AGRICULTURAL POWER, STRUCTURES, AND TECHNOLOGY ENTRY-LEVEL SKILLS: A COMPARISON OF INDUSTRY EXPERTS AND SCHOOL-BASED AGRICULTURAL EDUCATION TEACHERS' VIEWS IN OKLAHOMA

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Title of Study: AGRICULTURAL POWER, STRUCTURES, AND TECHNOLOGY ENTRY-LEVEL SKILLS: A COMPARISON OF INDUSTRY EXPERTS AND SCHOOL-BASED AGRICULTURAL EDUCATION TEACHERS' VIEWS IN OKLAHOMA

Major Field: AGRICULTURAL EDUCATION AND LEADERSHIP

Abstract:

Do you recall anyone questioning the curriculum currently being taught in schools? This question comes up frequently among parents, teachers, and school administrators when reviewing current trends in education (Mkandawire et al., 2018). Curriculum is easily accessed due to the transparency of school districts and various media platforms (Mkandawire et al., 2018). With new innovations in the agricultural power, structures, and technology (APST) field, the need for curriculum review and review of technical skills being taught within school-based agricultural education (SBAE) programs should be addressed. When considering SBAE programs that offer agricultural power, structures, and technology (APST) courses, it may be difficult to identify curriculum featuring recent innovations used in industry (Saucier et al., 2018). As the need for a more well-equipped workforce comes to fruition, industry experts must work with local, state, and national departments of education to aid in the development of relevant industry-validated curriculum. This research highlights the comparison of APST technical skills sought by industry experts for potential primary employment and technical skills related to APST taught in SBAE agricultural mechanics and related courses in Oklahoma.

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Chapter I

Introduction

Do you recall anyone questioning the curriculum currently being taught in schools? This question comes up frequently among parents, teachers, and school administrators when reviewing current trends in education (Mkandawire et al., 2018). Recent trends reflect new innovations and concepts concerning delivery of online distance learning and student engagement strategies (Zepke & Leach, 2010). Curriculum is easily accessed due to the transparency of school districts and various media platforms (Mkandawire et al., 2018). When considering school-based agricultural education (SBAE) programs that offer agricultural power and technology courses, it may be difficult to identify curriculum featuring recent innovations used in industry (Saucier et al., 2018).

Agriculture has been a long-standing interest of humankind. Because humans have had the ability to hunt and fish, forage, and raise crops on their own accord, agriculture and humans have experienced a mutualistic relationship. With passage of the Smith-Hughes Act of 1917, federal funds were allocated to help aid in the development of vocational education, including agricultural education, across the United States. It was determined the vocational education being provided in many comprehensive public schools was inadequate, because many industry needs were not being taught within the comprehensive school setting (P.L 64-347, 1917; H.R. 4164, 1984).

> Many secondary educators believed a large number of students enrolled in high schools were not qualified to be there, and that due to their attendance, standards of scholarship and knowledge were being seriously affected. While one faction believed that the major purpose of secondary education should continue to be preparation for higher education and expressed concern about the enrollment of a significant number of students who did not plan to attend college, others were concerned that secondary education continued to be primarily involved with college preparation and was not providing educational opportunities for the majority who needed a kind of education that was not college preparator. (Ogden, 1990, as cited in Butts & Cremin, 1953)

It would later be identified, by the Vocational Education Acts of 1963 and 1984, criticisms with the idea of gender and race classification within certain subjects, as well as, increased differentiation of vocational subject being taught within different schools.

Research conducted in the mid-to-late 2000s identified what agricultural power, structures, and technology (APST) industry experts expected students to learn from their respective Supervised Agricultural Experiences (SAEs). However, when compared to the perceptions of agricultural educators, those skills did not align (Ramsey & Edwards, 2011, 2012). Hubert (1996) had recommended "required preparatory courses in agricultural mechanics need to address current technology and skill areas as reflected by the changing agricultural industry" (p. 56). Research conducted in the area of skill acquisition and skill needs by individuals within the agricultural teaching profession has outweighed that done regarding industry experts' opinions on student needs to enter the workforce (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Differences in skills and competencies exist associated with available APST curriculum (Aakre & Bergin, 2020; Fulgenzi & Gibson, 2015; Fulgenzi & Milligan, 2016). With various options for curriculum implementation available to teachers, discrepancies regarding student skill and competency preparation occur (Nasr & Sharif, 2012). By identifying introductory skills and competencies and related acquisition, teachers could potentially assist students in finding employment within the agricultural mechanics industry (Hainline & Wells, 2019; Roberts & Ball, 2009).

Problem Statement

Content standards within primary and secondary classroom curriculum should be associated with validated learning standards. Content standards "describe the knowledge and skills that students should obtain" (Ohio Department of Education, n.d., para. 2). Content standards in agricultural education courses taught in SBAE should align with industry-validated curricula. These standards are the foundation for what should be taught and the skills or competencies students should be expected to know and perform at the conclusion of a lesson, unit, and course. Unfortunately, technical skills and competencies needed by students for employment are not always aligned with industry validated curriculum (Wall, 1972).

Purpose

The purpose of this study was to identify the alignment of agricultural power, structures, and technology (APST) technical skills required for employment as provided by industry experts with the APST skills being taught by selected agricultural educators in Oklahoma.

Objectives

Five objectives guided this study:

1. Identify the technical skills required by APST industry experts.

2. Identify the technical skills taught in APST courses in Oklahoma SBAE programs.
3. Identify selected personal and professional characteristics of the SBAE teacher expert panelists.
4. Identify selected personal and professional characteristics of the Oklahoma APST industry expert panelists.
5. Determine alignment of the technical skills taught by Oklahoma SBAE teachers and those sought by Oklahoma APST industry experts.

Definitions

Agriculture Industry: Industry encompassing "the production of agricultural commodities such as food, fiber, wood products, horticulture crops, and countless plant and animal products" (Koel et al., 2018, p. 15).

Agricultural Mechanics: selection, operation, maintenance, service, sale, and use of power units, machinery, equipment, structures, and utilities in agriculture (Herren, 2010).

APST: Career pathway relating to "the operation and maintenance of components, structures, and equipment used by the agriculture industry (Koel et al., 2018, p. 3).

Competencies: The ability to apply knowledge, skills, and related abilities to perform required work or tasks in a given setting (Lasse, 2020).

Curriculum: The combination of instructional practices, learning experiences, and students' performance assessment that are designed to bring out and evaluate the target learning outcomes of a particular course (University of Delaware, n.d.).

Curriculum for Agricultural Science Education (CASE): Curriculum developed for 11 different agricultural related courses. Developed using various instructional, pedagogical,

and assessment strategies for use within school-based agricultural education programs (Curriculum for Agricultural Science Education, n.d.).

Industry-Validated Curriculum: "curriculum that is developed with business or industry input and that is based on competencies and assessments that reflect the skills and knowledge necessary for a specific job or jobs within a specific type of business or industry" (Wisconsin Statute for Higher Education, 1974/2018, sec. 38.28).

Instruction: "the development of desirable attitudes, interests, ideals, appreciations, understandings, habit formations, and effective abilities" (Cook, 1947, p. 168-169).

Learning Standard: "Standards provide state agricultural education leaders and educators with a high-quality, rigorous set of standards to guide what students should know and be able to do after completing a program of study in each of the AFNR career pathways" (The National Council for Agricultural Education, 2018, para. 1).

School-Based Agricultural Education (SBAE): An educational program devoted to the promotion of teaching agriculture, food, and natural resource subjects to students in a school-based learning environment (SBAE.org, 2020).

Technical Skills: "sets of abilities or knowledge used to perform practical tasks in the areas of science, the arts, technology, engineering, and math" (Chen, 2021).

Scope of the study

The scope of this study featured the opinions of two expert panels. The first expert panel reflected SBAE teachers from the Central Region of Oklahoma as defined by the Oklahoma Agricultural Education Teachers Association and Oklahoma Career and Technical Education. The selected teacher panelists had experience teaching APST and with students participating in the Oklahoma Youth Exposition (OYE) Agricultural Mechanics Competition. The second expert

panel included industry personnel associated with the Oklahoma Youth Exposition Agricultural Mechanics Competition as well as other identified industry personnel whose employment was associated with the APST industry.

Assumptions

There were three assumptions included in this study:

1. All SBAE expert panelists were currently teaching in a comprehensive school district and taught at least one APST course.
2. SBAE panelists had a minimum of one student participate at the Oklahoma Youth Exposition Agricultural Mechanics Competition, or, taught in the Central Region as defined by the Oklahoma Agricultural Education Teachers Association during the 2020 – 2021 school year.
3. Industry expert panelists had sponsored the Oklahoma Youth Exposition Agricultural Mechanics Competition or were employed by organizations that worked within the APST industry of Oklahoma.

Limitations

The limitations of the study are SBAE teachers' populating the expert panel were identified as an expert by the OYE Agricultural Mechanics Competition superintendent, i.e., a key informant. The APST industry experts were purposefully selected if they had sponsored the OYE Agricultural Mechanics Competition or they worked in Oklahoma's APST industry. As a Delphi study, the opinions and results of this study should not be generalized beyond the study's panels.

Chapter II

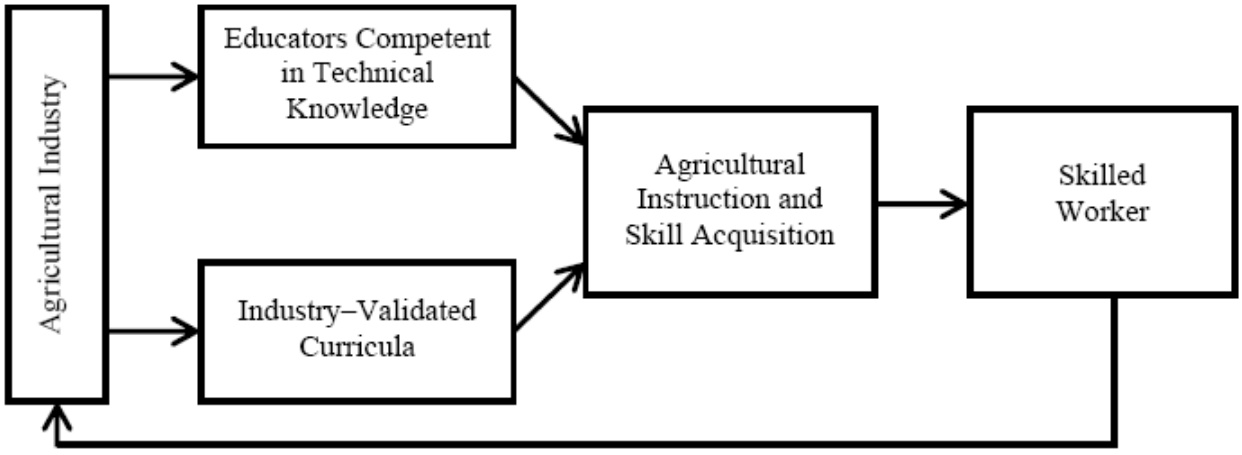
Literature Review

Conceptual Framework

The conceptual framework for this study was grounded in the content-based model for teaching agriculture (Roberts & Ball, 2009, p. 84) [Fig. 1]. The model was based on the works of John Dewey and David Snedden, and conceptualized "agriculture as content" (p. 82). The model represents a simplified conception of how a skilled worker in agriculture is prepared. The model represents a two-part system within the agricultural industry with SBAE teachers and "Industry-validated curricula" (p. 84) coming together to create SBAE instruction. Individuals who complete this process would then be classified as a "Skilled Worker" (p. 84) who would then be fully prepared to enter the "Agricultural Industry" (p. 84).

Figure 1

A Content-Based Model for Teaching Agriculture.



Note. Adapted from "Secondary Agricultural Science as Content and Context for Teaching," by

T. G. Roberts and A. L. Ball, 2009, *Journal of Agricultural Education, 50(1),* p. 84. Copyright 2009 by the American Association for Agricultural Education. Reprinted with permission

Using this conceptual framework, the industry skills desired for employment can be viewed as the "industry-validated curricula" (Roberts & Ball, 2009, p. 84), as taught by agricultural education teachers i.e., "Educators competent in Technical Knowledge" (Roberts & Ball, 2009).

Historical Purpose and Aspects of SBAE

School-based agricultural education can trace its roots back to the Morrill Act of 1862 and the Smith-Hughes Act of 1917 (Kosar, 2016). The Morrill Act of 1862 helped establish funds for states to create land-grant institutions to provide higher education focused on the practical arts including agriculture (P.L 37-108, 1862). The Smith-Hughes act provided federal funds to schools for the support of promoting and providing courses directly related to agricultural and vocational industries (P.L. 64-347, 1917). It was during this time the groundwork for the three-circle model of agricultural education would be formed (Phipps, 1956).

Prior to the Morrill Act of 1862, Jonathan Baldwin Turner of Illinois advocated for skill-based higher education. Turner's plan for an 'Industrial University for the State of Illinois included his thoughts on how agriculture and vocational studies should be taught within higher education institutions on the subjects of "anatomy, physiology, instincts and habits of all animals, soils, and bookkeeping" and that "no species of knowledge should be excluded, practical or theoretical" (Herren & Hillison, 1996, p. 27). The Illinois legislature would then take Turner's ideas and suggestions to draft a resolution to motivate the U.S. Congress:

> [to pass a law] donating to each state in the Union an amount of public lands not less in value than five hundred thousand dollars, for liberal endowment of a system of industrial

> universities, one in each state of the union (Carriel, 1961, p. 116, as cited in Herren & Hillison, 1996, p. 28).

With the Morrill Act of 1862 helping to establish public universities devoted to the teaching of agriculture and mechanical studies, the formal teaching of agricultural education in United State higher education institutions was established (Morrill Act, 1862).

According to Dr. Robert Terry (personal communication, September 23, 2020), universities, such as Oklahoma State University, were teaching agricultural education prior to the Smith-Hughes Act of 1917. The Smith-Hughes Act, was federal legislation that appropriated funds to help promote the teaching of industrial education, agriculture, and home economics (Smith-Hughes Act, 1917). The funds appropriated were distributed by the newly created Federal Board of Vocational Education and each state was allotted a certain amount depending on the student enrollment and financial need of each state (Smith-Hughes Act, 1917). Most states would provide funds to public, comprehensive school districts, however, not all states followed this approach. Other universities teaching agricultural education included the University of Missouri-Columbia, The Ohio State University, and the University of Illinois.

Over time, the need for changes in vocational training and vocational education were identified. In 1963, the Vocational Education Act was passed by Congress to aid in the promotion of enhancing and providing additional vocational training to individuals in high school and individuals seeking post-secondary training (H.R. 4955, 1963-1964). The federal funds were to be allocated to high schools, vocational and technical schools, colleges and universities for the training of students and teachers of vocational subjects (H.R. 4955, 1963-1964).

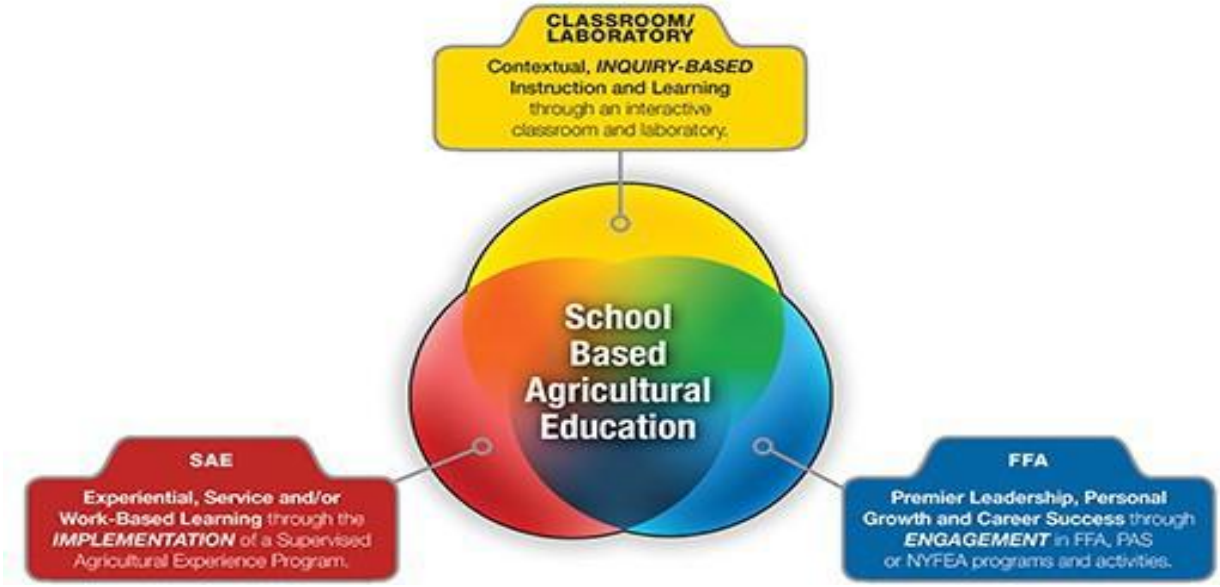
In 1984, representative Carl D. Perkins would propose H.R. 4164 (1983-1984), which would extend the Vocational Education Act of 1963, as well as provide additional funding to programs in education training individuals in vocational studies. H.R. 4164 (1983-1984) would fund programs at the state level on a fund-matching system. Funds could be used for the procurement of educational equipment, training teachers in the vocational arts, employment training and retraining, and for career-based counselors (H.R. 4164, 1983-1984). Part of the focus for H.R. 4164, was the focus on education of previously underserved individuals and students with special educational needs (Penny, 2019). This act would continue to be revised and reenacted on a five-year cycle and continues to be a primary source of funding for career and technical education in the United States.

The Agricultural Education Model

The three-component agricultural education model can be viewed as a Venn-diagram consisting of three different but hypothetically equal components that overlap [Fig. 2]. These three components include classroom and laboratory instruction, supervised agricultural experience (SAE), and FFA (Croom, 2008; National FFA Organization, 2020). The model provides a visual of the three components to be incorporated while developing and delivering SBAE programs (National FFA Organization, 2020).

Figure 2

School-Based Agricultural Education Three-Component Model



Note. Reprinted from *School-Based Agricultural Education Three-Component Model*. (2021). National FFA.

The classroom and laboratory segment includes all instruction occurring within the formal educational setting of SBAE, whether in a classroom or laboratory (Croom, 2008; Hainline & Wells, 2019; Phipps, 1956). Classroom instruction has been studied by various researchers focusing on independent subjects, time frames, and styles. Early education was based on the current needs of the people, religious studies, and teaching young boys and men to learn about vocational trades and agriculture (Steffes, 2020). Whereas females during the early periods of formal education were taught skills pertaining to home making and childcare (Steffes, 2020). Over time, classroom instruction took on the role of providing education in regard to diminishing illiteracy (True, 1915). “Classroom activities are characterized by learning activities designed by an agriculture teacher and presented to students using formal instruction methods such as lecture,

demonstration, guided and independent practice, review, and assessment" (Croom, 2008, p. 110). Typical agricultural education programs offer classroom instruction in agricultural mechanics, plant sciences, animal sciences, business and program management, natural resources, and food science (Albritton & Roberts, 2020). Within each one of these content areas, different educational standards, skills, projects, community and student needs, resource availability, advantages and disadvantages should be addressed by the instructor.

The SAE component was based on the concept of having "youth apprenticeship to skilled tradesman or as informal education at home" (Croom, 2008, p. 113). These apprenticeships were artifacts from early civilization and were a known component with settlers throughout the American colonies. Over time, the United States school system would evolve to promote early education and work to advance basic knowledge skills in various topics such as reading and mathematics (True, 1915). This aspect of the model dealing with SAEs, according to Phipps (1956), encompassed students' personal projects in and outside of the classroom through experiential learning. Students can participate in six main SAE types: foundational, ownership/entrepreneurship, placement/internship, research-based, school-based enterprise, and service-learning experience (National FFA Organization, 2017). Each type has its own set of advantages and challenges that aid students in learning through their agricultural education experiences. Each subject area taught within the agricultural education program has opportunities students can explore at deeper levels through their SAEs. Students who participate in an SAE have the opportunity to potentially receive FFA awards, degrees, and scholarships to colleges and universities. The SAE component of the three-circle model can be viewed as a bond between FFA and SBAE classroom instruction components.

The FFA component of the model features the youth development organization formerly known as The National Future Farmers of America. “Organizations for agricultural youth grew out of the boys and girls clubs established at the turn of the twentieth century” (Croom, 2008, p. 114). Corn clubs were originally held to discuss the growing season and provide an annual corn show to display the years’ crop (Bryant, 1911). From there, more clubs began to involve other vegetable crops and each member was required to read a certain passage or provided text to be informed about what was discussed (Croom, 2008; True, 1915). The National FFA organization would become a formal and nationally recognized organization in 1928 in Kansas City, Missouri (National FFA Organization, 2020). One of the main purposes of the development of the National FFA Organization was to help promote “social development and agricultural skill development” (Croom, 2008, p. 114). The National FFA organization focuses on “making a positive difference in the lives of students by developing their potential for premier leadership, personal growth and career success through agricultural education” (National FFA Organization, 2017, p. 35). The last three words in the mission statement, “through agricultural education,” exemplifies how the classroom and FFA intertwine with each other (see Fig. 2).

Agricultural Mechanics Curriculum in SBAE

In the Agricultural Power and Technology Curriculum for Agricultural Science Education (CASE) (Aakre & Bergin, 2020), students learn about the basic designs and processes of early agricultural machines such as a lever, fulcrum, and windmills. In early education settings, young men and women learned through an apprenticeship system to acquire valuable trade and home economic skills (Lauwerys et al., 2021). Over time, the primary education setting would provide young men, and women whose families could afford to send to schooling, basic education in subjects such as mathematics and religious studies. For agricultural and vocational

education, citizens who could not afford proper schooling continued to learn through apprenticeships (Lauwerys et al., 2021). As printing was enhanced and became more readily available and trade routes were established, more people began moving further distances for new opportunities. Commonalities in practices began to unfold within these apprenticeships (Lauwerys et al., 2021).

Agricultural mechanics-related curricula are abundant in the professional world. Many organizations such as Lincoln Electric, Hobart, and John Deere, among others have provided and aided in the development of industry-validated curricula (Fulgenzi & Gibson, 2015; Fulgenzi & Milligan, 2016; Koel et al., 2018). Other organizations have not only worked with corporations, but also with industries outside of the agriculture sector to incorporate more science, technology, engineering, and mathematics (STEM) into the curriculum (Aakre & Bergin, 2020). With this variety of offerings, similarities and differences within the given competencies were represented. These differences can lead to a wide range of student preparedness inside and outside of the classroom (Hainline & Wells, 2019; Saucier et al., 2012).

Oklahoma Department of Career and Technology Education, through the Curriculum and Instructional Materials Center (CIMC) developed curriculum for the agricultural education profession until 2015 (Fulgenzi & Gibson, 2015). This curriculum is widely utilized by agricultural educators in Oklahoma and bases its standards on the National Agriculture, Food, and Natural Resources standards put forth by The Council (Fulgenzi & Gibson, 2015; Fulgenzi & Milligan, 2016). The Introduction to Agricultural Power and Technology curriculum contains 24 units ranging from general safety to shielded metal arc welding to electrical principles (Fulgenzi & Gibson, 2015). Each unit focuses on one aspect of the larger agricultural mechanics

industry. The curriculum contains assignment, activity, and lab sheets, written tests, PowerPoints, grading rubrics, and OSHA fact sheets (Fulgenzi & Gibson, 2015).

Another available curriculum is the Curriculum for Agricultural Science Education (CASE). The CASE curriculum offers courses in Introduction to Agriculture, Food, and Natural Resources, Agricultural Power and Technology, and Mechanical Systems in Agriculture (CASE, n.d.). Each CASE course offers varying degrees of difficulty and includes different units of instruction that align with a specific sector of agriculture. The design of the curriculum is to allow students in typical comprehensive SBAE programs to complete the entire pathway of courses if offered by the school should they so desire. The final course for the pathway is the Agricultural Research and Development curriculum. This is the final course in all CASE curriculum pathways, it looks to encompass all course work taught and provides students with the opportunity to complete their own research projects (CASE, n.d.).

Delphi Research

Delphi research techniques have been utilized in a variety of research studies including agriculture, education, business, technology, the medical industry and beyond (Hainline & Wells, 2019; Mkandawire et al., 2018; Ramsey & Edwards, 2011, 2012; Wells et al., 2021). Weaver (1971), stated "[T]he Delphi Technique is an intuitive methodology for organizing and sharing 'expert' forecasts about the future" (p. 267). The Delphi method has been found to be a great asset when considering the opinions of various individuals of differing stature within an organization or network (Weaver, 1971). The Delphi technique allows "researchers to combine the reports or testimony of a group of experts into one, useful statement" (Stitt-Gohdes & Crews, 2004, p. 56). A Delphi research study may be appropriate if one or more of the following are identified:

1. The problem does not lend itself to precise analytical techniques but can benefit from subjective judgements on a collective basis.
2. More individuals are needed than can effectively interact in a face-to-face exchange.
3. Time and cost make frequent group meetings infeasible.
4. Disagreements among individuals are so severe or politically unpalatable that the communication process must be referred and/or anonymity assured.
5. The heterogeneity of the participants must be preserved to assure validity of the results, i.e., avoidance of domination by quantity or by strength of personality (Linstone & Turnoff, 1975, as cited in Stitt-Gohdes & Crews, 2004, p. 56-57).

In agricultural education, studies have featured topics ranging from identifying teacher knowledge and skills of Iowa SBAE teachers to identifying industry professionals' views versus teacher perceptions of skills learned in student SAEs, Delphi studies have helped researchers explore a variety of topics (Hainline & Wells, 2019; Ramsey, 2009; Saucier et al., 2012). In addition, the Delphi method has aided researchers in detecting areas of teacher preparation improvements at universities as well as potential in-service opportunities for educators (Hainline & Wells, 2019; Ramsey, 2009; Saucier et al., 2012). Another commonality within agricultural education studies that used the Delphi technique was the need to gain a consensus of expert opinions from various states on a particular topic or issue (Albritton & Roberts, 2020; Buriak & Shinn, 1993; Eck et al., 2019).

Single-panel Delphi studies are typically conducted when one group of experts, as defined by the investigator, are questioned to distinguish "convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas" (Hsu & Sandford, 2007,

p. 1). Saucier et al. (2012) conducted a single-panel Delphi study “to determine the essential agricultural mechanics skill areas needed for beginning Missouri school-based agricultural educators” (p. 139). In this study, 24 Missouri school-based agricultural educators were identified as experts within their state FFA district by their respective district supervisor and the professional development specialist of the Missouri Department of Elementary and Secondary Education (DESE). The study found 23 skills met consensus among the expert panelists. The final, or fourth round, of the study asked panelists to rank the individual skill areas from most to least important. The authors recommended institutions preparing SBAE teachers use the list of ranked skills to conduct an analysis of their individual programs to ascertain if they were adequately preparing their preservice teachers for employment (Saucier et al., 2012). Regarding a more regional study, Albritton and Roberts (2020) were interested in the technical skills needed by early career agricultural teachers. The researchers utilized the Southern Region of the American Association for Agricultural Education (AAAE) members who were teacher educators. The expert panels were made up of teachers who had taught five or more years, entry-level teachers with three years or less of experience, and teacher educators. Albritton and Roberts (2020) found various levels of skills needed by early-career teachers from the three expert panels. This was an important finding as it allowed other researchers, teacher educators, and novice teachers to view which technical skills various experts identified regarding what is needed in teacher preparation, professional development, or extension education.

Double-panel Delphi studies are typically conducted when researchers want to discover opinions from two different panels of experts and compare the results. An example of this study was conducted by Ramsey (2009): 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. Ramsey (2009) sought to "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" (p. 49). One panel included individuals whom represented various agricultural industries ranging from livestock to crops to agribusiness. The second panel was comprised of Oklahoma agricultural educators who had previously served on the Oklahoma Agricultural Education Teachers Association's (OAETA) Board of Directors in a minimum of one of the eight positions. Ramsey's (2009) study resulted in a consensus of agreement regarding 161 skills indicated by the teachers' panel and 60 skills from the industry panel.

Summary

Through the use of Roberts' and Ball's (2009) conceptual framework, a clearer understanding of how agriculture curricula transforms from basic conceptualization, to integration, to skilled learners can be obtained. The conceptual framework's basis is the identification of how "Industry-Validated Agricultural Curricula" and "Knowledge across Domains" conjoin to create "Integrated Curricula" (Roberts and Ball, 2009). The final piece of this framework aids in preparation of students and related student learning experiences to be "Successful Life Long Learners that are Agriculturally Literate Citizens" and "Skilled Agricultural Workforce" (Roberts & Ball, 2009).

Agricultural education can trace its heritage back to the Morrill Act of 1862 and the Smith-Hughes Act of 1917 (Cook, 1947). These legislative acts allocated federal funds to create land-grant universities (Morrill Act, 1862) in each state, and subsequent secondary vocational

education programs in U.S. high school settings (Smith-Hughes Act, 1917) including SBAE. These pieces of legislation would become instrumental in the establishment of agricultural science education in the United States.

The three-circle model for agricultural education encompasses classroom and laboratory instruction, FFA, and SAE (Croom, 2008; Hainline & Wells, 2019; National FFA Organization, 2017, 2020; Ramsey, 2009). Each component has its own primary focus on which teachers provide learning experiences at specific points within their SBAE programs. Each of these areas should overlap each other, signifying that such integration should occur within the SBAE program.

Agricultural mechanics curriculum in the United Sates can vary widely from state-to-state based on the industry-validated curricula provided to SBAE programs. To help provide a basis for agricultural mechanics curriculum, the Curriculum for Agricultural Science Education (CASE) has developed two courses focused on various agricultural mechanics skills and competencies. The CASE Agricultural Power & Technology (Aakre & Bergin, 2020) course is designed to teach students skills and competencies in shop safety, tool operation, fabrication, energy & power, machinery management, and so forth. The CASE Mechanical Systems in Agriculture (CASE, n.d.) takes the skills and competencies learned in the Agricultural Power & Technology course and expands the content to the areas of electrical, structural, and energy systems, while also exploring machine service, geographic/global positioning, and mechanical design.

The Delphi research methodology has been used widely in agricultural and extension education (Hainline & Wells, 2019; Hubert, 1996; Ramsey, 2009; Wells & Hainline, 2021; Wells et al., 2021). From teacher education preparation (Hainline & Wells, 2019), to skills

agricultural educators expect to be learned within students' SAE programs (Ramsey, 2009), to the course requirements required by different teacher educator preparation programs (Hubert, 1996), the Delphi method has been found to be a valid research methodology. Through the use of the Delphi research technique, the main purpose of this study is to find a level of agreement of opinions among experts (Hsu & Sandford, 2007). The studys' final round of data collection will allow the researcher to conclude their findings and make recommendations for future research and practice (Linstone, 1979).

Chapter III

Methodology

Introduction

Chapter III provides an overview of the methodological approach utilized in the research study. Chapter III also explains data collection and data analysis procedures. This chapter is comprised of: the purpose of the study, an explanation of the Institutional Review Board requirements from Oklahoma State University, the identification and selection of Delphi panelists within the study, instrumentation, data collection between the two separate panelists, and concludes with an explanation of the data analysis.

Purpose

The purpose of this study was to identify the alignment of agricultural power, structures, and technology (APST) technical skills required for employment as provided by industry experts with the APST skills being taught by selected agricultural educators in Oklahoma.

Institutional Review Board

Oklahoma State University and the United States Department of Health and Human Services require review of all research projects and studies that require human subjects prior to investigators beginning their research. Approval of research to be conducted at Oklahoma State University is provided by the Office of Research Compliance and the Institutional Review Board (IRB). The initial and subsequent approvals of the initial study and modifications, due to the second and third round questionnaires being created during the initial study period, were provided to

the Oklahoma State University Institutional Review Board. The institutional review board application number for this study was IRB-21-280 (Appendix A).

Research Design

For this study, two expert panels were identified. One panel featured industry experts and the other panel included SBAE teachers. Industry experts in agricultural power, structures, and technology (ASPT) were identified from the list of sponsors of the Oklahoma Youth Exposition (OYE) Agricultural Mechanics Competition. Industry sponsors of the OYE Agricultural Mechanics Competition were asked to identify personnel with direct links to skilled workers within their organizations and networks. Credentials were verified based on years of experience and testimonials of peers. The SBAE teachers were identified as having had a minimum of one student who participated in the OYE Agricultural Mechanics Competition in 2021.

Face and content validity of the questionnaires were established by the agricultural education teacher educators, prior to administering the questionnaires.

The level of consensus for this study was set at 70.00% or greater for the skills identified by the two expert panels (Ogbeifun et al., 2016; Stitt-Gohdes & Crews, 2004). As group size increases, the reliability of the results also increases, and the chances that replication of the same conditions would generate the similar results (Dalkey, 1969). The reliability of this study is based on a minimum of three responding personnel on each expert panel (Ogbeifun et al., 2016). A minimum of three to 11 Delphi panelists is crucial to maintain reliable data (Dalkey, 1969; Hsu & Sandford, 2007; Ogbeifun et al., 2016).

Identification and Selection of Delphi Panelists

The population for the SBAE panel consisted of 467 SBAE teachers. To better identify technical skills taught in APST courses, the researcher purposefully selected teachers known for

their expertise in teaching agricultural mechanics content. The selection criterion for the study's teacher panel also had connections to the Oklahoma Youth Exposition (OYE) Agricultural Mechanics Competition having a minimum of one student competing in the 2021 competition. Additional criteria included teachers who taught APST courses in the Central Region of the Oklahoma Agricultural Education Teachers Association (OAETA) during the 2020 – 2021 school year. Thirty-one SBAE teachers were identified, after two attempts made by the researcher and committee chair at recruitment, to possess technical knowledge and teaching skills related to agricultural mechanics and associated with the OYE Agricultural Mechanics Competition and/or were teachers in the Central Region of the OAETA.

The OAETA Central Region was chosen for two reasons: 1. The Central Region is the most populous region of Oklahoma and offers many APST industries, and 2. With Oklahoma State University and the Oklahoma Department of Career and Technology Education residing in the Central Region (see Appendix X).

The second panel was composed of industry personnel who provided sponsorship to the OYE Agricultural Mechanics Competition, or were identified via snowball sampling (Naderifar et al., 2017) of industry personnel from across the OAETA Central Region. The industry experts represented various industries of APST in Oklahoma i.e., in their job positions and having being associated with the agricultural mechanics field. The final potential panel (n = 33) identified for this study represented various areas within the agricultural sector, including natural resources and ecology, agricultural repair and sales, information processing and accounting.

Participants were sent an electronic mail message (Appendix C, E, I, K) describing the research project, the potential benefits of the study in regards to curriculum review, and directions to proceed with the study with a direct link imbedded within the message. In addition,

participants were told how to opt out of the study if they so desired. Stitt-Gohdes and Crews (2004) described that participants are more likely to continue with a study if they clearly understand the study and believe they are providing valuable input.

Instrumentation

Dalkey (1969) wrote "the Delphi technique is a method of eliciting and refining group judgements" (p. 408). The Delphi research method may be viewed as trying to create a consensus, or an agreement, of opinions among individuals who have expert-level knowledge and understanding about a topic or issue of interest. To conduct a Delphi study, one of two options exists: a pencil-and-paper response or a Delphi conference between researcher and participant(s) (Dalkey, 1969). For a pencil-and-paper format, typically three rounds of questioning and consensus formatting are utilized (Dalkey, 1969). Questionnaires are formatted to allow for open-ended responses on the initial round. Once data is collected, compounded answers are separated into individual options and parallel responses are condensed into one response option for the second round (Dalkey, 1969).

The second round differs from the first. Instead of participants providing open-ended responses, they are asked to either rank responses from the first round with an "agree" or "disagree" response; or participants rank the responses on a summated scale with a range of no less than one to five (Stitt-Gohdes & Crews, 2004). Electronic versions of a questionnaire can allow for instant feedback and factor summarization of the results by the researcher(s) and participants. Once data is collected from the second round, a third questionnaire is crafted reflecting items that did not meet consensus to be re-evaluated by the panelists to verify agreement or non-agreement.

The third round of the study includes those responses that failed to meet the desired level of consensus but considered worthy of further review by the panelists. The participants were asked if they prefer to keep the item or not by answering *yes* or *no* (Veugelers et al., 2020. Data are collected on the responses and a final "convergence of opinions" can be formed.

Data Collection

Properly conducting a Delphi study requires multiple rounds of questionnaires, created in subsequent fashion and based on previous answers provided by a panel of experts (Stitt-Gohdes & Crews, 2004). The primary purpose of this study was to identify APST technical skills required for employment (Industry Expert Panel) and the APST skills being taught by selected agricultural educators in the state of Oklahoma (SBAE Teacher Panel).

Round One: SBAE Teacher Panel

For the first round of the data collection an initial electronic mail message was sent on August 1, 2021 to the initial 16 participants identified as being experts in the field of teaching agricultural mechanics and associated with the Oklahoma Youth Exposition Agricultural Mechanics Competition. A Qualtrics® survey questionnaire (see Appendix G) was utilized with an imbedded hyperlink sent within the recruitment message (see Appendix C). The first-round questionnaire was composed of six questions for the teachers as pertaining to the objectives

1. What technical skills do you teach related to Small Gas Engines/Ag Power (e.g., ability to change oil in a motor)?
2. What technical skills do you teach related to Ag Structures (e.g., ability to calculate fencing materials costs)?
3. What technical skills do you teach related to Agricultural Electricity (e.g., ability to wire a switch to an outlet)?

4. What technical skills do you teach related to Ag Welding/Ag Construction (e.g., ability to properly set wire speed and amperage on a welding machine)?
5. What technical skills do you teach related to the Introduction of Agriscience curriculum (e.g., ability to identify proper PPE)?
6. What technical skills do you teach related to the CASE Ag Power & Technology/Mechanical Systems in Agriculture related courses (e.g., ability to calculate concrete materials needed for a foundation)?

A subsequent electronic mail message was sent two weeks (August, 15, 2021) (see Appendix D) after the initial electronic mail message to the teacher panel asking for any participant who had not completed the questionnaire, but still wanted to be a part of the study, to complete the questionnaire by August 22, 2021 (see Appendix G). After initial analysis of the data, a total of eight responses were provided. After discussion with the committee chair, a proposal to include expert teachers from the Central Region of OAETA was decided as the best course of action to gain more participation. The recruitment message sent to the initial potential panelists of SBAE teachers was utilized for soliciting additional participants (n = 15) and sent on August 29, 2021 with minor modifications made to address their standing in the Central Region and not necessarily associated to the OYE Agricultural Mechanics Competition (see Appendix E). A reminder email was sent out one week later (September 5, 2021) to the additional potential teacher panelists asking for any participant who had not completed the questionnaire, but still wanted to be a part of the study, to complete the questionnaire by September 12, 2021 (see Appendix F). Only one additional response was recorded for a total of nine responses of the 31 potential SBAE teacher panelists (29.00% response rate). In all, 156 items were provided by these panelists.

Round One: Industry Personnel Panel

For the first round of the data collection, an initial electronic mail message was sent on August 1, 2021 to 13 potential panelists identified as industry experts associated with sponsoring the OYE Agricultural Mechanics Competition. A Qualtrics® survey questionnaire was utilized with an imbedded hyperlink sent within the recruitment electronic mail message (see Appendix I, M). The first-round questionnaire was composed of one open-ended question:

> What technical skills (abilities or knowledge used to perform particular task(s) in a given area) do you believe recent high school graduates, without any post-secondary training, should possess to work in your organization, e.g., ability to read and utilize a tape measure, ability to change oil in a small gas engine, etc.?

A subsequent electronic mail message was sent two weeks (August, 15, 2021) after the initial email to the industry panelists asking for any participant who had not completed the questionnaire, but still wished to be a part of the study, to complete the questionnaire by August 22, 2021 (see Appendix J). A total of five responses (38.00% response rate) were received at this point. After discussion with the committee chair, a proposal to include industry experts identified in the Central Region of the OAETA was decided as the best course of action to incorporate additional potential participation. The electronic mail message sent to the initial industry expert panelists was utilized for the second group of potential panelists (n = 18) and sent on August 29, 2021 with minor modifications made to address having no association with the OYE Agricultural Mechanics Competition (see Appendix K). A reminder was sent one week later (September 5, 2021) to the industry expert panelists asking for any participant who had not completed the questionnaire, but still wished to be a part of the study, to complete the questionnaire by

September 12, 2021 (see Appendix L). Two additional responses were recorded for a total of seven responses of the 33 potential industry expert panelists (21.00% response rate).

Round Two: SBAE Teacher Panel

For the second-round of data collection, a second questionnaire and electronic mail message (see Appendix N) was sent on September 15, 2021 to the nine SBAE teacher panelists who participated in round one (see Appendix P). The questionnaire asked the panelists to rank their level of agreement for the 92 items retained from round one. The panelists were requested to indicate their levels of agreement using a six-point summated rating scale, i.e., *1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree* (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

For the second round of data collection, nine panelists responded (100.00% response rate). Eighty-six items were found to garner consensus greater than or equal 70.00% consensus. The six items that had greater than 51.00% to less than 70.00% consensus comprised a third-round questionnaire and were sent returned to the panelists to indicate either *yes* if they wanted to include the items in the final list of consensus, or *no* if they wanted to have the item removed from the study (Veugelers et al., 2020). A second electronic mail message reminder was sent on September 22, 2021 reminding the participants who had not completed the questionnaire to please do so by September 29, 2021 (see Appendix O).

Round Two: Industry Personnel Panel

For the second-round of data collection, a second questionnaire and electronic mail message (see Appendix Q, S) was sent on September 15, 2021 to the seven industry expert panelists who participated in round one. The questionnaire asked the panelists to rank their levels of agreement for the 13 items retained from round one. Panelists were requested to indicate their

level of agreement using the six-point summated rating scale, i.e., *1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree* (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

For the second round of data collection, seven panelists responded (100.00% response rate). Two items were found to garner consensus greater than or equal to 70.00% consensus. The five items had greater than 51.00% to less than 70.00% consensus comprised a third-round questionnaire and returned to the panelists to indicate either *yes* if they wanted to include the item in the final list of consensus, or *no* if they wanted to have the item removed from the study (Veugelers et al., 2020). A secondary reminder electronic mail message was sent on September 22, 2021 reminding the participants who had not completed the questionnaire to please do so by September 29, 2021(see Appendix R).

Round Three: SBAE Teacher Panel

For the third round of this Delphi study, the questionnaire was electronically mailed to the nine participants from round two on October 1, 2021 (see Appendix T, U). The third round attempted to achieve consensus of agreement on the retained items from round two. The questionnaire contained four items having consensus greater than 51.00% to less than 70.00% level of agreement from round two. The panelists were asked to indicate either *yes* if they wanted to include the item in the final list of consensus, or *no* if they wanted to have the item removed from the study (Veugelers et al., 2020). The final questionnaire was completed by all nine panelists (100.00% response rate) by October 8, 2021 and two additional items reached consensus of agreement.

Round Three: Industry Personnel Panel

For the third round of the Delphi study, the questionnaire was electronically mailed to the seven participants from round two on October 1, 2021 (see Appendix V, W). The third round attempted to achieve consensus of agreement on the retained items from round two. The questionnaire contained five items having greater than 51.00% to less than 70.00% level of agreement from round two. The panelists were to indicate either *yes* if they wanted to include the item in the final list of consensus, or *no* if they wanted to have the item removed from the study (Veugelers et al., 2020). The final questionnaire was completed by all seven panelists (100.00% response rate) by October 6, 2021 and four additional items reached consensus of agreement.

Data Analysis

Qualtrics® web-designed questionnaire were utilized for data analysis. The distribution and frequency of responses were automatically tabulated within the survey reports for rounds two and three of the study. Responses from round two that did not meet the 51.00% minimum level of consensus for continued study were removed from future questionnaires.

Chapter IV

Findings

Purpose

The purpose of this study was to identify the alignment of agricultural power, structures, and technology (APST) technical skills required for employment as provided by industry experts with the APST skills being taught by selected agricultural educators in Oklahoma.

Objectives

1. Identify the technical skills required by APST industry experts.
2. Identify the technical skills taught in APST courses in Oklahoma SBAE programs.
3. Identify selected personal and professional characteristics of the SBAE teacher expert panelists.
4. Identify selected personal and professional characteristics of the Oklahoma APST industry expert panelists.
5. Determine alignment of the technical skills taught by Oklahoma SBAE teachers and those sought by Oklahoma APST industry experts.

SBAE Teacher Panel

The SBAE teacher panel for this study were teachers who had at least one student participating in the OYE Agricultural Mechanics Competition or were SBAE teachers who were considered experts in teaching APST courses who were located in the OAETA Central Region. A total of 31 SBAE teachers were invited to participate in this study. Nine SBAE teachers completed all three rounds of the study (response rate = 29.00%).

Round One: SBAE Teacher Panel

In round one, SBAE teachers were asked to identify personal and professional characteristics, as well as identify technical skills taught in their courses related to APST. The APST course listings were broken into six content areas:

1. What technical skills do you teach related to Small Gas Engines/Ag Power (e.g., ability to change oil in a motor)?
2. What technical skills do you teach related to Ag Structures (e.g., ability to calculate fencing materials costs)?
3. What technical skills do you teach related to Agricultural Electricity (e.g., ability to wire a switch to an outlet)?
4. What technical skills do you teach related to Ag Welding/Ag Construction (e.g., ability to properly set wire speed and amperage on a welding machine)?
5. What technical skills do you teach related to the Introduction of Agriscience curriculum (e.g., ability to identify proper PPE)?
6. What technical skills do you teach related to the CASE Ag Power & Technology/Mechanical Systems in Agriculture related courses (e.g., ability to calculate concrete materials needed for a foundation)?

Nine panelists (29.00% response rate) who completed the first-round questionnaire identified 156 items (see Appendix G). After duplicated and similar items were combined (Dalkey, 1969), a total of 92 items (See Table 1) were retained for the second round questionnaire. The first question, "*What technical skills do you teach related to Small Gas Engines/Ag Power? (e.g., ability to change oil in a motor)"* resulted in 12 items to be included in the second-round questionnaire. The second question, *"What technical skills do you teach*

related to Ag Structures? (e.g., ability to calculate fencing materials costs)", resulted in 12 items to be included in the second-round questionnaire. The third question, *"What technical skills do you teach related to Agricultural Electricity? (e.g., ability to wire a switch to an outlet)"*, resulted in 20 items to be included in the second-round questionnaire. The fourth question, *"What technical skills do you teach related to Ag Welding/Ag Construction? (e.g., ability to properly set wire speed and amperage on a welding machine)"*, resulted in 36 items to be included in the second-round questionnaire. The fifth question, *"What technical skills do you teach related to the Introduction of Agriscience curriculum? (e.g., ability to identify proper PPE)"*, resulted in 12 items to be included in the second-round questionnaire. The sixth question, *"What technical skills do you teach related to the CASE Ag Power & Technology/Mechanical Systems in Agriculture related courses? (e.g., ability to calculate concrete materials needed for a foundation)"*, had no items reported from the first-round and was removed from future study.

Table 1

Technical Skills Identified by School-Based Agricultural Education Teachers During Round One of the Delphi Study. (N = *92*)

Technical skill field	Technical skill statement	Frequency (*N*)
Small Gas Engines/Ag Power		
	Ability to check and monitor fluids in a motor	
	Ability to change oil in a motor	
	Ability to diagnose a small gas engine	
	Ability to repair and maintain a small gas engine	
	Ability to change a tire	
	Identify similarities and differences between 2 – stroke and 4 – stroke engines	
	Ability to change blades on a lawn mower	
	Ability to properly I.D. parts of small gas engines	
	Ability to I.D. function(s) of small gas engine parts	
	Ability to check a spark plug gap	
	Able to rebuild a carburetor	

(continued)

	Able to perform basic problem-solving techniques related to small gas engines and motors	
Total Technical Skills for Small Gas Engines/Ag Power		12
Ag Structures		
	Ability to perform squaring of a project Ability to create material and cut lists Ability to create project budgets Ability to perform basic project planning (e.g., project plans and design) Ability to perform basic surveying skills (e.g., reading a survey stick) Able to perform basic carpentry skills (e.g., frame a wall) Ability to read and comprehend tape measures Ability to calculate slope of a plot Ability to calculate area of a project Ability to calculate material costs Ability to calculate perimeter of a project Ability to calculate diameter of circular projects	
Total Technical Skills for Ag Structures		12
Agricultural Electricity		
	Ability to differentiate between 110-volt and 220-volt systems Ability to wire electric outlets Ability to demonstrate proper repair of extension cord or live electrical line Ability to properly identify common electrical tools Ability to demonstrate proper grounding of an electrical circuit Ability to comprehend proper electrical safety procedures Ability to diagnose electrical issues Ability to develop wiring diagrams for projects Ability to perform basic problem-solving involving wiring and electricity Ability to wire an extension cord male and female ends Ability to demonstrate comprehension of the National Electrical Safety standards test (continued)	

	Ability to differentiate between Alternating Current (AC) and Direct Current (DC) Ability to wire two-pole switches Ability to wire agricultural projects Ability to wire light fixtures Ability to interpret wiring diagrams Ability to demonstrate Career Development Event (CDE) Agricultural Electricity topics Ability to explain different wiring diagrams and symbols Ability to wire breaker boxes Ability to perform basic wiring on a wiring board	
Total Technical Skills for Agricultural Electricity		20
Ag Welding/Ag Construction		
	Ability to properly setup a SMAW machine Ability to properly setup a GMAW machine Ability to operate computer operated plasma cutting systems Ability to perform basic maintenance on a SMAW machine Ability to perform basic maintenance on a GMAW machine Ability to operate different cutting tools (e.g., chop saw, band saw, cold-cut saw) Ability to perform basic welds with a SMAW machine Ability to perform basic welds with a GMAW machine Ability to operate hand-held plasm cutting systems Ability to comprehend basic welding safety procedures Ability to demonstrate basic welding safety procedures Ability to self-evaluate welds Ability to demonstrate comprehension of wire speed effects on welds Ability to setup torch for welding applications Ability to properly identify common electrodes used for project construction Ability to select proper electrode size Ability to differentiate gasses used in GMAW and GTAW welding Ability to differentiate gasses for oxy-fuel cutting Ability to differentiate gasses between GMAW/GTAW and oxy-fuel cutting/welding (continued)	

	Ability to diagnose GMAW welder machine problems Ability to diagnose GTAW welder machine problems Ability to diagnose SMAW welder machine problems Ability to explain weld penetration effects Ability to explain welding angle effects Ability to perform project design using different medias (e.g., paper, computer, etc.) Ability to construct agricultural project using different welding machines Ability to market welding projects Ability to explain various weld joints Ability to identify and demonstrate various weld positions Ability to identify proper project completion processes with welding applications Ability to setup oxy-fuel torch for cutting applications Ability to demonstrate comprehension of heat disposition on metal Ability to identify differences between welding mild-steel and aluminum using GTAW processes Ability to performs basic welds with a GTAW machine Ability to perform basic maintenance on a GTAW machine Ability to properly setup a GTAW machine	
Total Technical Skills for Ag Welding/Ag Construction		36
Introduction to Agriscience Curriculum		
	Ability to identify personal protective equipment for woodworking Ability to identify personal protective equipment for welding applications Ability to identify how personal protective equipment works within the woodworking and welding applications Ability to demonstrate personal protective equipment application (i.e., wearing the equipment) Ability to identify and demonstrate proper welding safety techniques Ability to perform proper woodworking safety techniques using common hand and power tools Ability to identify common shop hazards (continued)	

	Ability to demonstrate proper fire safety Ability to demonstrate proper oxy-fuel torch safety Ability to identify fire hazards Ability to identify common hand tools Ability to identify common power tools	
Total Technical Skills for Introduction to Agriscience Curriculum		12
Total		92

Round Two: SBAE Teacher Panel

For round two, the second questionnaire was sent to the nine panelists who completed round one (see Appendix P). Panelists were asked to rank their level of agreement on the 92 items from round one. Nine panelists (100.00% response rate) completed the second round of questionnaire within two weeks of sending the initial email.

Panelists were asked to utilize a six-point Summated Scale to rate their level of agreement on the 92 technical skills identified from round one: *1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree* (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021). Eighty-six statements met the initial minimum consensus level of agreement (70.00% ≥) (Ogbeifun et al., 2016; Stitt-Gohdes & Crews, 2004) (see Tables 2, 3, 4, 5, and 6).

Table 2

*Small Gas Engines/Ag Power Technical Skills Identified by SBAE Teachers During Round Two of the Delphi Study. (*N *= 10)*

Technical skill identified	Frequency (%)
Ability to check and monitor fluids in a motor	88.89
Ability to change oil in a motor	88.89

(continued)

Ability to diagnose a small gas engine	77.78
Ability to repair and maintain a small gas engine	77.78
Ability to change a tire	77.78
Identify similarities and differences between 2 – stroke and 4 – stroke engines	77.78
Ability to change blades on a lawn mower	77.78
Ability to properly I.D. parts of small gas engines	77.78
Ability to I.D. function(s) of small gas engine parts	77.78
Able to perform basic problem-solving techniques related to small gas engines and motors	77.78

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 3

*Ag Structures Technical Skills Identified by SBAE Teachers During Round Two of the Delphi Study. (*N *= 10)*

Technical skill identified	Frequency (%)
Ability to perform squaring of a project	100
Ability to create material and cut lists	100
Ability to create project budgets	100
Ability to perform basic project planning (e.g., project plans and design)	100
Ability to perform basic surveying skills (e.g., reading a survey stick)	88.89
Able to perform basic carpentry skills (e.g., frame a wall)	88.89
Ability to read and comprehend tape measures	88.89
Ability to calculate slope of a plot	88.89
Ability to calculate area of a project	88.89
Ability to calculate material costs	88.89

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 4

*Agricultural Electricity Technical Skills Identified by SBAE Teachers During Round Two of the Delphi Study. (*N *= 18)*

Technical skill identified	Frequency (%)
Ability to wire electric outlets	100.00
Ability to demonstrate proper repair of extension cord or live electrical line	100.00
Ability to properly identify common electrical tools	100.00
Ability to demonstrate proper grounding of an electrical circuit	100.00
Ability to comprehend proper electrical safety procedures	100.00
Ability to diagnose electrical issues	88.89
Ability to develop wiring diagrams for projects	88.89
Ability to perform basic problem-solving involving wiring and electricity	88.89
Ability to wire an extension cord male and female ends	88.89
Ability to demonstrate comprehension of the National Electrical Safety standards test	88.89
Ability to differentiate between Alternating Current (AC) and Direct Current (DC)	88.89
Ability to differentiate between 110- and 22-volt systems	88.89
Ability to wire electrical outlets	88.89
Ability to wire two-pole switches	88.89
Ability to wire light fixtures	88.89
Ability to interpret wiring diagrams	88.89
Ability to wire agricultural projects	88.89
Ability to demonstrate Career Development Event (CDE) Agricultural Electricity topics	88.89
Ability to explain different wiring diagrams and symbols	77.78

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 5

*Ag Welding/Ag Construction Technical Skills Identified by SBAE Teachers During Round Two of the Delphi Study. (*N = *36)*

Technical skill identified	Frequency (%)
Ability to properly setup a SMAW machine	100.00
Ability to properly setup a GMAW machine (continued)	

	100.00
Ability to operate computer operated plasma cutting systems	100.00
Ability to perform basic maintenance on a SMAW machine	100.00
Ability to perform basic maintenance on a GMAW machine	100.00
Ability to operate different cutting tools (e.g., chop saw, band saw, cold-cut saw)	100.00
Ability to perform basic welds with a SMAW machine	100.00
Ability to perform basic welds with a GMAW machine	100.00
Ability to operate hand-held plasm cutting systems	100.00
Ability to comprehend basic welding safety procedures	100.00
Ability to demonstrate basic welding safety procedures	100.00
Ability to self-evaluate welds	100.00
Ability to demonstrate comprehension of wire speed effects on welds	100.00
Ability to setup torch for welding applications	100.00
Ability to properly identify common electrodes used for project construction	100.00
Ability to select proper electrode size	100.00
Ability to differentiate gasses used in GMAW and GTAW welding	100.00
Ability to differentiate gasses for oxy-fuel cutting	100.00
Ability to differentiate gasses between GMAW/GTAW and oxy-fuel cutting/welding	100.00
Ability to diagnose SMAW welder machine problems	100.00
Ability to diagnose GMAW welder machine problems	100.00
Ability to diagnose GTAW welder machine problems	100.00
Ability to explain weld penetration effects	100.00
Ability to explain welding angle effects	100.00
Ability to perform project design using different medias (e.g., paper, computer, etc.)	100.00
Ability to construct agricultural project using different welding machines	100.00
Ability to market welding projects	100.00

(continued)

Ability to explain various weld joints	100.00
Ability to identify and demonstrate various weld positions	100.00
Ability to identify proper project completion processes with welding applications	100.00
Ability to setup oxy-fuel torch for cutting applications	100.00
Ability to demonstrate comprehension of heat disposition on metal	88.89
Ability to identify differences between welding mild-steel and aluminum using GTAW processes	88.89
Ability to performs basic welds with a GTAW machine	88.89
Ability to perform basic maintenance on a GTAW machine	88.89
Ability to properly setup a GTAW machine	88.89

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 6

*Introduction of Agriscience Curriculum Related Technical Skills Identified by SBAE Teachers During Round Two of the Delphi Study. (*N *= 12)*

Technical skill identified	Frequency (%)
Ability to identify personal protective equipment for woodworking	100.00
Ability to identify personal protective equipment for welding applications	100.00
Ability to identify how personal protective equipment works within the woodworking and welding applications	100.00
Ability to demonstrate personal protective equipment application (i.e., wearing the equipment)	100.00
Ability to identify and demonstrate proper welding safety techniques	100.00
Ability to perform proper woodworking safety techniques using common hand and power tools	100.00
Ability to identify common shop hazards	100.00
Ability to identify fire hazards	100.00
Ability to demonstrate proper fire safety (continued)	100.00

Ability to identify common hand tools	100.00
Ability to demonstrate proper oxy-fuel torch safety	100.00
Ability to identify common power tools	100.00

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

The items (N = 2) that did not reach the minimum level of consensus agreement of 51.00% were removed from the study and not included in the round three questionnaire (see Table 7).

Table 7

*Technical Skills that did not reach 51.00% Agreement in Round Two of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Ability to check a spark plug gap	44.44
Able to rebuild a carburetor	11.11

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Four items were found to have a level of consensus agreement between 51.00% to less than 70.00% agreement level based on the SBAE teacher panelists responses in round two (see Tables 8 and 9).

Table 8

*Ag Structures Technical Skills Reaching Between 51.00% to less than 70.00% Agreement During Round Two of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Ability to calculate perimeter of a project	66.67
Ability to calculate diameter of circular projects	55.56

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 9

*Agricultural Electricity Technical Skills Reaching Between 51.00% to less than 70.00% Agreement During Round Two of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Ability to wire breaker boxes	66.67
Ability to perform basic wiring on a wiring board	66.67

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Round Three: SBAE Teacher Panel

In round three, panelists were asked to select either *yes* or *no* for the four items identified in round two that fell between the minimum level of consensus agreement threshold (51.00% to less than 70.00%) (Veugelers et al., 2020). The third-round questionnaire was emailed to the nine panelists who completed the round one and two questionnaire (see Appendix U). The third-round questionnaire was completed by all nine SBAE teacher panelists (100.00% response rate) within one week of sending out the initial email with the survey (see Appendix V) (see Tables 10 and 11).

Table 10

*Ag Structures Technical Skills Presented During Round Three of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Ability to calculate perimeter of a project	77.78
Ability to calculate diameter of circular projects	44.44

Note. Consensus was determined if items reached 70.00% or greater consensus level of agreement with panelists selecting *yes* for the items (Veugelers et al., 2020).

Table 11

*Agricultural Electricity Technical Skills Presented During Round Three of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Ability to wire breaker boxes (continued)	77.78

Ability to perform basic wiring on a wiring board	44.44

Note. Consensus was determined if items reached 70.00% or greater consensus level of agreement with panelists selecting *yes* for the items (Veugelers et al., 2020).

Results: SBAE Teacher Panel

Round one of the SBAE teacher panelist survey initially reported 156 individual items (*n* = 9, 29.00% response rate). The researcher analyzed each item and combined similar or like responses from the survey to create the second round of questionnaire (Dalkey, 1969; Stitt-Gohdes & Crews, 2004). From the original 156 items from the SBAE teacher panelists, 92 were presented in round two.

Round two resulted in the consensus and agreement of 86 items through the five identified sections. To reach consensus, items had to reach 70.00% agreement or greater i.e., *5 = Agree, or 6 = Strongly Agree* (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021). The question "What technical skills do you teach related to Small Gas Engines/Ag Power (e.g., ability to change oil in a motor)?", resulted in ten items meeting consensus of agreement (70.00% ≥) (see Table 2). Two items did not reach the minimum threshold of 51.00% consensus and were removed from the study (see Table 7). The question "What technical skills do you teach related to Ag Structures (e.g., ability to calculate fencing materials costs)?", resulted in ten items reaching consensus of agreement of greater than or equal to 70.00% (see Table 3). Two items were between the minimum level of 51.00% to less than 70.00% consensus of agreement threshold and were included in the round three questionnaire (see Table 8). The question "What technical skills do you teach related to Agricultural Electricity (e.g., ability to wire a switch to an outlet)?", resulted in 18 items reaching consensus of agreement (see Table 4). Two items were found to have reached between the minimum consensus level of agreement of 51.00% to less than 70.00% threshold and were included in the round three questionnaire (see Table 9). The

question, “What technical skills do you teach related to Ag Welding/Ag Construction (e.g., ability to properly set wire speed and amperage on a welding machine)?”, resulted in 36 items reaching consensus of agreement (see Table 5). The final question from round two, “What technical skills do you teach related to the Introduction of Agriscience curriculum (e.g., ability to identify proper PPE)?”, resulted in 12 items reaching consensus of agreement (see Table 6).

The round three questionnaire included four items. Panelists were asked to select either *yes* if they wanted for the statement to remain in the study or *no* if they did not (Veugelers et al., 2020). After results were calculated, two items met the consensus of agreement of greater than or equal to 70.00% threshold (see Tables 10 and 11). After three rounds, the total number of items meeting the 70.00% or greater consensus level of agreement threshold was 88 (see Table 12).

Table 12

*Technical Skills Identified by School-Based Agricultural Education Teachers Panelists of the Delphi Study, (*N *= 88)*

Technical skills field	Technical skill statement	Frequency (*N)*
Small Gas Engines/Ag Power		
	Ability to change blades on a lawn mower	
	Ability to check and monitor fluids in a motor	
	Ability to change oil in a motor	
	Ability to diagnose a small gas engine	
	Ability to repair and maintain a small gas engine	
	Ability to change a tire	
	Identify similarities and differences between 2 – stroke and 4 – stroke engines	
	Ability to properly I.D. parts of small gas engines	
	Ability to I.D. function(s) of small gas engine parts	
	Able to perform basic problem-solving techniques related to small gas engines and motors	

(continued)

Total Technical Skills for Small Gas Engines/Ag Power		10
Ag Structures		
	Ability to perform squaring of a project Ability to create material and cut lists Ability to create project budgets Ability to perform basic project planning (e.g., project plans and design) Ability to perform basic surveying skills (e.g., reading a survey stick) Able to perform basic carpentry skills (e.g., frame a wall) Ability to read and comprehend tape measures Ability to calculate slope of a plot Ability to calculate area of a project Ability to calculate material costs Ability to calculate perimeter of a project	
Total Technical Skills for Ag Structures		11
Agricultural Electricity		
	Ability to demonstrate proper repair of extension cord or live electrical line Ability to properly identify common electrical tools Ability to perform basic problem-solving involving wiring and electricity Ability to demonstrate proper grounding of an electrical circuit Ability to comprehend proper electrical safety procedures Ability to diagnose electrical issues Ability to develop wiring diagrams for projects Ability to differentiate between 110- and 22-volt systems Ability to wire an extension cord male and female ends Ability to demonstrate comprehension of the National Electrical Safety standards test Ability to differentiate between Alternating Current (AC) and Direct Current (DC) (continued)	

	Ability to wire electrical outlets Ability to wire two-pole switches Ability to wire light fixtures Ability to interpret wiring diagrams Ability to wire agricultural projects Ability to demonstrate Career Development Event (CDE) Agricultural Electricity topics Ability to explain different wiring diagrams and symbols Ability to wire breaker boxes	
Total Technical Skills for Agricultural Electricity		19
Ag Welding/Ag Construction		
	Ability to properly setup a SMAW machine Ability to properly setup a GMAW machine Ability to operate computer operated plasma cutting systems Ability to perform basic maintenance on a SMAW machine Ability to perform basic maintenance on a GMAW machine Ability to operate different cutting tools (e.g., chop saw, band saw, cold-cut saw) Ability to perform basic welds with a SMAW machine Ability to self-evaluate welds Ability to perform basic welds with a GMAW machine Ability to operate hand-held plasm cutting systems Ability to comprehend basic welding safety procedures Ability to demonstrate basic welding safety procedures Ability to differentiate gasses used in GMAW and GTAW welding Ability to demonstrate comprehension of wire speed effects on welds Ability to setup torch for welding applications Ability to properly identify common electrodes used for project construction Ability to select proper electrode size (continued)	

	Ability to differentiate gasses for oxy-fuel cutting Ability to differentiate gasses between GMAW/GTAW and oxy-fuel cutting/welding Ability to diagnose SMAW welder machine problems Ability to diagnose GMAW welder machine problems Ability to diagnose GTAW welder machine problems Ability to explain weld penetration effects Ability to explain welding angle effects Ability to perform project design using different medias (e.g., paper, computer, etc.) Ability to construct agricultural project using different welding machines Ability to market welding projects Ability to explain various weld joints Ability to identify and demonstrate various weld positions Ability to identify proper project completion processes with welding applications Ability to setup oxy-fuel torch for cutting applications Ability to demonstrate comprehension of heat disposition on metal Ability to properly setup a GTAW machine Ability to identify differences between welding mild-steel and aluminum using GTAW processes Ability to performs basic welds with a GTAW machine Ability to perform basic maintenance on a GTAW machine	
Total Technical Skills for Ag Welding/Ag Construction		36
Introduction to Agriscience Curriculum		
	Ability to identify personal protective equipment for woodworking Ability to identify personal protective equipment for welding applications (continued)	

	Ability to identify how personal protective equipment works within the woodworking and welding applications Ability to demonstrate personal protective equipment application (i.e., wearing the equipment) Ability to identify and demonstrate proper welding safety techniques Ability to perform proper woodworking safety techniques using common hand and power tools Ability to identify common shop hazards Ability to identify fire hazards Ability to demonstrate proper fire safety Ability to demonstrate proper oxy-fuel torch safety Ability to identify common hand tools Ability to identify common power tools	
Total Technical Skills for Introduction to Agriscience Curriculum		12
Total Technical Skills Identified		88

Note. Agreement was determined if items reached 70.00% or greater consensus of agreement by panelists after three rounds of questionnaires (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Industry Expert Panel

The industry experts were individuals associated with the OYE Agricultural Mechanics Competition, as well as individuals identified to work in the APST industry in the Central Region of OAETA. A total of 33 individuals were invited to participate in this study. Seven participants were found to have completed all three rounds of the study.

Round One: Industry Expert Panel

In round one, industry expert panelists were asked to identify personal and professional characteristics, as well as technical skills they believed recent high-school graduates without post-secondary training need in relation to APST (see Appendix M). The first round of the

questionnaire identified 24 items (n = 7, 21.00% response rate). After duplications and like answers were combined (Dalkey, 1969), 13 items (see Table 13) were retained for the second questionnaire.

Table 13

*Technical Skills Identified be Industry Expert Panelists During Round One of the Delphi Study. (*N *= 13)*

Technical sills identified	Frequency (N)
Able to perform basic repair and maintenance on replacing non-fluid/filter parts (e.g., spark plugs, blades, etc.)	
Able to perform basic repair and maintenance of fluids and filters	
Able to operate heavy machinery	
Able to operate Microsoft PowerPoint	
Able to perform precision cuts on a variety of materials	
Able to perform a satisfactory weld	
Able to read and comprehend a tape measure	
Able to operate a welder	
Able to operate power tools	
Able to operate Microsoft Word	
Able to operate Microsoft Excel	
Able to conduct simple math	
Able to operate hand tools	
Total Technical Skills Needed Without Post-secondary Training	13

Round Two: Industry Expert Panel

For round two, the second questionnaire was sent to the seven panelists who completed round one (see Appendix S). The panelists were asked to rank their levels of consensus on the 13 items from round one. Seven panelists (100.00% response rate) completed the second-round questionnaire within one week after the reminder electronic message (see Appendix R).

Panelists were asked to utilize a six-point summated scale to rate their level of agreement on the 13 items identified in the first round: *1 = Strongly Disagree, 2 = Disagree, 3 = Slightly*

Disagree, 4 = Slightly Agree, 5 = Agree, or 6 = Strongly Agree (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021). Two statements met the initial consensus of agreement of 70.00% or greater set by the research team (Ogbeifun et al., 2016; Stitt-Gohdes & Crews, 2004) (see Table 14).

Table 14

*Technical Skills Identified by Industry Experts During Round Two of the Delphi Study. (*N = *2)*

Technical skill identified	Frequency (%)
Able to conduct simple math	100.00
Able to operate hand tools	85.71

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Eleven items did not meet the 70.00% consensus level of agreement i.e., a score of *5 = Agree, or 6 = Strongly Agree* for the statements (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021). The items (N = 2) that failed to reach the minimum level of consensus agreement of 51.00% were removed from the study and not included in round three (see Table 15 and 16).

Table 15

*Technical Skills that did not reach 51.00% Agreement in Round Two of the Delphi Study. (*N = *6)*

Technical skill identified	Frequency (%)
Able to perform basic repair and maintenance on replacing non-fluid/filter parts (e.g., spark plugs, blades, etc.)	42.86
Able to perform basic repair and maintenance of fluids and filters	42.86
Able to operate heavy machinery	42.86
Able to operate Microsoft PowerPoint	42.86
Able to perform precision cuts on a variety of materials	28.57
Able to perform a satisfactory weld	28.57

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Table 16

*Technical Skills Reaching 51.00% to 70.00% Agreement During Round Two of the Delphi Study. (*N = *5)*

Technical skill identified	Frequency (%)
Able to read and comprehend a tape measure	57.14
Able to operate a welder	57.14
Able to operate power tools	57.14
Able to operate Microsoft Word	57.14
Able to operate Microsoft Excel	57.14

Note. Consensus was determined if items reached a minimum of 70.00% agreement with panelists selecting *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

Round Three: Industry Personnel Panel

In round three, panelists were asked to select either *yes* or *no* for the five statements identified in round two that fell between the 51.00% and less than 70.00% level of agreement to keep within the study (Veugelers et al., 2020). The third-round questionnaire was electronically mailed (see Appendix W) to the seven panelists who completed rounds one and two. The third-round questionnaire was completed by all seven panelists (100.00% response rate) within one week of sending out the initial email with the survey (see Appendix V) (see Table 17).

Table 17

*Technical Skills Reaching Between 51.00% to less than 70.00% Agreement During Round Three of the Delphi Study. (*N = *5)*

Technical skill identified	Frequency (%)
Able to operate Microsoft Excel	100
Able to read and comprehend a tape measure	85.71
Able to operate Microsoft Word	85.71
Able to operate power tools	71.43
Able to operate a welder	57.14

Note. Consensus was determined if items reached 70.00% or greater consensus level of agreement with panelists selecting *yes* for the items (Veugelers et al., 2020).

Results

Round one of the industry expert panelist questionnaire initially yielded 24 individual items (*n* = 7, 21.00% response rate) provided by the panelists (see Table 13). The researcher analyzed each statement and combined similar or like responses from the survey to create the second round questionnaire (Dalkey, 1969; Stitt-Gohdes & Crews, 2004). From the original 24 statements and responses from the industry expert panelists, 13 items were presented in the round two questionnaire.

Round two resulted in the consensus of agreement of two items (see Table 14) that reached a consensus of agreement of 70.00% or greater from the panelists by having selected *5 = Agree, or 6 = Strongly Agree* for the items (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021). Six items were found to have not met the 51.00% or greater consensus threshold and were removed from the study (see Table 15). Five items were found between the minimum consensus of agreement of 51.00% and less than 70.00% and were resent to the panelists via the third-round questionnaire (see Table 16).

Round three included five items. Panelists were asked to select either *yes* if they wanted for the statement to remain in the study or *no* if they did not (Veugelers et al., 2020). After results were calculated, four additional items were found to have met the consensus threshold of at least 70.00% (see Table 17). After three rounds of the study, the total number of items meeting the 70.00% consensus threshold or greater was six (see Table 18).

Table 18

*Technical Skills Identified be Industry Expert Panelists During Three Rounds of the Delphi Study. (*N = *6)*

Technical skills identified	Frequency (%)
(continued)	

Able to conduct simple math	100
Able to operate Microsoft Excel	100
Able to operate Microsoft Word	85.71
Able to operate hand tools	85.71
Able to read and comprehend a tape measure	85.71
Able to operate power tools	71.43

Note. Consensus was determined if items reached 70.00% or greater consensus by panelists after three rounds of questionnaires (Hainline & Wells, 2019; Ramsey, 2009; Wells et al., 2021).

SBAE Teacher Panel: Personal & Professional Characteristics

Objective three focused on the personal and professional characteristics of the SBAE teacher panelists. The questions asked were: 1. What sex do you identify as?, 2. What is your current age?, 3. What teaching certification do you possess?, 4. How many years (total) have you taught agricultural education?, 5. What is your average teaching load of all courses taught?, 6. What is your average teaching load in courses related to Agricultural Power, Structures, and Technology?, 7. Of your courses related to Agricultural Power, Structures, & Technology, what content area(s) are taught?, 8. What experience, outside of teaching, do you possess in Agricultural Power, Structures, & Technology systems?, and, 9. Do you currently us an advisory council for your SBAE program? (See Table 19).

Nine SBAE teacher panelists completed all three rounds in which eight individuals self-identified as male. One participant self-identified as female. The range in age of the SBAE teacher panelists is from 26 to 59 years. Two panelists (22.22%) range from 21-30 years of age, two (22.22%) range from 31 – 40 years of age, three (33.33%) range from 41 – 50 years of age, and two (22.22%) range from 51 – 60 years of age. Seven (77.78%) of the panelists indicated having a traditional certification for teaching 6^{th} – 12^{th} grade agricultural education. Two panelists (22.22%) indicated they have an alternative certification for teaching agricultural education. The range in years of experience for the SBAE teacher panelists reflected a minimum

of four years and a maximum of 35 years of experience. Two panelists (22.22%) indicated they teach an average daily load of four courses. Six panelists (66.67%) indicated teaching five courses, while one panelist (11.11%) indicated teaching an average of seven courses daily. The daily course load directly related to the teaching of APST courses ranged from one course daily to four courses daily. There were 11 subjects or topics identified by the researcher from the *Introduction to Agricultural Power and Technology* textbook. Twelve subject areas were identified to have been taught within SBAE APST courses by the panelists, with the 12th subject being "Computer Metal Design". Eight panelists (88.89%) indicated having experience in areas outside of SBAE teaching such as production agriculture; three panelists (33.33%) had prior employment in the industry; nine panelists (100.00%) had previous professional development trainings; and one panelist (11.11%) indicated having professional certifications outside of SBAE teaching. Three panelists (33.33%) were found to utilize an advisory committee while six (66.67%) were identified as not utilizing an advisory committee.

Table 19

Selected Personal and Professional Characteristics: SBAE Teacher Panelists

Characteristic	Characteristic identifier	Frequency, *n* (%)
Age		
	21 – 30	2 (22.22)
	31 – 40	2 (22.22)
	41 – 50	3 (33.33)
	51 – 60	2 (22.22)
Sex		
	Male	8 (88.89)
	Female	1 (11.11)
Certification Type		
	Traditional	7 (77.78)
	Alternative	2 (22.22)

(continued)

Years Taught		
	1 – 5	1 (11.11)
	6 – 10	3 (33.33)
	11 – 15	1 (11.11)
	16 – 20	1 (11.11)
	21 – 25	1 (11.11)
	31 – 35	2 (22.22)
Avg. Course Load		
	4 – Courses	2 (22.22)
	5 – Courses	6 (66.67)
	7 – Courses	1 (11.11)
Courses Related to APST		
	1 – Course	1 (11.11)
	2 – Course	3 (33.33)
	3 – Course	1 (11.11)
	4 – Course	4 (44.44)
Units Taught		
	Ag Power	5 (55.56)
	Electricity	8 (88.89)
	Plumbing	4 (44.44)
	Project Planning	8 (88.89)
	Safety and PPE	9 (100.00)
	Small Gas Engines	2 (22.22)
	Structures	5 (55.56)
	Surveying	1 (11.11)
	Welding (Oxy-Fuel)	9 (100.00)
	Welding (GMAW, SMAW, GTAW, Flux Core)	9 (100.00)
	Woodworking	6 (66.67)
	Other: (Computer Metal Design)	1 (11.11)
Experiences Outside of Teaching		
	Production Agriculture	8 (88.89)
	Prior Employment in Industry	3 (33.33)
	Professional Development	9 (100.00)
	Professional Certifications	1 (11.11)
Currently Utilizing an Advisory Committee		
	Yes	3 (33.33)
	No	6 (66.67)

Industry Expert Panel: Personal and Professional Characteristics

Objective four focused on the personal and professional characteristics of the industry personnel panel. The first-round questionnaire asked the panelists to: 1. identify their age, 2. years associated with their employer, 3. years of experience associated with the APST industry, 4. their self-identified sex, and 5. any professional certifications panelists may hold. (see Table 20).

Seven panelists completed all three rounds of the study. Five industry panelists (71.43%) were found to have self-identified as male and two industry panelists (28.57%) self-identified as female. There was one panelist (14.28%) who was identified between the ages of 21 – 30; two panelists (28.57%) identified between 31 – 40 years of age; one panelist (14.28%) identified between 41 – 50 years of age; and three panelists (42.86%) identified between the ages of 51 – 60 years of age. Two panelists (28.57%) indicated having worked for their current employer for 1 – 10 years while four panelists (57.14%) and one panelist(14.28%) indicated working for their employer between 11 – 20 years and 31 – 40 years, respectively. For the years associated with agriculture and the APST industry, three panelists (42.86%) indicated having between 11 – 20 years of experience; two panelists (28.57%) indicated having 21 – 30 years of experience; and two panelists indicated having between 31 – 40 (14.28%) and 41 – 50 (14.28%) years of experience in the agriculture and the APST Industry. Four professional certifications were identified between the seven panelists. One panelist (14.28%) indicated having either a CWS or CWE welding certification. Two panelists (28.57%) indicated being certified as a Pressure Vessel Inspector (CPVI). Lastly, one panelist (14.28%) indicated having a Natural Gas Operator Qualifications (OQ) certification.

Table 20

Selected Personal and Professional Characteristics: Industry Expert Panelists

Characteristic	Characteristic identifier	Frequency, *n* (%)
Age		
	21 – 30	1 (14.28)
	31 – 40	2 (28.57)
	41 – 50	1 (14.28)
	51 – 60	3 (42.86)
Identified Sex		
	Male	5 (71.43)
	Female	2 (28.57)
Years with Employer		
	1 – 10	2 (28.57)
	11 – 20	4 (57.14)
	31 – 40	1 (14.28)
Years Assoc. with APST Industry		
	11 – 20	3 (42.86)
	21 – 30	2 (28.57)
	31 – 40	1 (14.28)
	41 – 50	1 (14.28)
Certifications Held		
	Welding (CWS) or (CWE)	1 (14.28)
	Pressure Vessel Inspector (CPVI)	2 (28.57)
	Natural Gas Operator Qualifications (OQ)	1 (14.28)

Determine alignment of current technical skills taught by Oklahoma SBAE agricultural educators and those sought by Oklahoma industry experts in the APST industry.

After completion of the three rounds of surveys from dual panels of experts, a total of 88 technical skills were taught within SBAE programs by teachers within the OAETA Central Region and/or by teachers who had at minimum one student competing at the OYE Agricultural Mechanics Competition. A total of six technical skills were identified by the industry expert

panelists who were identified as sponsors of the OYE Agricultural Mechanics Competition, or an individual who works within an organization in the OAETA Central Region.

When comparing the alignment of the technical skills identified by both panels, three technical skills were found to be aligned. The aligned technical skills were: 1. Able to operate hand tools, 2. Able to read and comprehend a tape measure, and 3. Able to operate power tools.

Chapter V

Conclusions, Implications, and Recommendations

Purpose

The purpose of this study was to identify the alignment of agricultural power, structures, and technology (APST) technical skills required for employment as provided by industry experts with the APST skills being taught by selected agricultural educators in Oklahoma. The study's purpose was achieved by meeting five research objectives.

Conclusions

Objective One

Identify the technical skills required by APST industry experts.

Objective one sought to identify technical skills required by APST industry experts for employment of high school graduates without post-secondary training. Six technical skills were identified to have met the consensus of agreement rate of 70.00% or greater as set forth by the researcher. Technical skills ranged from the utilization of software programs found on typical computer devices to tool operation.

Objective Two

Identify the technical skills taught in APST courses in Oklahoma SBAE programs.

Objective two sought to identify the technical skills taught within SBAE programs of the teacher panelists. Eighty-eight technical skills were identified to have met the consensus of agreement rate of 70.00% or greater as set forth by the researcher. Technical Skills identified were arranged into five sub-categories: 1. Small Gas Engines/Ag Power (n = 10), 2.

Ag Structures (*n* = 11), 3. Agricultural Electricity (*n* = 19), 4. Ag Welding/Ag Construction (*n*= 36), and 5. Technical skills related to the Introduction to Agriscience Curriculum (*n* = 12).

Objective Three

Identify selected personal and professional characteristics of the SBAE teacher expert panelists.

Objective three sought to identify the personal and professional characteristics of the SBAE teacher panelists who completed all rounds of the Delphi Study. Nine panelists (29.00% response rate) were shown to have completed all three rounds of the study. It was found that of the nine panelists, eight were male and one female. Seven panelists indicated holding a traditional 6^{th} – 12^{th} grade agricultural education teaching certification, whereas two indicated having alternative certification to teach agricultural education. The range of teaching experience was from four to 35 years, with three panelists indicating to have taught between six to 10 years (33.33%). The average daily course load ranged from four to seven courses, with a range of one to four courses related to APST topics. Panelists indicated four areas from which they acquired outside experience with APST: 1. production agriculture (*n* = 8), 2. prior employment (*n* = 2), 3. professional development (*n* = 9), and 4. professional certifications (*n*= 1).

Objective Four

Identify selected personal and professional characteristics of the Oklahoma APST industry expert panelists.

The initial population for the panel of industry experts was comprised of 33 individuals identified after two attempts of recruitment. These individuals had contributed to the OYE Agricultural Mechanics Competition and/or were identified as an APST industry employee within an organization located in the OAETA Central Region. Seven panelists (21.00% response rate) completed all three rounds of the Delphi Study. The panelists self-identified as five males

and two females who ranged in age from 26 years to 58 years and had been involved in agriculture and the APST industry ranging from 13 to 58 years. Four panelists also identified having an industry recognized credential associated with their respective industry sector.

Objective Five

Determine alignment of the technical skills taught by Oklahoma SBAE teachers and those sought by Oklahoma APST industry experts.

The fifth objective sought to find alignment of technical skills between the two expert panels. Three technical skills were found to have been aligned between the SBAE teacher panel and the industry expert panel. The three aligned technical skills were: 1. able to operate hand tools, 2. able to read and comprehend a tape measure, and 3. able to operate power tools.

A low response rate and low yield regarding technical skills identified by industry panelists led the researcher to conclude a different methodological approach for future investigations would be. A mixed methods approach could potentially identify additional technical skills sought for employment by industry personnel. The qualitative interview could provide additional clarity to the industry personnel views and allow for additional questions to be posed by the researcher.

By identifying key personnel informants, or individuals who have direct knowledge regarding technical skills needed to complete tasks within the industry, non-technical industry personnel could be dismissed from the study.

Implications

Fulgenzi & Milligan (2015) portrayed how The U.S. Department of Education divided all jobs and careers into 16 career clusters. The clusters are based on the specific knowledge and skills needed to perform each job-related task. This study looked to highlight technical skills

being taught in SBAE programs in APST related courses and also identify technical skills needed for employment without students having received post-secondary training. This study featured five key areas within the APST pathway and identified 88 technical skills being taught in SBAE programs from the nine expert teacher panelists. This study found six technical skills industry personnel identified were of high importance for students to comprehend and perform in order to secure employment without any post-secondary training.

Of the 88 technical skills identified by the SBAE teacher panelists, 62.5% (*n*= 36) were found within the Ag Welding/Ag Construction and Agricultural Electricity fields. This implies that a majority of SBAE teachers in this study consider Ag Welding/Ag Construction and Agricultural Electricity as two of the major APST skill areas important in their school district and/or, potentially, that their self-efficacy for teaching those skills is high. Future qualitative interviews with the identified SBAE teacher panelists could potentially aid in the understanding why the majority of technical skills were identified within these two specific curriculum areas.

A total of four technical skills identified from the first round of responses by the SBAE teacher panelists did not meet the minimum 51.00% consensus level of agreement to be retained for round two. Those technical skills were: 1. ability to check a spark plug gap, 2. able to rebuild a carburetor, 3. ability to calculate diameter of circular projects, and 4. ability to perform basic wiring on a wiring board. To understand the reasoning for these four technical skills not meeting the threshold, additional investigation should be conducted.

Identifying the technical skills taught in SBAE programs from a teacher's perspective could potentially allow researchers to gain some insight regarding students' technical skill acquisition. By identifying these technical skills, researchers could begin to evaluate, i.e., the effective level of proficiency of the students' technical skill acquisition.

State Career and Technical Education staff can review the findings of this study and begin an initial analysis of future program needs regarding curriculum, teacher preparation, facilities, and teacher resources. Future replication of this study with additional panelists and greater response rates could potentially find a consensus level of agreement with the identified technical skills, as well as discover new technical skills that may not have been revealed by this study. The findings of this study and future replications may assist in curriculum development for teaching APST in Oklahoma SBAE programs.

Recommendations for Practice

SBAE Teachers

Nine SBAE teacher panelists identified 88 technical skills they taught in their SBAE programs. The teachers who completed the study should assess their students at graduation to identify their level of proficiency related to the identified technical skills. Evaluating students at the end of their high school tenure would allow the students to know whether they have the necessary technical skills needed to complete specific industry tasks. This may allow for students to decide if they need to seek post-secondary training prior to employment.

Evaluating the curriculum being taught, how it is taught, and the resources being used in SBAE programs to enhance student learning, comprehension, and retention of technical skills is also important. Knowledge of the curriculum and proficiency for the technical skills are important for teachers to assess prior to teaching the curriculum. Different curriculums may have differences in the technical skills identified as important for students to practice and acquire.

Considering the instructional delivery method is vital to evaluating student comprehension. Learning styles impact a classroom, teachers must be prepared to teach the same technical skill in various ways. Examining and business-like delivery (Rosenshine & Furst,

1971) of the instructional strategies used to teach technical skills could aid teachers to better enhance their approach to providing the necessary tools and activities for students to learn and become proficient.

Six of the nine (66%) SBAE teachers in this study did not utilize an advisory committee with their SBAE programs. It is recommended the SBAE teachers work with key stakeholders in their communities to create advisory committees to help guide their programs. Advisory committees are created to aid in the improvement of educational programs and the implementation of various educational resources (California Department of Education: High School Leadership Division, 2018). The addition of a high quality and appropriate advisory committee to an SBAE program could aid in the implementation of new educational resources, new opportunities for student success through SAE opportunities, and potentially allow for the expansion of SBAE programs.

Teacher Educators in Agricultural Education

Offering in-service training for the CASE Agricultural Power and Technology course to Oklahoma SBAE teachers could allow for trialability (Rogers, 2003) of the curriculum. It was found that no technical skills were identified by the SBAE teachers that corresponded with the CASE Agricultural Power and Technology curriculum. As a nationally recognized curricula (CASE, n.d.) aligned to the National AFNR standards, the math and language arts Common Core standards, and aligned with the Next Generation Science standards, it has been validated by numerous individuals and industry personnel. The curriculum offers seven units, including safety, material properties, fabrication, energy, machines and structures, and mechanical applications (the first unit is an introduction) (CASE, n.d.). It has a daily calendar to assist planning of instruction and lessons plans detailing each individual lesson. The curriculum can be

modified to allow for the teaching of other topics if desired or identified as a priority by the local SBAE teacher and/or school district.

Recommendations for State Staff

Evaluation of resources used to teach technical skills to students should be conducted periodically. With new advancements in technology in the agriculture industry, it is important teachers and other school personnel work with industry and state staff to help provide students opportunities to observe, learn, and participate in hands-on training with the technology used in industry, to provide them with real-world application. New innovative technical skills will likely need to be developed in the context of APST to address changes in technology likely over time.

Recommendations for Future Research

SBAE Teachers

Data expressing teachers views on the technical skills they teach and an assessment of the students could be the next steps to determine comprehension and retention of technical skills by the students in SBAE programs. Performing this type of study could allow researchers and SBAE teachers to assess what students in SBAE programs are learning. This may also allow SBAE teachers to reflect on their current instructional and content delivery, formative and summative assessments, as well as resources used to teach, facilitate, and assess their students' learning.

Teacher Educators of Agricultural Education

Teacher preparation programs that offer courses or teach course topics in the APST pathway that align with the areas within this study can identify the technical skills taught in their courses and the technical skills identified by the SBAE teacher panelists. By comparing the technical skills identified, teacher educators could better align their course work to the technical

skills identified by the SBAE teachers as may be appropriate. By aligning the technical skills taught in collegiate courses related to APST, pre-service SBAE teachers may become more self-efficacious in the teaching of APST content and APST related technical skills they are likely to encounter during student teaching and/or in-service teaching.

It is recommended that teacher educators replicate this study on a larger scale with more agricultural educators from the state of Oklahoma and other industry personnel from across the state employed in the APST industry. Having a small sample of SBAE teachers and industry personnel complete all three rounds of this study and limits the generalizability of its results. Replicating the study to a broader audience and including more participants on both panels has the possibility of offering more reliable and generalizable data.

Recommendations for State Staff

A future research project that could be conducted would be to interview the industry panelists to describe which technical skills they develop within their places and compare the qualitative findings to the results of the SBAE teacher panel. Future studies could include reviewing the curriculum sources currently used by Oklahoma SBAE teachers and identifying the different technical skills. Examining the curricula, the technical skills embedded within such, and performing an alignment comparison of the different sources may allow for future revision and development of a curriculum guide that identifies the recommended or appropriate source for teaching various technical skills. This could reduce student learning discrepancies between SBAE programs regarding content and skills acquisitions for job entry into the APST sector.

References

Aakre, C., & Bergin, J. (2020). *APT*. Curriculum for Agricultural Science Education. https://www.case4learning.org/APT/

Albritton, M. C., & Roberts, T. G. (2020). Agricultural technical skills needed by entry level agriculture teachers: A modified Delphi study. *Journal of Agricultural Education*, *61*(1), 140–151. https://doi.org/10.5032/jae.2020.01140

Braaten, R. D. (1970, January 1). *Doing to learn with projects in the agricultural mechanics laboratory*. ScholarWorks at Montana State University (MSU). https://scholarworks.montana.edu/xmlui/handle/1/2912

Bryant, T. R. (1911). Boys' corn clubs and improved methods of corn growing. Kentucky Agricultural Experiment Station of the State University.

Buriak, P., & Shinn, G. C. (1993). Structuring research for agricultural education: A national Delphi involving internal experts. *Journal of Agricultural Education*, *34*(2), 31–36. https://doi.org/10.5032/jae.1993.02031

California Department of Education: High School Leadership Division (2018). *Agricultural Education: Advisory Committee Manual*. www.ffa.org. https://ffa.app.box.com/s/1mvzqgh9k1ze9zjrjnlyrlakw3l1ckbd

Cook, G. C. (1947). *Handbook on teaching vocational agriculture*. Interstate.

Croom, B. (2008). Development of the integrated three-component model of agricultural education. *Journal of Agricultural Education*, *49*(1), 110–120. https://doi.org/10.5032/jae.2008.01110

Curriculum for Agricultural Science Education. (n.d.). *Pathways*. Curriculum for Agricultural Science Education. https://www.case4learning.org/curriculum/pathways/

Dalkey, N. (1969). An experimental study of group opinion. *Futures*, *1*(5), 408–426. https://doi.org/10.1016/s0016-3287(69)80025-x

Fulgenzi, B. A., & Gibson, K. (2015). *Introduction to agricultural power and technology*. Oklahoma Department of Career and Technology Education.

Fulgenzi, B. A., & Milligan, J. (2016). *Introduction to agriscience*. Oklahoma Department of Career and Technology Education.

Hainline, M. S., & Wells, T. (2019). Identifying the agricultural mechanics knowledge and skills needed by Iowa school-based agricultural education teachers. *Journal of Agricultural Education, 60*(1), 59-79. https://doi.org/10.5032/jae.2019.01059

Harris, L. (n.d.). *Century of agricultural education*. USU https://caas.usu.edu/cultivate/spring18/century-ag

Herren, R. V. (2010). *Agricultural mechanics: Fundamentals and applications* (6th ed.). Cengage.

Herren, R. V., & Hillison, J. (1996). Agricultural education and the 1862 land-grant institutions: The rest of the story. *Journal of Agricultural Education*, *37*(3), 26–32. https://doi.org/10.5032/jae.1996.03026

Hillison, J. (1993). The role of Virginia in the development of the FFA. *Journal of Agricultural Education*, *34*(2), 37–45. https://doi.org/10.5032/jae.1993.02037

H.R.4164 - 98th Congress (1983-1984): Carl D. Perkins Vocational Education Act. (1984, October 19). https://www.congress.gov/bill/98th-congress/house-bill/4164

H.R.4955 - 88th Congress (1963-1964): An Act to strengthen and improve the quality of

vocational education and to expand the vocational education opportunities in the Nation, to extend for three years the National Defense Education Act of 1958 and Public Laws 815 and 874, Eighty-first Congress (federally affected areas), and-for other purposes. (1963, December 18). https://www.congress.gov/bill/88th-congress/house-bill/4955/text

Hubert, D. J. (1996). *An assessment of agricultural mechanics course requirements in agriculture teacher education programs in the United States* (Unpublished master's thesis). Oklahoma State University. https://shareok.org/bitstream/handle/11244/12533/Thesis-1996-H878a.pdf?sequence=1

Hsu, C.-C., & Sandford, B. A. (2007). The Delphi technique: Making sense of consensus. *Practical Assessment, Research, and Evaluation*, *12*(10). https://doi.org/10.7275/pdz9-th90

Johnson, D. M., Schumacher, L. G., & Stewart, B. R. (1990). An analysis of the agricultural mechanics laboratory management inservice needs of Missouri agriculture teachers. *Journal of Agricultural Education*, *31*(2), 35–39. https://doi.org/10.5032/jae.1990.02035

Key, R. L. (2019, April 9). *Confidence levels of Texas entry year agricultural science teachers in agricultural mechanics related skills*. (Unpublished master's thesis) Sam Houston State University. https://shsuir.tdl.org/handle/20.500.11875/2591

Koel, L., Radcliff, R. B., Moniz, B. J., & Mazur, G. A. (2018). *Agricultural technical systems and mechanics*. American Technical Publishers.

Kosar, K. R. (2016, June 8). *Vocational education act of 1917, or Smith-Hughes act of 1917*. Federal Education Policy History.

https://federaleducationpolicy.wordpress.com/2011/02/19/1917-vocational-education-act-or-smith-hughes-act/

Lafferty, J. (2005). An analysis of beginning Texas state agricultural science teachers' perceived importance and knowledge of basic agricultural mechanics competencies (thesis). ProQuest.com. https://www.proquest.com/docview/305040937/fulltextPDF/F9AD2A96629F4F71PQ/1?accountid=4117

Lasse, C. (2020, November 19). *What is a competency?* Association for Talent Development. https://www.td.org/insights/what-is-a-competency

Lauwerys, J. A., Graham, H. F., Swink, R. L., Mukerji, S.N., Arnove, R. F., Thomas, R. M., Shimahara, N., Lawson, R. F., Ipfling, H. , Nakosteen, M. K., Marrou, H., Meyer, A. E., Huq, M. S., Naka, A., Scanlon, D. G., Browning, R., Chen, T. H., Anweiler, O., Riché, P., Szyliowicz, J. S., Gelpi, E., Moumouni, A., Bowen, J., Vázquez, J. Z., & Chambliss, J. J. (2021, May 1). *Education*. *Encyclopedia Britannica*. https://www.britannica.com/topic/education

Linstone, H. A. (1979). *The Delphi method: Techniques and applications*. Addison-Wesley.

Luft, V. D. (1999). School to careers: How agricultural education can contribute. *Agricultural Education Magazine*, *72*(3), 20–21.

Mkandawire, M. T., Maulidi, F. K., Sitima, J., & Luo, Z. (2018). Who should be deciding what to be taught in schools? Perspectives from secondary school teacher education in Malawi. *Journal of Medical Education and Curricular Development*, *5*, 1–10. https://doi.org/https://doi.org/10.1177%2F2382120518767903

Morrill Act, 7 U.S.C.§ 301(1862). https://www.loc.gov/rr/program/bib/ourdocs/morrill.html

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Nasr, A.-R., & Sharif, M. (2012). Curriculum Design Requirements and challenges of the learning society approach. *Journal of Education and Learning*, *1*(2), 143–154. https://doi.org/10.5539/jel.v1n2p143

National FFA Organization. (2017). *The official FFA student handbook*. National FFA Organization.

National FFA Organization. (2020). *The official FFA student handbook*. National FFA Organization.

Ogbeifun, E., Agwa-Ejon, J., Mbohwa, C., & Pretorius, J. H. (2016). 2016 International Conference on Industrial Engineering and Operations Management. In *ieomsociety.com*. Kuala Lumpur. http://ieomsociety.org/ieom_2016/pdfs/589.pdf#:~:text=The%20Delphi%20technique%2C%20as%20a%20research%20method%2C%20seeks,and%20effective%20communication%20throughout%20the%20process%20%5B14%2C%205%5D

Ohio Department of Education. (n.d.). *Ohio's learning standards - terminology definitions*. Ohio Department of Education. http://education.ohio.gov/Topics/Learning-in-Ohio/Ohios-Learning-Standards/Ohio-Learning-Standards-Resources/Ohio-Learning-Standards-Terminology

Penny, M. (2019, August 9). *The Perkins Act has finally been reauthorized. here's what's in it and why it matters to MN*. Education Evolving. https://www.educationevolving.org/blog/2018/08/perkins-act-reauthorized

Phipps, L. J. (1956). *Handbook on teaching vocational agriculture* (6th ed.). Interstate.

Ramsey, J. W. (2009, December 1). *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* (dissertation). *https://shareok.org*. https://shareok.org/bitstream/handle/11244/6569/Department%20of%20Agricultural%20Education%2c%20Communications%2c%20and%20Leadership_19.pdf?sequence=1&isAllowed=y

Ramsey, J. W., & Edwards, M. C. (2011). Entry–level technical skills that agricultural industry experts expected students to learn through their supervised agricultural experiences: A modified Delphi Study. *Journal of Agricultural Education*, *52*(2), 82–94. https://doi.org/10.5032/jae.2011.02082

Ramsey, J. W., & Edwards, M. C. (2012). Entry–level technical skills that teachers expected students to learn through supervised agricultural experiences (SAES): A modified Delphi study. *Journal of Agricultural Education*, *53*(3), 42–55. https://doi.org/10.5032/jae.2012.03042

Roberts, G., & Ball, A. (2009). Secondary agricultural science as content and context for teaching. *Journal of Agricultural Education*, *50*(1), 81–91. https://doi.org/10.5032/jae.2009.01081

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Rosenshine, B., & Furst, N. (1971). Research on teacher performance criteria. In B.O. Smith (Ed.), *Research in Teacher Education* (p. 37–72). Englewood Cliffs, NJ: Prentice Hall.

Saucier, R., McKim, B., & Tummons, J. (2012). A Delphi approach to the preparation of early career agricultural educators in the curriculum area of agricultural mechanics: Fully qualified and highly motivated or status quo? *Journal of Agricultural Education*, *53*(1), 136–149. https://doi.org/10.5032/jae.2012.01136

SBAE.org, (2020). *What is SBAE?* SBAE. https://sbae.org/sbae/what-is-sbae/

Smith-Hughes Act, 20 U.S.C. § 11 *et seq.* (1917). https://www.britannica.com/topic/Smith-Hughes-Act

Steffes, T. L. (2020, July 24). *Smith-Hughes Act*. Encyclopædia Britannica. https://www.britannica.com/topic/Smith-Hughes-Act

Stitt-Gohdes, W. L., & Crews, T. B. (2004). The Delphi technique: A research strategy for career and technical education. *Journal of Career and Technical Education*, *20*(2). https://doi.org/10.21061/jcte.v20i2.636

The National Council for Agricultural Education. (2016). *National Quality Program Standards*. Team Ag Ed Site. https://www.teamaged.co/nqps.aspx

The National Council for Agricultural Education. (2018, August 27). *AFNR standards*. The National Council for Agricultural Education. https://thecouncil.ffa.org/afnr/

True, A. C. (1915). Agricultural Education and Agricultural Prosperity. *The Annals of the American Academy of Political and Social Science*, *59*, 51–64.

University of Delaware. (n.d.). *Definitions of Curriculum*. Definitions of curriculum. https://www1.udel.edu/educ/whitson/897s05/files/definitions_of_curriculum.htm

Veugelers, R., Gaakeer, M. I., Patka, P., & Huijsman, R. (2020). Improving design choices in Delphi Studies in medicine: The case of an exemplary physician multi-round panel study

with 100% response. *BMC Medical Research Methodology*, *20*(1). https://doi.org/10.1186/s12874-020-01029-4

Wall, J. E. (1972, October 26). *Document resume VT 018 409 author wall ... - files.eric.ed.gov*. ERIC: Institute of Education Services. https://files.eric.ed.gov/fulltext/ED070866.pdf

Weaver, W. (1971). The Delphi forecasting method. *The Phi Delta Kappan, 52*(5), 267-271. http://www.jstor.org/stable/20372868

Wells, T. and Hainline, M. (2021). Examining teachers' agricultural mechanics professional development needs: A national study. *Journal of Agricultural Education, 62*(2), 217-238. http://doi.org/10.5032/jae.2021.02217

Wells, T., Hainline, M., Rank, B., Sanders, K., & Chumbley, S. (2021). A regional study of the agricultural mechanics knowledge and skills needed by school-based agricultural education teachers**.** *Journal of Agricultural Education, 62*(2), 148-166. http://doi.org/10.5032/jae.2021.02148

Whitehair, R. L., Sands Schramm, K. R., Wells, T., and Hainline, M. S. (2020). Preservice teachers' conceptualizations of agricultural mechanics. *Journal of Agricultural Education, 61*(3), 60-74. https://doi.org/10.5032/jae.2020.03060

Wisconsin Statutes Higher Education, Wis. Stat. § 38.28 (1974 & rev. 2018). https://docs.legis.wisconsin.gov/statutes/statutes/38/28

Zepke, N., & Leach, L. (2010). Improving student engagement: Ten proposals for action. *Active Learning in Higher Education, 11*(3), 167–177. https://doi.org/10.1177/1469787410379680

APPENDICIES

Appendix A

Institutional Review Board Approval Form

Oklahoma State University Institutional Review Board

Date:	06/30/2021
Application Number:	IRB-21-280
Proposal Title:	Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry Experts to Skills Taught in Agricultural Mechanics Courses in Secondary Education Settings: a Two-Panel Delphi Study
Principal Investigator:	Kris Rankin III
Co-Investigator(s):	
Faculty Adviser:	Jon Ramsey
Project Coordinator:	
Research Assistant(s):	
Processed as:	Exempt
Exempt Category:	

Status Recommended by Reviewer(s): Approved

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 45CFR46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

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 approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

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 the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,

Oklahoma State University IRB

Appendix B

Informed Consent SBAE Teacher Panel

Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry Experts to Skills Taught in Agricultural Mechanics Courses in Secondary Education Settings: a Two-Panel Delphi Study (Informed Consent)

You are invited to participate in a research study looking at the current technical skills being taught within school-based agricultural education (SBAE) programs. The goal of this study is to be able to compare technical skills currently being taught within SBAE programs within the state of Oklahoma and technical skills desired by current agricultural industries associated with the agricultural mechanics sector. The study is being conducted by Kristopher Rankin III, a graduate student at Oklahoma State University, in preparation for a thesis defense.

Technical skills are abilities and knowledge used to perform particular task(s) in a given area. An example of technical skills is the "ability to read and interpret a tape measure". These differ from employability skills which are transferable skills of an individual possesses to make them "employable". An example of employability skills is "good communication".

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to answer a series of questions through use of the Qualtrics survey system. All answers will be confidential and all names/identifiable information will be removed prior to the presentation of the findings. The study will consist of three rounds of questioning at different points between July and August. Each round of questions will take approx. 10-30 minutes to answer. You may skip any questions you do not wish to answer and may refuse to continue in the study at any time.

The research team works to ensure complete confidentiality with all participants. It is possible, however unlikely, that unauthorized individuals could gain access to your responses because of the online survey format. However, your participation in this survey involves risks similar to a person's everyday internet usage. If you have concerns, please consult the Qualtrics privacy policy here. Participation in this study may not benefit you directly, however, the goal of this research is to be able to identify if current technical skills sought by industry personnel associated with the agricultural mechanics sector aligns with current technical skills being taught. This data will be used to aid in the development of potential in-service, curriculum, and school district resources based on the findings.

Your time and answers to the questions are of great value to the research individual(s). If you wish to participate in this study, please follow the link to the Qualtrics survey. If you do not wish to participate in this study, you may exit out of this, or, click "no" on the first question of the survey to take you directly to the end without answering any other questions.

The Institutional Review Board (IRB) for the protection of human research participants at Oklahoma State University has reviewed and approved this study. If you have questions about the study, please contact Kris Rankin or Dr. Jon Ramsey at the information below. If you have questions about the IRB process or concerns regarding the safety of the study, please contact the IRB at (405)-744-3377 or irb@okstate.edu. All reports and correspondence will be kept confidential.

Kris Rankin: kris.rankin@okstate.edu or 573-808-1855
Dr. Jon Ramsey: jon.ramsey@okstate.edu or (405)-744-8036.

Appendix C

Electronic Mail Message (Initial Recruitment), Round One

SBAE Teacher Panel

Subject Line: Seeking participants for research study in Agricultural Education Thesis

Body:
Dear potential Thesis research participant:

I am Kris Rankin and am a current graduate student with Oklahoma State University in the department of Agricultural Education, Communications & Leadership. You have been identified as an agricultural education teaching expert associated with the Oklahoma Youth Expo Agricultural Mechanics Competition.

I am asking for your participation in a research study looking into the technical skills currently being taught within school-based agricultural education programs. These technical skills are abilities or knowledge used to perform particular task(s) in a given area. These differ from employability skills as they are considered "soft skills" like "good communication" or "follows instructions".

Your participation in this study would be most appreciated. The end goal of this study is to compare the skills desired by industry experts and compare them to skills currently being taught within school-based agricultural education programs. This can lead to the potential development of new curriculum for schools, in-service opportunities, and potential legislation that benefits our career and technical education programs. If you wish to participate in this study, please click here. If you do not wish to participate in this study, you may delete this email, or, follow the link and click "no" to not participate in the study.

Sincerely,

Kris Rankin III

Appendix D

Follow-up Reminder (Initial Recruitment), Round One

SBAE Teacher Panel

To all potential research participants:

I just wanted to reach out to you all again asking if you would like to participate in a Master's Research study. You have been identified as an agricultural education teaching expert in the field of agricultural power, structures, and technology (APST) who is also associated with the Oklahoma Youth Expo Agricultural Mechanics contest. This first round of questions will remain open until next Sunday, August 22nd at 11:59 p.m.

Sincerely,

Kris Rankin III

Appendix E

Electronic Mail Message (Secondary Recruitment), Round On

SBAE Teacher Panel

Dear potential Thesis research participants:

I am Kris Rankin and am a current graduate student with Oklahoma State University in the department of Agricultural Education, Communications & Leadership. You have been identified as an agricultural education teaching expert associated with the Central Region of the Oklahoma Agricultural Education Teachers Association (OAETA).

I am asking for your participation in a research study looking into the technical skills currently being taught within school-based agricultural education programs. These technical skills are abilities or knowledge used to perform particular task(s) in a given area. These differ from employability skills as they are considered "soft skills" like "good communication" or "follows instructions".

Your participation in this study would be most appreciated. The end goal of this study is to compare the skills desired by industry experts and compare them to skills currently being taught within school-based agricultural education programs. This can lead to the potential development of new curriculum for schools, in-service opportunities, and potential legislation that benefits our career and technical education programs. If you wish to participate in this study, please click here. If you do not wish to participate in this study, you may delete this email, or, follow the link and click "no" to not participate in the study.

Sincerely,
Kris Rankin III

Appendix F

Follow-up Reminder (Secondary Recruitment), Round On

SBAE Teacher Panel

To all potential research participants:

I just wanted to reach out to you all again asking if you would like to participate in a Master's Research study. You have been identified as an agricultural education teaching expert in the field of agricultural power, structures, and technology who is also located in the Central Region of the Oklahoma Agricultural Education Teachers Association (OAETA). This first round of questions will remain open until next Sunday, September 12th at 11:59 p.m.

Sincerely,

Kris Rankin III

Appendix G

Round One Questionnaire

SBAE Teacher Panel

Skills taught within SBAE program agricultural mechanization courses

Q1

Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry Experts to Skills Taught in Agricultural Mechanics Courses in Secondary Education Settings: a Two-Panel Delphi Study (Informed Consent)

You are invited to participate in a research study looking at the current technical skills being taught within school-based agricultural education (SBAE) programs. The goal of this study is to be able to compare technical skills currently being taught within SBAE programs within the state of Oklahoma and technical skills desired by current agricultural industries associated with the agricultural mechanics sector. The study is being conducted by Kristopher Rankin III, a graduate student at Oklahoma State University, in preparation for a thesis defense.

Technical skills are abilities and knowledge used to perform particular task(s) in a given area. An example of technical skills is the "ability to read and interpret a tape measure". These differ from employability skills which are transferable skills of an individual possesses to make them "employable". An example of employability skills is "good communication".

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to answer a series of questions through use of the Qualtrics survey system. All answers will be confidential and all names/identifiable information will be removed prior to the presentation of the findings. The study will consist of three rounds of questioning at different points between July and August. Each round of questions will take approx. 10-30 minutes to answer. You may skip any questions you do not wish to answer and may refuse to continue in the study at any time.

The research team works to ensure complete confidentiality with all participants. It is possible, however unlikely, that unauthorized individuals could gain access to your responses because of the online survey format. However, your participation in this survey involves risks similar to a person's everyday internet usage. If you have concerns, please consult the Qualtrics privacy policy here. Participation in this study may not benefit you directly, however, the goal of this research is to be able to identify if current technical skills sought by industry personnel associated with the agricultural mechanics sector aligns with current technical skills being taught. This data will be used to aid in the development of potential in-service, curriculum, and school district resources based on the findings.

Your time and answers to the questions are of great value to the research individual(s). If you wish to participate in this study, please follow the link to the Qualtrics survey. If you do not wish to participate in this study, you may exit out of this, or, click "no" on the first question of the survey to take you directly to the end without answering any other questions.

The Institutional Review Board (IRB) for the protection of human research participants at Oklahoma State University has reviewed and approved this study. If you have questions about the study, please contact Kris Rankin or Dr. Jon Ramsey at the information below. If you have

questions about the IRB process or concerns regarding the safety of the study, please contact the IRB at (405)-744-3377 or irb@okstate.edu. All reports and correspondence will be kept confidential.

Kris Rankin: kris.rankin@okstate.edu or 573-808-1855
Dr. Jon Ramsey: jon.ramsey@okstate.edu or (405)-744-8036.

Do you consent to participating in this survey?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry E... = No

Q2 Please enter the school where you are currently employed:

_____

Q3 What is your current age?

	0 10 20 30 40 50 60 70 80 90 100
Age (years) ()	

Q4 What sex do you identify as?

- ○ Male (1)
- ○ Female (2)
- ○ Prefer to not answer (3)

Q5 What teaching certification do you possess?

- ○ Traditional certification (1)
- ○ Alternative certification (2)
- ○ Emergency certification (3)

Q6 What is your state FFA area?

- Northeast area (1)
- Northwest area (2)
- Central area (3)
- Southeast area (4)
- Southwest area (5)

Q7 How many years (total) have you taught agricultural education? (As of July, 2021)

0 10 20 30 40 50 60 70 80 90 100

Years of experience ()	

Q8 What is your average teaching load of all courses taught?

- 1 course (1)
- 2 courses (2)
- 3 courses (3)
- 4 courses (4)
- 5 courses (5)
- 6 courses (6)
- 7 or more courses (7)

Q9 What is your average teaching load in courses related to Agricultural Power & Technology?

- ○ 1 course (1)
- ○ 2 courses (2)
- ○ 3 courses (3)
- ○ 4 courses (4)
- ○ 5 courses (5)
- ○ 6 courses (6)
- ○ 7 or more courses (7)

Q10 Of your courses related to Agricultural Power & Technology, what content area(s) are taught? (Select all that apply)

- ☐ Ag Power (diesel technology, sustainable energy systems) (1)
- ☐ Electricity (2)
- ☐ Plumbing and/or Irrigation (3)
- ☐ Project planning (4)
- ☐ Safety and PPE (5)
- ☐ Small Gas Engines (6)
- ☐ Structures (Concrete, wood/metal framing, masonry) (7)
- ☐ Surveying (GPS/GIS) (8)
- ☐ Welding (SMAW, GMAW, GTAW, Flux Core) (9)
- ☐ Welding (Oxy-Acetylene, Oxy-Propane, and cutting applications) (10)
- ☐ Woodworking (small projects, furniture grade) (11)
- ☐ Other (please specify) (12)

Q11 What experience, outside of teaching, do you possess in Agricultural Power & Technical systems? e.g., production agriculture, prior work experience in agricultural mechanics, etc. (select all that apply)

- ☐ Production Agriculture (current/past) (1)
- ☐ Prior employment in industry (2)

☐ Professional development/in-service (3)

☐ Professional certificate(s) (4)

☐ Degree(s) in Agricultural Power, Structures & Technical Systems (5)

☐ Other (please specify) (6)

_____

Q12 Do you currently use an advisory council for your SBAE program?

○ Yes (1)

○ No (2)

Q13 What technical skills do you teach related to Small Gas Engines/Ag Power? (e.g., ability to change oil in a motor). If you do not teach courses related to this area, leave blank and please go to the next question.

_____

_____

_____

_____

_____

Q14 What technical skills do you teach related to Ag Structures? (e.g., ability to calculate fencing materials costs). If you do not teach content related to this area, leave blank and please go to the next question.

_____

_____

_____

_____

_____

Q15 What technical skills do you teach related to Agricultural Electricity? (e.g., ability to wire a switch to an outlet). If you do not teach content related to this area, leave blank and please go to the next question.

_____

_____

_____

_____

_____

Q16 What technical skills do you teach related to Ag Welding/Ag Construction? (e.g., ability to properly set wire speed and amperage on a welding machine). If you do not teach content related to this area, leave blank and please go to the next question.

_____

_____

_____

_____

_____

Q17 What technical skills do you teach related to the Introduction of Agriscience curriculum? (e.g., ability to identify proper PPE). If you do not teach a course or content related to this area, leave blank and please go to the next question.

_____

_____

_____

_____

_____

Q18 What technical skills do you teach related to the CASE Ag Power & Technology/Mechanical Systems in Agriculture related courses? (e.g., ability to calculate concrete materials needed for a foundation). If you do not teach CASE curricula in this area, please leave blank.

_____

Appendix H

Informed Consent Industry Expert Panel

Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry Experts to Skills Taught in Agricultural Mechanics Courses in Secondary Education Settings: a Two-Panel Delphi Study (Informed Consent)

You are invited to participate in a research study looking at the current technical skills being taught within school-based agricultural education (SBAE) programs. The goal of this study is to be able to compare technical skills currently being taught within SBAE programs within the state of Oklahoma and technical skills desired by current agricultural industries associated with the agricultural mechanics sector. The study is being conducted by Kristopher Rankin III, a graduate student at Oklahoma State University, in preparation for a thesis defense.

Technical skills are abilities and knowledge used to perform particular task(s) in a given area. An example of technical skills is the "ability to read and interpret a tape measure". These differ from employability skills which are transferable skills of an individual possesses to make them "employable". An example of employability skills is "good communication".

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to answer a series of questions through use of the Qualtrics survey system. All answers will be confidential and all names/identifiable information will be removed prior to the presentation of the findings. The study will consist of three rounds of questioning at different points between July and August. Each round of questions will take approx. 10-30 minutes to answer. You may skip any questions you do not wish to answer and may refuse to continue in the study at any time.

The research team works to ensure complete confidentiality with all participants. It is possible, however unlikely, that unauthorized individuals could gain access to your responses because of the online survey format. However, your participation in this survey involves risks similar to a person's everyday internet usage. If you have concerns, please consult the Qualtrics privacy policy here. Participation in this study may not benefit you directly, however, the goal of this research is to be able to identify if current technical skills sought by industry personnel associated with the agricultural mechanics sector aligns with current technical skills being taught. This data will be used to aid in the development of potential in-service, curriculum, and school district resources based on the findings.

Your time and answers to the questions are of great value to the research individual(s). If you wish to participate in this study, please follow the link to the Qualtrics survey. If you do not wish to participate in this study, you may exit out of this, or, click "no" on the first question of the survey to take you directly to the end without answering any other questions.

The Institutional Review Board (IRB) for the protection of human research participants at Oklahoma State University has reviewed and approved this study. If you have questions about the study, please contact Kris Rankin or Dr. Jon Ramsey at the information below. If you have questions about the IRB process or concerns regarding the safety of the study, please contact the IRB at (405)-744-3377 or irb@okstate.edu. All reports and correspondence will be kept confidential.

Kris Rankin: kris.rankin@okstate.edu or 573-808-1855

Dr. Jon Ramsey: jon.ramsey@okstate.edu or (405)-744-8036

Appendix I

Electronic Mail Message (Initial Recruitment), Round One

Industry Expert Panel

Subject Line: Seeking participants for research study in Agricultural Education Thesis

Body:
Dear potential Thesis research participant:

I am Kris Rankin and am a current graduate student with Oklahoma State University in the department of Agricultural Education, Communications & Leadership. You have been identified as an agricultural industry expert associated with the Oklahoma Youth Expo Agricultural Mechanics Competition.

I am asking for your participation in a research study looking into the technical skills desired by your industry for potential employment. These technical skills are abilities or knowledge used to perform particular task(s) in a given area. These differ from employability skills as they are considered "soft skills" like "good communication" or "follows instructions".

Your participation in this study would be most appreciated. The end goal of this study is to compare the skills desired by industry experts and compare them to skills currently being taught within school-based agricultural education programs. This can lead to the potential development of new curriculum for schools, in-service opportunities, and potential legislation that benefits our career and technical education programs. If you wish to participate in this study, please click here. If you do not wish to participate in this study, you may delete this email, or, follow the link and click "no" to not participate in the study.

Sincerely,

Kris Rankin III

Appendix J

Follow-up Reminder (Initial Recruitment), Round One

Industry Expert Panel

To all potential research participants:

I just wanted to reach out to you all again asking if you would like to participate in a Master's Research study. You have been identified as an expert in your field who is also associated with the Oklahoma Youth Expo Agricultural Mechanics contest. This first round of questions will remain open until next Sunday, August 22nd at 11:59 p.m.

Sincerely,

Kris Rankin III

Appendix K

Electronic Mail Message (Secondary Recruitment), Round On

Industry Expert Panel

Dear potential Thesis research participants:

I am Kris Rankin and am a current graduate student with Oklahoma State University in the department of Agricultural Education, Communications & Leadership. You have been identified as an agricultural power, structures, and technology industry expert associated with the Central Region of the Oklahoma Agricultural Education Teachers Association (OAETA).

I am asking for your participation in a research study looking into the technical skills currently being taught within school-based agricultural education programs. These technical skills are abilities or knowledge used to perform particular task(s) in a given area. These differ from employability skills as they are considered "soft skills" like "good communication" or "follows instructions".

Your participation in this study would be most appreciated. The end goal of this study is to compare the skills desired by industry experts and compare them to skills currently being taught within school-based agricultural education programs. This can lead to the potential development of new curriculum for schools, in-service opportunities, and potential legislation that benefits our career and technical education programs. If you wish to participate in this study, please click here. If you do not wish to participate in this study, you may delete this email, or, follow the link and click "no" to not participate in the study.

Sincerely,
Kris Rankin III

Appendix L

Follow-up Reminder (Secondary Recruitment), Round One

Industry Expert Panel

To all potential research participants:

I just wanted to reach out to you all again asking if you would like to participate in a Master's Research study. You have been identified as an expert in your field who is also located in the Central Region of the Oklahoma Agricultural Education Teachers Association (OAETA). This first round of questions will remain open until next Sunday, September 12th at 11:59 p.m.

Sincerely,

Kris Rankin III

Appendix M

Round One Questionnaire

Industry Expert Panel

Skills sought for employment by Oklahoma Youth Expo Ag Mech competition sponsors

Q1 Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry Experts to Skills Taught in Agricultural Mechanics Courses in Secondary Education Settings: a Two-Panel Delphi Study (Informed Consent)

You are invited to participate in a research study looking at the current technical skills being taught within school-based agricultural education (SBAE) programs. The goal of this study is to be able to compare technical skills currently being taught within SBAE programs within the state of Oklahoma and technical skills desired by current agricultural industries associated with the agricultural mechanics sector. The study is being conducted by Kristopher Rankin III, a graduate student at Oklahoma State University, in preparation for a thesis defense.

Technical skills are abilities and knowledge used to perform particular task(s) in a given area. An example of technical skills is the "ability to read and interpret a tape measure". These differ from employability skills which are transferable skills of an individual possesses to make them "employable". An example of employability skills is "good communication".

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to answer a series of questions through use of the Qualtrics survey system. All answers will be confidential and all names/identifiable information will be removed prior to the presentation of the findings. The study will consist of three rounds of questioning at different points between July and August. Each round of questions will take approx. 10-30 minutes to answer. You may skip any questions you do not wish to answer and may refuse to continue in the study at any time.

The research team works to ensure complete confidentiality with all participants. It is possible, however unlikely, that unauthorized individuals could gain access to your responses because of the online survey format. However, your participation in this survey involves risks similar to a person's everyday internet usage. If you have concerns, please consult the Qualtrics privacy policy here. Participation in this study may not benefit you directly, however, the goal of this research is to be able to identify if current technical skills sought by industry personnel associated with the agricultural mechanics sector aligns with current technical skills being taught. This data will be used to aid in the development of potential in-service, curriculum, and school district resources based on the findings.

Your time and answers to the questions are of great value to the research individual(s). If you wish to participate in this study, please follow the link to the Qualtrics survey. If you do not wish to participate in this study, you may exit out of this, or, click "no" on the first question of the survey to take you directly to the end without answering any other questions.

The Institutional Review Board (IRB) for the protection of human research participants at Oklahoma State University has reviewed and approved this study. If you have questions about the study, please contact Kris Rankin or Dr. Jon Ramsey at the information below. If you have questions about the IRB process or concerns regarding the safety of the study, please contact the IRB at (405)-744-3377 or irb@okstate.edu. All reports and correspondence will be kept

confidential.
Kris Rankin: kris.rankin@okstate.edu or 573-808-1855
Dr. Jon Ramsey: jon.ramsey@okstate.edu or (405)-744-8036

Do you consent to participating in this survey?

- Yes (1)
- No (2)

Skip To: End of Survey If Comparing Entry-level Skills Expected by Agricultural Power, Structures and Technology Industry E... = No

Q2 Which Oklahoma Agricultural Industry do you represent?

_____

Q3 What sex do you identify as?

- Male (1)
- Female (2)
- Prefer not to answer (3)

Q4 What is your current age as?

	0 10 20 30 40 50 60 70 80 90 100
Age (years) ()	

Q5 What is your current position within your organization?

_____

Q6 How many years have you been with your organization?

	0 10 20 30 40 50 60 70 80 90 100
Years (w/ organization) ()	

Q7 How many years have you worked in the agricultural industry or organization that associated with or served the agricultural sector?

0 10 20 30 40 50 60 70 80 90 100

Years (assoc. w/ ag sector) ()	

Q8 What certifications do you currently hold? (Select all that apply)

- ☐ Welding (CWI/SCWI) (1)
- ☐ Welding (CWSR) (2)
- ☐ Welding (CWS) or (CWE) (3)
- ☐ Electrical (CESCP) (4)
- ☐ Electrical (CEST) or (CESW) (5)
- ☐ Electrical (CEPSS) (6)
- ☐ Automotive (ASE) Certification (7)
- ☐ Natural Gas Operator Qualifications (OQ) (8)
- ☐ Pressure Vessel Inspector (CPVI) (9)
- ☐ Certified Petroleum Geologist (CPG) (10)
- ☐ Petroleum Engineer Certification (CPE) (11)
- ☐ IWCF Drilling Well Control Certification (12)
- ☐ Other (Please Specify): (13) _____

Q9 To which professional organization(s) related to agriculture are you a current member? List all that apply

_____

_____

_____

_____

_____

Q10 Would you consider working with a local Agricultural Education program as part of an FFA Alumni or Advisory Council member?

- ○ I currently serve on an Advisory Council for a local Agricultural Education Program (1)
- ○ Yes (2)
- ○ Maybe (3)
- ○ No (4)

Q11 What technical skills (abilities or knowledge used to perform particular task(s) in a given area) do you believe recent high school graduates, without any post-secondary training, should possess to work in your organization? e.g., ability to read and utilize a tape measure, ability to change oil in a small gas engine, etc.

_____

_____

_____

_____

_____

Appendix N

Electronic Mail Message, Round Two

SBAE Teacher Panel

Dear Participants,

I want to first say thank you for your initial input on the first round of the surveys helping to identify technical skills taught within various agricultural power, structures, and technology courses. For this round, there were 92 differentiated skills identified between five different course sections or pathways. I am wanting to see your individual level of agreeance with each identified technical skill and if you believe it is necessary for students to learn the technical skill within a school-based agricultural education program.

The survey can be found here:
https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_7PLE7OtQSUGGjky

Sincerely,

Kris Rankin III

Appendix O

Follow-up Reminder, Round Two

SBAE Teacher Panel

Dear SBAE Agricultural Mechanics Teaching Experts:

I just wanted to touch base with everyone and say thank you for those that have completed the second round of the instrumentation. If you have not already completed the second round of the instrument, I would greatly appreciate any and all support you can generate for the instrument. Your input will help to analyze curriculum sources currently available and aid in the potential for curriculum updates.

https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_7PLE7OtQSUGGjky

Sincerely,

Kris Rankin III

Appendix P

Round Two Questionnaire

SBAE Teacher Panel

Technical skills taught within SBAE programs

Q1 Directions: In round one, you were asked to answer the questions: 1.) What technical skills do you teach related to Small Gas Engines/Ag Power? (e.g., ability to change oil in a motor); 2.) What technical skills do you teach related to Ag Structures? (e.g., ability to calculate fencing materials costs); 3.) What technical skills do you teach related to Agricultural Electricity? (e.g., ability to wire a switch to an outlet); 4.) What technical skills do you teach related to Ag Welding/Ag Construction? (e.g., ability to properly set wire speed and amperage on a welding machine); 5.) What technical skills do you teach related to the Introduction of Agriscience curriculum? (e.g., ability to identify proper PPE).

Below are the statements identified from round one with similar answers combined into one another. Each item identified is aligned with a six-point summated scale to determine your level of agreeance. An answer of 1 would mean that you strongly disagree with the statement and deem it is not necessary for secondary high school students to gain employment following high school. Each subsequent number indicates a different level of agreeance to the statement with 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, and 6 = strongly agree.

After the statements, there is an opportunity for you to address any questions, concerns, or other statements you believe should have been included within this survey. Should you have any questions about the survey, statements identified, additional answers you think should be included, or about the study in general, please contact Kris Rankin at kris.rankin@okstate.edu

Once you have completed your survey, please click the submit button to submit your survey. Once all surveys have been accounted for, a possible third-final round may be conducted if any statements need a final vote of approval from the expert panelists.

The Qualtrics privacy policy can be found here:
https://www.qualtrics.com/privacy-statement/

Do you consent to the second round of the survey?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If Directions: In round one, you were asked to answer the questions: 1.) What technical skills do yo... = No

Q2 The following represent the statements identified from the question: "What technical skills do you teach related to Small Gas Engines/Ag Power? (e.g., ability to change oil in a motor)". Please read each individual statement and determine you level of agreeance using the summated scale.	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)
Identify similarities and differences between 2 - stroke and 4 - stroke engines (1)	○	○	○	○	○	○
Ability to change oil in a motor (2)	○	○	○	○	○	○

Ability to check a spark plug gap (3)	○	○	○	○	○	○
Ability to diagnose a small gas engine (4)	○	○	○	○	○	○
Ability to repair and maintain a small gas engine (5)	○	○	○	○	○	○
Ability to change a tire (6)	○	○	○	○	○	○
Ability to check and monitor fluids within a motor (7)	○	○	○	○	○	○
Ability to rebuild a carburetor (8)	○	○	○	○	○	○
Ability to change blades on a lawn mower (9)	○	○	○	○	○	○
Ability to properly I.D. parts of small gas engines (10)	○	○	○	○	○	○

Ability to I.D. function(s) of small gas engine parts (11)	○	○	○	○	○	○
Able to perform basic problem solving techniques related to small gas engines and motors (12)	○	○	○	○	○	○

Q3 The following represent the statements identified from the question: "What technical skills do you teach related to Ag Structures? (e.g., ability to calculate fencing materials costs)". Please read each individual statement and determine you level of agreeance using the summated scale.	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)

Ability to calculate material costs (1)	○	○	○	○	○	○
Ability to calculate area of a project (2)	○	○	○	○	○	○
Ability to perform basic surveying skills (e.g., reading a surveying stick) (3)	○	○	○	○	○	○
Ability to perform basic project planning (e.g., project plans and design) (4)	○	○	○	○	○	○
Ability to create project budgets (5)	○	○	○	○	○	○
Ability to perform basic carpentry skills (e.g., frame a wall) (6)	○	○	○	○	○	○
Ability to read and comprehend measurements and tape measures (7)	○	○	○	○	○	○
Ability to calculate slope of a plot (8)	○	○	○	○	○	○

Ability to calculate perimeter of a project (9)	○	○	○	○	○	○
Ability to calculate diameter of circular projects (10)	○	○	○	○	○	○
Ability to create material and cut lists (11)	○	○	○	○	○	○
Ability to perform squaring of a project (12)	○	○	○	○	○	○

Q4 The following represent the statements identified from the question: "What technical skills do you teach related to Agricultural Electricity? (e.g., ability to wire a switch to an outlet)". Please read each individual statement and determine you level of agreeance using the summated scale.	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)

Ability to wire light fixtures (1)	○	○	○	○	○	○
Ability to wire two-pole switches (2)	○	○	○	○	○	○
Ability to wire breaker boxes (3)	○	○	○	○	○	○
Ability to perform basic wiring on a wiring board (4)	○	○	○	○	○	○
Ability to wire electrical outlets (5)	○	○	○	○	○	○
Ability to wire an extension cord male and female ends (6)	○	○	○	○	○	○
Ability to diagnose electrical issues (7)	○	○	○	○	○	○
Ability to develop wiring diagrams for projects (8)	○	○	○	○	○	○
Ability to perform basic problem solving involving wiring and electricity (9)	○	○	○	○	○	○

Ability to comprehend proper electrical safety procedures (10)	○	○	○	○	○	○
Ability to demonstrate comprehension of the National Electrical Safety standards test (11)	○	○	○	○	○	○
Ability to differentiate between Alternating Current (AC) and Direct Current (DC) (12)	○	○	○	○	○	○
Ability to differentiate 110 volt and 220 volt systems (13)	○	○	○	○	○	○
Ability to demonstrate proper grounding of an electrical circuit (14)	○	○	○	○	○	○
Ability to properly identify common electrical tools (15)	○	○	○	○	○	○

Ability to demonstrate proper repair of an extension cord or live electrical line. (16)	○	○	○	○	○	○
Ability to interpret wiring diagrams (17)	○	○	○	○	○	○
Ability to explain different wiring diagrams and symbols (18)	○	○	○	○	○	○
Ability to demonstrate Career Development Event (CDE) Agricultural Electricity topics (19)	○	○	○	○	○	○
Ability to wire agricultural projects (20)	○	○	○	○	○	○

Q5 The following represent the statements identified from the question: "What technical skills do you teach related to Ag Welding/Ag Construction? (e.g., ability to properly set wire speed and amperage on a welding machine)". Please read each individual statement and determine you level of agreeance using the summated scale.	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)
Ability to properly setup a SMAW machine (1)	○	○	○	○	○	○
Ability to properly setup a GMAW machine (2)	○	○	○	○	○	○
Ability to properly setup a GTAW machine (3)	○	○	○	○	○	○
Ability to perform basic maintenance on an SMAW machine (4)	○	○	○	○	○	○

Ability to perform basic maintenance on a GMAW machine (5)	○	○	○	○	○	○
Ability to perform basic maintenance on a GTAW machine (6)	○	○	○	○	○	○
Ability to perform basic welds with an SMAW machine (7)	○	○	○	○	○	○
Ability to perform basic welds with a GMAW Machine (8)	○	○	○	○	○	○
Ability to perform basic welds with a GTAW machine (9)	○	○	○	○	○	○
Ability to comprehend proper welding safety procedures (10)	○	○	○	○	○	○
Ability to demonstrate proper welding safety procedures (11)	○	○	○	○	○	○
Ability to self-evaluate welds (12)	○	○	○	○	○	○

Ability to demonstrate comprehension of wire speed effects on welds (13)	○	○	○	○	○	○
Ability to demonstrate comprehension of heat disposition on metal (14)	○	○	○	○	○	○
Ability to properly identify common electrodes used for project construction (15)	○	○	○	○	○	○
Ability to select proper electrode size (16)	○	○	○	○	○	○
Ability to differentiate welding gases used in GMAW and GTAW welding (17)	○	○	○	○	○	○
Ability to differentiate different gases used for oxy-fuel cutting (18)	○	○	○	○	○	○
Ability to differentiate gases used for GMAW/GTAW welding and oxy-fuel welding/cutting (19)	○	○	○	○	○	○

Ability to diagnose SMAW welder machine problems (20)	○	○	○	○	○	○
Ability to diagnose GMAW welder machine problems (21)	○	○	○	○	○	○
Ability to diagnose GTAW welder machine problems (22)	○	○	○	○	○	○
Ability to explain weld penetration effects (23)	○	○	○	○	○	○
Ability to explain welding angle effects (24)	○	○	○	○	○	○
Ability to perform project designs using different medias (e.g., paper, computer, etc.) (25)	○	○	○	○	○	○
Ability to construct agricultural projects using different welding machines (26)	○	○	○	○	○	○
Ability to market welding projects (27)	○	○	○	○	○	○

Ability to explain various weld joints (28)	○	○	○	○	○	○
Ability to identify and demonstrate weld positions (29)	○	○	○	○	○	○
Ability to identify proper project completion processes with wielding applications (30)	○	○	○	○	○	○
Ability to setup oxy-fuel torch for cutting applications (31)	○	○	○	○	○	○
Ability to setup torch for welding applications (32)	○	○	○	○	○	○
Ability to identify differences between welding mild steel and aluminum using GTAW processes (33)	○	○	○	○	○	○
Ability to operate hand-held plasma cutting systems (34)	○	○	○	○	○	○

Ability to operate computer operated plasma cutting systems (35)	○	○	○	○	○	○
Ability to operate different cutting tools (e.g., chop saw, band saw, cold-cut saw) (36)	○	○	○	○	○	○

Q6 The following represent the statements identified from the question: "What technical skills do you teach related to the Introduction of Agriscience curriculum? (e.g., ability to identify proper PPE)". Please read each individual statement and determine you level of agreeance using the summated scale.	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)

Ability to identify personal protection equipment for woodworking (1)	○	○	○	○	○	○
Ability to identify personal protection equipment for welding applications (2)	○	○	○	○	○	○
Ability to identify how personal protective equipment works within the woodworking and welding applications (3)	○	○	○	○	○	○
Ability to demonstrate proper personal protective equipment application (i.e., wearing of the equipment) (4)	○	○	○	○	○	○

Ability to identify and demonstrate proper welding safety techniques (5)	○	○	○	○	○	○
Ability to perform proper woodworking safety techniques using common hand and power tools (6)	○	○	○	○	○	○
Ability to identify common shop hazards (7)	○	○	○	○	○	○
Ability to identify fire hazards (8)	○	○	○	○	○	○
Ability to demonstrate proper fire safety (9)	○	○	○	○	○	○
Ability to demonstrate proper oxy-fuel torch safety (10)	○	○	○	○	○	○
Ability to properly identify common hand tools (11)	○	○	○	○	○	○

Ability to properly identify common power tools (12)	○	○	○	○	○	○

Q7 Are there any questions, concerns, or additional technical skills you believe should be within this study?

_____

_____

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_____

_____

Appendix Q

Electronic Mail Message, Round Two

Industry Expert Panel

Dear Participants,

I want to first say thank you for your initial input on the first round of the surveys helping to identify technical skills sought various agricultural power, structures, and technology employment opportunities. For this round, there were 13 differentiated skills identified from the initial survey. I am wanting to see your individual level of agreeance with each identified technical skill and if you believe it is necessary for students to learn the technical skill within a school-based agricultural education program.

If you participated in the first round and would like to assist myself within this study, the second round can be found here:
https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_0PNMX51Mlenz78O

If you have any questions or concerns about the survey, feel free to contact Kris Rankin at:
kris.rankin@okstate.edu

Sincerely,
Kris Rankin III

Appendix R

Follow-up Reminder, Round Two

Industry Expert Panel

Dear Industry Personnel Experts:

I just wanted to touch base with everyone and say thank you for those that have completed the second round of the instrumentation. If you have not already completed the second round of the instrument, I would greatly appreciate any and all support you can generate for the instrument. Your input will help to analyze curriculum sources currently available and aid in the potential for curriculum updates.

https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_0PNMX51Mlenz78O

Sincerely,

Kris Rankin III

Appendix S

Round Two Questionnaire

Industry Expert Panel

Technical skills sought within secondary high school students for employment

Q2 Directions: In round one, you were asked to answer the question: "What technical skills (abilities or knowledge used to perform particular task(s) in a given area) do you believe recent high school graduates, without any post-secondary training, should possess to work in your organization? e.g., ability to read and utilize a tape measure, ability to change oil in a small gas engine, etc.".

Below are the statements identified from round one with similar answers combined into one another. Each item identified is aligned with a six-point scale to determine your level of agreeance. An answer of 1 would mean that you strongly disagree with the statement and deem it is not necessary for secondary high school students to gain employment following high school. Each subsequent number indicates a different level of agreeance to the statement with 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, and 6 = strongly agree.

After the statements, there is an opportunity for you to address any questions, concerns, or other statements you believe should have been included within this survey. Should you have any questions about the survey, statements identified, additional answers you think should be included, or about the study in general, please contact Kris Rankin at kris.rankin@okstate.edu

Once you have completed your survey, please click the submit button to submit your survey. Once all surveys have been accounted for, a possible third-final round may be conducted if any statements need a final vote of approval from the expert panelists.

The Qualtrics privacy policy can be found here:
https://www.qualtrics.com/privacy-statement/

Do you consent to participating in the second round of the survey?

- ○ yes (1)
- ○ no (2)

Skip To: End of Survey If Directions: In round one, you were asked to answer the question: "What technical skills (abilitie... = no

Q1 The following represent the technical skills identified from the round-one questionnaire that students need for employment. Please read each statement and determine you level of agreement	1 - Strongly Disagree (1)	2 - Disagree (2)	3 - Slightly Disagree (3)	4 - Slightly Agree (4)	5 - Agree (5)	6 - Strongly Agree (6)
Able to read and comprehend a tape measure (1)	○	○	○	○	○	○
Able to conduct simple math (2)	○	○	○	○	○	○
Able to operate a welder (3)	○	○	○	○	○	○
Able to perform a satisfactory weld (4)	○	○	○	○	○	○
Able to operate power tools (5)	○	○	○	○	○	○
Able to operate hand tools (6)	○	○	○	○	○	○

Able to perform precision cuts on a variety of materials (7)	○	○	○	○	○	○
Able to operate heavy machinery (8)	○	○	○	○	○	○
Able to operate Microsoft Word (9)	○	○	○	○	○	○
Able to operate Microsoft Excel (10)	○	○	○	○	○	○
Able to operate Microsoft PowerPoint (11)	○	○	○	○	○	○
Able to perform basic repair and maintenance on fluids and filters (12)	○	○	○	○	○	○

Able to perform basic repair and maintenance on replacing non-fluid/filter parts (e.g., spark plugs, blades, etc.) (13)	○	○	○	○	○	○

Q3 Are there any questions, concerns, or additional statements you believe should have been within the survey?

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Appendix T

Electronic Mail Message, Round Three

SBAE Teacher Panel

Dear SBAE Agricultural Mechanics Teaching Experts:

I just wanted to touch base with everyone and say thank you for completing the second-round questionnaire. For the third, and final round, of questionnaires, you will be asked to answer whether or not you would like to have four items from round two that reached between 51.00% to less than 70.00% consensus kept for the study. Please follow the link below to the survey. If you do not wish to continue in the study, you may either decline the survey on Qualtrics™ or you may simply delete this email. I thank you for your time commitment to this study and wish you all best of luck at your fall speech contests!

https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_7PEL94HtY0I3Gjky

Sincerely,

Kris Rankin III

Appendix U

Round Three Questionnaire

SBAE Teacher Panel

Technical skills taught within SBAE programs Rd 3

Q1 In the first two rounds of the study, you were asked to identify technical skills currently taught within your agricultural power, structures, and technology courses; as well as to rank each statement identified by the research team.

For this final survey, we have identified three (3) responses that were in the 51% to 70% agreeance range. We ask that you select "yes" or "no" on these three items to determine if they will be accepted within the study.

Do you consent to the final round of this Delphi Study?

- ○ Yes (1)
- ○ No (2)

Q2 Do you believe students should: be able to calculate the perimeter of a project?

- ○ No (1)
- ○ Yes (2)

Q3 Do you believe students should: be able to calculate diameter of circular objects?

- ○ No (1)
- ○ Yes (2)

Q4 Do you believe students should: Be able to wire beaker boxes?

- ○ No (1)
- ○ Yes (2)

Q5 Do you believe students should: Be able to perform basic wiring on a wiring board?

- ○ Yes (1)
- ○ No (2)

Appendix V

Electronic Mail Message, Round Three

Industry Expert Panel

Dear Industry Expert Panelists:

I just wanted to touch base with everyone and say thank you for completing the second-round questionnaire. For the third, and final round, of questionnaires, you will be asked to answer whether or not you would like to have five items from round two that reached between 51.00% to less than 70.00% consensus kept for the study. Please follow the link below to the survey. If you do not wish to continue in the study, you may either decline the survey on Qualtrics™ or you may simply delete this email. I thank you for your time commitment to this study and wish you a great rest of your week!

https://okstatecasnr.az1.qualtrics.com/jfe/form/SV_856Ple3JW5M2sGjky

Sincerely,

Kris Rankin III

Appendix W

Round Three Questionnaire

Industry Expert Panel

Technical skills sought by APST employers

Q1 In the first two rounds of the study, you were asked to identify technical skills currently sought for employment with no post-secondary training, as well as to rank each statement identified by the research team.

For this final survey, we have identified three (5) responses that were in the 51% to 70% agreeance range. We ask that you select "yes" or "no" on these three items to determine if they will be accepted within the study.

Do you consent to the final round of this Delphi Study?

- Yes (1)
- No (2)

Q2 Do you believe students should: be able to read and comprehend a tape measure?

- No (1)
- Yes (2)

Q3 Do you believe students should: be able to operate a welder?

- No (1)
- Yes (2)

Q4 Do you believe students should: be able to operate power tools?

- No (1)
- Yes (2)

Q5 Do you believe students should: be able to operate Microsoft Word?

- No (1)
- Yes (2)

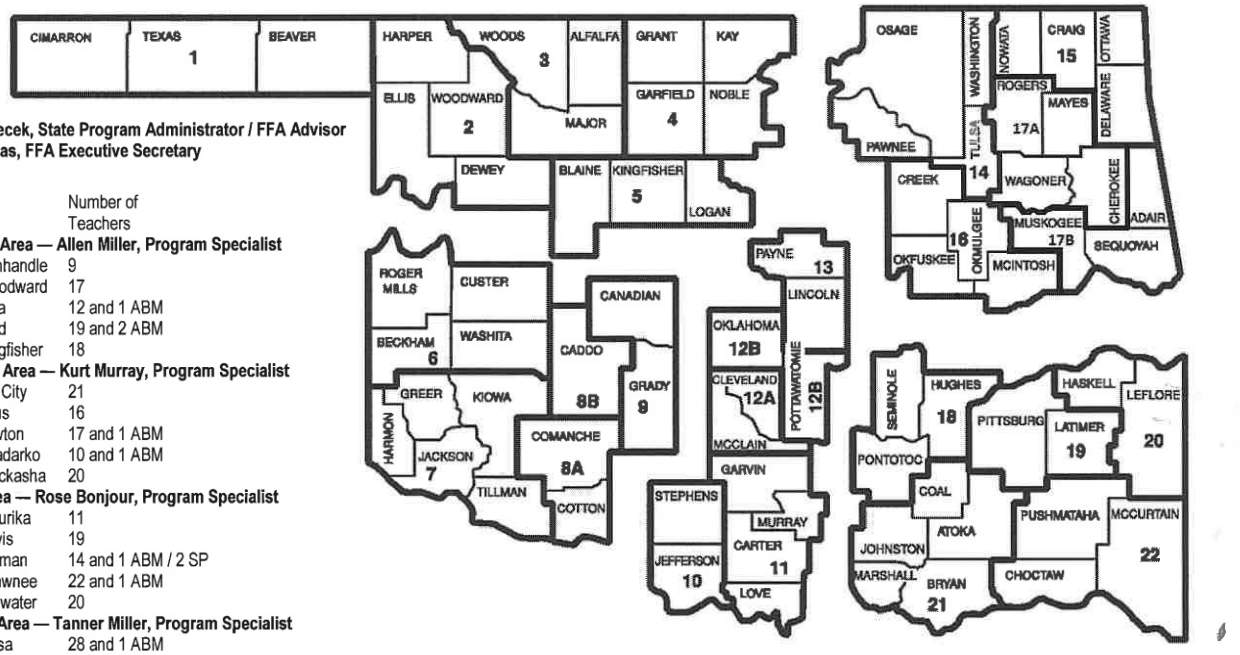
Q6 Do you believe students should: be able to operate Microsoft Excel?

- ○ No (1)
- ○ Yes (2)

Appendix X

Map of the OAETA Regions

2021-2022
OKLAHOMA AGRICULTURAL EDUCATION TEACHERS' AREA AND REGIONAL GROUPS



Scott Nemecek, State Program Administrator / FFA Advisor
Trevor Lucas, FFA Executive Secretary

Region		Number of Teachers
Northwest Area — Allen Miller, Program Specialist		
1	Panhandle	9
2	Woodward	17
3	Alva	12 and 1 ABM
4	Enid	19 and 2 ABM
5	Kingfisher	18
Southwest Area — Kurt Murray, Program Specialist		
6	Elk City	21
7	Altus	16
8A	Lawton	17 and 1 ABM
8B	Anadarko	10 and 1 ABM
9	Chickasha	20
Central Area — Rose Bonjour, Program Specialist		
10	Waurika	11
11	Davis	19
12A	Norman	14 and 1 ABM / 2 SP
12B	Shawnee	22 and 1 ABM
13	Stillwater	20
Northeast Area — Tanner Miller, Program Specialist		
14	Tulsa	28 and 1 ABM
15	Vinita	18 and 1 ABM
16	Morris	26
17A	Wagoner	27
17B	Muskogee	22
Southeast Area — Clark Long, Program Specialist		
18	Holdenville	19 and 1 ABM
19	Wilburton	14 and 1 ABM
20	Poteau	20
21	Atoka	28
22	Idabel	20

Each Region has elected officers and meets each month with a state staff member.

	No. Depts.	Single-Teacher Dept.	Two-Teacher Dept.	Three-Teacher Dept.	Four-Teacher Dept.	Total Teachers	*ABM Al	**SP
Northwest Area	62	51	9	2		75	3	
Southwest Area	64	50	9	4	1	84	2	
Central Area	68	54	10	4		86	2	2
Northeast Area	91	63	26	2		121	2	
Southeast Area	**79**	60	16	3		101	2	
Total	364	278	70	15	1	467	11	2

*Agricultural Business Management - Adult Instructors
**Special Programs

VITA

Kristopher Robert Lee Rankin III

Candidate for the Degree of

Master of Science

Thesis: AGRICULTURAL POWER, STRUCTURES, AND TECHNOLOGY ENTRY-LEVEL SKILLS: A COMPARISON OF INDUSTRY EXPERTS AND SCHOOL-BASED AGRICULTURAL EDUCATION TEACHERS' VIEWS IN OKLAHOMA

Major Field: Agricultural Education

Biographical:
Personal Data: Born in Columbia, MO on November 11, 1992, son of Robert and Jo Britt-Rankin

Education:

Completed the requirements for the Master of Science in Agricultural Education at Oklahoma State University, Stillwater, OK in 2021.

Completed the requirements for the Bachelor of Science in Agricultural Education at the University of Missouri, Columbia, MO in 2015.

Experience:

Agricultural Education Instructor/FFA Advisor, Russellville, MO, 2015 – 2016
Agricultural Education Instructor/FFA Advisor, Ashland, MO, 2016 – 2020

Professional Memberships:

American Association for Agricultural Education (AAAE)
Association for Career and Technical Education Research (ACTER)
National Association of Agricultural Educators (NAAE)
North American Colleges and Teachers of Agriculture (NACTA)