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Entry–level Technical Skills that Teachers Expected Students to Learn through Supervised Agricultural Experiences (SAEs): A Modified Delphi Study

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Supervised experiences are designed to provide opportunities for the hands–on learning of skills and practices that lead to successful personal growth and future employment in an agricultural career (Talbert, Vaughn, Croom, & Lee, 2007). In the Annual Report for Agricultural Education (2005–2006), it was stated that 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 component of the model has implications regarding agricultural education's role in the preparation of students for entry–level jobs in the agricultural industry. This study used a modified Delphi technique to coalesce the views of an expert panel of agricultural education teachers on the role of SAEs in preparing students for entry–level careers in the agricultural industry. In some instances, the learning experiences being taught in secondary agricultural education may not be congruent with today's agricultural industry standards. This incongruence may be contributing to the decline in students who participate actively in SAEs.

Keywords: supervised agricultural experience; career pathways; delphi method; entry–level technical skills

Introduction and Conceptual Framework

SAE 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 the component of agricultural education that sets it apart from other programs or subjects in many secondary schools.

Roberts and Ball (2009; see Figure 1) reported that a review of early secondary agricultural education curricula revealed its focus 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, Osborne, Dyer, & Ball, 2008; Talbert et al., 2007), which has focused on preparing skilled workers for the industry of agriculture.

SAE is one of the critical components of secondary agricultural education's *three–circle* model of program delivery: classroom and laboratory instruction; youth leadership development; and supervised agricultural experiences. Agricultural education's proponents have touted the benefits of this critical component of the program 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). In so far as students developing favorable work attitudes, Dyer and Williams (1997) spoke to the knowledge and skills students acquire in that regard through SAE placement opportunities particularly.

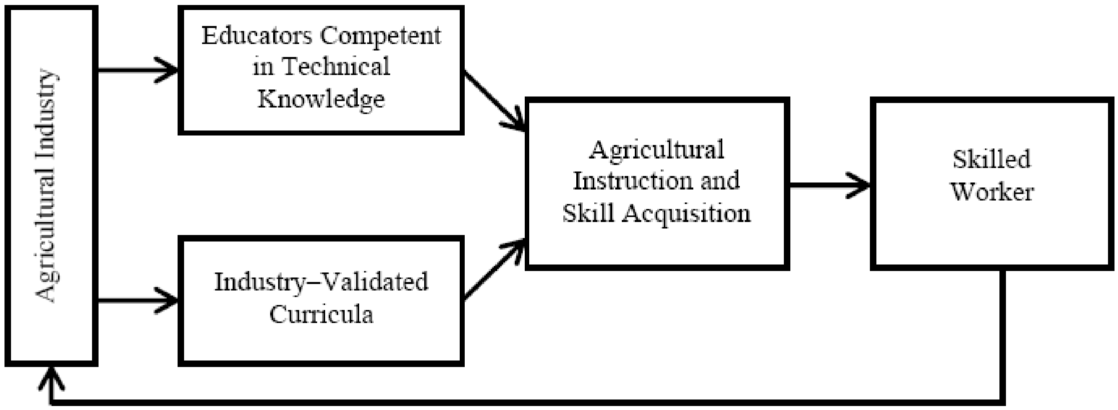

Figure 1. A content–based model for teaching agriculture From "Secondary agricultural science as content and context for teaching", by T.G. Roberts and A.L. Ball, 2009, Journal of Agricultural Education, 50 p. 81–91. Reprinted with permission.

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* (Roberts & Ball, 2009). Regarding a model that focuses on *melding* or integrating classroom and laboratory instruction and youth development through experiential learning, an observer can easily identify opportunities for skill acquisition occurring in secondary agricultural education's hallmark experiential learning component, SAE.

However, the decline in delivery of this facet of the model (Baggett–Harlin & Weeks, 2000; Dyer & Osborne, 1995; Rayfield & Wilson, 2009; Steele, 1997) has implications regarding agricultural education's role in the preparation of students for entry–level positions in the agricultural industry. For example, the skills being learned may not be congruent with the needs of today's agricultural industry. This discrepancy may be contributing to a decline in students participating in SAEs. However, little is known about reasons for that *decline*, especially empirically.

Today's workplace reflects the many changes that have occurred over the past century, from emergence of the information age to the shift to a global economy; the contemporary workplace requires a different set of skills (Ruffing, 2006). The career cluster 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 (Oklahoma Department of Career and Technology Education ODCTE, 2009; Ruffing, 2006). Federal lawmakers, through authorization of Perkins IV legislation, called for the development of *programs of study* at both secondary and post–secondary levels that would be aligned with industry–recognized standards (Carl D. Perkins Career and Technical Education Improvement Act of 2006, p. 683). These "career pathways are programs of academic and technical study that integrate classroom and real–world learning organized around industry" (Hoachlander, 2008, p. 23). However, little is known about the views of agricultural education teachers, who prepare students for the AFNR career cluster, regarding the role of SAE and its potential for helping students acquire entry–level technical skills.

Purpose and Objectives

The purpose of this study was to describe the perceptions of a select group of agricultural education teachers (i.e., an expert panel) regarding the entry–level technical skills they expected students to learn by participating in the SAE component of secondary agricultural education in Oklahoma. A modified Delphi technique was used to achieve this purpose. Three objectives guided this study: (a) describe selected personal and professional characteristics of secondary agricultural education teachers who comprised the study's Delphi panel; (b) describe the perceptions of panelists regarding SAE as related to the technical skill acquisition of students preparing for entry–level positions in the agricultural industry, using the seven career pathways as an exploratory framework; (c) suggest career pathways in which students should learn entry–level skills through participation in SAEs such that their job preparedness on entering the agricultural industry is enhanced.

Methods and Procedures

This was a descriptive study that employed a survey research design using the Delphi technique (Sackman, 1975). The Delphi technique is a widely accepted method for achieving convergence of opinion concerning real–world knowledge solicited from experts in certain topic areas (Hsu & Sandford, 2007). Linstone and Turoff (1975) characterized the Delphi technique as a communication process 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 and combine the responses into one useful statement or *position* (Stitt–Gohdes & Crews, 2004).

A review of the *Journal of Agricultural Education* from 2000 to 2006 revealed eight studies that relied on the Delphi technique to investigate a variety of topics of importance to agricultural education researchers. For example, the technique has been used in the area of curriculum planning and the identification of personal qualities of student leaders (Martin & Frick, 1998). Moreover, Camp, Clarke, and Fallon (2000) used the Delphi technique to examine the efficacy and structure of SAE for the 21st century.

Purposeful sampling was used to select members for the study's expert panel. Creswell (2005) 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). This design allows for development of consensus on a number of issues without face–to–face confrontation (Helmer, 1966). According to Dalkey, Rourke, Lewis, and Snyder (1972), when a Delphi panel has at least 15 members and is truly representative of the expert community, the method is reliable. For this study, a panel of secondary agricultural education teachers representing the Oklahoma Agricultural Education Teachers Association (OAETA) was used.

To ensure statewide representation, service on the OAETA Board of Directors served as the criterion for selection as a panelist: president, past president, president–elect, secretary, treasurer–reporter, district vice–presidents, and one and two–year directors. Nineteen active agricultural education teachers who held offices in Oklahoma's state level professional organization for agricultural education teachers were members of the panel. Offices are 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.

Agricultural education faculty members at Oklahoma State University established content and face validity of the initial instrument used in this study. One of the original researchers who developed the Delphi technique, i.e., Dalkey (1969), stated that reliability of .7 or greater could be achieved when the expert panel consisted of 11 members or more. 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, Dalkey et al. (1972) recommended a group size of 12 to 15 panelists. The initial inclusion of 19 secondary agricultural education teachers as panelists contributed to the reliability of the multiple round, modified Delphi procedure.

Personal and professional characteristics unique to the panel of experts were collected: gender, age, years of professional experience, and highest degree earned. Regarding SAEs (or similar 4–H projects), their types, intensity of involvement, and panelists' perceptions of benefits to themselves were also of interest to the researchers. In all, eight items were asked regarding panelists' characteristics. Using the seven career pathways for agricultural education in Oklahoma as the context, panelists were asked to identify entry–level technical skills that should be learned by students participating in the SAE component of secondary agricultural education. In addition, the following explanatory paragraph was included on the round one instrument.

> 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 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. (Ramsey, 2009, p. 57)

An electronic *reminder* message was sent to the panelists approximately one week prior to the assigned due date encouraging the return of round one responses. From round one, 555 statements (*n* = 19; 100% response rate) were provided by the Delphi panelists. The researcher analyzed each statement. Similar or duplicate statements (i.e., skills) were combined or eliminated while compound statements were separated. From 555 original statements, 260 were retained for presentation to panelists in round two.

The round two instrument asked panelists to rate their level of agreement on the entry–level technical skills retained from round one. All panelists were asked to respond to the 260 statements presented in round two. Panelists were asked to use a six–point response scale to rate the skills: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Slightly Disagree*, 4 = *Slightly Agree*, 5 = *Agree*, or 6 = *Strongly Agree*. An electronic *reminder* message was sent to panelists approximately one week prior to the assigned due date encouraging the return of round two responses. Some preliminary consensus began to form in round two. One hundred forty skills (*n* = 16; 84.2% response rate) received a score of 5 or 6 by 75% or more of the respondents and were considered skills for which consensus was reached. Moreover, 34 skills, for which less than 51% of the respondents scored the item a 5 or 6, were removed from further investigation (Hsu & Sandford, 2007).

Buriak and Shinn (1989) described the third round of a Delphi study as developing consensus. Per that, the third round instrument of this study focused on developing consensus for the 86 skills that remained. The panelists were asked to rate their level of agreement for those skills for which at least 51% but less than 75% of panelists had selected *Agree* or *Strongly Agree* in round two. The round three instrument included the percentage of panelists who indicated *Agree* or *Strongly Agree* for that skill in round two. An electronic *reminder* message was sent to panelists approximately one week prior to the assigned due date encouraging the return of round three responses. Compared to the previous round, only a slight increase in *consensus of agreement* was expected (Anglin, 1991; Dalkey et al., 1972; Jacobs, 1996; Weaver, 1971). However, an additional 21 skills received a score of 5 (*Agree*) or 6 (*Strongly Agree*) by 75% or more of the respondents and were considered skills for which consensus was reached. The remaining 65 skill items failed to reach the established level of agreement for consensus.

The 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 (i.e., ≥ 75% of the panelists indicated *Agree* or *Strongly Agree*).

Findings

Of the 19 panelists who completed the round one instrument, 94.7% were male, and 5.3% elected not to identify their gender. Fourteen of 19 (73.6%) panelists reported their age to be between 20 and 49 years of age. Five of the 19 (26.4%) panelists reported being 50 years or older. Regarding ethnicity or race, 89.4% of the panelists reported they were Caucasian, 5.3% were Native American, and 5.3% indicated being Hispanic. Nearly two–thirds of the panelists reported a bachelor's degree as their highest level of educational attainment; 36.8% of the panelists held a master's degree. Full–time employment or full–time temporary employment in agriculture prior to their careers as educators was reported by 73.6% of the teachers; 21.0% of the teachers indicated part–time employment or employment that was *mostly avocational*.

The panelists reported a range of involvement in agricultural youth organizations. 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. Five or more years of participation was reported by 68.4% of the panelists. The remaining panelists indicated four, three, or two years of participation in an agricultural youth organization. Seventy–eight percent of the panelists indicated they were *very involved* in an agricultural youth organization, 15.8% indicated *above average involvement*, and 5.3% reported *average involvement*. In addition, more than 90% of the panelists participated in an SAE/4–H project. The SAE/4–H projects included *exhibited 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%). When asked if participation in SAE/4–H projects led to entry–level technical skill acquisition, 18 of 19 (94.7%) panelists reported *yes*.

Round One Findings: Entry–level Technical Skills

The 555 skills provided by the teacher panelists in round one ranged from *General Safety* to *Identify Wholesale Cuts of Meat*. After accounting for duplicate and compound statements, 260 items were retained for presentation to the Delphi panel in round two. The number of skills identified by pathway were Agribusiness and Management (AGBMGT, *29*), Agricultural Communications (AGCM, *35*), Animal Science (ANSI, *35*), Agricultural Power, Structures and Technology (APST, *42*), Food Products and Processing (FPP, *35*), Natural Resources and Environmental Science (NRES, *30*), and Plant and Soil Science (PSS, *54*).

Round Two Findings: Entry–level Technical Skills

In round two, the panelists were asked to rate their level of agreement on 260 entry–level technical skills. The number of items reaching *consensus of agreement* (i.e., ≥ 75 % indicated *Agree* or *Strongly Agree*), by pathway, were AGBMGT, *13*; AGCM, *29*; ANSI, *23*; APST, *25*; FPP, *15*; NRES, *9*; and PSS, *26*. In total, 140 items reached the level of agreement considered as *consensus* (see Table 1).

Round Three Findings: Entry–level Technical Skills

The panelists were asked to rate their level of agreement on 86 entry–level technical skills in round three that had not reached consensus previously. The number of additional items reaching *consensus of agreement*, by pathway, were AGBMGT, *1*; ANSI, *5*; APST, *4*; FPP, *4*; NRES, *4*; and PSS, *3*. Overall, 21 additional skill items reached agreement in round three (see Table 1).

After three rounds of the modified Delphi procedure, the total number of entry–level technical skills that reached *consensus of agreement* was 161. The distribution of skills by career pathway was, AGBMGT, *14*; AGCM, *29*; ANSI, *28*; APST, *29*; FPP, *19*; NRES, *13*, and PSS, *29* (see Figure 2).

Table 1
Entry–level Technical Skills Teachers Expected Students to Learn through SAEs that Reached Consensus of Agreement after Three Rounds of a Modified Delphi Study

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%
Net worth	AGBMGT	78.60%
How to manage an inventory	AGBMGT	75.00%
Understand a balance sheet	AGBMGT	75.00%
Managing credit	AGBMGT	75.00%
Total Number of Skills for the AGBMGT 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%
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 AGCM Pathway	29	

Entry–level Technical Skills	Pathway	% Agreement
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%
Animal concerns	ANSI	92.90%
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%
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%
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%
Total Number of Skills for the ANSI 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%
Oxy acetylene welding	APST	92.90%
Equipment repair (problem solving)	APST	92.90%
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%
GMAW troubleshooting	APST	85.70%
Shop safety skills	APST	81.30%
Bill of materials	APST	81.30%
SMAW operation	APST	81.30%
GMAW parts	APST	81.30%

Entry–level Technical Skills	Pathway	% Agreement
Make minor repairs valuable in the agriculture industry	APST	78.60%
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%
Total Number of Skills for the APST Pathway	29	
Responsibility	FPP	100.00%
Decision making	FPP	100.00%
General safety	FPP	100.00%
People skills	FPP	100.00%
How to read and understand a nutrition label	FPP	100.00%
Communication	FPP	100.00%
Selection of products	FPP	92.90%
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%
Food handling safety	FPP	85.70%
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%
Basic knowledge and application of food products	FPP	78.60%
Identify wholesale cuts of meat	FPP	75.00%
Grades of meat	FPP	75.00%
Equipment operation	FPP	75.00%
Total Number of Skills for the FPP Pathway	19	
Work skills	NRES	93.80%
Identification of all things related to SAE	NRES	87.50%
Wildlife habitat recognition	NRES	85.70%
Wildlife management	NRES	85.70%
Map reading (GPS)	NRES	81.30%
Land use	NRES	81.30%
Basic knowledge, appreciation for the environment	NRES	81.30%
Wildlife conservation	NRES	78.60%
Tree identification	NRES	78.60%
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%
Total Number of Skills for the NRES Pathway	13	

Entry–level Technical Skills	Pathway	% Agreement
Chemical safety	PSS	93.80%
Soil conservation	PSS	93.80%
Weed control	PSS	93.80%
Farm Safety	PSS	92.90%
Crop identification	PSS	87.50%
Proper planting techniques	PSS	87.50%
Positive environmental impacts on soil	PSS	85.70%
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%
Identify beneficial insects	PSS	78.60%
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%
Total Number of Skills for the PSS Pathway	29	
Total Number of Skills for all Pathways	161	

Note. Wording represents the panelists' verbatim responses with the exception of editing for spelling in a few cases, and the addition of parenthetical information for improved clarity.

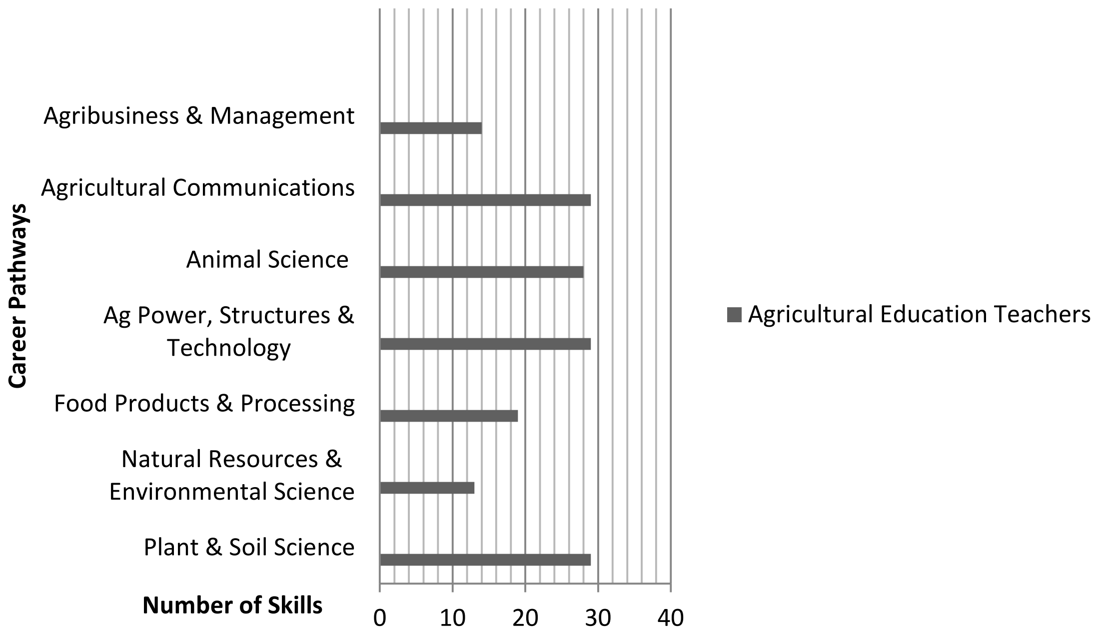

Figure 2. Total number of entry–level technical skills reaching *consensus of Agreement*, as identified by career pathway

Conclusions

Concerning objective one, a majority of the teacher panelists were Caucasian males who ranged in age from 20 to 49. A majority of panelists identified FFA as the agricultural youth association in which they were most involved as youth. Most panelists reported five or more years of participation in agricultural youth associations; the panelists' predominant level of participation was *very involved*. Ninety–five percent of panelists reported participation in SAEs or 4–H projects as youth. A majority of the SAEs or 4–H projects were entrepreneurial; panelists perceived their participation had led to the acquisition of entry–level technical skills.

Regarding objective two, the expert teacher panelists reached *consensus of agreement* on 161 entry–level technical skills that should be learned by students participating in SAEs (see Table 1). It was concluded that a student learning these technical skills could facilitate his or her preparation for an entry–level position in the agricultural industry. The panelists identified Agricultural Communications, Agricultural Power, Structures, and Technology, Animal Science, and Plant and Soil Science as career pathways having the most entry–level technical skills that reached *consensus of agreement*, i.e., 29, 29, 28, and 29 skills, respectively (see Table 1; Figure 2). Therefore, based on the teacher panelists' perceptions, it was concluded that SAE held the most potential for students learning entry–level technical skills related to those career pathways.

As for objective three, this study identified the career pathways that selected teacher panelists perceived as having the largest number of entry–level technical skills that should be learned by students who participate in the SAE component of secondary agricultural education in Oklahoma. These findings support Roberts and Ball's (2009) content–based model of teaching agricultural education and expand its relevance to SAE. Specifically, the identification of entry–level technical skills per the seven career pathways for the AFNR career cluster informs the *Agricultural Instruction and Skill Acquisition* component of their model (see Figure 1).

Recommendations

Recommendations for Future Research

The teachers identified entry–level technical skills in all seven pathways; however, they reached *consensus of agreement* on significantly fewer skills representing the Agribusiness and Management, Food Products and Processing, and Natural Resources and Environmental Science pathways. These pathways represent important agricultural employment sectors in Oklahoma (Oklahoma Department of Commerce, 2005), but the panelists did not view SAE as a program component through which students could learn as many entry–level technical skills when compared to the other four career pathways. Investigations should be conducted to determine the perceptions of teachers regarding their adoption of career pathways as a context for planning and delivering the secondary agricultural education program. It may be equally important to understand teachers' information sources informing their views on the changing workforce needs in Oklahoma and what that should mean to their programs' educational priorities, including students' SAEs.

Additional studies are required 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. To that end, special attention should be paid to Roberts and Ball's (2009) model (see Figure 1) such that any future research is additive. Although entry–level technical skills viewed through the contextual prism of the AFNR Career Cluster were identified by this study, more understanding is needed to inform the development of a robust and mature model pertaining to students' SAEs.

Recommendations for Future Practice

Teacher educators should make the AFNR Career Cluster and its 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 opportunities that exist for entry–level technical skill acquisition by students should be emphasized.

State staff members responsible for agricultural education should consider facilitating externships that allow teachers to experience industry workplaces and expectations for entry–level workers. According to Luft (1999), externships help teachers make their instruction more relevant when preparing students for the world of work. Work–based learning experiences are important for teachers and students of agricultural education.

Teachers could use contextual examples from their externship experiences when planning, facilitating, and assessing students' SAEs. Teacher attitudes and expectations influence student participation in SAEs (Dyer & Osborne, 1995). Camp et al. (2000) reported that SAE, as structured then, was a vital component of a comprehensive program of secondary agricultural education. This study found that the teacher panelists perceived students should learn entry–level technical skills related to employability in the agricultural industry. So, teachers, teacher educators, and state program leaders should continue to facilitate and promote the SAE component of secondary agricultural education. In particular, teachers should consider increasing their collaboration with industry partners to provide worksite placement opportunities for students.

Discussion and Implications

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 existed (2008–2009 Official FFA Manual). A comprehensive program model consisting of classroom and laboratory instruction, FFA, and SAE is used to deliver experiential learning opportunities to students enrolled in secondary agricultural education (Dyers & Osborne, 1995; Roberts & Ball, 2009, Talbert et al., 2007). This study supports using the SAE component of secondary agricultural education to assist students in learning entry–level technical skills. However, not all AFNR career pathways were viewed by the study's Delphi panelists as holding or promoting a substantial number of entry–level technical skills.

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 (Oklahoma Department of Commerce, 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. To that end, the findings of this study are incongruent or *imbalanced* with the needs identified by the Governor's Council for Workforce and Economic Development report (Oklahoma Department of Commerce, 2005). The teacher experts reached *consensus of agreement* on only 19 entry–level technical skills for the FPP pathway and 29 skills in the career pathway APST. These are career pathways that could prepare students for entry–level positions in the Mechanical and Food Production sectors of the agriculture and food processing industry in Oklahoma and its region. However, was the teacher panel's consensus on 19 and 29 skills, respectively, sufficient?

Roberts and Ball (2009) proffered a content–based model for teaching agriculture (see Figure 1) relying on industry–relevant instruction that results in observable skill acquisition by students. But how should teachers acquire industry–relevant content knowledge and skills such that they can facilitate SAEs by which students learn and practice entry–level technical skills sufficiently? Is Luft's (1999) view on *externships* an appropriate answer? What may be other methods or approaches? These questions require further consideration and study by agricultural education professionals.

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