6 #7 **(Select one and Circle)**

Entry-level technical skills

1
2
3
4
5
6
7
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10
11
12
13
14
15
16
17
18

19
20

Please, list any additional entry-level skills even if they exceed 20.

Career Pathway #1 #2 #3 #4 #5 #6 #7 **(Select one and Circle)**

<u>Entry-level technical skills</u>

1
2
3
4
5
6
7
8
9
10
11

12
13
14
15
16
17
18
19
20

Please, list any additional entry-level skills even if they exceed 20.

Career Pathway #1 #2 #3 #4 #5 #6 #7 **(Select one and Circle)**

Entry-level technical skills

1
2
3
4

5
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Please, list any additional entry-level skills even if they exceed 20.

APPENDIX I

PERSONAL AND PROFESSIONAL CHARACTERISTICS INSTRUMENT

Demographic profile of agricultural teacher and agricultural industry panelists

Directions:

The following questions will help us describe the panelists who participated in the study. ***Section one*** *will address basic demographic information for all panelists. Then, if you are an agricultural industry panelists, please proceed to* ***section two****. Or, if you are an agricultural education teacher, please, proceed to* ***section three****. Thank you for providing this important information. Please click on the appropriate button that most accurately describes your profile.*

Section 1: All Panelists complete

1. What is your gender?

A. Male

B. Female

2. What is your age range?

A. 20-29
B. 30-39
C. 40-49
D. 50-59
E. 60 or older

3. What is your race/ethnicity?

A. Caucasian
B. Native American
C. Hispanic
D. African American
E. Other _____

4. What is your highest educational degree earned?

A. High School Diploma
B. Associate's
C. Bachelor's
D. Master's
E. Doctorate

Section 2: Agricultural Industry Panelists

1. How many years did you participate in an agricultural youth organization as a youth? (9-18 years of age)

A. One
B. Two
C. Three
D. Four
E. Five or more

2. Identify the agricultural youth organization you were primarily involved in during high school.

A. 4-H
B. FFA
C. Youth Livestock Association
D. American Farmers and Ranchers organization (Oklahoma Farmers Union)
E. Other

3. How would you rate your involvement in that agricultural youth organization?

A. Very involved
B. Above average involvement
C. Average involvement
D. Somewhat involved
E. I was not a member of any agricultural youth organization, or my high school did not offer an agricultural youth program.

4. Did you participate in a supervised agricultural experience (SAE) program and/or have a 4-H project as a youth (e.g., an animal or plant "project")?

A. Yes
B. No

5. Indicate the SAE or 4-H Project with which you had the **most** experience. (Mark all that apply.)

A. Exhibited livestock (All types)
B. Worked in an agriculturally related job
C. Raised livestock (large or small Animal)
D. Raised crops (small grains, vegetables, fruit)
E. Conducted agricultural experiments
F. Performed research on an agricultural topic

6. Did your participation in an SAE or 4-H project help you acquire entry-level technical skills that would be useful for initial employment in the agricultural industry?

A. Yes
B. No

If yes, please list a few of those entry-level technical skills that you acquired.

_____

_____

_____

7. Identify the agricultural youth organizations that your children were/are primarily involved in during high school.

A. 4-H
B. FFA
C. Youth Livestock Association
D. American Farmers and Ranchers organization (Oklahoma Farmers Union)
E. Other (Please Specify)
F. Not Applicable

8. How would you rate your child's involvement in that agricultural youth organization?

A. Very involved
B. Above average involvement
C. Average involvement
D. Somewhat involved
E. Not applicable

9. Did your child's participation in an SAE or 4-H project help him/her acquire entry-level technical skills that would be useful for initial employment in the agricultural industry?

A. Yes

B. No

If yes, please list a few of those entry-level technical skills that you acquired.

_____

_____

_____

Section 3: Agricultural Education Teacher Panelists

1. How many years did you participate in an agricultural youth organization as a youth?

A. One
B. Two
C. Three
D. Four
E. Five or more

2. Identify the agricultural youth organization you were primarily involved in during high school.

A. 4-H
B. FFA
C. Youth Livestock Association
D. American Farmers and Ranchers organization (Oklahoma Farmers Union)
E. Other

3. How would you rate your involvement in **that** agricultural youth organization?

A. Very involved
B. Above average involvement
C. Average involvement
D. Somewhat involved
E. I was not a member of any agricultural youth organization, or my high school did not offer an agricultural youth program.

4. Identify the agricultural youth organizations that your children were/are primarily involved in during high school.

A. 4-H
B. FFA
C. Youth Livestock Association
D. American Farmers and Ranchers organization (Oklahoma Farmers Union)
E. Other (Please specify)
F. Not Applicable

5. How would you rate your child's involvement in that agricultural youth organization?

A. Very involved
B. Above average involvement
C. Average involvement
D. Somewhat involved
E. Not Applicable

6. Did your child's participation in an SAE or 4-H project help him/her acquire entry-level technical skills that would be useful for initial employment in the agricultural industry?

A. Yes

B. No

If yes, please list a few of those entry-level technical skills that you acquired.

_____

_____

_____

7. Did you participate in a supervised agricultural experience (SAE) program and have a 4-H project as a youth?

A. Yes
B. No

8. Indicate the SAE or 4-H project with which you had the most experience.

A. Exhibited livestock (All types)
B. Worked in an agriculturally related job
C. Raised livestock (large or small Animal)
D. Raised crops (small grains, vegetables, fruit)
E. Conducted agricultural experiments
F. Performed research on an agricultural topic

9. Other than your formal education, which would best describe your agricultural work experience?

A. Full-time employment, for more than six months, in the agricultural industry
B. Full-time temporary employment, one or more summers, in a production agriculture or agribusiness setting

C. Part-time employment (e.g., working at the local feed store after school or on the weekends)
D. Mostly avocational (e.g., assist a friend in “feeding cows” on an occasional weekend. Planting and caring for a garden)
E. None

APPENDIX J

FOLLOW-UP REMINDER, ROUND ONE TEACHER

Dear Teacher Panelist:

Please accept my thanks if you have already completed the round one questionnaire that was sent out on May 16, 2009. If you have not had the opportunity to complete the questionnaire, please take a few moments to complete the instrument, your input will provide a more complete picture of the technical skills that are acquired through SAE participation.

Thank you,

Jon Ramsey
Teaching Associate/Coordinator of Field Placement
Oklahoma State University
Agricultural Education, Communications & Leadership
457 Ag Hall, Stillwater, OK 74078
jon.ramsey@okstate.edu

APPENDIX K

FOLLOW-UP REMINDER, ROUND ONE INDUSTRY

Dear Industry Panelist:

Please accept my thanks if you have already completed the round one questionnaire that was sent out on May 16, 2009. If you have not had the opportunity to complete the questionnaire, please take a few moments to complete the instrument, your input will provide a more complete picture of the technical skills that are important for entry-level job seekers.

Thank you,

Jon Ramsey
Teaching Associate/Coordinator of Field Placement
Oklahoma State University
Agricultural Education, Communications & Leadership
457 Ag Hall, Stillwater, OK 74078
jon.ramsey@okstate.edu

APPENDIX L

TEACHER ROUND TWO INSTRUMENT

Agricultural Educators' Entry-Level Technical Skill Statements

Directions: In Round One, you were asked to identify the **entry-level technical skills** that should be learned through student participation in the supervised agricultural education (SAE) component of the agricultural education program using the seven career pathways for agricultural education as a context.

The Oklahoma Department of Career and Technology Education (2008) defines SAE programs as **teacher-supervised, individualized, hands-on, student developed projects that give student's real-world experience in agriculture and/or agriculture related areas.**

Below is a list of 260 statements representing **entry-level technical skills** that you said should be learned by students who participate in the supervised agricultural education component of the agricultural education model. Please, read each statement and determine **your level of agreement with each entry-level technical skill.**

Note: The statements are not listed in any particular order.

A **1 to 6 scale** is available for you to use to indicate your level of agreement with each entry-level technical skill. Please, rate each skill from 1 to 6 as follows: **1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree 5 = Agree, 6 = Strongly Agree.** Space is also provided for you to offer additional **comments** if you believe that more information, detail, or clarification is needed regarding a particular skill. In addition, at the end of the instrument, space is provided for you to share additional skills that you believe may have been overlooked in round one. Please, share any thoughts you have for including or excluding another skill.

After you have responded to all the statements, please, **click the submit button** located at the bottom of your screen. If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree	
	Round One Statements	**1**	**2**	**3**	**4**	**5**	**6**	**Comments**
1	General safety							
2	Food handling safety							
3	Food processing safety							
4	Safe use of pesticides							
5	Bacteria analysis							
6	Food preparation (temperature codes)							
7	Food supply control							
8	Sanitation (food service)							
9	Processing procedures for poultry							
10	Processing procedures for grains							
11	Processing procedures for meat products							
12	Processing procedures for milk							
13	Processing procedures for nuts							
14	Grain grading							
15	Identify retail cuts of meat							
16	Grades of meat							
17	Grades of animals							
18	Meat evaluation							
19	Equipment operation							
20	Selection of products							
21	Evaluation of products							
22	Selection of equipment							
23	Marketing (agriculture products)							
24	Communication							
25	People skills							
26	Advertizing							
27	Responsibility							
28	Decision making							
29	Interpreting data (enterprise income, expenses, and production output)							

30	Maintaining data (enterprise income, expenses, and production output)							
31	Recording data (enterprise income, expenses, and production output)							
32	Product development							
33	How to read and understand a nutrition label							
34	Basic knowledge and application of food products							
35	Identify wholesale cuts of meat							
36	Plant identification							
37	Proper handling of plants for sale							
38	Proper planting techniques							
39	Reproduction of plants							
40	Basic anatomy of plants							
41	Seed identification							
42	Crop identification							
43	Minimum tillage methods							
44	Reproduction of tree species							
45	Parts of a plant							
46	Nutritional requirements of plants							
47	Plant life cycles							
48	Hay storage							
49	Harvest operations							
50	Seed germination							
51	Crop storage							
52	Alternative crops							
53	Green manure crops							
54	Crop rotations							
55	Particular plants' macronutrients requirements							
56	Soil testing							
57	How to take a soil sample							
58	Soil preparation for particular crops							
59	How to change soil after reading analysis							
60	Soil media							
61	Soil quality							
62	Soil uses							
63	Soil parts							

64	Soil requirements							
65	Soil formations							
66	Proper tillage and land preparation							
67	Soil types							
68	Land judging							
69	Land capability classes							
70	Identify beneficial insects							
71	Identify harmful insects							
72	Chemical safety							
73	Weed control							
74	Use of pesticides							
75	Positive environmental impacts on soil							
76	Negative environmental impacts on soil							
77	Positive environmental impacts on plants							
78	Negative environmental impacts on plants							
79	Soil conservation							
80	Soil erosion controls							
81	Greenhouse management							
82	Greenhouse operations							
83	Watering (greenhouse plants)							
84	Surveying							
85	Hay equipment operation							
86	Servicing equipment							
87	Farm Safety							
88	Irrigation							
89	Soil preparation for particular trees							
90	Docking (animal)							
91	Proper livestock handling							
92	Castration							
93	Basic veterinary practices							
94	Deworming							
95	Vaccination (animal)							
96	Disease identification (animal)							
97	Ear notching							
98	Dehorning							
99	Diagnosis of health problems in livestock							
100	Administering medications							

101	Use of a squeeze chute							
102	Haltering livestock							
103	Reproductive process (reproductive process)							
104	Birthing process							
105	Proper care of newborn animals							
106	Artificial insemination							
107	Embryo transfer							
108	Genetics (animal)							
109	Timing of animal breeding							
110	Proper marketing of animals							
111	Role of agricultural animals in the “big picture” of the economy and world							
112	Record keeping							
113	Livestock selection							
114	Animal anatomy							
115	Breeds of livestock							
116	Breed development							
117	Pedigrees (animal)							
118	Feed rations							
119	Animal feeding							
120	Animal digestion							
121	Native and improved pastures							
122	Fertilization and herbicide application on pastures							
123	Carcass evaluation							
124	Signs of nutritional deficiencies in animals							
125	Fire safety							
126	Shop safety skills							
127	Basic geometry							
128	Power equipment usage							
129	Equipment repair (problem solving)							
130	Equipment maintenance							
Congratulations! You are halfway. Please, continue and complete the list to the best of your ability. Thank you!!								
	Round One Statements	**1**	**2**	**3**	**4**	**5**	**6**	**Comments**
131	How to use measuring devices							
132	Bill of materials							

133	Basic math							
134	How to read a tape measure							
135	How to use a framing square							
136	How to use a portable grinder							
137	How to use an abrasive cut-off saw							
138	How to use a portable drill							
139	How to use a drill press							
140	Tool identification							
141	Blue print reading							
142	Fabrication (layout for projects)							
143	Project construction							
144	Types of metal							
145	Flux core arc welding troubleshooting							
146	Flux core arc welding comprehension							
147	Flux core arc welding parts							
148	Flux core arc welding operation							
149	SMAW troubleshooting							
150	GMAW parts							
151	Oxy acetylene welding							
152	SMAW comprehension							
153	SMAW operation							
154	SMAW parts							
155	GMAW operation							
156	Plasma cutting							
157	GMAW troubleshooting							
158	Brazing							
159	Oxy acetylene cutting							
160	Types of fuel gasses and uses							
161	Engine repair							
162	Small gas engine principles							
163	Erosion control							
164	Basic electrical skills							
165	Applying sheet metal to a structure							
166	Make minor repairs valuable in the agriculture industry							
167	Developing a budget							
168	Income and expenses							

169	Spread sheets							
170	Cash flows							
171	Net worth							
172	Checking accounts							
173	Savings accounts							
174	How to manage an inventory							
175	Understand a balance sheet							
176	Tax management							
177	Depreciation							
178	Knowledge of markets and how they work							
179	Current market trends							
180	Futures market							
181	Business plan							
182	Contracting (in agribusiness)							
183	Board of trade (agriculture)							
184	Time management							
185	Using an adding machine							
186	Risk management							
187	Pricing (in agribusiness)							
188	Calculating breakeven analysis							
189	Banking							
190	Managing credit							
191	Time value of money (investments/retirement)							
192	Insurance							
193	Capital-debt to asset ratio							
194	Basic money management							
195	Simple interest							
196	Public speaking							
197	Contacting local newspapers and radio stations							
198	Designing flyers							
199	Chapter publicity							
200	Presenting ideas and reports							
201	Body language							
202	Non response language							
203	How to build a marketing plan							

204	Proper language usage							
205	Media resources							
206	Proper writing styles							
207	Editing							
208	Writing news releases							
209	Preparing speeches							
210	News reporting							
211	News writing							
212	Article writing and communication							
213	Inverted pyramid							
214	Computer skills							
215	Using powerpoint presentations							
216	Photography							
217	Web design							
218	Basic graphic design							
219	Photo editing							
220	Use of word processing equipment							
221	Time on task skills							
222	How to build a résumé							
223	How to interview for a job							
224	Telephone skills							
225	Using information							
226	Manage an activity budget							
227	Overall knowledge of agriculture in general							
228	Parliamentary procedure							
229	How to plan and conduct a banquet							
230	Problem solving							
231	Non point source pollution							
232	Understand the impact of globalization on natural resources							
233	Basic knowledge, appreciation for the environment							
234	Recycling and managing waste							
235	Land assessment/classification							
236	Land use							
237	Air pollution and concerns							
238	Understand environmental impacts							

	locally as well as downstream land areas							
239	Water safety and concerns							
240	Water run-off management							
241	Fish identification							
242	Wildlife population assessment							
243	Wildlife conservation							
244	Wildlife habitat recognition							
245	Animal concerns							
246	Wildlife management							
247	Wildlife identification							
248	Oklahoma hunting and fishing regulations							
249	Animal tagging							
250	Timber cruising							
251	Forestry knowledge and skills							
252	Tree identification							
253	Spraying of chemicals and related concerns							
254	Recognition of government regulations							
255	Legal land description							
256	Map reading (GPS)							
257	Role of Natural Resource Conservation Service and the landowner							
258	Work skills							
259	Identification of all things related to SAE							
260	Understand the impact of globalization on the economy							

Now that you have completed round two, if you have any other **entry-level technical skills** you believe have been missed, please, list them below. Also, if you believe some of the entry-level technical skills should be combined, please, indicate that in the space provided and include their number.

INSERT TEXT BOX

APPENDIX M

INDUSTRY EXPERT ROUND TWO INSTRUMENT

Agricultural Industry Representatives' Entry-Level Technical Skill Statements

Directions: In Round One, you were asked to identify the **entry-level technical skills** that should be learned through student participation in the supervised agricultural education (SAE) component of the agricultural education program using the seven career pathways for agricultural education as a context.

The Oklahoma Department of Career and Technology Education (2008) defines SAE programs as **teacher-supervised, individualized, hands-on, student developed projects that give student's real-world experience in agriculture and/or agriculture related areas.**

Below is a list of 105 statements representing **entry-level technical skills** that you said should be learned by students who participate in the supervised agricultural education component of the agricultural education model. Please, read each statement and determine **your level of agreement with each entry-level technical skill.**

Note: The statements are not listed in any particular order.

A **1 to 6 scale** is available for you to use to indicate your level of agreement with each entry-level technical skill. Please, rate each skill from 1 to 6 as follows: **1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree 5 = Agree, 6 = Strongly Agree.** Space is also provided for you to offer additional **comments** if you believe that more information, detail, or clarification is needed regarding a particular skill. In addition, at the end of the instrument, space is provided for you to share additional skills that you believe may have been overlooked in round one. Please, share any thoughts you have for including or excluding another skill.

After you have responded to all of the statements, please, click the submit button located at the bottom of your screen. If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree	
Round One Statements		**1**	**2**	**3**	**4**	**5**	**6**	**Comments**
1	Hygiene (as related to handling food)							
2	Food borne pathogens							
3	Basic livestock anatomy							
4	Species of livestock							
5	Wheat quality parameters							
6	Cuts of meat							
7	Meat preparation (cooking)							
8	Milling skills							
9	Baking skills							
10	Harvesting (livestock)							
11	Processing (livestock)							
12	Handling (livestock)							
13	Bread making							
14	Yield potential							
15	Test weights							
16	Marketing (agriculture products)							
17	Overall yields							
18	Plant structure							
19	Anatomy of plants							
20	Breeding (plants)							
21	Diseases (plants)							
22	Plant types							
23	Physiology of plants							
24	P.H.							
25	Soil types							
26	Nutrient deficiency							
27	Seed identification							
28	Plant identification							
29	Weed identification							
30	Identify bloat							
31	Proper vaccination sites							
32	Animal breeding							
33	Animal reproduction							
34	Birthing assistance							
35	Basic animal nutrition							
36	Disease treatment (animals)							
37	Processing of newborns							

38	Animal health							
39	Vaccination of animals							
40	Marketplace sale trends							
41	Consumer expectations							
42	Basic math							
43	Budgets							
44	Inventory							
45	Balancing a checkbook							
46	Live animal evaluation							
47	Different classes of livestock							
48	Differences between major breeds of livestock							
49	Know proper terminology regarding gender (livestock)							
50	First hollow stem (wheat pasture management)							
51	Tannin production (ruminant digestibility)							
52	Waste management							
53	Nutrient utilization							
54	State regulations (regarding agriculture)							
55	Confined Animal Feeding Operations							
56	Air quality (animal confinement)							
57	People skills							
58	Basic first aid							
59	Basic electrical wiring							
60	Operating a welder							
61	Construction principles							
62	Plumbing							
63	Small gas engines maintenance							
64	Safety awareness							
65	Bio-security							
66	Licensed Managed Feeding Operations							
67	Characteristics of a gas engine							
68	Characteristics of a diesel engine							
69	Properly inflate a tire							
70	Change a tire							
71	Function of a spark plug							
72	Change oil							
73	Basic computer skills							
74	Tool identification							
75	Differentiate between metric and standard wrenches							
76	Soil compaction							
77	No-till (soil preparation)							

78	Sensing technology							
79	Assets and liabilities							
80	Balance sheets							
81	Simple interest							
82	Business math							
83	Applied statistics							
84	Trends analysis							
85	Speaking (oral communication)							
86	Writing news releases							
87	Policy position papers							
88	Writing letters to the editor							
89	Writing letters to elected, appointed, and career officials							
90	Web site design							
91	Lobbying skills							
92	Dependability							
93	Consistency							
94	Determination							
95	Confidence							
96	Organization							
97	Self-motivation							
98	Empathy							
99	Reliability							
100	Commitment							
101	Trust							
102	Loyalty							
103	Team-player							
104	Carbon issues							
105	Water quality							

Now that you have completed round two, if you have any other **entry-level technical skills** you believe have been missed, please, list them below. Also, if you believe some of the entry-level technical skills should be combined, please, indicate that in the space provided and include their numbers.

INSERT TEXT BOX

APPENDIX N

FOLLOW-UP REMINDER, ROUND TWO TEACHER PANELISTS

August 3, 2009

Dear Study Participant:

Thank you for agreeing to participate in my graduate study entitled, **"Identifying entry-level skills required in the agricultural industry and determining whether they are being acquired through students' participation in the supervised agricultural experience component of the agricultural education program: A comparison of the perceptions of two expert panels."** If you have submitted Round Two, thank you. If you have not had the opportunity to complete the Round Two survey instrument, please take a few minutes to complete the survey.

I have attached the second round survey instrument to this e-mail.

In Round One, 260 statements were identified as **entry-level technical skills** that should be learned through student participation in the supervised agricultural education (SAE) component of the agricultural education program using the seven career pathways for agricultural education as a context.

In Round Two, please, rate your level of agreement with each entry-level technical skill. Space is also provided for you to offer additional comments if you believe that more information, detail, or clarification is needed regarding a particular skill. In addition, at the end of the instrument, space is provided for you to share additional skills that you believe may have been overlooked in round one. Please, share any thoughts you have for including or excluding another skill.

Please follow the link http://survey.okstate.edu/ageducator/ to access the Round Two survey instrument.

If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu. Please, complete and return the attached second round survey instrument by August 7, 2009.

Sincerely,

Jon W. Ramsey

APPENDIX O

FOLLOW-UP REMINDER, ROUND TWO INDUSTRY PANELISTS

August 3, 2009

Dear Study Participant:

Thank you for agreeing to participate in my graduate study entitled, **"Identifying entry-level skills required in the agricultural industry and determining whether they are being acquired through students' participation in the supervised agricultural experience component of the agricultural education program: A comparison of the perceptions of two expert panels."** If you have submitted Round Two, thank you. If you have not had the opportunity to complete the Round Two survey instrument, please take a few minutes to complete the survey.

I have attached the second round survey instrument to this e-mail.

In Round One, 105 statements were identified as **entry-level technical skills** that should be learned through student participation in the supervised agricultural education (SAE) component of the agricultural education program using the seven career pathways for agricultural education as a context.

In Round Two, please, rate your level of agreement with each entry-level technical skill. Space is also provided for you to offer additional comments if you believe that more information, detail, or clarification is needed regarding a particular skill. In addition, at the end of the instrument, space is provided for you to share additional skills that you believe may have been overlooked in round one. Please, share any thoughts you have for including or excluding another skill.

Please follow the link http://survey.okstate.edu/agindustry/ to access the Round Two survey instrument.

If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu. Please, complete and return the attached second round survey instrument by August 7, 2009.

Sincerely,

Jon W. Ramsey

APPENDIX P

TEACHER ROUND THREE INSTRUMENT

Agricultural Educators

Round Three

Introduction

The two-fold purpose of this study is to 1) describe the perceptions of a select group of agricultural professionals (secondary agricultural education teachers and industry experts) regarding the entry-level technical skills required by the agricultural industry and the acquisition of these skills by students through participation in the SAE component of secondary agricultural education; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' SAEs.

Directions

In Round Two, you indicated your level of agreement with 260 statements representing **entry-level technical skills** that should be learned by students who participate in the SAE component of the agricultural education model. Of those statements, 140 entry-level technical skills reached consensus: 75% or more of the panelists chose to "Agree" (5) or "Strongly Agree" (6) that the skill should be learned by students who participate in the SAE component of the agricultural education model.

In Round Three, we are attempting to reach consensus for 86 entry-level technical skills for which at least 51% but less than 75% of panelists selected "Agree" (5) or "Strongly Agree" (6) in Round Two. To aid in developing consensus, the percentage of panelists who indicated "Agree" (5) or "Strongly Agree" (6) for that skill in Round Two have been included in this Round.

Please, rate each entry-level skill in this Round using a **1 to 6 scale** to indicate your level of agreement: **1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree 5 = Agree, 6 = Strongly Agree.**

In addition to developing consensus, the opportunity to provide an alternative description of the skill is available in this Round. Suggesting an alternative description may assist you in

determining your level of agreement. If you provide an alternative description of the skill, please, do that in the space provided.

After you have responded to all statements, please, click the submit button located at the bottom of your screen. If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu

Thank you for your time and participation!

Round Three Questionnaire: Educator Panel

N=86

	% agreement reached in Round 2	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree	What alternative description would you suggest to agree or strongly agree with this item?
Entry-Level Technical Skills		**1**	**2**	**3**	**4**	**5**	**6**	
Farm Safety	68.8%							
Spraying of chemicals and related concerns	68.8%							
Understand the impact of globalization on the economy	68.8%							
Knowledge of markets and how they work	68.8%							
Using an adding machine	68.8%							
Watering (greenhouse plants)	68.8%							
Reproductive process (reproductive process)	68.8%							

Applying sheet metal to a structure	68.8%							
Tax management	68.8%							
Oklahoma hunting and fishing regulations	68.8%							
Land judging	68.8%							
How to plan and conduct a banquet	68.8%							
Land assessment/classification	68.8%							
Soil media	68.8%							
Soil requirements	68.8%							
Negative environmental impacts on soil	68.8%							
Timing of animal breeding	68.8%							
Fertilization and herbicide application on pastures	68.8%							
Blue print reading	68.8%							
Erosion control	68.8%							
Make minor repairs valuable in the agriculture industry	68.8%							
Wildlife conservation	68.8%							
Grades of animals	68.8%							
Meat evaluation	68.8%							
Soil quality	68.8%							
Positive environmental impacts on soil	68.8%							
Wildlife habitat recognition	68.8%							
Non point source pollution	68.8%							

Recognition of government regulations	68.8%							
Food handling safety	62.5%							
Net worth	62.5%							
Non response language	62.5%							
Current market trends	62.5%							
Food processing safety	62.5%							
Advertizing	62.5%							
Alternative crops	62.5%							
Surveying	62.5%							
Understand environmental impacts locally as well as downstream land areas	62.5%							
Crop rotations	62.5%							
Types of metal	62.5%							
Spread sheets	62.5%							
Capital-debt to asset ratio	62.5%							
Recycling and managing waste	62.5%							
Product development	62.5%							
Use of a squeeze chute	62.5%							
Artificial insemination	62.5%							
Embryo transfer	62.5%							
Animal digestion	62.5%							
Business plan	62.5%							
Air pollution and concerns	62.5%							

Wildlife management	62.5%							
Evaluation of products	62.5%							
Seed identification	62.5%							
Haltering livestock	62.5%							
Oxy acetylene welding	62.5%							
GMAW troubleshooting	62.5%							
Brazing	62.5%							
Basic graphic design	62.5%							
Animal concerns	62.5%							
Selection of products	62.5%							
Signs of nutritional deficiencies in animals	62.5%							
Media resources	62.5%							
Inverted pyramid	62.5%							
Risk management	62.5%							
Sanitation (food service)	62.5%							
Equipment repair (problem solving)	62.5%							
Calculating breakeven analysis	56.3%							
Futures market	56.3%							
How to read and understand a nutrition label	56.3%							
Native and improved pastures	56.3%							
Flux core arc welding operation	56.3%							
Pricing (in agribusiness)	56.3%							
Basic knowledge and application of	56.3%							

food products								
Proper handling of plants for sale	56.3%							
Identify beneficial insects	56.3%							
Genetics (animal)	56.3%							
SMAW comprehension	56.3%							
Board of trade (agriculture)	56.3%							
Soil formations	56.3%							
Docking (animal)	56.3%							
Basic geometry	56.3%							
Tree identification	56.3%							
Greenhouse management	56.3%							
Food supply control	56.3%							
Processing procedures for poultry	56.3%							
Seed germination	56.3%							

APPENDIX Q

INDUSTRY EXPERT ROUND THREE INSTRUMENT

Agricultural Industry

Round Three

Introduction

The two-fold purpose of this study is to 1) describe the perceptions of a select group of agricultural professionals (secondary agricultural education teachers and industry experts) regarding the entry-level technical skills required by the agricultural industry and the acquisition of these skills by students through participation in the SAE component of secondary agricultural education; 2) describe gaps or differences that may exist between the perceptions of Oklahoma agricultural industry experts and Oklahoma secondary agricultural education teachers regarding entry-level technical skills "needed" versus technical skills "learned" through students' SAEs.

Directions

In Round Two, you indicated your level of agreement with 105 statements representing **entry-level technical skills** that should be learned by students who participate in the SAE component of the agricultural education model. Of those statements, 54 entry-level technical skills reached consensus: 75% or more of the panelists chose to "Agree" (5) or "Strongly Agree" (6) that the skill should be learned by students who participate in the SAE component of the agricultural education model.

In Round Three, we are attempting to reach consensus for 27 entry-level technical skills for which at least 51% but less than 75% of panelists selected "Agree" (5) or "Strongly Agree" (6) in Round Two. To aid in developing consensus, the percentage of panelists who indicated "Agree" (5) or "Strongly Agree" (6) for that skill in Round Two have been included in this Round.

Please, rate each entry-level skill in this Round using a **1 to 6 scale** to indicate your level of agreement: **1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree 5 = Agree, 6 = Strongly Agree.**

In addition to developing consensus, the opportunity to provide an alternative description of the skill is available in this Round. Suggesting an alternative description may assist you in determining your level of agreement. If you provide an alternative description of the skill, please, do that in the space provided.

After you have responded to all statements, please, click the submit button located at the bottom of your screen. If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu

Thank you for your time and participation!

Round Three Questionnaire Industry Panel

	% agreement reached in Round 2	**Strongly Disagree**	**Disagree**	**Slightly Disagree**	**Slightly Agree**	**Agree**	**Strongly Agree**	**What alternative description would you suggest to agree or strongly agree with this item?**
Entry-Level Technical Skills		**1**	**2**	**3**	**4**	**5**	**6**	
Empathy	69.2%							
Seed identification	69.2%							
Nutrient deficiency	69.2%							
Waste management	69.2%							
Confined Animal Feeding Operations	69.2%							
Properly inflate a tire	69.2%							
Tool identification	69.2%							

Harvesting (livestock)	69.2%							
Soil types	69.2%							
Water quality	69.2%							
Construction principles	69.2%							
Licensed Managed Feeding Operations	69.2%							
Air quality (animal confinement)	61.5%							
P.H.	61.5%							
Soil compaction	61.5%							
Anatomy of plants	61.5%							
Function of a spark plug	61.5%							
Change oil	61.5%							
Processing (livestock)	53.8%							
Nutrient utilization	53.8%							
First hollow stem (wheat pasture management)	53.8%							
Basic electrical wiring	53.8%							
Sensing technology	53.8%							
Plumbing	53.8%							
Differentiate between metric and standard wrenches	53.8%							
Trends analysis	53.8%							
Small gas engines maintenance	53.8%							

N=27

APPENDIX R

FOLLOW-UP REMINDER, ROUND THREE TEACHER

October 7, 2009

Dear Study Participant:

Several of you have completed the third round of my survey, **thank you very much**! To insure my study's reliability, it is critical that more than 13 participants respond. So, if you have not yet responded to round three, I have included a link to the third round instrument in this message.

In **Round Three**, we are attempting to reach consensus for 86 entry-level technical skills for which at least 51% but less than 75% of panelists selected "Agree" (5) or "Strongly Agree" (6) in Round Two. To aid in developing consensus, the percentage of panelists who indicated "Agree" (5) or "Strongly Agree" (6) for that skill in Round Two have been included in this Round.

The opportunity to provide an alternative description of the skill is available in this round. Suggesting an alternative description may assist you in determining your level of agreement.

Finally, at the end of the questionnaire there is space provided for you to share your thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program.

Please follow the link http://survey.okstate.edu/ageducator to access the **Round Three** questionnaire.

If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu. Again, we hope to receive your ratings by **Friday October 9, 2009.**

Thank you very much for your participation!

Sincerely,

Jon W. Ramsey

APPENDIX S

FOLLOW-UP REMINDER, ROUND THREE INDUSTRY

October 7, 2009

Dear Study Participant:

Several of you have completed the third round of my survey, **thank you very much**! To insure my study's reliability, it is critical that more than 13 participants respond. So, if you have not yet responded to round three, I have included a link to the third round instrument in this message.

In **Round Three**, we are attempting to reach consensus for 27 entry-level technical skills for which at least 51% but less than 75% of panelists selected "Agree" (5) or "Strongly Agree" (6) in Round Two. To aid in developing consensus, the percentage of panelists who indicated "Agree" (5) or "Strongly Agree" (6) for that skill in Round Two have been included in this round.

The opportunity to provide an alternative description of the skill is available in this round. Suggesting an alternative description may assist you in determining your level of agreement.

Finally, at the end of the instrument there is space provided for you to share your thoughts, concerns, or recommendations for integrating entry-level technical skills into the SAE component of the agricultural education program.

Please follow the link http://survey.okstate.edu/agindustry/ to access the Round Three survey instrument.

If you have any questions regarding this study, please, e-mail me at jon.ramsey@okstate.edu. Again, we hope to receive your ratings by **Friday October 9, 2009.**

Thank you for your participation!

Sincerely,

Jon W. Ramsey

VITA

Jon Warren Ramsey

Candidate for the Degree of

Doctor of Philosophy

Thesis: IDENTIFYING ENTRY-LEVEL SKILLS EXPECTED BY AGRICULTURAL INDUSTRY EXPERTS AND DETERMINING TEACHERS' PERCEPTIONS ON WHETHER THEY ARE BEING LEARNED THROUGH STUDENTS' PARTICIPATION IN THE SUPERVISED AGRICULTURAL EXPERIENCE COMPONENT OF THE SECONDARY AGRICULTURAL EDUCATION PROGRAM: A TWO-PANEL DELPHI STUDY

Major Field: Agricultural Education

Biographical:

Personal Data: Born at Dodge City, Kansas on April 2, 1964, son of Kit and Jenyle Ramsey, Married September 3, 1988 to Kim Ritchie, father of Jerod Warren and Koy Tipton Ramsey

Education:

Completed the requirements for the Doctor of Philosophy in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in December 2009.

Completed the requirements for the Master of Science in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in 1997.

Completed the requirements for the Bachelor of Science in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in 1986.

Experience: Teaching Associate, Department of Agricultural Education, Communications and Leadership, Oklahoma State University; Secondary Agricultural Education Instructor, Cushing High School; Secondary Agricultural Education Instructor, Atoka High School

Professional Memberships: National Association of Agricultural Educators; Oklahoma Agricultural Education Teachers Association.

Name: Jon W. Ramsey Date of Degree: December, 2009

Institution: Oklahoma State University ... Location: Stillwater, Oklahoma

Title of Study: IDENTIFYING ENTRY-LEVEL SKILLS EXPECTED BY AGRICULTURAL INDUSTRY EXPERTS AND DETERMINING TEACHERS' PERCEPTIONS ON WHETHER THEY ARE BEING LEARNED THROUGH STUDENTS' PARTICIPATION IN THE SUPERVISED AGRICULTURAL EXPERIENCE COMPONENT OF THE SECONDARY AGRICULTURAL EDUCATION PROGRAM: A TWO-PANEL DELPHI STUDY

Pages in Study: 256 Candidate for the Degree of Doctor of Philosophy

Major Field: Agricultural Education

Scope and Method of Study: The population of this study was composed of all secondary agricultural education teachers and State FFA Proficiency Award sponsors (i.e., agricultural industry experts) in the state of Oklahoma during 2009. This study was descriptive in nature and employed a survey research design utilizing a modified Delphi technique that included three rounds of data collection.

Findings and Conclusions: A majority of panelists who completed the instrument were male and Caucasian. Most of the panelists reported participation in supervised agricultural experiences (SAEs) or 4-H projects during their youth. Agricultural industry experts reached "consensus of agreement" on 60 entry-level technical skills that should be learned by students participating in SAEs, with regard to their future employment in various agricultural sectors. Secondary agricultural education teacher panelists reached "consensus of agreement" on 161 entry-level technical skills that should be learned by students who participate in the SAE component of the secondary agricultural education program. The panels were most similar regarding the highest number of skills reaching "consensus of agreement," by career pathways, for Animal Science, 28 and 31 and Agricultural Communications, 29 and 13, teacher and industry panelists respectively. These findings support Roberts' and Ball (2009) content-based model of teaching agricultural education. Specifically, identifying entry-level technical skills, per the seven career pathways for the Agriculture, Food and Natural Resources Career Cluster, supports the *Agricultural Instruction and Skill Acquisition* component of the content-based model proffered by Roberts and Ball. Results of this study should be shared with all stakeholders concerned about the role of SAEs in secondary agricultural education in the 21st century. More studies are needed to inform further the development of an SAE model that would facilitate students' job preparedness for entry into the agricultural industry in Oklahoma.

ADVISER'S APPROVAL: Michael Craig Edwards