PERCEIVED COMPETENCE OF AGRICULTURAL EDUCATION STUDENT TEACHERS TO TEACH ACROSS THE NATIONAL AGRICULTURE, FOOD, AND NATURAL RESOURCES CAREER PATHWAYS: A NEEDS ASSESSMENT AT OKLAHOMA STATE UNIVERSITY

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Bachelor of Science in Agriscience Education

The Ohio State University

Columbus, Ohio

2017

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 2019

PERCEIVED COMPETENCE OF AGRICULTURAL EDUCATION STUDENT TEACHERS TO TEACH ACROSS THE NATIONAL AGRICULTURE, FOOD, AND NATURAL RESOURCES CAREER PATHWAYS: A NEEDS ASSESSMENT AT OKLAHOMA STATE UNIVERSITY

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ACKNOWLEDGEMENTS

This thesis is dedicated to agricultural education teachers in Ohio and Oklahoma. You make a tremendous difference in the lives of students. Thank you for dedicating your careers to developing young people to become successful contributors to our local and state communities. I hope this work will enhance the efforts put forth to develop future generations of agricultural education teachers.

Thank you to Mom and Sydney for supporting me unconditionally. Thank you to Holly for being the agricultural education teacher who started it all. Thank you to my friends at Oklahoma State for encouraging me throughout my two years here.

Above all, thank you to God for instilling in me the passion, strength, and diligence needed to survive graduate school. (Matthew 5:16, Romans 12:12, James 1:2-3).

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Date of Degree: MAY, 2019

Title of Study: PERCEIVED COMPETENCE OF AGRICULTURAL EDUCATION STUDENT TEACHERS TO TEACH ACROSS THE NATIONAL AGRICULTURE, FOOD, AND NATURAL RESOURCES CAREER PATHWAYS: A NEEDS ASSESSMENT AT OKLAHOMA STATE UNIVERSITY

Major Field: AGRICULTURAL EDUCATION

Abstract: This exploratory, pilot study explored the implied knowledge, perceived competence, and perceived levels of importance of student teachers in Oklahoma State University's teacher preparation program for agricultural education to teach the National Agriculture, Food, and Natural Resources (AFNR) Career Pathways (The National Council for Agricultural Education, 2015). Using a congruent, parallel mixed-methods design (Creswell, 2012), data were collected through questionnaires and interviews with student teachers ($N = 16$) and their cooperating teachers ($N = 16$). Descriptive statistics and eclectic coding strategies (Saldaña, 2016) were used to explain the quantitative and qualitative findings. Though the study cannot be generalized, findings were assessed using the Borich (1980) Needs Assessment Model to identify knowledge and competence needs of the student teachers in regard to teaching the eight National AFNR Career Pathways.

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CHAPTER I

INTRODUCTION

Need for the Study

"Agriculture is the world's oldest science" (Ricketts, Duncan, & Peake, 2006, p. 48). By definition, agriculture is a comprehensive applied science, which includes principles of the physical, chemical, and biological sciences related to food production and processing (Dailey, Conroy, & Shelley-Tolbert, 2001). The agricultural industry always has been and always will be an indispensable aspect of the economic, political, and social needs of the world (Newcomb, McCracken, Warmbrod, & Whittington, 2004). As such, throughout time one fact has held true for all living people: the need for food, fiber, and fuel (Doerfert, 2011). With this heavy reliance on the agricultural industry, it is imperative the public be knowledgeable about agriculture (Pope, 1990).

With the projection of the world's population expected to reach nine billion people by 2050, a need exists for improved storage and distribution of agricultural products (Blackburn, 1999; Hodges, 2005; Johnson & Jorgenson, 2006; Sayers, 2011). The pending rise in the population has spurred the need for improvement regarding dispersal of agricultural yields and related education for consumers (Blackburn, 1999; Hodges, 2005; Johnson & Jorgenson, 2006). The agricultural industry in the United

States has historically met this global demand through changing and improving the means, by which agricultural products are produced, stored, and distributed (Gebbers & Adamchuk, 2010). Changes include: the increased use and success of mechanized equipment to plant and harvest agricultural crops, modified animal housing, and the implementation of biotechnology (Hoppe, 2012; Smith, 2016). As a result of increased research and improved technology, the United States' agricultural industry has, and must continue to, become more sustainable and productive over time to meet the needs of a growing world population (Gebbers & Adamchuk, 2010; Hoope, 2012; Smith, 2016).

Although emphasis should be placed on the agricultural industry to meet the needs of the growing population, consumers have continued to move away from rural America at an amassed rate (Dale, Robinson, & Edwards, 2017). Today, less than one fourth of the United States population lives in rural areas (United States Department of Agriculture, 2019), and farmers and ranchers make up less than two percent of the population (American Farm Bureau Federation, 2019). Today's population relies primarily on others to produce their food (Dale et al., 2017). This increased *modernization* and *urbanization* of society has created a disconnect between the agricultural industry and the general public (Powell & Agnew, 2011) due to a lack of hands-on, lived experiences related to agriculture (Turnbull, 2002). A subsequent decline in agricultural knowledge has occurred (Blackburn, 1999; Dale et al., 2017; Kovar & Ball, 2013). "With such a disconnect, the agricultural industry needs to focus on ways to educate its consumer base more efficiently and more effectively" (Dale et al., 2017, p. 1).

"Consumers think about food production constantly, yet know very little about how food is brought to the dinner table" (U.S. Farmers and Ranchers Alliance, 2011, para. 5). What is more, citizens in the United States have little concern regarding the supply of high quality and low cost products (Blackburn, 1999). An educated population can understand and appreciate the role of agriculture resulting in better decisions on economic, social, and environmental issues affecting the industry (Kovar & Ball, 2013; Pense & Leising, 2004). These educated individuals can contribute more successfully to their communities and society (Newcomb et al., 2004). Therefore, the gap between awareness and understanding of the agricultural industry is important to research to reduce the existing disconnect and educate consumers (Dale et al., 2017; Doerfert, 2011; Hughes & Barrick, 1993).

The agricultural industry in the United States has stepped up to the plate to meet the increased need for and access to agricultural products (Blackburn, 1999; Hodges, 2005; Johnson & Jorgenson, 2006). But, what is being done to meet the increased need to educate consumers regarding agriculture? One avenue for educating people about agriculture is through school-based agricultural education (SBAE) programs (Agricultural Education, 2012). SBAE programs were established to combine the applied sciences of agriculture and education (Barrick, 1989). SBAE was created to teach individuals about the agriculture, food, and natural resources industry and to provide students with the essential skills necessary to achieve success in related career pathways and/or in post-secondary education (Barrick, 1989; Roberts & Ball, 2009). SBAE is "a comprehensive term, including instruction in chemistry, geology, botany, zoology, mechanics-embracing, in short the science as well as the practice of agriculture" (Hillison, 1996, p. 10).

To support the efforts of SBAE to adapt to the changing agricultural industry, The National Council for Agricultural Education (2015) recommended a national curriculum to serve as a framework for meeting the broad definition of agricultural education (see Figure 1). This framework, the National Agriculture, Food, and Natural Resources (AFNR) Career Pathways, was designed to expose students to diverse areas of agriculture and develop their technical agricultural knowledge (The National Council for Agricultural Education, 2015). This shift in curriculum occurred to reflect changes in the agricultural industry, the perspectives of agriculturists, the viewpoints of SBAE students (Martin & Enns, 2017), and to meet the needs of the 21st century society in the United States (Clemons et al., 2018; DiBenedetto, Willis, & Barrick, 2018). Therefore, a demand exists in the United States to provide high quality SBAE teachers (Duncan & Ricketts, 2008; Wallis, 2008) to provide instruction for such curriculum.

Figure 1. Curriculum framework of the National Agriculture, Food, and Natural Resources (AFNR) Content Standards (The National Council for Agricultural Education, 2015). Figure reprinted with permission.

“Competent, qualified teachers are the backbone of high quality instruction at any level” (Leiby, Robinson, & Key, 2013, p. 180). Teachers with the competence to teach are more satisfied in their jobs and more likely to continue teaching (Crebert, Bates, Bell, Carol-Joy, & Vanda, 2004; Hoy & Miskel, 2001). In addition, students are more likely to experience success being taught by competent teachers who possess the necessary skill set (Stripling, Ricketts, Roberts, & Harlin, 2008). To improve the competence of SBAE teachers, research is needed to identify teachers’ current gaps in knowledge and skills (Clemons et al., 2018; Desimone, 2009; DiBenedetto et al., 2018; Duncan, Ricketts, Peake, & Uessler, 2006; Findlay & Drake, 1989; Thoron & Myers, 2010).

A plethora of research exists evaluating the knowledge and performance competence of SBAE teachers to instruct subject areas such as science, math, and language arts (Berliner, 1994; Scales, Terry, & Torres, 2006; Thoron & Myers, 2010). However, little research has assessed the current knowledge and performance competence levels of agricultural education teachers regarding their own content area – agricultural education. Nonetheless, SBAE teachers are expected to teach specific agricultural education content and meet AFNR course standards (The National Council for Agricultural Education, 2015). These expectations include teaching across eight National AFNR Career Pathways to educate students about the agricultural industry and meet its workforce needs (The National Council for Agricultural Education, 2015). DiBendetto et al. (2018) recommended teacher preparation programs in agricultural education assess their preservice teachers to determine if and how the curriculum used aligns to the content needs and expectations of agricultural education teachers in their respective states.

Determining the knowledge teachers should possess regarding the eight career pathway areas and the curricula they are expected to teach are imperative tasks (Clemons et al., 2018; Desimone, 2009; Findlay & Drake, 1989; Garton & Chung, 1996; Joerger, 2002; Knobloch, 2006; Wingenbach et al., 2007). Roberts and Dyer (2004) recommended teacher preparation programs in agricultural education evaluate the preservice teachers' perceived needs and areas of deficiency. To prepare agricultural education teachers to teach across the National AFNR Career Pathways, it is important to assess the gaps, deficiencies, and needs that exist related to the content they are expected to instruct (Sorenson et al., 2018).

Research Problem Statement

"Training institutions search continually for ways to improve their training programs" (Borich, 1980, p. 39). It is the role of teacher preparation programs in agricultural education to prepare teachers to be successful in their careers (Leiby et al., 2013). Research has revealed, unfortunately, that agricultural education preservice teachers often lack the necessary knowledge and teaching skills to be effective in their classrooms (Boone, Gartin, Boone, & Hughes, 2006; Duncan & Ricketts, 2008; Goecker, 1992; Sorenson, Tarpley, & Warnick, 2010). Researchers have been called to assess the needs of SBAE teachers prior to their entering teaching (Clemons et al., 2018; Garton & Chung, 1997; Joerger, 2002; Sorenson et al., 2018). Therefore, what are the needs of preservice agricultural education teachers related to teaching across the eight National AFNR Career Pathways?

Purpose and Objectives

The purpose of the study was to determine the implied knowledge competence, the perceived performance competence, and the perceived levels of importance held by SBAE student teachers regarding their ability to teach across the eight National AFNR Career Pathways (The National Council for Agricultural Education, 2015). "Training programs can apply the [Borich (1980) Needs Assessment Model] by defining what is as the measured behaviors, skills, and competencies of the trainee and what should be as the goals of the training program" (Borich, 1980, p. 39). To align with Borich's (1980) needs assessment model, the teacher education program in agricultural education at Oklahoma State University was viewed as the training program and the trainees were the participating student teachers (N = 16) experiencing their student teaching internship during the Spring 2019 semester. The measured *what is* in the study was the participants' implied levels of knowledge based on Oklahoma Subject Area Test (OSAT) scores and their perceived levels of importance and self-perceived performance competence as measured by a self-efficacy questionnaire (see Appendix A). In addition, *what should be* was the expected ability of the participants to teach across the eight National AFNR Career Pathways. Five specific objectives undergirded the study.

1. Describe selected personal and professional characteristics of agricultural education student teachers at Oklahoma State University during the Spring 2019 semester.
2. Describe the agricultural education student teachers' implied knowledge competence regarding the eight National AFNR Career Pathways.

3. Describe the agricultural education student teachers' perceptions of the levels of importance to teach across the eight National AFNR Career Pathways.
4. Describe the agricultural education student teachers' self-perceived levels, and their cooperating teacher assessed levels, of performance competence to teach across the eight National AFNR Career Pathways.
5. Prioritize the eight National AFNR Career Pathways in need of knowledge and competence enhancement using the Borich (1980) Needs Assessment Model.

Limitations

Self-perceived performance competence, or an individual's self-efficacy, related to teaching abilities is simply that; a self-perception of competence rather than an actual level of competence (Tschannen-Moran & Woolfolk Hoy, 2007). This study relied on participants to self-report their competence, which may be biased and not reflective of the actual ability held by each participant. Perception bias results in researcher inclination to be either more or less subjective about personal beliefs (Pronin, Lin, & Ross, 2002). In addition, the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019) was used to assess student teachers' knowledge regarding the National AFNR Career Pathways, although the test does not align directly with the National AFNR Career Pathways.

Assumptions

It was assumed the subjects in the study were truthful in their responses to the questionnaire, though it was possible for self-perceived bias to occur in the responses provided by these individuals. It was also assumed that the researcher understood and interpreted self-efficacy and self-perceived competence successfully regarding the participants' responses.

Definitions of Key Terminology

Agricultural Education. "The scientific study of the principles and methods of teaching and learning as they pertain to agriculture" (Barrick, 1989, p. 26).

Cooperating Teacher. The certified SBAE teacher of an accredited school who supervises the student teacher's experience (Borko & Mayfield, 1995; Ganser, 2010).

Importance. Value placed on learning a perspective competence (Borich, 1980).

Knowledge Competence. "The ability to accurately recall, paraphrase, or summarize the procedural mechanics of a behavior on a paper and pencil test" (Borich, 1980, p. 40).

National Agriculture, Food, and Natural Resources (AFNR) Career Pathways. Career pathways consisting of educational standards related to meeting the workforce expectations and needs of the agriculture, food, and natural resources industry (The National Council for Agricultural Education, 2015).

Perception. An individual's way of viewing a particular phenomenon (McDonald, 2011).

Performance Competence. "The ability to accurately execute the behavior in a real or stimulated environment" (Borich, 1980, p. 40).

Preservice Teachers. University students studying education, with the intention to teach, who engage in content courses, professional education courses, and field experiences (Lively, 2019).

School-Based Agricultural Education (SBAE). A classroom course-based program designed to prepare students for career success and/or college preparation and a "lifetime of informed choices in the global agriculture, food, fiber, and natural resources systems" (Agricultural Education, 2012).

Self-Efficacy. "People's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 1).

Student Teacher. A college student who is working under the guidance of a certified teacher at an accredited school to practice teaching content in the classroom (Borko & Mayfield, 1995; Ganser, 2010).

Student Teaching Internship. A period of guided teaching during which the student teacher is under the direction of a cooperating teacher and takes increasing responsibility for leading the school experiences of a given group of students (Zeichner, 1978).

CHAPTER II

REVIEW OF LITERATURE

Overview of Introduction

The agricultural industry always has been and always will be an indispensable aspect of the economic, political, and social needs of the world (Newcomb et al., 2004). With a reliance on the agricultural industry, it is imperative for the public to be knowledgeable about agriculture (Pope, 1990). Simultaneous to the advances in agriculture, the population has stopped producing and growing its own food, and as people continue to move away from rural America, agricultural knowledge has declined (Dale et al., 2017). As such, the gap between awareness and understanding of the agricultural industry leads to an increased need to promote agricultural literacy to the general public (Doerfert, 2011; Hughes & Barrick, 1993).

School-based agricultural education (SBAE) can serve as a medium to educate individuals about agriculture. SBAE programs combine the applied sciences of agriculture and education (Barrick, 1989). Agricultural education is "a comprehensive term, including instruction in chemistry, geology, botany, zoology, mechanics-embracing, in short the science as well as the practice of agriculture" (Hillison, 1996, p. 10). The National Council for Agricultural Education (2015) has recommended a national

set of curriculum expectations to serve as a framework for operationalizing instruction to achieve the broad definition of SBAE (Clemons et al., 2018; Martin & Enns, 2017). This framework, the National AFNR Career Pathways were designed to expose students to diverse areas of agriculture and develop their content knowledge related to agricultural products and issues (The National Council for Agricultural Education, 2015).

Agricultural education teachers are expected to teach specific agricultural education content and meet course standards, including teaching across the eight National AFNR Career Pathways to educate students about the agricultural industry and meet the workforce needs of the industry (The National Council for Agricultural Education, 2015). It is important to assess the gaps, deficiencies, and needs that exist amongst SBAE teachers related to the content they are expected to instruct (Sorenson et al., 2018).

Background of United States School-Based Agricultural Education

"The agriculture, food and natural resources (AFNR) industry is a highly technical and ever-changing sector of the global economy upon which everyone is dependent" (The National Council for Agricultural Education, 2015, p. 2). The United States produces and sells various agricultural products within the country and across the world (United States Department of Agriculture, 2017). The agricultural industry accounts for 11% of domestic employment and holds a 5.5% share of the country's overall economy (United States Department of Agriculture, 2018). "Agriculture – broadly defined – is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies" (National Research Council, 1988, p. 8).

"Agricultural education programs in the public school are designed to accomplish educational objectives that pertain specifically to acquiring appreciation, understanding, knowledge, and skills applicable to the agricultural sciences, agribusiness, and the production and processing of food and fiber" (Newcomb et al., 2004, p. 10). SBAE is the foundation, within public schools, for students to acquire knowledge pertaining to the industry of agriculture (Barrick, 1989). As such, the National Council for Agricultural Education (2015) has determined specific content for SBAE programs in the United States to create agriculturally literate individuals based on AFNR standards and pathways (National Council for Agricultural Education, 2015).

National Agriculture, Food, and Natural Resources (AFNR) Career Pathways

To meet the domestic and global demands for the AFNR industry, SBAE programs are tasked with developing agriculturally literate individuals (Clemons et al., 2018; Newcomb et al., 2004; Pope, 1990; The National Council for Agricultural Education, 2015). The National AFNR Career Pathways encompass the necessary instruction regarding essential knowledge and skills required for success in agricultural careers (The National Council for Agricultural Education, 2015). These pathways "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 following AFNR career pathways" (The National Council for Agricultural Education, 2015, p. 3).

These eight pathways are part of a nationally recommended framework for curriculum in the field of agricultural education and designed to provide SBAE students with a variety of course options to obtain a holistic understanding of the agricultural industry (National Council for Agricultural Education, 2015). In addition to the career pathways, the framework presents standards related to Career Ready Practices and AFNR Cluster Skills. It is expected that all SBAE teachers understand and be competent to teach the technical content and skills encompassed by the Career Ready Practices, AFNR Cluster Skills, and AFNR Career Pathways (Clemons et al., 2018; The National Council for Agricultural Education, 2015). The eight National AFNR Pathways include Agribusiness Systems, Animal Systems, Biotechnology Systems, Environmental Service Systems, Food Products and Processing Systems, Natural Resource Systems, Plant Systems, and Power, Structural and Technical Systems (see Figure 1) and are explained in the following sections.

Agribusiness Systems Pathway

The Agribusiness Systems (ABS) Pathway includes the study of agribusinesses and their management, including record keeping, budget management, business planning, and sales/marketing (The National Council for Agricultural Education, 2015). SBAE students completing this pathway are required to meet five standards: apply management planning principles, achieve business objectives using record keeping, manage budgets, develop a business plan, and use marketing principles for an agribusiness (The National Council for Agricultural Education, 2015).

Animal Systems Pathway

The Animal Systems (AS) Pathway includes content areas such as life processes, health, nutrition, genetics, management, and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses, and/or poultry (The National

Council for Agricultural Education, 2015). SBAE students who complete the AS pathway must accomplish the following eight standards: analyze industry related trends, utilize best-practice protocols, provide proper animal nutrition, apply reproduction principles, evaluate environmental factors affecting animal performance, evaluate animals, apply effective animal health care, and analyze environmental factors associated with animal production (The National Council for Agricultural Education, 2015).

Biotechnology Systems Pathway

The Biotechnology Systems (BS) Pathway includes the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to AFNR (The National Council for Agricultural Education, 2015). SBAE students completing the BS pathway must meet three standards: assess the evolution of agricultural biotechnology, apply appropriate laboratory skills to complete research, and use biotechnology to solve industry problems (The National Council for Agricultural Education, 2015).

Environmental Service Systems Pathway

The Environmental Service Systems (ESS) Pathway involves the study of systems, instruments, and technology used to monitor and minimize the impact of human activity on the environment (The National Council for Agricultural Education, 2015). Successful SBAE students in the ESS pathway must meet the five standards: manage environmental systems, evaluate the impact of public regulations on environmental systems, propose solutions to environmental issues, demonstrate the operation of related systems, and display proper use of common tools in environmental systems (The National Council for Agricultural Education, 2015).

Food Products and Processing Systems Pathway

The Food Products and Processing (FPP) Systems Pathway includes the study of food safety and sanitation, nutrition, biology, microbiology, chemistry, human behavior in local and global food systems, food selection and processing for storage, distribution and consumption, and the development of the food industry (The National Council for Agricultural Education, 2015). SBAE students completing this pathway are required to demonstrate their skills regarding four standards: implement safety procedures in food facilities, apply principles of nutrition to the development of food products, process food for storage and consumption, and explain the scope of the food industry (The National Council for Agricultural Education, 2015).

Natural Resources Systems Pathway

The Natural Resources Systems (NRS) Pathway features the study of management, protection, enhancement, and improvement of soil, water, wildlife, forests, and air as natural resources (The National Council for Agricultural Education, 2015). Four standards must be accomplished by successful SBAE students in this pathway: plan and conduct management activities, analyze the relationships between humans and natural resources, develop plans to ensure sustainability, and demonstrate responsible natural resources management practices (The National Council for Agricultural Education, 2015).

Plant Systems Pathway

The Plant Systems (PS) Pathway includes the study of plant life cycles, classifications, functions, structures, reproduction, media, nutrients, and growth and cultural practices through the study of crops, turf grass, trees, shrubs, and/or ornamental plants (The National Council for Agricultural Education, 2015). SBAE students who complete this pathway must meet four standards: develop a crop management plan, apply appropriate principles of plant classification, use industry standards to grow plants, and apply proper principles to enhance a plant system's environment (The National Council for Agricultural Education, 2015).

Power, Structural, and Technical Systems Pathway

The Power, Structural, and Technical (PST) Systems involves the study of agricultural equipment, power systems, alternative fuel sources, precision technology, woodworking, metalworking, welding, and project planning for agricultural structures (The National Council for Agricultural Education, 2015). SBAE students must master five standards in this pathway: apply science principles to solve problems in associated systems, successfully operate mechanical equipment, properly service and repair equipment, create and maintain structural systems, and demonstrate the proper use of technologies in PST systems (The National Council for Agricultural Education, 2015).

Expectations of Agricultural Education Teachers

"In today's ever changing world, teachers of agriculture are expected to know more, teach a more technologically advanced curriculum, and meet the increasing demands of a diverse student population" (Zarafshani & Baygi, 2008, p. 347). Although the process of teaching and learning is considered intricate and complicated (DePorter, Reardon, & Singer-Nourie, 1999), the key role of teachers is to guide students through the process of learning and ensure excellent learner performance (Darling-Hammond, 1996; Liakopoulou, 2011; Newcomb et al., 2004). Federal legislation, as enacted, has demanded all teachers meet certain criteria (No Child Left Behind, 2002). To be deemed

Highly Qualified, teachers must hold the proper certification, have received a bachelor's degree, and be competent in their content knowledge and classroom performance (No Child Left Behind, 2002). Schools strive to hire teachers deemed competent and effective because they do not have the time or training capacity to employ teachers with unknown potential (Roberts & Dyer, 2004). Expert and fully prepared teachers should possess a large amount of knowledge and skill and be confident in their ability to execute in the classroom (Clark & Peterson, 1986; Glaser & Chi, 1988; Liakopoulou, 2011; Luft & Thompson, 1995; Schempp, Tan, Manross, & Fincher, 1998).

The expectation for SBAE teachers is no different (Newcomb et al., 2004). Highly competent SBAE teachers are expected to understand their subject content and possess the ability to perform effectively in the classroom (Newcomb et al., 2004; Talbert, Vaughn, Croom, & Lee, 2007). However, SBAE teachers are in a discipline that requires assorted competencies unique from many other subject areas (Harper, Weiser, & Armstrong, 1990; Roberts, Dooley, Harlin, & Murphrey, 2006; Shoulders & Toland, 2017; Sorenson et al., 2018). Teaching SBAE also extends outside of the classroom (Phipps & Osborne, 1988; Shoulders & Toland, 2017). "Agricultural science teachers are expected to facilitate student projects, advise student organizations, administer adult groups, as well as plan and operate the agricultural science program" (Roberts et al., 2006, p. 2). SBAE teachers require an understanding of learners' needs, teaching methodologies, curriculum development, and technical knowledge because SBAE is unique and versatile in a way that is different than other courses found in United States' public schools (Dobbins & Camp, 2000; Sorenson et al., 2018).

In addition, as a part of Career Technical Education, SBAE teachers are simultaneously tasked with preparing students for college and the workforce (Roberts & Dyer, 2004). "Career Technical Education provides students of all ages with the academic and technical skills, knowledge, and training necessary to succeed in future careers and to become lifelong learners" (Advance CTE, 2019). As such, SBAE teachers must teach across the three-circle agricultural education model (see Figure 2) created for SBAE programs (Agricultural Education, 2012; Croom, 2008). This comprehensive model is vital for program success and consists of three major components of a student's experience within agricultural education: classroom/laboratory instruction, supervised agricultural experience (SAE), and FFA involvement (Agricultural Education, 2012; National FFA Organization, 2018; Shoulders & Toland, 2017; Sorenson et al., 2018; The National Council for Agricultural Education, 2015).

The classroom and laboratory instruction component of the model includes the daily content being taught in the classroom by the SBAE teacher (Agricultural Education, 2012). SAE includes student projects and the FFA dimension includes career and leadership development events and community service involvement conducted outside of the regular school day (Agricultural Education, 2012; Croom, 2008; National FFA Organization, 2018). If done correctly, the SAE and FFA components of the model should extend and compliment classroom instruction (Croom, 2008).

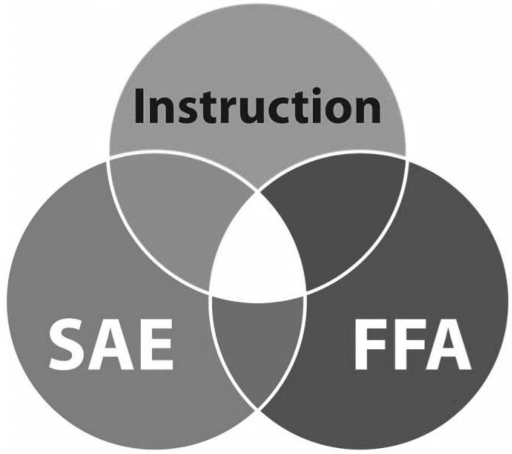

Figure 2. Three-Circle Model of Agricultural Education (Agricultural Education, 2012). Figure reprinted with permission.

SBAE is a versatile field requiring students to learn various content that reflect the needs of the AFNR industry (Dailey et al., 2001). This learning occurs within all three portions of the three-circle model of agricultural education (Agricultural Education, 2012; Croom, 2008). It is an expectation of SBAE teachers to understand the content expected to be taught in the classroom and/or laboratory instruction dimension which includes the eight National AFNR Career Pathways (The National Council for Agricultural Education, 2015).SBAE teachers must prepare their students to be knowledgeable about the agricultural industry (Clemons et al., 2018; McKim, Pauley, Velez, & Sorenson, 2017), and they should be well-versed in current related content (Clemons et al., 2018; Morley, 2001; Shulman, 1987; Wolf, 2011).

Through utilizing the nationally recognized and recommended National AFNR Career Pathways, SBAE teachers can prepare their students to engage in related sectors in the future (The National Council for Agricultural Education, 2015). SBAE teachers need to be prepared to meet these expectations and guide students to experience success in their classrooms and in life (Daily et al., 2001; Layfield & Dobbins, 2002; Liakopoulou, 2011; Roberts & Dyer, 2004). SBAE teachers must provide their students with sufficient opportunities to display understanding of agricultural education content (Burris, Robinson, & Terry, 2005; Shinn & Cheek, 1981). "Effective teachers should be well-rounded with both a content specialization and a broad knowledge about the field of agriculture" (Roberts et al., 2006, p. 5).

SBAE teachers are expected to be competent in teaching all subject areas related to the agricultural industry (Cannon, Kitchel, & Duncan, 2010; Myers & Dyer, 2004; Roberts et al., 2006; Robinson, Krysher, Haynes, & Edwards, 2010; Schempp et al., 1998; Talbert, Camp, & Heath-Camp, 1994). For SBAE teachers to be successful, they must effectively apply this knowledge and skill expertise (Barrick, 1989). Newcomb et al. (2004) stated relatedly, "it is important that persons preparing to teach agriculture and those who are teachers realize that it is essential that current knowledge and skill be continually updated and new knowledge and skill acquired if teaching is to be most effective" (p. 23).

SBAE teachers, however, are not always fully prepared to teach their curriculum's specific content (Boone et al., 2006; Burris & Keller, 2008; Duncan & Ricketts, 2008; Garton & Chung, 1996; Goecker, 1992; Hughes & Barrick, 1993; Joerger, 2002; Peake, Duncan, & Ricketts, 2007; Roberts et al., 2006; Shinn & Cheek, 1981; Wilson, Kirby, & Flowers, 2002). To do such requires that SBAE teachers possess technical agricultural knowledge (Burris & Keller, 2008; Dobbins & Camp, 2000; Duncan & Ricketts, 2008; Garton & Chung, 1996; Goecker, 1992; Hughes & Barrick, 1993; Joerger, 2002; Peake et al., 2007; Roberts et al., 2006; Shinn & Cheek, 1981;

Wilson et al., 2002) as well as a unique set of pedagogical competencies to be effective educators (Burris & Keller, 2008; King & Miller, 1985; Lindner, Dooley, & Wingenbach, 2003; Stiggins & Bridgeford, 1985). SBAE teachers are expected to possess not only knowledge and understanding of the AFNR industry (Burris & Keller, 2008), but also the ability to apply what they know about related content and the performance of effective teaching (Newcomb et al., 2004).

Knowledge and Performance Competence

"Without question, teachers are faced with challenges trying to provide an adequate learning environment and prepare their students for productive lives in today's fast-paced world" (Layfield & Dobbins, 2002, p. 46). Teachers should be knowledgeable about their content and pedagogy (Richardson & Arundell, 1989) because "competent, qualified teachers are the backbone of high quality instruction at any level" (Leiby et al., 2013, p. 180). Competent teachers are those who have obtained the proper licensing, are knowledgeable of their content area, and are competent to teach said content (Darling-Hammond & Berry, 2006). Competent teachers have reported that mastery in subject content enables them to be more prepared to teach lessons, answer students' questions, and create unique and enriching learning experiences (Schempp et al., 1998). Thus, SBAE teachers require an understanding in teaching pedagogy, curriculum development, learning styles, and technical areas related to agricultural sciences (Dobbins & Camp, 2000).

One of the challenges SBAE teachers have reported is the dearth of technical agricultural knowledge they have received during their teacher preparation programs and therefore lack when entering the classroom (Boone et al., 2006; Davis & Falba, 2002; Duncan & Ricketts, 2008; Duncan et al., 2006; Garton & Chung, 1996; Harlen & Holroyd, 1997; Henderson & Nieto, 1991; Joerger, 2002; Kahler, 1974; Lindner et al., 2003; Mundt, 1991). SBAE teachers struggle to acquire the appropriate technical knowledge and expertise, in part, because few originate directly from an agricultural background (Myers & Dyer, 2004; Wingenbach et al., 2007). Therefore, they require additional coursework or in-service training to prepare them to be knowledgeable about their content (Burris & Keller, 2008; Goecker, 1992). Preservice teachers, in particular, have recognized their need to understand more about changes and advances in the agricultural industry and have a desire to become more competent (Joerger, 2002; Peake et al., 2007).

Competence is described as effective ability, which results in an individual's achievement (Ready, 1967). Competence is viewed as the existing body of knowledge and skills that an individual possesses (Stoof, Martens, & Van Merriënboer, 2000). "Collectively; knowledge, skills, and abilities are referred to as competencies" (Lindner et al., 2003, p. 51). Knowledge is defined as cognitively acquiring a body of information (Buford & Lindner, 2002; Doolittle & Camp, 1999), which can later be recalled and related to a behavior (Borich, 1980). Knowledge competence is not only necessary, but is an expectation for SBAE teachers to be effective at their jobs (Barrick, 1989; Burris & Keller, 2008; Newcomb et al., 2004; Roberts et al., 2006).

A teacher's perceived content knowledge notwithstanding, SBAE teachers are also expected to have the competence to teach such content to their students (Burris & Keller, 2008; Cole, 1984; Lindner et al., 2003; Newcomb et al., 2004; Stiggins &

Bridgeford, 1985). “Competent teachers are those who, through experience and continued learning, have achieved a respectable and recognizable level of pedagogical expertise” (Schempp et al., 1998, p. 11). Self-perceived performance competence, or an individual’s self-efficacy related to his or her teaching abilities, is simply that; a self-perception of competence rather than an actual level of competence (Tschannen-Moran & Woolfolk Hoy, 2007). However, many teachers have been found to have low perceived and actual levels of performance competence (Boone et al., 2006; Layfield & Dobbins, 2002; Peake et al., 2007; Sorenson et al., 2018). Low competence is due to a series of obstacles, including the changing curriculum (Clemons et al., 2018), the absence of hands-on experiences within agriculture (Sorenson et al., 2010), a lack of technical agricultural knowledge, and a gap in understanding the curricular expectations within agricultural education (Sorenson et al., 2018). This is especially true for beginning and student teachers who have reported low self-esteem and low self-confidence (Henderson & Nieto, 1991).

These abilities and skills have been identified as imperative for SBAE teachers to be successful in both their classrooms and FFA programs (King & Miller, 1985). Sarbin (1954) stressed individuals cannot accomplish expected tasks in their careers if they lack the needed competencies. Researchers have confirmed that performance competence has been an issue for SBAE teachers at various points in their careers (Amberson & Bishop, 1982; King & Miller, 1985; Sunderhaus & Miller, 1985).

Experiences Influence Competence

Experience is imperative for learning (Kolb, 1984), and research has found strong relationships between individuals' experiences and their perceived levels of competence (Cole, 1984; Edwards & Briers, 2001; Findlay, 1992; Findlay & Drake, 1989). Edwards and Briers (2001) found agricultural work experience related positively to an SBAE teacher's motivation to remain in the profession. A higher quality work experience and a longer-term experience can also result in better teacher retention (Cole, 1984; Edwards & Briers, 2001). Preparation and involvement in the agricultural industry lead SBAE teachers to be more prepared and successful in their careers (Edwards & Briers, 2001). In addition, teachers are motivated to remain in their careers when they possess a high competence to teach (Coladarci, 1992; Wolf, 2011). Therefore, experiences can positively impact perceived competence (Cole, 1984; Findlay & Drake, 1989). "The literature suggests that experiences are indeed related to perceived competence" (Edwards & Briers, 2001, p. 8).

An individual's competence to perform a task is influenced directly by his or her self-efficacy to perform a given task (Bandura, 1977; Bandura & Schunk, 1981). Self-efficacy beliefs can determine the motivations, actions, and likely outcomes of an individual to perform a task or job role (Bandura, 1989; Bandura, 1993). Moreover, an individual's perceptions of efficacy are especially influenced by his or her experiences (Bandura, 1977). This includes successful and failed experiences based on social, environmental, situational, and temporal circumstances (Bandura, 1977). For teachers, their expected performance competence is affected by the perceptions they hold regarding their own abilities to teach their content and perform successfully in the classroom (Bandura, 1993; Woolfolk & Hoy, 1990).

Experiences influence the perceived competence and self-efficacy of SBAE teachers (Findlay & Drake, 1989). “To this end, experience is often viewed as a determinant of competence, while inexperience may be seen as an indicator of need for in-service education to develop competence further” (Edwards & Briers, 2001, p. 9). Therefore, understanding the personal and professional experiences and characteristics of preservice SBAE teachers can provide insight to teacher educators (Edwards & Briers, 2000) of any *mitigating factors* affecting the teachers’ perceptions of competence (Cole, 1984; Findlay & Drake, 1989).

Agricultural Education Teacher Preparation

“If overall school improvement is our primary goal, then teachers’ professional growth and development become paramount” (Stiggins & Bridgeford, 1985, p. 85). Teachers require better preparation each and every year (American Council on Education, 1999), and it is the role of teacher preparation programs to ensure its graduates are prepared to enter the classroom (Leiby et al., 2013; Morley, 2001; Peddle, 2000). Kennel (2009) stated; “[B]ecause teachers are the single most important influence on student achievement, teacher education programs need to provide learning experiences for preservice educators to impact their confidence to teach pertinent subject matter and their perceptions of its importance” (p. 2).

The experiences preservice teachers acquire through a university teacher preparation program can lead them to be highly competent and efficacious when entering teaching (Knobloch & Whittington, 2003; Rocca & Washburn, 2006; Rubeck & Enochs, 1991; Thoron & Myers, 2010; Wolf, 2011). Teacher education programs that prepare their preservice teachers in pedagogical skill, content knowledge, and practices of teaching and learning will supply the profession with teachers ready to advance to a state of mastery (Schempp et al., 1998). Therefore, a relationship exists between the teacher preparation received by SBAE teachers and their competence and motivation to teach and remain in the profession (Cole, 1984; Edwards & Briers, 2001).

"The responsibility of preparing future effective teachers resides with teacher educators at universities with agricultural education programs" (Roberts & Dyer, 2004, p. 87). It is evident, however, that agricultural education teacher preparation programs vary across institutions regarding the depth at which they focus on content knowledge and pedagogical skill training (McLean & Camp, 2000). Teacher preparation programs often struggle to meet the growing needs of preservice teachers because evaluation practices for classroom teachers change frequently (Lynch, 1996; Steadman & Simmons, 2007). Teacher educators must adapt by preparing preservice teachers to meet these expected and changing demands (Hillison, 1998; Myers & Dyer, 2004). Though, noted by Roberts and Dyer (2004), this would be an easier task "if the characteristics requisite for being an effective agriculture teacher were known" (p. 83). Therefore, it is important for teacher educators to continue to explore how teacher competence impacts the success of preservice teachers (Hillison, 1998; Pajares, 2000; Swortzel, 1996).

Agricultural education has been urged, specifically, to assess and reform its teacher preparation programs (National Research Council, 1988). In Swortzel's (1996) evaluation of teacher preparation programs, it was found that, although SBAE curriculum changes continually, the field's preservice teachers received the same traditional curriculum and training in their preparation programs. Teacher preparation programs in agricultural education are tasked with preparing educators to enter the classroom with appropriate content and pedagogical knowledge (Myers & Dyer, 2004). However, each year, some SBAE teachers claim to graduate from their programs without the skills and knowledge needed to be successful in teaching technical agriculture (Claycomb & Petty, 1983; Sorenson et al., 2018; Wingenbach et al., 2007).

Teacher preparation programs, ideally, should focus on providing opportunities for preservice teachers to acquire high levels of technical skill competence while increasing the efficacy of these individuals to teach such content (Crebert et al., 2004; Kennel, 2009; Wallis, 2008). These programs should be aiming to identify and fill in the gaps of their university students' content and pedagogical knowledge (Peddle, 2000; Tyler, 1969). But, with the restrictions of most undergraduate degree plans, teacher preparation programs often struggle to include the technical agricultural knowledge and performance competence training necessary for preservice teachers (Burris et al., 2005; Robinson et al., 2010). Creating a foundation of learning to ensure SBAE teachers are successful in teaching agricultural sciences has been an ongoing and elusive pursuit for many years (Barrick, 1989).

With constant changes in the agricultural industry, it is necessary for teacher educators to continually evaluate their curricula and the preparation needs of preservice teachers (Birkenholz & Harbstreit, 1987; Claycomb & Petty, 1983; Duncan et al., 2006; Joerger, 2002). Competent and effective SBAE teachers are needed in the United States (Duncan & Ricketts, 2008; Wallis, 2008). Therefore, understanding the content areas for which SBAE teachers are most knowledgeable and competent to teach is vital (Leiby et al., 2013; Roberts & Dyer, 2004; Wolf, 2011). Likewise, identifying the deficiencies of their knowledge and competence to teach their curriculum's specific content is equally critical (Findlay, 1992; Garton & Chung, 1996; Sorensen et al., 2018; Wolf, 2011).

Agricultural Education Student Teaching Internship Experience

"The student teaching practicum experience is designed to give preservice teachers practical experience with teaching and is an important step in their development" (Sorenson et al., 2018, p. 105). Student teaching is arguably the most important aspect of a preservice teacher's professional development (Edwards & Briers, 2001). Preservice teachers' perceptions of teaching before and during their student teaching experience will impact their success in the classroom (Henson, 2001). Wolf (2011) found student teaching experiences provide a large and often positive effect on teacher self-efficacy. However, little research exists regarding the competence of SBAE teachers to teach specific agricultural education content, i.e., AFNR career pathways, during their time as student teaching interns (Knobloch, 2006; Roberts & Dyer, 2004; Sorenson et al., 2018; Stripling et al., 2008).

Student Teaching Internship at Oklahoma State University

Regarding the student teaching internship, the Oklahoma State University Department of Agricultural Education, Communication, and Leadership (2012) policies stated:

> Student teaching is, perhaps, the most dynamic and vital phase of the total curriculum for preparing teachers of Agricultural Education. In no other way can

> a person quite so effectively develop the competence necessary to assume his [or] her role as an agricultural leader and teacher in a local community and the classroom. (Department of Agricultural Education, Communication, and Leadership, 2012, p. 1)

During the 15-week internship, student teachers at Oklahoma State University are expected to acquire competence related to the three-circle model of agricultural education (see Figure 2) through teaching in the classroom, advising FFA activities, working with students' SAE projects (Agricultural Education, 2012; Department of Agricultural Education, Communication, and Leadership, 2012). These expectations are monitored and assessed through lesson plan development, weekly reports, a teaching portfolio, and evaluations conducted by cooperating teachers and university supervisors (Department of Agricultural Education, Communication, and Leadership, 2012).

The student teaching internship affords 12 of the 120 required hours of undergraduate agricultural education degree requirement (College of Agricultural Sciences and Natural Resources, 2017) [see Appendix J]. Prior to student teaching, the preservice teachers are required to complete the other 108 hours of courses, including general education courses and major-specific courses (College of Agricultural Sciences and Natural Resources, 2017). Major-specific courses include animal science, plant science, agricultural economics, natural resources, and agricultural mechanics (College of Agricultural Sciences and Natural Resources, 2017). During the student teaching semester, students earn an additional 12 hours of credit (College of Agricultural Sciences and Natural Resources, 2017). In addition, students are required to pass three assessments for student teaching candidacy (Department of Agricultural Education, Communication, and Leadership, 2012), which includes the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education, the Oklahoma General Education Test (OGET), and the Oklahoma Professional Teaching Examination (OPTE) (Certification Examination for Oklahoma Educators, 2019).

Role of the Cooperating Teacher

Regarding the responsibilities of the cooperating teacher during a student teaching internship, the Oklahoma State University Department of Agricultural Education, Communication, and Leadership (2012) policies stated:

> A successful cooperating teacher creates an enriching experience for both the students in the classroom and the student teacher. The cooperating teacher involves the student teacher in such activities as learning students' names, developing seating charts, tutoring, teaching small groups, developing a teaching unit, teaching one course, and finally teaching multiple courses. The cooperating teacher retains responsibility for the classroom while guiding the student teacher through these activities. (p. 5)

The cooperating teacher accepts, supports, guides, and critiques the student teacher during the internship experience (Department of Agricultural Education, Communication, and Leadership, 2012). This occurs by allowing the student teacher opportunities to create and teach lessons, advise FFA activities and events, and be a part of the school's SBAE teaching team (Department of Agricultural Education, Communication, and Leadership, 2012). Cooperating teachers are expected to fully include the student teacher in all aspects of the school's functions and evaluate his or her abilities throughout the experience (Department of Agricultural Education, Communication, and Leadership, 2012).

Related Research

An abundance of research exists currently to determine the knowledge and competence of SBAE teachers to integrate content such as science, reading, and mathematics into their courses (Clemons et al., 2018). Scales, Terry, and Torres (2006) investigated the knowledge and competence of SBAE teachers in Missouri regarding their ability to integrate science standards into their curriculum. They found these instructors perceived themselves as highly efficacious in teaching general science concepts specifically related to agricultural education, but were not competent to teach general science topics because their knowledge for the subject area was not proficient (Scales et al., 2006). Likewise, Thoron and Myers (2010) conducted a study to ascertain the perceptions of preservice teachers on integrating science into SBAE content and concluded student teachers had positive perceptions of their ability to integrate science concepts into SBAE curriculum but lacked the knowledge needed to successfully integrate said science content into their curriculum.

Research regarding science integration in SBAE curriculum have concluded that although teachers identify benefits of such integration, they lack the competence and knowledge to effectively demonstrate such behavior (Boone et al., 2006; Conroy & Walker, 2000; Myers, Washburn, & Dyer, 2004; Ricketts et al., 2006; Washburn & Myers, 2010; Wilson et al., 2002). Even though a plethora of research exists evaluating the knowledge and performance competence of SBAE teachers to teach other subject areas in regard to content integration (Scales et al., 2006; Thoron & Myers, 2010), few studies have been conducted to determine the current knowledge and competence of agricultural education teachers regarding their own content area, i.e. the curriculum comprising agricultural education (Sorenson et al., 2018).

Theoretical Framework

This exploratory, pilot study was undergirded in Bandura's (1994) Self-Efficacy Theory. Self-efficacy is defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 1). Bandura's (1977) Social Cognitive Theory nurtured the Self-Efficacy Theory, which includes a significant focus on self-reflection and individuals' perceptions of their performance abilities (Bandura, 1994; Knobloch, 2006). Bandura (1977) stated self-perceived efficacy could result in someone's ability to successfully execute a behavior, complete a task, or produce an outcome. "Self-efficacy also determines how well knowledge and skills are learned" (Whittington, McConnell, & Knobloch, 2006, p. 28). The belief an individual has about his or her ability to achieve a task may increase the likelihood of a competent performance (Stripling et al., 2008).

Bandura (1977) outlined four sources of efficacy: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (see Figure 3). However, for the purpose of the study, the focus is on *performance accomplishments* and *vicarious experience* (see Figure 4). Performance accomplishments are the abilities and achievements of an individual that impacts his or her perception of efficacy and are influential because they're based on personal experiences of mastery (Bandura, 1977). "Success raise mastery expectations; repeated failures lower them" (Bandura, 1977, p.

195). Performance accomplishments influence efficacy through four modes of induction: participant modeling, performance desensitization, performance exposure, and self-instructed per romance (Bandura, 1977). Expectations of efficacy are also derived from vicarious experience, which is composed of the experiences an individual has had, and the experiences of those around the individual, which leads to his or her perceptions of self-efficacy (Bandura, 1977). Vicarious experiences affects efficacy through two modes of induction: live modeling and symbolic modeling. The performance accomplishments and vicarious experience sources of efficacy are especially useful when assessing or measuring self-perceived competence because such are based on an individual's experiences and beliefs (Bandura, 1977).

This study aimed to describe the self-perceived performance accomplishments and abilities of the participants, while determining how their related, vicarious experiences impacted that self-perception, as measured by a self-efficacy questionnaire. The participants were agricultural education student teachers at Oklahoma State University during the Spring 2019 semester ($N = 16$).

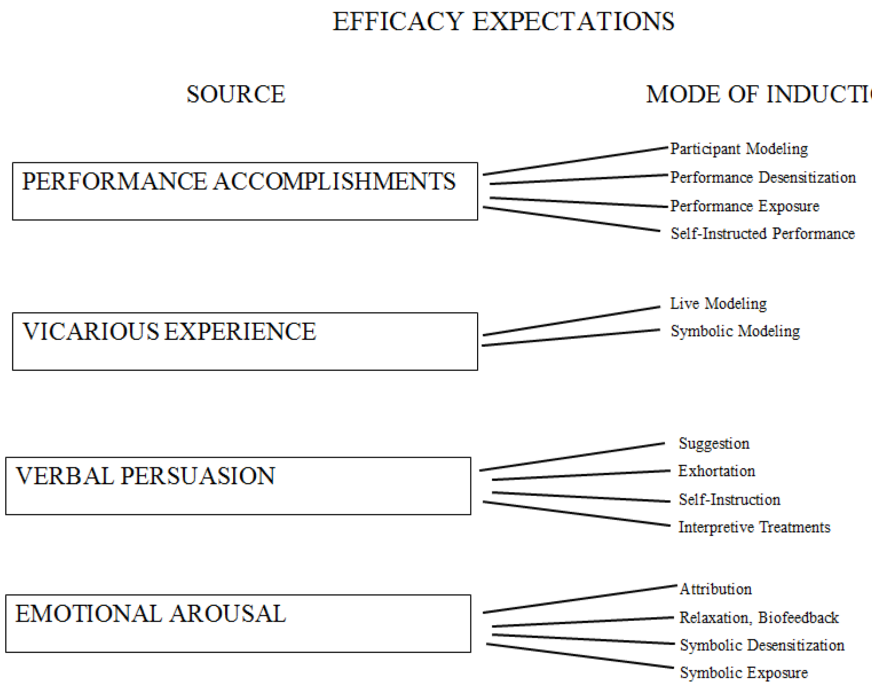

Figure 3. Bandura's (1977) Model of Sources of Efficacy Information. Figure reprinted with permission.

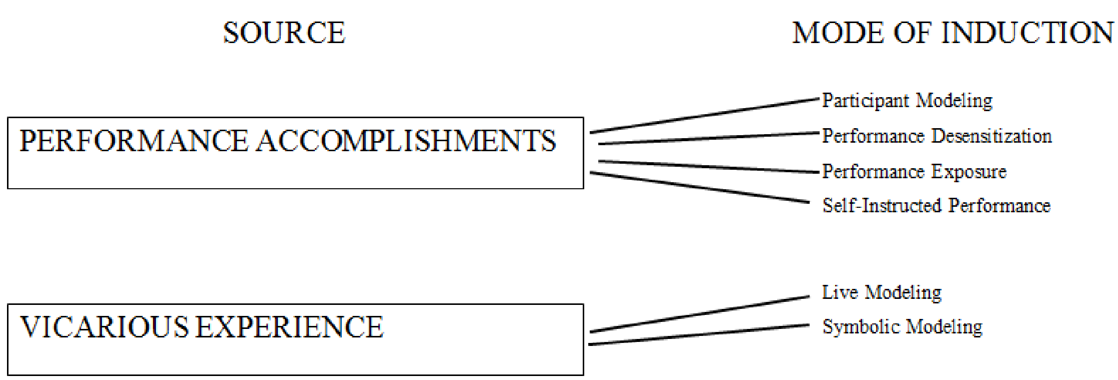

Figure 4. Dimensions of Bandura's (1977) Model of Sources of Efficacy Information assessed in the study. Figure reprinted with permission.

Teacher Self-Efficacy

"Teachers' sense of efficacy is a little idea with big impact" (Tschannen-Moran & Woolfolk Hoy, 2007, p. 24). Self-efficacy consists of the beliefs an individual has of his or her ability to accomplish a task (Gibson & Dembo, 1984; Whittington et al., 2006). Teachers' self-perceived beliefs of their own abilities can determine their success (Friedman & Kass, 2002; Pajares, 1996; Tschannen-Moran & Woolfolk Hoy, 2001; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Teacher self-efficacy can also increase job satisfaction (Hoy & Miskel, 2001; Pajares, 2000). Even the extent to which an individual will engage in learning a particular topic is dependent on his or her self-efficacy beliefs and the importance he or she places on the learning (Ormrod, 2012).

"The theory of self-efficacy has been applied to teachers and labeled teacher self-efficacy" (Wolf, 2011, p. 164). Teacher self-efficacy theory is one of the primary areas studied in education (Bruinsma & Jansen, 2010). Tschannen-Moran et al. (1998) defined teacher self-efficacy as "the teacher's belief in his or her capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (p. 233). Teacher self-efficacy is a self-concept of a teacher's ability to accomplish desired outcomes related to three constructs: student engagement, instructional strategies, and classroom management (Stripling et al., 2008). Teachers possessing confidence and efficacy about themselves and their ability in the classroom are more likely to succeed in their jobs' roles (Stripling et al., 2008).

Teacher self-efficacy correlates directly to teacher excitement, effort, and willingness to work with unmotivated students (Tschannen-Moran et al., 1998). This definition was based on Bandura's (1977) theory of self-efficacy, which noted teacher self-efficacy as a belief of an individual's abilities to be successful in the classroom despite unmotivated or misbehaving students. "Teacher [self-]efficacy provides a promising future to help teachers, especially novices, be more successful in their teaching experiences" (Knobloch, 2001, p. 119). It also contributes to teaching effectiveness (Tschannen-Moran et al., 1998), and is related to preservice teachers' commitments to the profession (Bruinsma & Jansen, 2010; Coladarci, 1992; Darling-Hammond, Chung, & Frelow, 2002; Evans & Tribble; 1986; Lortie, 1975), resiliency in the classroom (Hoy & Miskel, 2005), and job satisfaction (Blackburn & Robinson, 2008; Glickman & Tamashiro, 1982; Knobloch & Whittington, 2003; Lindner, Dooley, & Murphy, 2001). Teacher self-efficacy is comprised of the beliefs or convictions a teacher has regarding his or her ability to influence student learning (Guskey & Passaro, 1994).

Perceptions and beliefs influence actions and behaviors (DePorter et al., 1999). "Compelling evidence has been accumulating over the past three decades revealing the relationship of teachers' beliefs about their capability to impact students' motivation and achievement to important processes and outcomes in school" (Tschannen-Moran & Woolfolk Hoy, 2007, p. 2). Competent and efficacious teachers are more effective (Friedman & Kass, 2002; Miller, Kahler, & Rheault, 1989) and likely to positively impact student performance (Ashton & Webb, 1986; Gibson & Dembo, 1984; Guskey & Passaro, 1994; Rocca & Washburn, 2006; Tschannen-Moran & Woolfolk Hoy, 2007).

Teachers are also more likely to engage in necessary behaviors or actions to learn to improve their performance in the classroom if they have a high level of self-efficacy (Ormrod, 2012; Schunk & Pajares, 2004). Highly efficacious teachers have been shown to have a greater impact on student achievement and motivation (Ashton & Webb, 1986, Tschannen-Moran et al., 1998). “Efficacy significantly predicted commitment to teaching” (Coladarci, 1992, p. 332) and “to retain teachers, they must believe that they are competent in the tasks they are required to perform as agricultural educators” (Wolf, 2011, p. 164). Teachers are more likely to be satisfied with their jobs and remain in the profession if they possess a high self-efficacy and competence to complete the necessary teaching tasks (Glickman & Tamashiro, 1982; Hoy & Miskel, 2001).

Bandura (1993) defined self-efficacy as the belief an individual has regarding his or her ability to successfully complete a job task. Highly efficacious individuals approach challenging situations with ease and the assurance they can accomplish the task at hand (Bandura, 1994). Pajares and Miller (1994) concluded self-efficacy to be “a context-specific assessment of competence to perform a specific task, a judgement of one’s capabilities to execute specific behaviors in specific situations” (p. 194). Woolfolk and Spero (2005) defined efficacy as “a future-oriented judgement that has to do with perceptions of competence rather than actual level of competence” (p. 344). Individuals form expectations about the outcomes of their actions and behaviors (Ormrod, 2012). These notions include efficacy expectations, which are the beliefs individuals hold about their ability to accomplish specific tasks (Bandura, 1997; Ormrod, 2012; Pajares, 2000).

Conceptual Framework

This study was framed conceptually around Woolfolk Hoy’s and Hoy’s (2009) Teacher’s Perceived Efficacy model (see Figure 5). The conceptual lens specifically supporting this study focus on only a portion of the model (see Figure 6). The Teacher’s Perceived Efficacy model (see Figure 5) is a concept map showing the teacher’s process of assessing a teaching task and analyzing his or her competence to accomplish the task which formats a teacher's sense of efficacy.

Wolf (2011) conducted a similar descriptive study evaluating the perceived self-efficacy of agricultural education student teachers by focusing their conceptual lens on the assessment of teaching competence and teacher sense of efficacy dimensions of Woolfolk Hoy's and Hoy's (2009) model to explore the perceptions of preservice teachers during their student teaching experiences. Wolf (2011) found that the preservice teachers had high levels of self-efficacy related to their competence to teach in the SBAE classroom. However, Wolf's (2011) study did not measure student teachers' perceptions of their abilities to teach specific content or the cooperating teachers' assessment of the student teachers' competence. The same model is used in the current study to assess student teachers' perceptions of their ability and the cooperating teachers' perceptions of the student teachers' abilities to teach across the eight National AFNR Career Pathways. The study also assessed the teachers' perception of their competence to complete identified tasks related to teaching the National AFNR Career Pathways.

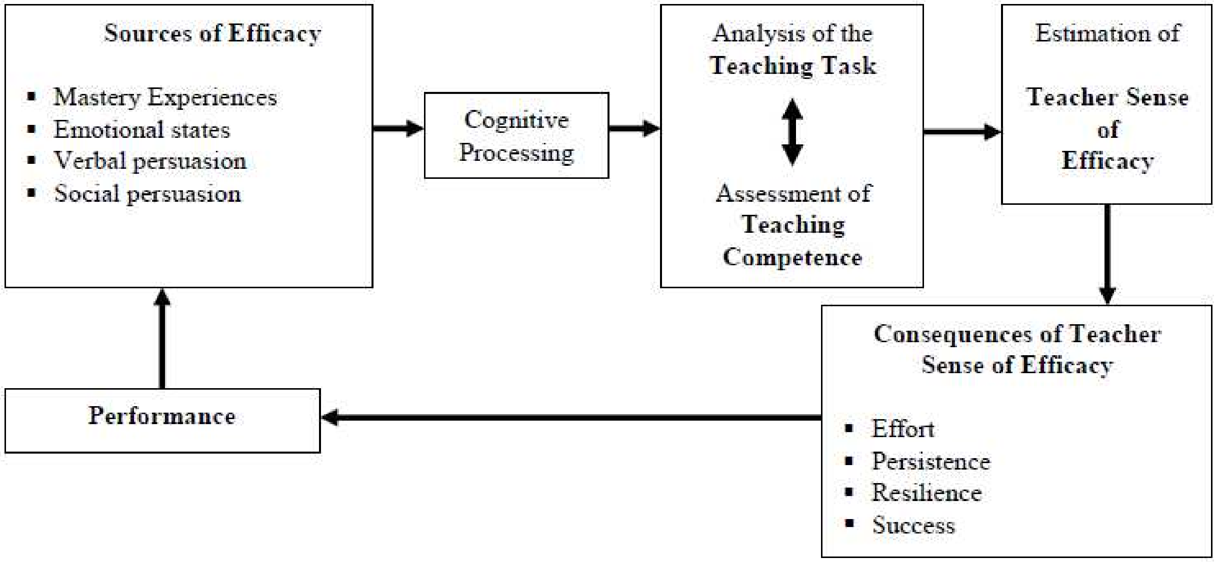

Figure 5. Teacher's Perceived Efficacy Model (Woolfolk Hoy & Hoy, 2009). Figure reprinted with permission.

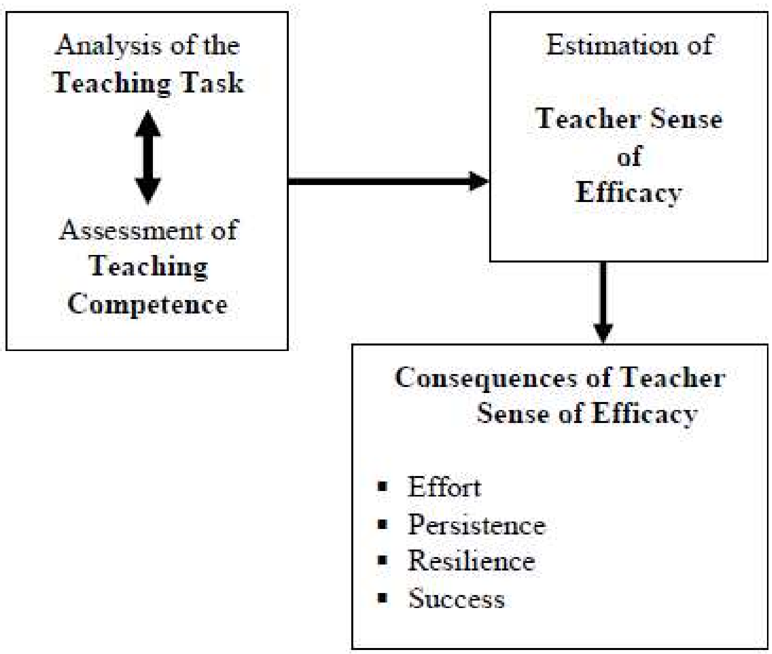

Figure 6. Dimensions of the Teacher's Perceived Efficacy Model (Woolfolk Hoy & Hoy, 2009) addressed in the study. Figure reprinted with permission.

CHAPTER III

METHODOLOGY

Overview of Introduction

The agricultural industry always has been and always will be an indispensable aspect of the economic, political, and social needs of the world (Newcomb et al., 2004). With a reliance on the agricultural industry, it is imperative for the public to be knowledgeable about agriculture (Pope, 1990). Simultaneous to the advances in agriculture, the population has stopped producing and growing its own food, and as people continue to move away from rural America, agricultural knowledge has declined (Dale et al., 2017). As such, the gap between awareness and understanding of the agricultural industry leads to an increased need to promote agricultural literacy to the general public (Doerfert, 2011; Hughes & Barrick, 1993).

School-based agricultural education (SBAE) can serve as a medium to educate individuals about agriculture. SBAE programs combine the applied sciences of agriculture and education (Barrick, 1989). Agricultural education is "a comprehensive term, including instruction in chemistry, geology, botany, zoology, mechanics-embracing, in short the science as well as the practice of agriculture" (Hillison, 1996, p. 10). The National Council for Agricultural Education (2015) has recommended a national

set of curriculum expectations to serve as a framework for operationalizing instruction to achieve the broad definition of SBAE (Clemons et al., 2018; Martin & Enns, 2017). This framework, the National AFNR Career Pathways, was designed to expose students to diverse areas of agriculture and develop their content knowledge related to agricultural products and issues (The National Council for Agricultural Education, 2015).

Agricultural education teachers are expected to teach specific agricultural education content and meet course standards, including teaching across the eight National AFNR Career Pathways to educate students about the agricultural industry and meet the workforce needs of the industry (The National Council for Agricultural Education, 2015). It is important to assess the gaps, deficiencies, and needs that exist amongst SBAE teachers related to the content they are expected to instruct (Sorenson et al., 2018).

Research Problem Statement

"Training institutions search continually for ways to improve their training programs" (Borich, 1980, p. 39). It is the role of teacher preparation programs in agricultural education to prepare teachers to be successful in their careers (Leiby et al., 2013). Research has revealed, unfortunately, that agricultural education preservice teachers often lack the necessary knowledge and teaching skills to be effective in their classrooms (Boone, Gartin, Boone, & Hughes, 2006; Duncan & Ricketts, 2008; Goecker, 1992; Sorenson, Tarpley, & Warnick, 2010). Researchers have been called to assess the needs of SBAE teachers prior to their entering teaching (Clemons et al., 2018; Garton & Chung, 1997; Joerger, 2002; Sorenson et al., 2018). Therefore, what are the needs of

preservice agricultural education teachers related to teaching across the eight National AFNR Career Pathways?

Purpose and Objectives

The purpose of the study was to determine the implied knowledge competence, the perceived performance competence, and the perceived levels of importance held by SBAE student teachers regarding their ability to teach across the eight National AFNR Career Pathways (The National Council for Agricultural Education, 2015). "Training programs can apply the [Borich (1980) Needs Assessment Model] by defining what is as the measured behaviors, skills, and competencies of the trainee and what should be as the goals of the training program" (Borich, 1980, p. 39). To align with Borich's (1980) needs assessment model, the teacher education program in agricultural education at Oklahoma State University was viewed as the training program and the trainees were the participating student teachers (*N* = 16) experiencing their student teaching internship during the Spring 2019 semester. The measured *what is* in the study was the participants' implied levels of knowledge based on Oklahoma Subject Area Test (OSAT) scores and their perceived levels of importance and self-perceived performance competence as measured by a self-efficacy questionnaire (see Appendix A). In addition, *what should be* was the expected ability of the participants to teach across the eight National AFNR Career Pathways. Five specific objectives undergirded the study.

1. Describe selected personal and professional characteristics of agricultural education student teachers at Oklahoma State University during the Spring 2019 semester.

2. Describe the agricultural education student teachers' implied knowledge competence regarding the eight National AFNR Career Pathways.
3. Describe the agricultural education student teachers' perceptions of the levels of importance to teach across the eight National AFNR Career Pathways.
4. Describe the agricultural education student teachers' self-perceived levels, and their cooperating teacher assessed levels, of performance competence to teach across the eight National AFNR Career Pathways.
5. Prioritize the eight National AFNR Career Pathways in need of knowledge and competence enhancement using the Borich (1980) Needs Assessment Model.

This exploratory, pilot study received Institutional Review Board approval (see Appendix VIII) on February 27, 2019. The study sought to describe the implied knowledge competence, perceived performance competence, and perceived levels of importance of agricultural education student teachers at Oklahoma State University to teach across the eight National AFNR Career Pathways. The eight pathways consist of: Agribusiness Systems, Animal Systems, Biotechnology Systems, Environmental Service Systems, Food Products and Processing Systems, Natural Resource Systems, Plant Systems, and Power, Structural and Technical Systems (see Figure 1).

Duncan et al. (2006) stated that "improving university agricultural teacher education curricula and statewide continuing education programs calls for assessing the needs of current practitioners of the agriculture teaching craft" (p. 24). Therefore, understanding these three factors can inform the Oklahoma State University teacher preparation program in agricultural education of the needs of preservice teachers regarding their abilities to teach the content within the pathways. Wingenbach et al. (2007) indicated preservice agricultural education teachers "needed more preparation in the eight areas essential to every agricultural education classroom" (p. 123). Identified deficiencies are based on participants' perceived levels of importance and competence and can create implications for interventions by teacher preparation and professional development programs supporting SBAE. What is more, exploration of the self-efficacy of SBAE teachers could help explain the issue of teacher shortage in the profession (Wolf, 2011).

Research Design

A convergent, parallel mixed-methods (Creswell, 2012) design was used for this exploratory, pilot study to describe the existing implied knowledge, the perceived levels of importance, and the self-perceived levels of performance competence of agricultural education student teachers. The independent variable used to assess the three aforementioned dependent variables were the set of eight National AFNR Career Pathways. The convergent, parallel design was chosen because it is mixed-methods design which allowed the researcher to collect quantitative and qualitative data simultaneously, conduct an analysis through comparing and relating the data, and conclude interpretations based on both data types (Creswell, 2012) [see Figure 7].

The Convergent Parallel Design (Creswell, 2012)

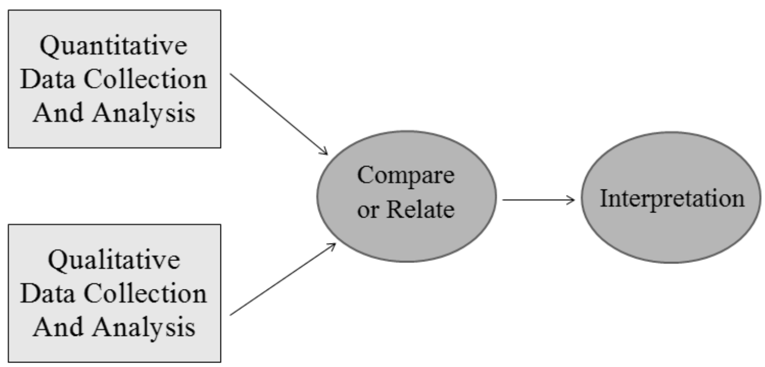

Figure 7. Creswell's (2012) convergent, parallel mixed-methods design. Figure reprinted with permission.

The study evaluated agricultural education student teachers (*N* = 16) at Oklahoma State University who student taught during the Spring 2019 semester. These students had completed the required course and observation hours to advance to the student teaching experience. In addition, they had passed the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019), a statewide, mandated testing requirement to be met prior to student teaching.

Quantitative data were collected through questionnaires (see Appendices A and B) and qualitative data were gathered through interviews, observations, and field notes (see Appendix D) (Ary, Jacobs, & Razavieh, 2002; Gall, Gall, & Borg, 2003). In a convergent parallel mixed-methods design, quantitative and qualitative data are collected, merged, and used simultaneously to understand the research problem (Creswell, 2012).

Collecting and analyzing both sets of data result in a more complete understanding of the phenomenon (Creswell, 2012).

Quantitative Data

Instrumentation and Data Collection

To address Objectives 1, 3, and 4, a researcher-developed questionnaire was distributed (see Appendix A) to the participants (N = 16). The questionnaire sought to gather information regarding personal and professional characteristics of the student teachers and to evaluate their perceived levels of importance and competence to teach across the National AFNR Career Pathways. To further address Objective 4, a questionnaire also was distributed (see Appendix B) to the cooperating teachers (N = 16) supervising the student teachers (N = 16). The pen and paper questionnaires were administered in person to 15 of the 16 pairs of student and cooperating teachers. One student teacher was placed out-of-state. For that case, the questionnaire was distributed to the student teacher and cooperating teacher via Qualtrics. Student teachers and cooperating teachers also received a Participant Information Form (see Appendix C) and their provided consent prior to data collection.

DiBendetto et al. (2018) recommended a cohesive and consistent instrument to be created, assessed, and utilized nationwide to determine the curricular needs of preservice agricultural education teachers. The distributed instruments (see Appendix A and B) were developed using questions in accord with Bandura’s (1994) Teacher Self-Efficacy Scale (see Appendix E) and Tschannen-Moran’s and Woolfolk-Hoy’s (2001) Teachers’ Sense of Efficacy Scale (see Appendix F). This study’s questionnaire can be used to collect large amounts of data and to allow for ease of comparative analysis (Carnevale, Gainer, & Meltzer, 1990). The questionnaire was designed to assess the participants' perceptions of their competence and the importance to teach across the eight National AFNR Career Pathways. A committee of five faculty members at Oklahoma State University reviewed and tested the content and face validity of the instrument prior to its use, as suggested by Salkind (2012). This committee was comprised of agricultural education faculty members with more than 40 years' experience teaching SBAE and more than 90 years' experience preparing students to become SBAE teachers. In addition, the committee had extensive experience conducting quantitative research studies and teaching research methods and data analysis courses to graduate students at Oklahoma State University.

The original scale of the Tschannen-Moran's and Woolfolk-Hoy's (2001) instrument (see Appendix F) instrument assessed three factors related to teacher self-efficacy: instructional strategies, classroom management, and student engagement. However, this study assessed only the participants' efficacy for instructional strategies in regard to their perceived ability to teach the eight National AFNR Career Pathways. Therefore, the questionnaires used (see Appendices A and B) related to items 7, 10, 11, 17, 18, 20, 23, and 24 from the Tschannen-Moran & Woolfolk-Hoy (2001) Teachers' Sense of Efficacy Scale (see Appendix F). The questions sought to evaluate the self-perceived performance competence of the participants. Nie, Lau, and Liau (2012) found Tschannen-Moran's and Woolfolk-Hoy's (2001) scale to have "good internal consistent reliability" (p. 415) with a Cronbach's alpha of .87 for the instructional strategies construct. If modified, the scale was found to have a Cronbach's alpha of .83 (Nie, Lau, & Liau, 2012). The response scale used in this study mirrors the scales used by Bandura

(1994) and Tschannen-Moran and Woolfolk-Hoy (2001) (see Appendix E and F). A 9-point scale was employed to assess the participants' perceived importance and competence. The scale consisted of: 1 = *Nothing*, 2 = *Very little*, 3 = *Some*, 4 = *Quite a bit*, and 5 = *A great deal*.

To accomplish Objective 2, student teachers' test scores from an Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019) were collected. Finally, to address Objective 5, the data collected for Objectives 3 and 4 were used to determine mean weighted discrepancy scores (MWDS) based on the Borich (1980) Needs Assessment Model approach.

Data Analysis

To address Objective 1, frequencies and percentages were reported to describe personal and professional characteristic information of the participants. To address Objective 2, the study examined the participants' test scores from the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019). These test scores were aggregated and reported as a group mean score per test subarea. The seven OSAT subareas were assessed and correlated with the most similar National AFNR Career Pathway. The subareas included Agricultural Business, Economics, and Marketing, Animal Science, Plant and Soil Science, Agricultural Mechanics, Environmental Science and Natural Resources, Foundations of Agricultural Education, and an Essay Constructed Response. To address Objectives 3 and 4, means and standard deviations were determined to describe the perceived levels of importance and competence. To address Objective 5, the participants' perceived levels of competence and importance regarding each of the eight National AFNR Career Pathways were reviewed and used to determine mean weighted discrepancy scores (MWDS) and prioritize the content needs of student teachers (Borich, 1980).

The discrepancy that exists within self-perceived levels of performance competence and importance is considered an informative measure if assessing the needs of agricultural education teachers (Clemons et al., 2018). Borich (1980) noted great value can be yielded by determining the existing discrepancies, between *is* and *ought*, to emphasize the needs for future curricular improvement. "Effective needs assessment provides the basis for decisions on priorities either for program development or retrenchment" (Witkin, 1984, p. 29). Although no universally accepted frameworks exist for needs assessments (Witkin, 1984), the Borich (1980) Needs Assessment Model has been used widely in agricultural education (Garton & Chung, 1997; Zarafshani & Baygi, 2008). The Borich (1980) model utilizes survey questionnaire methodology, which is described as "questioning individuals on a topic or topics and then describing their responses" (Jackson, 2011, p. 17), to find discrepancy scores. Discrepancy scores were calculated by subtracting the competence rating from the importance rating for each preservice teacher within each of the eight National AFNR Career Pathways. A mean weighted discrepancy score (MWDS) was calculated by finding the sum of the weighted discrepancy scores within each pathway and dividing each by the number of participants (N = 16) [Borich, 1980].

Qualitative Data

Instrumentation and Data Collection

Interviews were conducted using a semi-structured interview protocol (see Appendix D) with questions designed to not "get a simple yes and no answer, but describe an episode, a linkage, an explanation . . . to evoke good responses" (Stake, 1995, p. 65). Ten questions were created for the student teachers focused on their experiences and related perceptions of self-efficacy (Bandura, 1977) and their perceived levels of importance and competence associated with teaching across the National AFNR Career Pathways. Fourteen questions were created for the cooperating teachers focused on describing the SBAE programs where data were collected, their experiences and self-efficacy, and their perceived levels of importance and competence related to teaching across the National AFNR Career Pathways.

The interview protocol was assessed by a committee of three faculty members at Oklahoma State University to evaluate content validity, as suggested by Salkind (2012). The committee was comprised of agricultural education faculty members with a combined 22 years' experience teaching SBAE and experience with conducting qualitative research. Interviews were digitally recorded, transcribed verbatim by the researcher to enhance the reconstruction of the accounts, and sent to respondents to confirm transcriptions as a form of member checking (Stake, 1995). Field notes were recorded in a reflective journal, and photographs were taken at each of the school sites visited to triangulate the quantitative and qualitative data culminating in a comprehensive interpretation of the data.

The 16 student teachers studied completed their student teaching experience at 14 school sites, including 12 schools in Oklahoma, 1 school in Arkansas, and 1 school in Ohio. Two school sites in Oklahoma with multiple cooperating teachers had two student teachers. An approximate 2,415 miles were travelled from February 26, 2019 to March 12, 2019 to 10 of the 14 cooperating school sites to collect survey data and interview 11 of the student teachers and their cooperating teachers. This travel included two sites in northwest Oklahoma, two sites in northeast Oklahoma, one site in southwest Oklahoma, one site in southeast Oklahoma, three sites in central Oklahoma, and one site in northwest Arkansas. One interview was conducted over the telephone with a student teacher and cooperating teacher in western Ohio on March 6, 2019. Due to scheduling and time conflicts, four of the in-state student teachers and their cooperating teachers were visited at the Oklahoma Youth Expo Livestock Exhibition in Oklahoma City, Oklahoma on March 18, 2019.

Reflexivity Statement

Potential biases were presented based on my related experiences and perspectives. I grew up with an agricultural background on a farming operation raising beef cattle and alfalfa hay while also exhibiting swine and goat projects at livestock exhibitions. In SBAE, I was a very involved student and FFA member for four years culminating in my election as a State FFA Officer in 2012. I completed a student teaching internship in 2017 and therefore had personal expectations regarding student teacher competence and knowledge. These biases were controlled through structuring the interview protocol, focusing on the purpose and objectives of the study, and the use of bracketing during the analysis of participants' interviews (Calsyn & Winter, 1999).

Data Analysis

After the collection of interview data, interviews were transcribed verbatim. Then, coding procedures described by Saldaña (2016) were used to interpret the data. Data were coded using the *eclectic* coding strategy, a hybrid coding method suited for explorative research (Saldaña, 2016). Eclectic coding allows the researcher to employ more than one coding strategy to create comprehensive themes from the data (Saldaña, 2016). The study used a hybrid of In-vivo, pattern, and descriptive coding to conduct three levels of coding based on suggestions by Saldaña (2016). In-vivo codes were used in the first cycle of analysis because it allowed for preservation of the participants' voices (Saldaña, 2016). Pattern coding followed as a secondary coding procedure to arrange the In-vivo codes into patterned groups (Saldaña, 2016). As a third level, descriptive coding was used to create final themes from the patterned codes to portray the researcher's interpretation of the data's meaning (Saldaña, 2016) [see Appendix G].

CHAPTER IV

FINDINGS

Overview of Introduction

The agricultural industry always has been and always will be an indispensable aspect of the economic, political, and social needs of the world (Newcomb et al., 2004). With a reliance on the agricultural industry, it is imperative for the public to be knowledgeable about agriculture (Pope, 1990). Simultaneous to the advances in agriculture, the population has stopped producing and growing its own food, and as people continue to move away from rural America, agricultural knowledge has declined (Dale et al., 2017). As such, the gap between awareness and understanding of the agricultural industry leads to an increased need to promote agricultural literacy to the general public (Doerfert, 2011; Hughes & Barrick, 1993).

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preservice agricultural education teachers related to teaching across the eight National AFNR Career Pathways?

Purpose and Objectives

The purpose of the study was to determine the implied knowledge competence, the perceived performance competence, and the perceived levels of importance held by SBAE student teachers regarding their ability to teach across the eight National AFNR Career Pathways (The National Council for Agricultural Education, 2015). "Training programs can apply the [Borich (1980) Needs Assessment Model] by defining what is as the measured behaviors, skills, and competencies of the trainee and what should be as the goals of the training program" (Borich, 1980, p. 39). To align with Borich's (1980) needs assessment model, the teacher education program in agricultural education at Oklahoma State University was viewed as the training program and the trainees were the participating student teachers (N = 16) experiencing their student teaching internship during the Spring 2019 semester. The measured *what is* in the study was the participants' implied levels of knowledge based on Oklahoma Subject Area Test (OSAT) scores and their perceived levels of importance and self-perceived performance competence as measured by a self-efficacy questionnaire (see Appendix A). In addition, *what should be* was the expected ability of the participants to teach across the eight National AFNR Career Pathways. Five specific objectives undergirded the study.

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5. Prioritize the eight National AFNR Career Pathways in need of knowledge and competence enhancement using the Borich (1980) Needs Assessment Model.

Findings and Interpretations associated with the Quantitative Data

Objective 1

Objective 1 sought to describe select personal and professional characteristics of agricultural education student teachers in their final semester at Oklahoma State University. Sex, ethnicity, and state of permanent residence were nominal data and reported using frequencies and percentages. Age also was presented as a personal characteristic using frequency and percentage (see Table 1).

Regarding sex, 12 (75.00%) of the student teachers were female and four (25.00%) were male (see Table 1). Fourteen (87.50%) of the student teachers reported their ethnicity as white and two (12.50%) reported their ethnicity as Native American. Ten (62.50%) student teachers reported Oklahoma as their state of permanent residence.

Three (18.75%) student teachers reported California as their state of permanent residence. Two (12.50%) student teachers reported Ohio as their state of permanent residence. One (6.25%) student teacher reported Florida as their state of permanent residence. The age span of student teachers ranged from 20 to 24 years with a majority being 21 to 22 years of age ($f = 10$, 62.50%).

Table 1

Personal Characteristics of Agricultural Education Student Teachers (N = 16) at Oklahoma State University in the Spring 2019 Semester

Characteristic	*f*	%
Sex		
Female	12	75.00
Male	4	25.00
Ethnicity		
Native American	2	12.50
White	14	87.50
State of Permanent Residence		
California	3	18.75
Florida	1	6.25
Ohio	2	12.50
Oklahoma	10	62.50
Age		
20	1	6.25
21	5	31.25
22	5	31.25
23	3	18.75
24	2	12.50

Note. Participants were asked to report their age and the state where they graduated high school.

Years of agricultural education and FFA enrollment are presented in Table 2 using frequencies and percentages. Levels of involvement in high school agricultural education and FFA and level of agricultural work experience are interval data and also reported using frequencies and percentages.

Involvement in agricultural education and FFA spanned from four to six years for the student teachers (see Table 2). Nine participants (56.25%) reported four years agricultural education/FFA involvement, six (37.50%) reported five years of involvement, and one (6.25%) indicated six years of involvement.

For the level of involvement in agricultural education and FFA, 14 (87.50%) preservice teachers reported to be very involved in high school. One (6.25%) indicated having been somewhat involved, and one (6.25%) reported above average involvement (see Table 2).

For agricultural work experience, 10 (47.62%) student teachers experienced some type of full-time, temporary employment, which included full-time summer internships or semester-long work experiences. Five (23.80%) participants reported to have engaged in part-time employment, which included after-school and weekend jobs. Three (14.29%) reported having a full-time employment agricultural work experience, i.e. any work experience with a duration exceeding longer than six months. Three (14.29%) participants reported as having had mostly avocational, or hobby, related agricultural work experience (see Table 2).

Table 2

Agriculturally-Related Characteristics of Agricultural Education Student Teachers (N = 16) at Oklahoma State University in the Spring 2019 Semester

Level	*f*	%
Years of Agricultural Education/FFA Involvement		
4	9	56.25
5	6	37.50
6	1	6.25
Perceived Level of Agricultural Education/FFA Involvement		
No Involvement	-	-
Somewhat Involved	1	6.25
Average Involvement	-	-
Above Average Involvement	1	6.25
Very Involved	14	87.50
Agricultural Work Experience[a]		
Part-Time Employment	3	14.29
Full-Time Employment	5	23.80
Full-Time, Temporary Employment	10	47.62
Mostly Avocational (Hobby)	3	14.29

Note. Participants were asked to select their years of agricultural education/FFA involvement from 0 to 6 years. [a] = The reported agricultural work experience frequencies (*N* = 21) are higher than the number of participants (*N* = 16) because some participants reported experience at multiple levels.

Objective 2

Objective 2 sought to describe the implied agricultural education knowledge competence of student teachers regarding the eight National AFNR Pathways. Prior to entering student teaching, the 16 preservice teachers were assessed on their content knowledge via the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019). The test framework includes six subareas plus a seventh section for constructed responses or essay type answers.

Subarea 1 is Agricultural Business, Economics, and Marketing, which aligns with the National AFNR Pathway Agribusiness Systems. Subarea 2 is Animal Science, which aligns with the National AFNR Pathway Animal Systems. Subarea 3 is Plant and Soil Science, which aligns with the National AFNR Pathway Plant Systems. Subarea 4 is Agricultural Mechanics, which aligns with the National AFNR Pathway Power, Structural, and Technical Systems. Subarea 5 is Environmental Science and Natural Resources, which aligns with the National AFNR Pathways Environmental Service Systems and Natural Resource Systems. Subarea 6 is Foundations of Agricultural Education, which assesses the preservice teachers' knowledge of agricultural education and FFA history and background, but does not align directly with any of the existing National AFNR Pathways. The seventh section of the examination involved constructed essay responses, i.e. written answers, related to instructional practices in SBAE.

Test results are reported on a scale ranging from 100 to 300 with a minimum passing score of 240 within each subarea as well as for the overall test score (Certification Examination for Oklahoma Educators, 2019). The preservice teachers' aggregate subarea and overall test scores are reported using means (see Table 3).

The 16 preservice teachers' reported a passing average score (*M* = 259) for the Oklahoma Subject Area Test in Agricultural. A passing score was reported in six of the seven subareas, with Agricultural Mechanics (*M* = 238) the lone subarea not meeting the minimum passing score of 240. The average score for Foundations of Agricultural Education (*M* = 275), had the highest score of all subareas. This was followed by Animal Science (*M* = 272), Environmental Science and Natural Resources (*M* = 267), Plant and

Soil Science ($M = 261$), Agricultural Business, Economics, and Marketing ($M = 258$), and Constructed Response ($M = 259$).

Table 3

Oklahoma Subject Area Test (OSAT), Agricultural Education, Mean Scores for Agricultural Education Student Teachers (N = 16) at Oklahoma State University in the Spring 2019 Semester

Subarea	*M*
1. Agricultural Business, Economics, and Marketing	258
2. Animal Science	272
3. Plant and Soil Science	261
4. Agricultural Mechanics	238
5. Environmental Science and Natural Resources	267
6. Foundations of Agricultural Education	275
7. Constructed Response	252
Overall Test Score	259

Note. Standard deviation scores could not be calculated because the researcher was only given access to aggregate test scores and not individual test scores.

Objective 3

To address objective 3 mean scores (see Table 4) were calculated to report the perceptions of SBAE student teachers regarding the importance to teach across the eight National AFNR Pathways. Overall, the student teachers perceived Food Products and Processing Systems [FPP] ($M = 8.16$, $SD = 1.15$) as the pathway with the highest level of importance to teach. This was followed by Animal Systems [AS] ($M = 8.09$, $SD = 1.11$), Power, Structural, and Technical Systems [PST] ($M = 8.06$, $SD = 1.26$), Plant Systems [PS] ($M = 7.86$, $SD = 1.43$), Natural Resources Systems [NRS] ($M = 7.52$, $SD = 1.46$), Environmental Service Systems [ESS] ($M = 7.47$, $SD = 1.67$), and Agribusiness Systems

[ABS] (*M* = 7.39, *SD* = 1.47). Biotechnology Systems [BS] (*M* = 7.11, *SD* = 1.54) was perceived with the lowest level of importance.

On average, student teachers rated teaching within the FPP Pathway to range from quite a bit to a great deal of importance (*M* = 8.16, *SD* = 1.15). They perceived the statement, demonstrate knowledge of food products and processing systems to students who are confused about the topic (*M* = 8.63, *SD* = 1.05), to be most important to teach and, individualize your food products and processing systems lessons for your students (*M* = 7.50, *SD* = 1.50), the least important within FPP (see Table 4).

On average, student teachers rated teaching within the AS Pathway to range from quite a bit to a great deal of importance (*M* = 8.09, *SD* = 1.11). They perceived the statement, gauge student understanding of animal systems (*M* = 8.50, *SD* = 0.87), to be most important to teach and, individualize your animal systems lessons for your students (*M* = 7.13, *SD* = 1.32), the least important (see Table 4).

On average, student teachers rated teaching within the PST Pathway to range from quite a bit to a great deal of importance (*M* = 8.06, *SD* = 1.26). They perceived the statement, challenge capable students in your power, structural, and technical systems lessons (*M* = 8.50, *SD* = 0.87), to be most important to teach and, individualize your power, structural, and technical systems lessons for your students (*M* = 7.75, *SD* = 1.56), the least important within PST (see Table 4).

On average, student teachers rated teaching within the PS Pathway for having quite a bit of importance (*M* = 7.86, *SD* = 1.43). They perceived the statements, use a variety of assessment strategies to assess your students' knowledge of plant systems (*M* = 8.13, *SD* = 1.22), and, create effective and creative plant systems lessons (*M* = 8.13, *SD*

= 1.41), to be most important to teach and, individualize your plant systems lessons for your students (M = 7.38, SD = 2.03), the least important for PS (see Table 4).

On average, student teachers rated teaching within the NRS Pathway as quite a bit of importance (M = 7.52, SD = 1.46). They perceived the statements, create effective and creative natural resources systems lessons (M = 7.75, SD = 1.19), and, challenge capable students in your natural resources systems lessons (M = 7.75, SD = 1.56), to be most important to teach and, individualize your natural resources systems lessons for your students (M = 7.13, SD = 1.79), the least important for NRS (see Table 4).

On average, student teachers rated teaching within the ESS Pathway as quite a bit of importance (M = 7.47, SD = 1.67). They perceived the statement, challenge capable students in your environmental service systems lessons (M = 7.88, SD = 1.58), to be most important to teach and, individualize your environmental service systems lessons for your students (M = 6.75, SD = 1.71), the least important statement within ESS (see Table 4).

On average, student teachers rated teaching within the ABS Pathway as quite a bit of importance (M = 7.39, SD = 1.47). They perceived, use a variety of assessment strategies to assess your students' knowledge of agribusiness systems (M = 7.75, SD = 1.56), and, create effective and creative agribusiness lessons (M = 7.75, SD = 1.39), to be the statements with the highest levels of importance to teach and, gauge student understanding of agribusiness systems (M = 6.75, SD = 1.98), the statement with the lowest level of importance within ABS (see Table 4).

On average, student teachers rated teaching within the BS Pathway as quite a bit of importance (M = 7.11, SD = 1.54). They perceived the statement, respond to questions from your students related to biotechnology systems knowledge (*M* = 7.50, *SD* = 1.32), to have the highest level of importance to teach and, individualize your biotechnology systems lessons for your students (*M* = 6.00, *SD* = 1.87), the statement with the lowest level of importance within BS (see Table 4).

Table 4

Student Teachers' (N = 16) Perceptions of Levels of Importance to Teach across the Eight National AFNR Career Pathways using Mean Scores

	ABS		AS		BS		ESS		FPP		NRS		PS		PST	
Statement	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Respond to questions from your students related to [pathway] knowledge?	7.38	1.05	8.38	0.93	7.50	1.32	7.63	1.69	8.00	1.22	7.50	1.50	8.00	1.22	8.38	0.93
Gauge student understanding of [pathway]?	6.75	1.98	8.50	0.87	7.13	1.49	7.50	1.50	8.38	0.93	7.50	1.12	7.75	1.39	8.25	0.97
Craft good questions for your students related to [pathway]?	7.00	1.22	7.88	1.41	7.38	1.27	7.50	1.66	8.38	0.93	7.63	1.36	7.88	1.22	7.88	1.58
Individualize your [pathway] lessons for your students?	6.88	1.65	7.13	1.32	6.00	1.87	6.75	1.71	7.50	1.50	7.13	1.79	7.38	2.03	7.75	1.56
Use a variety of assessment strategies to assess your students' knowledge of [pathway]?	7.75	1.56	8.38	1.17	7.13	1.49	7.25	1.71	8.00	1.22	7.50	1.50	8.13	1.22	7.88	1.73
Demonstrate knowledge of [pathway] to students who are confused about the topic?	7.50	1.66	8.25	0.97	7.25	1.71	7.75	1.71	8.63	1.05	7.38	1.62	7.75	1.39	7.88	1.22
Create effective and creative [pathway] lessons?	7.75	1.39	8.13	0.99	7.25	1.56	7.50	1.80	8.25	0.97	7.75	1.19	8.13	1.41	8.00	1.22
Challenge capable students in your [pathway] lessons?	8.13	1.22	8.13	1.22	7.25	1.56	7.88	1.58	8.13	1.41	7.75	1.56	7.88	1.58	8.50	0.87
Average Level of Importance	7.39	1.47	8.09	1.11	7.11	1.54	7.47	1.67	8.16	1.15	7.52	1.46	7.86	1.43	8.06	1.26

Note. ABS = Agribusiness Systems, AS = Animal Systems, BS = Biotechnology Systems, ESS = Environmental Service Systems, FPP = Food Products and Processing Systems, NRS = Natural Resources Systems, PS = Plant Systems, PST = Power, Structural, and Technical Systems. The self-perceived statements followed the sentence construct "How important is it to. . ." Instrument Scale: 1 = *None At All*, 3 = *Very Little*, 5 = *Some*, 7 = *Quite A Bit*, 9 = *A Great Deal*.

Objective 4

Objective 4 sought to describe the perceptions of SBAE student teachers and their cooperating teachers regarding the student teachers' performance competence to teach across the eight National AFNR Career Pathways. Mean scores were used to describe the self-perceived performance competence of the student teachers (see Table 5). Mean scores were also used to describe the cooperating teachers' perceptions of the student teachers' competence (see Table 6) to teach across the AFNR Pathways. Overall, the student teachers perceived to be the most competent in Animal Systems [AS] (M = 6.94, SD = 1.52). This was followed by, Plant Systems [PS] (M = 6.14, SD = 2.07), Food Products and Processing Systems [FPP] (M = 6.09, SD = 1.63), Natural Resources Systems [NRS] (M = 5.95, SD = 1.59), Environmental Service Systems [ESS] (M = 5.33, SD = 1.91), Agribusiness Systems [ABS] (M = 5.06, SD = 1.76), and Biotechnology Systems [BS] (M = 4.33, SD = 2.18.). The student teachers perceived having the lowest level of competence in Power, Structural, and Technical Systems [PST] (M = 8.06, SD = 1.26).

Student teachers perceived themselves, on average, to have quite a bit (M = 6.94, SD = 1.52) of competence when teaching content in the AS Pathway. They perceived themselves to be most competent regarding the statement, use a variety of assessment strategies to assess your students' knowledge of animal systems (M = 7.38, SD = 1.45), and least competent regarding the statement, individualize your animal systems lessons for your students (M = 6.38, SD = 1.36).

Student teachers perceived themselves, on average, to range from some to quite a bit (*M* = 6.14, *SD* = 2.07) of competence when teaching content in the PS Pathway. They perceived themselves to be most competent regarding the statements, gauge student understanding of plant systems (*M* = 6.50, *SD* = 2.29), and, use a variety of assessment strategies to assess your students' knowledge of plant systems (*M* = 6.50, *SD* = 1.80), and least competent regarding the statement, individualize your plant systems lessons for your students (*M* = 5.75, *SD* = 2.12).

Student teachers perceived themselves, on average, to range from some to quite a bit (*M* = 6.09, *SD* = 1.63) of competence when teaching content in the FPP Pathway. They perceived themselves to be most competent regarding the statement, use a variety of assessment strategies to assess your students' knowledge of food products and processing systems (*M* = 6.63, *SD* = 1.27), and least competent regarding the statements, respond to questions from your students related to food products and processing systems knowledge (*M* = 5.75, *SD* = 1.98), and, challenge capable students in your food products and processing systems lessons (*M* = 5.75, *SD* = 1.56).

Student teachers perceived themselves, on average, have some (*M* = 5.95, *SD* = 1.59) competence when teaching content in the NRS Pathway. They perceived themselves to be most competent regarding the statement, respond to questions from your students related to natural resources systems knowledge (*M* = 6.25, *SD* = 1.39), and least competent regarding the statements, individualize your natural resources systems lessons for your students (*M* = 5.63, *SD* = 1.69), and, demonstrate knowledge of natural resources systems to students who are confused about the topic (*M* = 5.63, *SD* = 1.83).

Student teachers perceived themselves, on average, have some (M = 5.33, SD = 1.91) competence when teaching content in the ESS Pathway. They perceived themselves to be most competent regarding the statement, gauge student understanding of environmental service systems (M = 5.88, SD = 1.99), and least competent regarding the statement, demonstrate knowledge of environmental service systems to students who are confused about the topic (M = 4.63, SD = 1.62).

Student teachers perceived themselves, on average, have some (M = 5.06, SD = 1.76) competence when teaching content in the ABS Pathway. They perceived themselves to be most competent regarding the statement, create effective and creative agribusiness systems lessons (M = 5.63, SD = 2.32), and least competent regarding the statement, individualize your agribusiness systems lessons for your students (M = 4.50, SD = 1.32).

Student teachers perceived themselves, on average, range from very little to some (M = 4.33, SD = 2.18) competence when teaching in the BS Pathway. They perceived themselves to be most competent regarding the statements, gauge student understanding of biotechnology systems (M = 4.88, SD = 2.29), and, craft good questions for your students related to biotechnology systems (M = 4.88, SD = 2.49), and least competent regarding the statement, challenge capable students in your biotechnology systems lessons (M = 3.75, SD = 1.71).

Student teachers perceived themselves, on average, range from very little to some (M = 4.83, SD = 2.26) competence when teaching content in the PST Pathway. They perceived themselves to be most competent regarding the statement, gauge student understanding of power, structural, and technical systems ($M = 5.38$, $SD = 2.47$), and least competent regarding the statement, demonstrate knowledge of power, structural, and technical systems to students who are confused about the topic ($M = 4.38$, $SD = 2.20$).

Table 5

Student Teachers' (N = 16) Perceptions of their Performance Competence to Teach across the Eight National AFNR Career Pathways using Mean Scores

Statement	ABS		AS		BS		ESS		FPP		NRS		PS		PST	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Respond to questions from your students related to [pathway] knowledge?	4.86	1.65	6.88	1.32	4.38	2.09	5.25	1.56	5.75	1.98	6.25	1.39	6.25	2.11	4.88	2.29
2. Gauge student understanding of [pathway]?	5.50	2.06	7.25	1.39	4.88	2.29	5.88	1.99	6.50	1.50	6.13	1.58	6.50	2.29	5.38	2.47
3. Craft good questions for your students related to [pathway]?	5.38	2.03	7.25	1.56	4.88	2.49	5.63	1.83	6.25	1.85	6.13	1.73	5.88	2.12	5.00	2.45
4. Individualize your [pathway] lessons for your students?	4.50	1.32	6.38	1.36	3.88	1.87	5.13	1.93	5.75	1.71	5.63	1.69	5.75	2.12	4.88	1.93
5. Use a variety of assessment strategies to assess your students' knowledge of [pathway]?	5.25	1.39	7.38	1.45	4.50	2.39	5.50	2.18	6.63	1.27	6.13	1.73	6.50	1.80	4.50	1.80
6. Demonstrate knowledge of [pathway] to students who are confused about the topic?	4.75	1.56	6.88	1.65	4.00	2.24	4.63	1.62	6.13	1.73	5.63	1.83	6.13	2.12	4.38	2.20
7. Create effective and creative [pathway] lessons?	5.63	2.32	6.75	1.85	4.38	2.32	5.38	2.15	6.00	1.41	6.00	1.22	6.25	1.98	5.00	2.24
8. Challenge capable students in your [pathway] lessons?	4.63	1.76	6.75	1.56	3.75	1.71	5.25	1.98	5.75	1.56	5.75	1.56	5.88	1.99	4.63	2.67
Average Level of Competence	5.06	1.76	6.94	1.52	4.33	2.18	5.33	1.91	6.09	1.63	5.95	1.59	6.14	2.07	4.83	2.26

Note. ABS = Agribusiness Systems, AS = Animal Systems, BS = Biotechnology Systems, ESS = Environmental Service Systems, FPP = Food Products and Processing Systems, NRS = Natural Resources Systems, PS = Plant Systems, PST = Power, Structural, and Technical Systems. The self-perceived statements followed the sentence construct "How much can you do to. . ." Instrument Scale: 1 = *None At All*, 3 = *Very Little*, 5 = *Some*, 7 = *Quite A Bit*, 9 = *A Great Deal*.

Overall, the cooperating teachers perceived the student teachers to be most competent in Animal Systems (AS) (*M* = 7.50, *SD* = 1.71), followed by Food Products and Processing Systems (FPP) (*M* = 5.77, *SD* = 2.41), Power, Structural, and Technical Systems (PST) (*M* = 5.58, *SD* = 2.05), Plant Systems (PS) (*M* = 5.17, *SD* = 2.59), Natural Resources Systems (NRS) (*M* = 4.67, *SD* = 2.94), Agribusiness Systems (ABS) (*M* = 4.40, *SD* = 2.61), Environmental Service Systems (ESS) (*M* = 4.10, *SD* = 2.56), and Biotechnology Systems (BS) (*M* = 3.53, *SD* = 2.54).

The cooperating teachers perceived the student teachers to be quite a bit (*M* = 7.50, *SD* = 1.71) competent teaching content in the AS Pathway. The cooperating teachers perceived the student teachers to be the most competent regarding the statement, craft good questions for your students related to animal systems (*M* = 7.80, *SD* = 1.42), and least competent regarding the statement, gauge student understanding of animal systems (*M* = 7.13, *SD* = 1.71).

The cooperating teachers perceived student teachers to have some (*M* = 5.77, *SD* = 2.41) competence teaching content in the FPP Systems. The cooperating teachers perceived the student teachers to be the most competent regarding the statement, demonstrate knowledge of food products and processing systems to students who are confused about the topic (*M* = 6.07, *SD* = 2.29), and least competent regarding the statements, craft good questions for your students related to food products and processing systems (*M* = 5.53, *SD* = 2.25), and, use a variety of assessment strategies to assess your students' knowledge of food products and processing systems (*M* = 5.53, *SD* = 2.36).

The cooperating teachers perceived the student teachers to have some (M = 5.58, SD = 2.05) competence to teach content in the PST Systems Pathway. The cooperating teachers perceived the student teachers to be the most competent regarding the statements, use a variety of assessment strategies to assess your students' knowledge of power, structural, and technical systems (M = 5.93, SD = 2.17), and, create effective and creative power, structural, and technical systems lessons (M = 5.93, SD = 1.91). They perceived the student teachers to be the least competent regarding the statement, respond to questions from your students related to power, structural, and technical systems knowledge (M = 4.87, SD = 1.86).

The cooperating teachers perceived the student teachers to have some (M = 5.17, SD = 2.59) competence teaching content in the PS Pathway. The cooperating teachers perceived the student teachers to be the most competent regarding the statements, craft good questions for your students related to plant systems (M = 5.40, SD = 2.55), and, create effective and creative plant systems lessons (M = 5.40, SD = 2.85). They perceived the student teachers to be least competent regarding the statement, demonstrate knowledge of plant systems to students who are confused about the topic (M = 4.87, SD = 2.36).

The cooperating teachers perceived the student teachers to range from very little to some (M = 4.67, SD = 2.94) competence teaching content in the NRS Pathway. The cooperating teachers perceived the student teachers to be most competent regarding the statements, demonstrate knowledge of natural resources systems to students who are confused about the topic (M = 4.87, SD = 2.96), and, create effective and creative natural resources systems lessons (M = 4.87, SD = 3.22). They perceived the student teachers to be least competent regarding the statement, craft good questions for your students related to natural resources systems (*M* = 4.47, *SD* = 2.87).

The cooperating teachers perceived the student teachers to range from very little to some (*M* = 4.40, *SD* = 2.61) competence teaching content in the ABS Pathway. The cooperating teachers perceived the student teachers to be the most competent regarding the statements, respond to questions from your students related to agribusiness knowledge (*M* = 4.60, *SD* = 2.55), and, challenge capable students in your agribusiness lessons (*M* = 4.60, *SD* = 2.75). They perceived the student teachers to be least competent regarding the statement, use a variety of assessment strategies to assess your students' knowledge of agribusiness systems (*M* = 3.93, *SD* = 2.29).

The cooperating teachers perceived student teachers to range from very little to some (*M* = 4.10, *SD* = 2.56) competence teaching content in ESS Pathways. The cooperating teachers perceived the student teachers to be the most competent regarding the statement, demonstrate knowledge of environmental service systems to students who are confused about the topic (*M* = 4.33, *SD* = 2.79) and least competent regarding the statement, individualize your environmental service systems lessons for your students (*M* = 3.80, *SD* = 2.40).

The cooperating teachers perceived the student teachers to have very little (*M* = 3.53, *SD* = 2.54) competence teaching content in the BS Pathway. The cooperating teachers perceived the student teachers to be most competent regarding the statement, craft good questions for your students related to biotechnology systems (*M* = 3.93, *SD* = 2.62) and least competent regarding the statements, challenge capable students in your biotechnology systems lessons (*M* = 3.27, *SD* = 2.41), and, use a variety of assessment strategies to assess your students' knowledge of biotechnology systems (*M* = 3.27, *SD* = 2.41).

Table 6

Cooperating Teachers' (N = 16) Perceptions of the Student Teachers' Performance Competence to Teach across the Eight National AFNR Career Pathways using Mean Scores

	ABS		AS		BS		ESS		FPP		NRS		PS		PST	
Statement	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Respond to questions from your students related to [pathway] knowledge?	4.60	2.55	7.67	1.58	3.80	2.51	4.07	2.05	5.93	2.52	4.60	2.85	5.00	2.42	4.87	1.86
2. Gauge student understanding of [pathway]?	4.47	2.78	7.13	1.71	3.53	2.58	4.07	2.52	5.67	2.49	4.60	2.85	5.13	2.36	5.13	2.12
3. Craft good questions for your students related to [pathway]?	4.60	2.65	7.80	1.42	3.93	2.62	3.93	2.17	5.53	2.25	4.47	2.87	5.40	2.55	5.53	2.12
4. Individualize your [pathway] lessons for your students?	4.20	2.51	7.27	2.41	3.53	2.58	3.80	2.40	5.80	2.29	4.60	2.85	5.13	2.47	5.67	2.39
5. Use a variety of assessment strategies to assess your students' knowledge of [pathway]?	3.93	2.29	7.40	1.82	3.27	2.41	4.20	2.71	5.53	2.36	4.60	2.75	5.27	2.82	5.93	2.17
6. Demonstrate knowledge of [pathway] to students who are confused about the topic?	4.33	2.69	7.53	1.15	3.40	2.45	4.33	2.79	6.07	2.29	4.87	2.96	4.87	2.36	5.80	1.90
7. Create effective and creative [pathway] lessons?	4.47	2.68	7.67	1.74	3.53	2.78	4.20	2.90	5.67	2.49	4.87	3.22	5.40	2.85	5.93	1.91
8. Challenge capable students in your [pathway] lessons?	4.60	2.75	7.53	1.86	3.27	2.41	4.20	2.90	5.93	2.62	4.73	3.17	5.13	2.96	5.80	1.90
Average Level of Competence	4.40	2.61	7.50	1.71	3.53	2.54	4.10	2.56	5.77	2.41	4.67	2.94	5.17	2.59	5.58	2.05

Note. ABS = Agribusiness Systems, AS = Animal Systems, BS = Biotechnology Systems, ESS = Environmental Service Systems, FPP = Food Products and Processing Systems, NRS = Natural Resources Systems, PS = Plant Systems, PST = Power, Structural, and Technical Systems. The statements followed the sentence construct "How much can your student intern do to. . ." Instrument Scale: 1 = *None At All*, 3 = *Very Little*, 5 = *Some*, 7 = *Quite A Bit*, 9 = *A Great Deal*.

Objective 5

Objective 5 sought to prioritize the National AFNR Career Pathways in need of competence and knowledge enhancement amongst the student teachers using the Borich (1980) needs assessment model. The Borich (1980) model takes two ratings into account to determine where discrepancies exist. Discrepancy scores were calculated by subtracting the mean competence rating from the mean importance rating for each preservice teacher within each of the eight National AFNR Career Pathways. A weighted discrepancy score was then calculated by multiplying the individual discrepancy scores by the mean importance rating for each pathway. Next, a mean weighted discrepancy score (MWDS) was calculated by finding the sum of the weighted discrepancy scores within each pathway and dividing each by the number of participants ($N = 16$). The pathways were ranked and categorized according to MWDS.

To prioritize the National AFNR Career Pathways for curricular development, three categories were determined based on the MWDS. Category I is considered a *high discrepancy* and consisted of all MWDS larger than 1.20. Category II is considered a *moderate discrepancy* and consisted of all MWDS ranging from 0.90 to 1.20. Category III is considered a *low discrepancy* and consisted of all MWDS ranging from 0.50 to 0.89.

Category I consisted of the Power, Structural, and Technical Systems (*MWDS* = 1.63) and Biotechnology Systems (*MWDS* = 1.24) Pathways. Category II included the Agribusiness Systems (*MWDS* = 1.08), Food Products and Processing Systems (*MWDS* = 1.06), and Environmental Service Systems (*MWDS* = 0.99) Pathways. Category III consisted of the Plant Systems (*MWDS* = 0.84), Natural Resources Systems (*MWDS* = 0.74), and Animal Systems (*MWDS* = 0.58) Pathways.

Table 7

Student Teachers' (N = 16) Perceptions of Competence and Knowledge Enhancement Needs of the National AFNR Career Pathways using Mean Weighted Discrepancy Scores (MWDS)

Category	National AFNR Career Pathway	MWDS
I	Power, Structural, and Technical Systems	1.63
	Biotechnology Systems	1.24
II	Agribusiness Systems	1.08
	Food Products and Processing Systems	1.06
	Environmental Service Systems	0.99
III	Plant Systems	0.84
	Natural Resources Systems	0.74
	Animal Systems	0.58

Findings and Interpretations Associated with the Qualitative Data

Through data analysis of the semi-structured interviews (see Appendix D), themes related to student teacher (ST) and cooperating teacher (CT) knowledge, perceived levels of competence, and perceived levels of importance emerged (see Table 8). Three themes emerged regarding National AFNR Career Pathway content selection: *Local Community Expectations and Agricultural Presence, Student Demand, and Teacher Interest*. In addition, three themes emerged regarding ST and CT knowledge and performance competence to teach across the National AFNR Career Pathways: *Agriculturally-Related Personal Experiences, Professional Work Experiences, and Teacher Interests*. Three themes emerged regarding the ST and CT teacher-determined importance within the

National AFNR Career Pathways: *Local Community and Agricultural Presence, Teacher Interest, and Student Demand.*

Table 8

Key Issues and Resolutions regarding the National AFNR Career Pathways

Key Issues	Resolutions
1. What leads to course selection within the National AFNR Career Pathways?	Content selections within the National AFNR Pathways are influenced by the local community expectations and agricultural presence, student demand, and teacher interest.
2. What leads to teacher knowledge and competence to teach the National AFNR Career Pathways?	Teacher knowledge and competence regarding the National AFNR Career Pathways are influenced by the teacher's agriculturally-related personal experiences, professional work experiences, and the interests.
3. What leads to teacher-determined importance regarding the National Career AFNR Pathways?	Teacher-determined importance regarding the National AFNR Career Pathways is influenced by local community expectations and agricultural presence, the interests of the teacher, and student demand.

Note. Resolutions are based on themes derived from ST and CT perceptions shared in the semi-structured interviews.

Objective 1

Objective 1 sought to describe select personal and professional characteristics of agricultural education ST in their final semester at Oklahoma State University. The achievement of this objective was further informed qualitatively by using the study's interview protocol (see Appendix D) to probe STs. STs were asked questions regarding their agriculturally related experiences and education. For confidentiality, pseudonyms were used to identify ST and CT participants and school sites (see Table 9).

Table 9

Pseudonyms Connecting School Sites, Cooperating Teachers, and Student Teachers

School Site	Cooperating Teacher [CT] (Years Teaching)	Student Teacher (ST)
A	Mr. Adams (24 years)	Ms. Alex
B	Ms. Berry (23 years)	Ms. Baker
C	Mr. Cooper (32 years)	Ms. Cross
	Mr. Clary (7 years)	Ms. Clemons
D	Mr. Dallas (22 years)	Ms. Down
E	Mr. Engle (10 years)	Mr. Ellis
F	Mr. Finn (14 years)	Ms. Faulk
G	Ms. Gale (5 years)	Ms. Gray
H	Ms. High (20 years)	Ms. Hale
J	Mr. Jay (25 years)	Mr. Jerry
K	Mr. Koyle (9 years)	Ms. Kay
L	Mr. Light (37 years)	Ms. Lane
M	Mr. Mane (22 years)	Ms. Ment
	Ms. Mill (20 years)	Ms. Maxon
N	Mr. North (19 years)	Mr. Nang
P	Ms. Perry (15 years)	Ms. Pale

The personal and professional experiences of the ST group varied in type and length. Ms. Alex, ST school site A, a small one-teacher program in northeast Oklahoma, noted a long-term professional experience related to her role as an SBAE teacher. “I worked at Braum’s for five years, so I know how to handle meats properly.” ST at school site D, a small, rural, one-teacher program in central Oklahoma, Mr. Down, had varying professional work experiences and stated that, “all through high school, I worked at a livestock auction, in the summers, I would work at Blue & Gold Sausage taking care of lawns, in junior college, I worked on a sheep farm, and I got a job at Reproduction Enterprises." Ms. Gray at school site G, a rural, two-teacher program in northwest Oklahoma said: "I worked at a goat dairy in high school so we would milk about 200 [goats] a day." Ms. Kay at school site K, a suburban, three-teacher program in northwest Arkansas, mentioned that "in college, I took a job with CGB, Consolidated Grain & Barge, and I worked with them as a harvest employee for the summer." She added: "I took an internship with a grain company over in northwest Oklahoma called Enterprise Green Company." ST at school site L, a small, rural, one-teacher program in northeastern Oklahoma, Ms. Lane, said: "I interned last summer with the research and extension experience for undergraduates' program under the horticulture department."

Some STs came from farm backgrounds with varying experiences working and learning on their own agriculturally related operations. Ms. Baker, ST at school site B, an urban, two-teacher program in central Oklahoma, remembered "when we weren't at school, we were helping either cooking or doing something to take care of [the farm]." Ms. Clemons at school site C, a large, urban, three-teacher program in central Oklahoma shared: "I grew up on a beef production ranch, a cow-calf operation." Likewise, Ms. Faulk at school site F, a large, rural two-teacher program in northwestern Oklahoma stated: "I'm a fourth- or fifth-year generation cattle producer." Additionally, Ms. Kay said: "I did grow up in a rural background on a small family cow-calf operation."

Objective 2

Objective 2 sought to describe the implied knowledge competence of agricultural education ST regarding the eight National AFNR Career Pathways. The achievement of this objective was further informed qualitatively by using the interview protocol (see Appendix D) to probe STs. STs were asked interview questions regarding their implied knowledge to teach across the National AFNR Career Pathways. They reported varying knowledge across the eight pathways.

Mr. Ellis, ST at school site E, a rural, two-teacher program in central Oklahoma, recognized his knowledge in Agribusiness Systems by stating: "actually owning my own farm, it encompasses a lot of [knowledge]," Mr. Jerry, ST at school site J, a rural, one-teacher program in southwestern Oklahoma, was not as knowledgeable. Ho said: "my knowledge base is narrow . . . it would be something I would need a lot of refreshing on to really feel competent to pass on knowledge."

Numerous STs expressed knowledge in the Animal Systems Pathways. "I know good enough basics to get that basic information out there," said Ms. Faulk. High levels of perceived knowledge exist from student teachers with related academic experiences. "All of my electives were animal science based," said Ms. Alex. "As an animal science major, it was a major direction going through college," reported Ms. Cross, at school site C. Ms. Baker added, "that's what I did in high school, and that's what I've been around."

Regarding the Biotechnology Systems, Pathway Ms. Gray recognized that "it's just such a hot topic." But, Ms. Baker noted: "I'd need a lot more education on it before I could teach more than a lesson or two on the subject." She stated further: "there [are] a lot of cool things you can do with that but I just don't know it." In addition to Ms. Baker, six other STs stressed a lack of knowledge related to BS. Few perspectives were shared related to BS indicating a low level of perceived knowledge by the STs.

Environmental Service Systems knowledge was contrasted by Ms. Kay and Mr. Jerry who stated, respectively: "To be honest, I don't even know what all is encompassed by environmental services," and "those were the classes that I thrived most in [during] college." Ten STs perceived ESS content expectations to be unclear and potentially overlapping with NRS, supporting the view expressed by Ms. Kay.

Knowledge in Food Products and Processing Systems is expressed by Ms. Clemons, who stated: "I've had enough experiences with it to teach, especially if I spend time and dig into it and study what I'm going to teach." However, Ms. Gray added: "I'm not proficient in it." Six STs shared similar perspectives to Ms. Gray's statement, i.e. perceiving their knowledge to not be proficient to meet the curricular expectation to teach it.

Natural Resources Systems knowledge was perceived as an area of strength by the STs. Ms. Baker said: "I feel like I have a good understanding of [NRS], but it's just a matter of being confident enough that I can actually tell it to other people and teach it." Additionally, Mr. Ellis noted: "I took a couple classes in [NRS] and really like that, and it got me out of my comfort zone." However, 10 STs perceived that the NRS content expectations potentially overlapped with the ESS curriculum. Similar to Ms. Baker's position, four other STs expressed possessing NRS content knowledge but lacked the related confidence to teach the pathway.

Plant Systems knowledge was also perceived as an area of strength by the STs. "I took a horticulture class where we had to do greenhouse [activities] and that's just something I get," said Ms. Clemons. Ms. Hale, ST at school site H, a rural, two-teacher program in western Ohio, recognized her knowledge in the PS pathway. She said: "I learned it in college and growing up." Likewise, Mr. Jerry noted: "my [SBAE] program in high school had two greenhouses and a horticulture building." And Ms. Lane said: "I have a concentration in horticulture." In addition, Ms. Cross added: "I'm pretty confident but in an introductory level rather than a higher level."

In Power, Structural, and Technical Systems, ST's perceptions of their knowledge varied. "I've always been able to repair stuff," said Mr. Ellis regarding his knowledge in this pathway. Moreover, Ms. Hale reported, "I need a better understanding of it," and Ms. Alex related her lack of knowledge to her academic experiences. She said: "there's only a five-week course of welding, and it goes by so quickly." Twelve STs agreed with Ms. Hale and identified a lack of knowledge regarding PST pathway content.

Overall, the ST group possesses varying amounts of implied and perceived levels of knowledge in regard to teaching across the National AFNR Pathways. For example, "I'm pretty confident in teaching the introduction level. I feel very confident I don't have to worry if they'll ask me things I won't know the answer to," said Ms. Cross about her knowledge to teach AFNR pathways. "All I've done is grow in my level of knowledge," is what Ms. Lane noted regarding her student teaching experience and the organization of additional content knowledge.

Objective 3

Objective 3 sought to describe the perceptions of agricultural education STs regarding the importance to teach across the eight National AFNR Career Pathways. The achievement of this objective was further informed, quantitatively, by using the interview protocol (see Appendix D). STs were asked interview questions regarding the level of importance they placed on teaching across the National AFNR Career Pathways. CTs were also asked about their perceptions of importance to teach the AFNR pathways to further understand the SBAE programs where the STs were located. In, addition, the researcher recorded observations at 10 of the 14 school sites and took field notes and photographs during the visits.

Mr. Adams, CT at school site A, noted BS to be “something that is extra for kids that want to go above and beyond unless you’re in an area where that is important.” He perceived BS content to be unnecessary for his students who, he emphasized, instead had a need for PST curriculum. PST meets student’s need for “survivability in rural communities,” said Mr. Adams. The researcher observed available resources related to both of the aforementioned pathways (see Figures 8 and 9). The CT identified PST to be an important pathway to teach and perceived BS to have less value. Yet, 10 textbooks titled *Biotechnology* sat on the bottom shelf of this teacher’s classroom and seven textbooks titled *The Science of Agriculture: A Biological Approach* on the shelf directly above the bottom shelf (see Figure 8). The CT, Mr. Adams, devalued the need for BS curriculum and identified it as a pathway not being taught in the SBAE program at site A. However, resources were available to teach that curriculum. Likewise, the PST laboratory was clearly well maintained and had available technology, which Mr. Adams emphasized using in his courses.

Figure 8. Biotechnology textbooks and *The Science of Agriculture: A Biological Approach* available at school site A.

Figure 9. Well-maintained welding booths, with student projects and recently used welding electrodes surrounding the booths, at school site A.

The CT, Ms. Berry, at school site B, noted PS as being important to teach because "horticulture classes have been really popular just with general [student] interest in the greenhouse industry." Ms. Berry further emphasized: "there is a lot of interest [for] more hands-on things" and noted spending PS classroom time "either in the labs or greenhouses probably 80% of the time." A large and highly used greenhouse, as evidenced by the number of growing plants, served as a resource related to the PS Pathway (see Figure 10), which supported Ms. Berry's response. School site B offers multiple PS courses and opportunities for students to utilize the greenhouse to grow and sell plants, supporting Ms. Berry's emphasis on the PS Pathway.

Figure 10. Large greenhouse at school site B had many growing plants, watering cans, potting soil, and gardening tools.

The CT at school site D, Mr. Dallas, valued teaching content in the PST and AS Pathways. Regarding the value of these pathways, Mr. Dallas stated, "we live in an area where [PST] is needed." He added, "I have a lot of students with their own livestock and we're very active in livestock showing, too." Evidence supporting Mr. Dallas' comments included a large PST laboratory with several student projects, welding booths, gas cylinders, piping, and scrap metal. At the time of the visit to school site D, the PST laboratory was being used to store and build resources for AS-related projects and students' SAEs. A scale, recently used to weigh livestock projects, was located in front of students' PST projects and welding supplies (see Figure 11). Livestock bedding was located in front of paneling and gates and surrounded by fuel cylinders and other welding supplies (see Figure 12). The researcher visited a few days before the Oklahoma Youth Expo and Mr. Dallas noted the PST laboratory was being used to prepare for the students' participation in that livestock exhibition. These observations supported the comments by Mr. Dallas.

Figure 11. A scale, recently used to weigh livestock projects, was located in the PST laboratory inhibiting access to student projects and PST supplies, at school site D.

Figure 12. Livestock bedding for the Oklahoma Youth Expo being stored in the PST Laboratory in front of welding supplied at school site D.

The CT at school site E, Mr. Engle, emphasized importance of the AS Pathway. He stated: "our state is heavy in showing livestock and raising livestock. I think the Animal Systems Pathway is key." A heavy presence of AS realia and technology was observed in the classroom at school site E supporting the statements of Mr. Engle. Large 3-D diagrams of livestock animals were found placed around the classroom in addition to several poster diagrams outlining the anatomy and physiology of livestock animals (see Figure 13). Several banners, trophies, and plaques earned for livestock exhibitions were hanging on the classroom walls. An incubator with chicken eggs, used in a specific AS course, was on display in the classroom for all students in the SBAE program to observe as the chicks went through the process of development, incubation, and hatching (see Figure 14).

Figure 13. At school site E, the SBAE classroom was full of 3-D animal diagrams, posters, and awards related to the AS Pathway.

Figure 14. A chicken egg incubator, at school site E, was used for a specific AS course but was displayed in the classroom for all students to observe.

Mr. Finn, the CT at school site F, identified FPP Systems as the most important pathway to teach. “That’s our most basic needs, food and water. . . . You should always want to know where your food comes from.” Though Mr. Finn emphasized the value of FPP, no resources were observed. A large laboratory consisting of several welding booths, fuel cylinders, welding supplies, workspace tables, woodworking tools, several archery bows, and a large section dedicated to archery practice were within view. A small corner of the PST laboratory was dedicated to PS Pathway-related content, including three large vertical PVC gardens and six large tubs with potted plants (see Figures 15 and 16). Despite the numerous resources, Mr. Finn did not mention a perceived value to teach content supporting the PST or PS Pathways.

Figure 15. Three vertical PVC gardens at school site F were housed in a corner of the PST laboratory.

Figure 16. Six tubs with potted plants under a heated light at school site F were housed in a corner of the PST laboratory.

The CT at school site G, Ms. Gale, stated: “when I think value, I am going to go with all of [the AFNR Pathways] because I think they all offer such important components.” An even distribution of classroom focus and resources across several pathways existed at school site G, including ABS, AS, PS, and PST (see Figures 17 and 18). Ms. Gale noted the existence of an animal laboratory, or school farm, off campus for use. At the classroom site, a large and open PST laboratory consisted of several welding booths and welding supplies, woodworking supplies and tools, a school tractor, and supplies for planting ornamental plants (see Figures 17 and 18). In the classroom, posters promoting agricultural literacy, FFA involvement, and communication technology lined the walls. This realia supported Ms. Gale’s comments and emphasis of integrating all pathways into a SBAE program.

Figure 17. The PST laboratory at school site G included woodworking tools such as a chop saw, planting tools, e.g., such as pots, mulch, a wheelbarrow, and student workspaces.

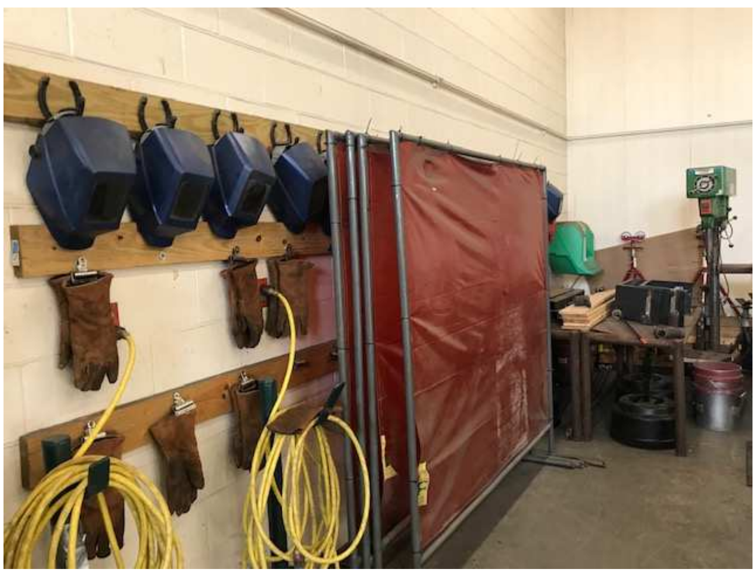

Figure 18. The PST laboratory at school site G displayed evidence of daily use in courses related to PST Systems, including students' projects on the workspaces and welding supplies strewn throughout the facility's welding booths.

At school site J, the CT, Mr. Jay, emphasized a need for comprehensive integration of the AFNR pathways within SBAE programs. "I get to looking at production agriculture, and all of [the AFNR pathways] have a little piece or component of production within it." However, the PST laboratory had little evidence of recent use by students. Rather, the PST laboratory was being utilized solely for storage. In addition, an unusable greenhouse, due to a damaged fan, was observed resulting in relocation of plants into the classroom area. Due to current construction at the school site and at the request of the CT, the researcher only captured images of the new facility for school site J's future SBAE program (see Figure 19). The new program will include the acronym "STEM" in the title (see Figure 19), supporting Mr. Jay's emphasis on integrating the AFNR pathways into SBAE programs. The image includes a large PST laboratory, a greenhouse, and a studio with an editing bay for teaching video production in agricultural communications courses.

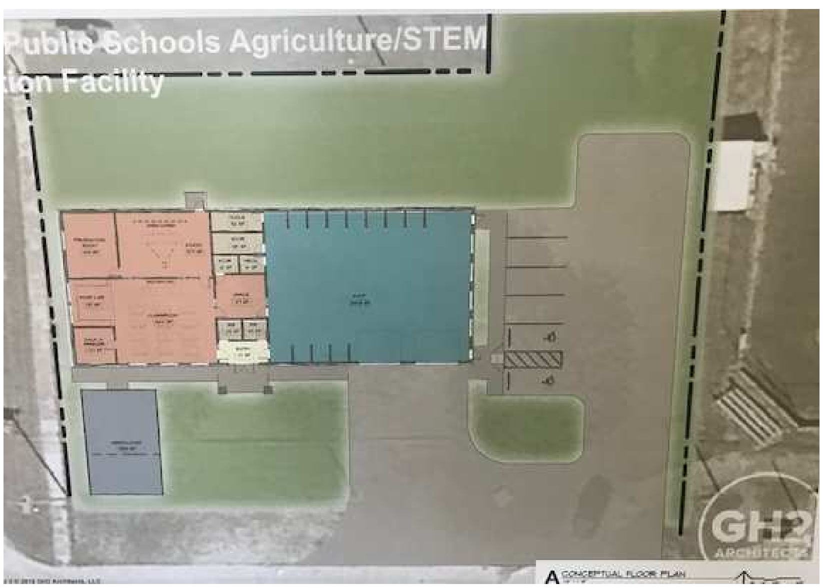

Figure 19. The new SBAE facility being constructed at school site J.

Mr. Koyle, CT at school site K, expressed value for the ABS, AS, PST Pathways. About AS, he noted: "while you're in an urban area, there's still a lot of farming in this area but most of the kids we get live inside subdivisions, so you can teach them the animal systems side of it." Mr. Koyle valued teaching PST in SBAE because "those guys are making a lot of money really fast, but you have to be trained in it. You have to have that foundational training." It was observed at school site K that no PST laboratory or school farm, i.e., animal laboratory, existed. In addition, limited access to technology in the classroom was observed. This supports Mr. Koyle's comments about a need for new resources for his program. However, a large greenhouse was seen to be sitting empty, lacking evidence of daily use (see Figure 20). Although Mr. Koyle emphasized a need for resources to support the important pathways to teach, a resource existed that was not utilized. The greenhouse, a resource for PS, is not used to enhance content within the pathways that Mr. Koyle identified as important.

Figure 20. An empty and unused greenhouse at school site K.

Mr. Light, the CT at school site L admitted to valuing teaching the PS and PST Pathways. Mr. Light stated: "there are several plant systems-related [businesses]. There are greenhouses, farm stores, and nurseries" and "of course on the [PST], if they go into industry we are near [city] where they can work for a company." Regarding facilities and learning spaces, a greenhouse with evidence of regular use and a PST laboratory with various projects and resources (see Figures 21 and 22), was observed, which complemented Mr. Light's statements. In the greenhouse, several plants were being grown and many planting tools lined the floor and its exterior (see Figure 21). Mr. Light noted growing ferns for an upcoming fundraising sale and gave one to the researcher at the completion of the visit. This supported his emphasis on teaching PS curriculum content and preparing students for careers related to the PS Pathway. This PST laboratory housed several student projects, including a large smoker, metalworking supplies and tools, as well as woodworking supplies and tools (see Figure 22). This supported Mr. Light's comments about teaching within the PST pathway. He described spending daily class time in the PST laboratory to provide students the opportunity to create and build projects.

Figure 21. The greenhouse at school site L had several plants and planting tools, including ferns being grown for an upcoming plant sale.

Figure 22. The PST laboratory at school site L showed evidence of daily use with student projects throughout the space and many tools and supplies on display.

Objective 4

Objective 4 sought to describe the perceptions of agricultural education STs and CTs regarding the STs' performance competence to teach across the eight National AFNR Pathways. The achievement of this objective was further informed, qualitatively, by using the interview protocol (see Appendix D).

Regarding Agribusiness Systems (ABS), STs noted varying competence to teach within the pathway. "It's a little bit of lack of [competence and] experience," said Ms. Kay about her competence to teach ABS. Six additional STs agreed with Ms. Kay, expressing a lack of competence in ABS resulting from a deficit of experiences related to the pathway. Mr. Jerry noted: "I feel confident to teach it," however, he later added, "it would be something I would need a lot of refreshing on to feel really competent to pass on knowledge." A lack of experience and academic preparation impacted the perceived competence of STs to teach content comprising the ABS pathway.

On the other hand, the AS Pathway was an area where the STs perceived high competence. "That is definitely where I am most comfortable," said Ms. Faulk. Fourteen other STs shared Ms. Faulk's perspective. Ms. Cross and Ms. Clemons expressed competence in teaching AS as coming from their backgrounds with raising livestock. "I've been around livestock all my life, in all different forms," said Ms. Cross. "I grew up showing livestock and we raised our own showing animals," added Ms. Clemons. However, Mr. Ellis added: "I really wasn't confident in it. I'm not animal science minded." The STs perceived higher competence for the AS pathway because of past experiences learning, working, and teaching within the pathway.

For the BS pathway, Mr. Ellis noted low levels of competence. He stated: "I just haven't done enough to make myself feel confident teaching." Ms. Maxon, a ST a school site M, said the BS pathway was "just a little bit out of my comfort zone." These themes were supported by 15 other STs. For example, Ms. Gray noted experiences learning about BS and identified some competence in the pathway. The STs perceived their competence regarding the BS pathway's content as low resulting from a lack of related knowledge and experiences.

Regarding the ESS Pathway, the STs reported having less competence to teach related content. "I'm a little more uncomfortable because I don't have the experience," said Mr. Down about ESS. Several STs agreed with Mr. Down and identified a lack of experiences as the cause of their perceived low competence to teach content supporting the ESS pathway. Ms. Pale, ST at school site P, added: “I am not very strong in [ESS] because I haven’t had to teach it.” The STs have lower perceptions of competence because they have not taught or worked specifically with ESS-related content.

The self-perceived competence of STs to teach within the FPP Pathway was low. To this point, Mr. Down shared: “[FPP] would be a weaker area of unfamiliarity.” In fact, few STs shared any perspectives regarding the FPP Pathway. Instead, they breezed over the pathway making statements similar to Mr. Down’s comment. Twelve STs expressed being uncomfortable when discussing FPP content. Their low competence may have led them to have few thoughts related to FPP because they lacked experience related to the pathway’s content.

For the NRS Pathway, STs indicated being somewhat competent to teach its content. “I feel like I have a good understanding of [NRS] but it’s just a matter of being confident enough that I can actually [explain] it to other people and teach it,” said Ms. Baker. Ms. Alex added: “I have some experience in those areas and even with my background,” when describing her competence in NRS. Ms. Gray described an interest and competence in NRS stating that her competence was driven by “my love for the outdoors and kind of understanding more about certain parts of it.” The STs perceived moderate competence based on their interests and varied experiences related to NRS. They perceived themselves as knowledgeable and interested in NRS, but identified some lack of competence to teach the pathway’s content.

The STs expressed competence regarding their ability to teach the PS pathway’s content. “[PS] is what I did in high school, and that’s what I’ve been around,” said Ms.

Baker. “I grew up around agronomical plants,” said Ms. Hale. Seven other STs explicitly stated having past experiences related to PS, similar to Ms. Baker and Ms. Hale. Mr. Jerry shared, “I’m much more confident than a lot of my peers” in regard to his competence to teach within the PS pathway. However, Mr. Ellis added, “I’m uncomfortable with [PS] just because I don’t have that experience,” and Mr. Down said that, “[PS] is where I usually get lost . . . that’s where I lose a little bit of confidence.” In addition to Mr. Down and Mr. Ellis, five other STs expressed a lack of competence and experience related to PS. The ST cohort varied in their personal perception of their PS related competence. STs with prior work or academic experiences expressed a higher perceived level of competence to teach PS than did their counterparts who did not have previous work experience.

STs’ competence in PST was also perceived at varying levels. “It isn’t high on my level of confidence,” said Ms. Maxon regarding PST. “I can do assessment, but I can’t demonstrate what they’re supposed to do,” said Ms. Alex in regard to teaching PST in the laboratory. However, Mr. Ellis expressed competence by stating that “I enjoy doing that so I’m competent because I’ve been around it growing up.” Mr. Nang, ST at school site N, stated: “I’ve had some experience and the longer I work, the more confident I’m becoming.” The ST group varied in their implied perceptions of competence related to the PST Pathway. The STs with experiences related to PST expressed higher levels of competence, and the STs with no or experience, perceived lower levels of competence.

Objective 5

Objective 5 sought to prioritize the National AFNR Career Pathways in need of content knowledge and competence improvement using the Borich (1980) Needs Assessment Model. Qualitatively, The achievements of this objective were further informed, qualitatively, using the interview protocol (see Appendix D). STs were asked interview questions regarding their areas of need to teach across the National AFNR Career Pathways.

Based on the semi-structured interviews, the STs perceived needs for knowledge and competence enhancement in Agribusiness Systems (ABS), Biotechnology Systems (BS), Plant Systems (PS), and Power, Structural, Technical Systems (PST). Although not stated explicitly by the STs, the scarce attention given to the Food Products and Processing Systems (FPP) Pathway during the interviews indicated a lack of comfort, or perhaps even awareness, and therefore a need for knowledge and competence enhancement in that pathway.

Regarding the ABS pathway, Mr. Jerry stated: "we don't get enough exposure and enough self-confidence to be able to teach it." For the BS pathway, Ms. Baker said: "I'd need a lot more education on it before I could teach more than a lesson or two on the subject." Further, Ms. Pale mentioned: "I'm not really sure what the curriculum is for those classes." Referring to the ESS pathway, Ms. Kay stated: "to be honest, I don't even know what all is encompassed by environmental services." Regarding the PST, Ms. Alex said: "there's only a five-week course of welding, and it goes by so quickly." This perspective was supported by Ms. Hale who said: “I need a better understanding of [PST].” And Ms. Lane added: “I’m definitely not confident in the [PST laboratory].”

CHAPTER V

CONCLUSIONS

Overview of Introduction

The agricultural industry always has been and always will be an indispensable aspect of the economic, political, and social needs of the world (Newcomb et al., 2004). With a reliance on the agricultural industry, it is imperative for the public to be knowledgeable about agriculture (Pope, 1990). Simultaneous to the advances in agriculture, the population has stopped producing and growing its own food, and as people continue to move away from rural America, agricultural knowledge has declined (Dale et al., 2017). As such, the gap between awareness and understanding of the agricultural industry leads to an increased need to promote agricultural literacy to the general public (Doerfert, 2011; Hughes & Barrick, 1993).

School-based agricultural education (SBAE) can serve as a medium to educate individuals about agriculture. SBAE programs combine the applied sciences of agriculture and education (Barrick, 1989). Agricultural education is "a comprehensive term, including instruction in chemistry, geology, botany, zoology, mechanics-embracing, in short the science as well as the practice of agriculture" (Hillison, 1996, p. 10). The National Council for Agricultural Education (2015) has recommended a national

set of curriculum expectations to serve as a framework for operationalizing instruction to achieve the broad definition of SBAE (Clemons et al., 2018; Martin & Enns, 2017). This framework, the National AFNR Career Pathways were designed to expose students to diverse areas of agriculture and develop their content knowledge related to agricultural products and issues (The National Council for Agricultural Education, 2015).

Agricultural education teachers are expected to teach specific agricultural education content and meet course standards, including teaching across the eight National AFNR Career Pathways to educate students about the agricultural industry and meet the workforce needs of the industry (The National Council for Agricultural Education, 2015). It is important to assess the gaps, deficiencies, and needs that exist amongst SBAE teachers related to the content they are expected to instruct (Sorenson et al., 2018).

Research Problem Statement

"Training institutions search continually for ways to improve their training programs" (Borich, 1980, p. 39). It is the role of teacher preparation programs in agricultural education to prepare teachers to be successful in their careers (Leiby et al., 2013). Research has revealed, unfortunately, that agricultural education preservice teachers often lack the necessary knowledge and teaching skills to be effective in their classrooms (Boone, Gartin, Boone, & Hughes, 2006; Duncan & Ricketts, 2008; Goecker, 1992; Sorenson, Tarpley, & Warnick, 2010). Researchers have been called to assess the needs of SBAE teachers prior to their entering teaching (Clemons et al., 2018; Garton & Chung, 1997; Joerger, 2002; Sorenson et al., 2018). Therefore, what are the needs of

preservice agricultural education teachers related to teaching across the eight National AFNR Career Pathways?

Purpose and Objectives

The purpose of the study was to determine the implied knowledge competence, the perceived performance competence, and the perceived levels of importance held by SBAE student teachers regarding their ability to teach across the eight National AFNR Career Pathways (The National Council for Agricultural Education, 2015). "Training programs can apply the [Borich (1980) Needs Assessment Model] by defining what is as the measured behaviors, skills, and competencies of the trainee and what should be as the goals of the training program" (Borich, 1980, p. 39). To align with Borich's (1980) needs assessment model, the teacher education program in agricultural education at Oklahoma State University was viewed as the training program and the trainees were the participating student teachers (N = 16) experiencing their student teaching internship during the Spring 2019 semester. The measured *what is* in the study was the participants' implied levels of knowledge based on Oklahoma Subject Area Test (OSAT) scores and their perceived levels of importance and self-perceived performance competence as measured by a self-efficacy questionnaire (see Appendix A). In addition, *what should be* was the expected ability of the participants to teach across the eight National AFNR Career Pathways. Five specific objectives undergirded the study.

1. Describe selected personal and professional characteristics of agricultural education student teachers at Oklahoma State University during the Spring 2019 semester.

2. Describe the agricultural education student teachers' implied knowledge competence regarding the eight National AFNR Career Pathways.
3. Describe the agricultural education student teachers' perceptions of the levels of importance to teach across the eight National AFNR Career Pathways.
4. Describe the agricultural education student teachers' self-perceived levels, and their cooperating teacher assessed levels, of performance competence to teach across the eight National AFNR Career Pathways.
5. Prioritize the eight National AFNR Career Pathways in need of knowledge and competence enhancement using the Borich (1980) Needs Assessment Model.

Overview of the Study's Methodology

A convergent, parallel mixed-methods design (Creswell, 2012) was used for this exploratory, pilot study to describe the existing implied knowledge, self-perceived level of importance, and self-perceived level of performance competence of SBAE student teachers. The dependent variable used to assess the three aforementioned independent variables were the set of eight National AFNR Career Pathways. The study assessed the perceptions of agricultural education student teachers (*N* = 16) at Oklahoma State University who student taught during the Spring 2019 semester and their cooperating teachers (*N* = 16). The student teachers had completed the required course and observation hours to advance to the student teaching experience. In addition, they had completed and passed the Oklahoma Subject Area Test (OSAT), test code 042, for Agricultural Education (Certification Examination for Oklahoma Educators, 2019), a statewide test requirement, prior to student teaching.

Quantitative data were collected through questionnaires (see Appendices A and B), and qualitative data were gathered through interviews, observations, and field notes (see Appendix D) following recommendations of Ary, Jacobs, and Razavieh (2002) and Gall, Gall, and Borg (2003). In a convergent, parallel mixed-methods design; quantitative and qualitative data are collected, merged, and used simultaneously to understand the phenomenon under investigation (Creswell, 2012). Collecting and analyzing both sets of data result in a more complete understanding of the research problem (Creswell, 2012).

Conclusions

Objective 1 – Personal and Professional Characteristics

The typical SBAE student teacher at Oklahoma State University was a white female that was a 22-year-old native Oklahoman (see Table 1). She was involved in SBAE for four years and perceived herself to had been very involved in the program (see Table 2). She had full-time, temporary employment related to agriculture, such as a summer internship or jobs during university enrollment (see Table 2). Additionally, she participated in raising and exhibiting livestock as an SBAE member. However, she did not come from a large-scale production agricultural operation, such as a farm or ranch (see Table 2).

Objective 2 – Implied Knowledge

SBAE student teachers at Oklahoma State University had varied levels of content knowledge related to the National AFNR Career Pathways (see Table 3). These conclusions were based on the quantitative and qualitative findings derived from the data collected for objective 2. In their personal interviews, the student teachers perceived their existing knowledge to be a result of their personal, professional, and academic experiences (see Table 8) related to the National AFNR Career Pathways.

The qualitative findings and interpretations indicated the student teachers were motivated to acquire content knowledge based on their personal interests in the pathways. Therefore, three themes regarding teacher knowledge were derived from the qualitative findings for objective 2 (see Table 8). These themes consist of the teacher interests, personal experiences of the teacher related to agriculture, and professional work experiences of the teacher (see Table 8). This conclusion aligns with Bandura's (1977) emphasis on performance accomplishments and vicarious experiences as a source of efficacy (see Figure 4). These student teachers were motivated to acquire necessary knowledge because they have seen success of others, i.e., vicarious experiences, and themselves, i.e., performance accomplishments, when knowledge exists related to the National AFNR Career Pathways.

The student teachers demonstrated knowledge about agricultural education and FFA history (see Table 3). This content knowledge is important because, as full-time teachers, they will teach it in the Introduction to AFNR course for first-year students enrolled in SBAE programs (The National Council for Agricultural Education, 2015). The student teachers were highly knowledgeable in content knowledge related to Animal Systems (see Table 3), and they reported varied experiences related to Animal Systems in their personal interviews. Therefore, it was concluded, the student teachers' Animal Systems knowledge had been acquired through their well-rounded personal and professional experiences (see Table 8) related to Animal Systems content. Through these experiences, the student teachers experienced, reflected, conceptualized, and experimented (Kolb, 1984) with the acquired knowledge. This boosted their self-efficacy in Animal Systems, aligning to Bandura's (1977) performance accomplishments source of efficacy (see Figure 4).

The student teachers possessed a proficient level of content knowledge related to the Environmental Service Systems, Natural Resources Systems, Plant Systems, and Agribusiness Systems Pathways (see Table 3). This conclusion is based on their OSAT scores and personal perceptions regarding their knowledge in those pathways. Student teachers had a moderate level of knowledge about the Food Products and Processing Systems Pathway and a low level of knowledge about the Biotechnology Systems and Power, Structural, and Technical Systems Pathways (see Table 3). These conclusions also were derived from the student teachers' OSAT scores as well as personal interviews. Some student teachers reported, in their personal interviews, experiences related to Environmental Service Systems, Natural Resources Systems, and Plant Systems resulting in a proficient level of knowledge in these pathways. It is concluded a lack of personal and professional experiences related to Agribusiness Systems, Biotechnology Systems, Food Products and Processing Systems, and Power, Structural, and Technical Systems results in a lower level of knowledge within the pathway (see Table 8).

These conclusions align with Bandura (1977) who stated experience leads to high levels of efficacy and competence to perform a task. Regarding the task of teaching, Edwards and Briers (2001) stated prior experiences impact teacher longevity positively. However, it is common for agricultural education teachers to struggle with having the necessary knowledge to feel competent to teach across various areas or pathways (Clemons et al., 2018; Duncan & Ricketts, 2008; Sorenson et al., 2010; Sorenson et al., 2018; Wingenbach et al., 2007). Quantitative and qualitative findings of this study indicate student teachers reported academic, personal, and professional experiences have enhanced their content knowledge in particular pathways.

Objective 3 – Perceived Levels of Importance

Student teachers at Oklahoma State University varied in their perceptions regarding the level of importance placed on teaching across the eight National AFNR Career Pathways (see Table 4). However, all pathways were deemed quite a bit important to teach by the respondents (see Table 4). These conclusions are based on the findings and interpretations of the data collected for objective 3. The student teachers placed high importance on teaching the Food Products and Processing Systems, Animal Systems, and Power, Structural, and Technical Systems Pathways (see Table 4). They placed a moderate level of importance on teaching the Plant Systems, Natural Resources Systems, Environmental Service Systems, and Agribusiness Systems Pathways (see Table 4). Regarding Biotechnology Systems, student teachers perceived it to be the least important to teach of the eight National AFNR Career Pathways (see Table 4).

Based on personal interviews, it is indicated the course selections and teacher-placed importance ratings (see Table 4) are motivated by teacher interest, student demand, and local community expectations and agricultural presence (see Table 8). In their personal interviews, the cooperating teachers identified levels of importance across the eight National AFNR Career Pathways based on local community needs and student demand. A lack of community needs related to a certain pathway, as perceived by the student and cooperating teachers, led to a lower level of importance placed by the teacher to teach courses related to that pathway. It is concluded that SBAE student teachers rated the levels of importance based on the perceived needs of their local community.

These conclusions align to the National FFA's Local Program of Success Guide, which identifies strong local partnerships and community support as an integral part of successful SBAE programs (National FFA Organization, 2018). In addition, student teachers rated teaching across the eight AFNR pathways higher in importance than competence (see Tables 4 and 5). This is congruent with findings of employees perceiving employability skills to be more important than their actual ability to perform those skills (Radhakrishna & Bruening, 1994; Robinson & Garton, 2008).

Lower levels of strengths and interests related to the pathways, as perceived by the student and cooperating teachers in their interviews, resulted in a lower level of importance placed on those pathways. Based on personal interviews, the student teachers value, and therefore choose to teach, courses related to their own personal interests and abilities. Likewise, they indicated, qualitatively, valuing teaching courses that meet the needs and interests of their students. However, this was not always reflected in what was observed at the SBAE sites. Therefore, it can be concluded the interests and the strengths of the teacher are the most substantial factor affecting teacher-placed importance within the pathways.

Objective 4 – Self-Perceived Competence

The self-perceived competence needed to teach across the eight National AFNR Career Pathways varied among SBAE student teachers (see Table 5). These conclusions were based on the quantitative and qualitative findings and interpretations of the data collected for objective 4. The student teachers reported a high level of competence in teaching Animal Systems, Plant Systems, and Food Products and Processing Systems Pathways (see Table 5). They reported a moderate level of competence to teach Natural Resources Systems, Environmental Service Systems, and Agribusiness Systems and a low level of competence in the Power, Structural, and Technical Systems and Biotechnology Systems Pathways (see Table 5).

In personal interviews, the respondents reported their perceived competence is impacted by their various personal, professional, and academic experiences. It can be concluded that student teachers are competent to teach across the Animal Systems, Plant Systems, and Food Products and Processing Systems Pathways because, as the qualitative data found, they have had appropriate academic preparation and personal experiences, based on their personal perspectives. This conclusion is supported by the existing curriculum for the agricultural education major, not pursuing an additional Bachelor's Degree in a different discipline, at Oklahoma State University. The plan of study includes a required four credit hours of Animal Systems, six required credit hours of Plant Systems, and three credit hours in Food Products and Processing Systems, in addition to optional courses in all three pathways (College of Agricultural Sciences and Natural Resources, 2019) [see Appendix H].

The qualitative data indicated student teachers were motivated to improve their competence because of their interest in the content. Therefore, it is concluded, based on the findings, that student teacher competence results from teacher interests, personal experiences of the teacher related to agriculture, and professional work experiences of the teacher (see Table 8). Bandura (1977) identified emotional arousal, such as interest and excitement about a topic, as an expectation for self-efficacy (see Figure 3), aligning with the conclusion that teacher interest motivated perceived competence. Additionally, personal experiences affect teacher competence (Cole, 1984; Edwards & Briers, 2001; Findlay, 1992; Findlay & Drake, 1989) as does vicarious experience (Bandura, 1977), aligning with the conclusion that personal and professional experiences of the teacher impact student teacher competence to teach across the eight National AFNR Career Pathways.

Objective 5 – Knowledge and Competence Enhancement

These conclusions were based on the quantitative and qualitative data collected in regard to accomplishing objective 5. Student teachers reported a high need for knowledge and competence enhancement in the Power, Structural, and Technical Systems and the Biotechnology Systems Pathways (see Table 7). The need for development in Power, Structural, and Technical Systems is congruent with findings by Leiby et al. (2013) who stated SBAE teachers require professional development in agricultural mechanics content.

A moderate need of enhancement for the student teachers was expressed for the Agribusiness Systems, Food Products and Processing Systems, and Environmental Service Systems Pathways (see Table 7). Agribusiness Systems knowledge and competence was previously found to be in need of enhancement by Radhakrishna and Bruening (1994). The Natural Resources Systems and Plant Systems Pathways were found to be those with a low need for knowledge and competence enhancement amongst the student teachers (see Table 7). During personal interviews, student teachers reported a particularly high level of knowledge and competence, and therefore a low need for curricular enhancement, within the Animal Systems Pathway (see Table 7).

According to Bandura (1977), competence and self-efficacy result from experience and success (see Figure 3). High levels of self-efficacy are related to higher amounts of experiences while a low self-efficacy is related to the lack of experiences associated to the specific task being assessed (Bandura, 1977). The student teachers' self-perceived competence to teach within the National AFNR Career Pathways, as found by the quantitative and qualitative data, is impacted by their teacher self-efficacy. Based on the discrepancy scores and personal perceptions of the student teachers, it can be concluded, knowledge and competence development amongst students enrolled in the Oklahoma State University's teacher preparation program in agricultural education is needed for the Agribusiness Systems, Biotechnology Systems, Food Products and Processing Systems, and the Power, Structural, and Technical Systems Pathways.

Recommendations for Practice

It is recommended the Oklahoma State University teacher preparation program consider revising the college core courses for agricultural education majors to include more courses in the Plan of Study related to all eight National AFNR Career Pathways. Moreover, the teacher preparation program in agricultural education is urged to enhance its curriculum in the Power, Structural, and Technical Systems and the Biotechnology Systems Pathways to expand the knowledge and competence of preservice teachers related to these pathways. Based on student teacher and cooperating teacher perceptions, it is recommended for experiences related to the Agribusiness Systems Pathway to be introduced into the teacher preparation program. This may occur through additional undergraduate courses and elective options, short course or weekend trainings for undergraduate students, and/or strategic student teaching site placements. Likewise, it is recommended for other university teacher preparation programs in agricultural education to assess the competence of their students to teach across the National AFNR Career Pathways and enhance the related curriculum and experiences used in their programs, as may be warranted.

Student teachers reported a greater need for direct experiences in Power, Structural, and Technical Systems that last over a substantial period of time. It is recommended to expand the agricultural mechanics course offerings in agricultural education to provide preservice teachers with more exposure to Power, Structural, and Technical Systems prior to student teaching. Perhaps, this may occur by holding additional short course or weekend trainings for agricultural education majors related to Power, Structural, and Technical Systems content.

Preservice teachers require more exposure and education related to the Biotechnology Systems Pathway. Student teachers in this study had little understanding of and experience in this pathway. It is recommended for the Oklahoma State University teacher preparation program in agricultural education to enhance the student teacher knowledge and competence in Biotechnology Systems. This may occur by adding a course to the degree requirements related to Biotechnology Systems or providing short course or weekend trainings for preservice teachers to improve their competence to teach within the pathway prior to student teaching.

Based on student teachers' and cooperating teachers' perceptions, various SBAE programs have a local need for and emphasis on Agribusiness Systems. However, preservice teachers need additional training in this pathway. It is recommended that the Oklahoma State University teacher preparation program in agricultural education enhance the knowledge and competence of student teachers related to content in the Agribusiness Systems Pathway. This may occur by adding courses to the degree requirements related to Agribusiness Systems or providing short course or weekend trainings for preservice teachers to improve their competence to teach within the pathway prior to student teaching.

Further, it is recommended for university teacher preparation programs in agricultural education to emphasize the importance of preservice teachers acquiring agriculturally related work experience prior to student teaching. Bandura (1977) stated vicarious experiences and personal accomplishments relate positively to increasing a person's self-efficacy (see Figure 4). Therefore, an increase in appropriate experiences may improve self-efficacy among SBAE student teachers regarding aspects of the AFNR industry and its allied sectors. This practice may occur through the creation of a list of viable and helpful work experiences, internship opportunities, short course or weekend training programs, campus involvements, and research topics to be distributed to preservice teachers during their preparation program. It is recommended for the Oklahoma State University teacher preparation program in agricultural education to increase the amount of early field-based experiences, in the classroom or otherwise, required for preservice teachers prior to student teaching.

Beginning SBAE teachers may require additional professional development experiences to enhance their knowledge and competence to teach across the eight National AFNR Career Pathways. It is recommended that agricultural education faculty members of Oklahoma State University collaborate with staff members of the Oklahoma Department of Career and Technology Education to create systematic, prolonged, and intensive professional development experiences for SBAE teachers in Oklahoma. This professional development should align directly to the National AFNR Content Standards and enhance teacher efficacy within the career pathways' content.

Recommendations for Research

Due to participant size and state specificity, the findings in this study should not be generalized beyond the Oklahoma State University teacher preparation program in agricultural education. To address this limitation, a similar study should be replicated at Oklahoma State University with a larger group of participants and across the United States in other teacher preparation programs for agricultural education. This could occur by assessing all beginning agricultural education teachers within a particular state rather than only student teachers or through conducting regional studies assessing agricultural education student teachers at various institutions. In particular, individual states in the United States should conduct their own needs assessments for knowledge and competence enhancement related to the National AFNR Career Pathways within their university teacher preparation programs in agricultural education to determine where gaps and deficiencies exist. In addition, this study should be replicated over time to evaluate other cohorts in the Oklahoma State University teacher preparation program in agricultural education and detect trends in competence, knowledge, and perceived importance regarding the National AFNR Career Pathways.

It is recommended a longitudinal study to be conducted with the cohort of student teachers assessed to measure their competence to teach across the National AFNR Career Pathways as they progress into their teaching careers. These student teachers could be followed throughout their careers to determine how their knowledge, importance, and competence change in regard to teaching across the eight National AFNR Career Pathways. Much more exists to be learned about the factors affecting and improving the knowledge and competence of SBAE teachers to teach the content supporting the AFNR pathways. A longitudinal study assessing these variables over time could identify changes in teacher competence and the factors affecting such. Future studies also should assess the impact these teachers have on their SBAE students' learning about content knowledge in the AFNR pathways and its contribution to their agricultural literacy.

Further, it is recommended to replicate the study and include the university supervisors' ratings of the student teachers' competence. This will triangulate the understanding of the student teachers' abilities by using self-reporting, cooperating teacher views, and the university supervisors' perceptions. The university supervisors may provide more insight into the student teachers' knowledge and competence in regard to the academic preparation they have received and what may be related knowledge gaps.

Research should be conducted to understand further where and how SBAE teachers feature the National AFNR Career Pathways in regard to the three-circle model for agricultural education (Agricultural Education, 2012) [see Figure 2]. As found in the study, some teachers perceived various pathways existed better outside of the experiences supporting student learning in the classroom/laboratory instruction component of SBAE. For example, cooperating teachers reported omitting Agribusiness Systems from their classroom instruction because it is content taught within the Supervised Agricultural Experience aspect of the program. Research should be conducted to substantiate their views and determine where and how agricultural education teachers teach the eight National AFNR Career Pathways within the three-circle model for SBAE and its effect on student learning.

Investigations also should occur to identify what specific competencies exist within each of the eight National AFNR Career Pathways. For example, although teachers reported high competence in Animal Systems, generally, are they equally competent to meet each expected competency across the entire pathway? Research is needed to define the specific student competencies associated with each AFNR pathway and then to assess teacher knowledge and competence related to such.

Finally, it is recommended university teacher preparation programs in agricultural education assess the needs for their state's agricultural industry as related to the National AFNR Career Pathways (Ramsey & Edwards, 2011). By understanding the needs of the AFNR industry, the needs of students enrolled in SBAE courses can be understood better. This is congruent with recommendations by Ramsey and Edwards (2011) who stated SBAE teachers are expected to provide experiences to their students that reflect such aspects of the industry. By understanding student needs, the expectations and needs of SBAE teachers become more transparent and their curricular needs at the university-level can be more clearly identified.

Discussion and Implications

There is an implied lack of interest and focus among SBAE teachers to teach within some of the National AFNR Career Pathways. For example, few cooperating teachers reported teaching courses associated with the Agribusiness Systems Pathway. Rather, they reported teaching aspects of Agribusiness Systems in other pathway courses, in their Introduction to AFNR course, and while preparing students for Supervised Agricultural Experiences (SAE). SBAE teachers only have the ability to teach a certain number of courses per day. It is implied they perceived Agribusiness Systems to be a pathway that can be taught in other courses and activities and, therefore, one that does not need to be taught as a stand-alone course. Perhaps, this is true for other pathways as well, i.e., Biotechnology Systems, which are left out during course selections. Or, perhaps teacher interest and strength plays the primary role in course selection and the courses being left out, such as Agribusiness Systems and Biotechnology Systems, are not perceived as interesting to teach by the teachers.

Regarding SAE, cooperating teachers noted teaching Agribusiness Systems to students who need it for those projects. For example, one teacher suggested teaching Agribusiness Systems was necessary for helping a student learn to operate a business selling livestock exhibition supplies. Therefore, it is implied content related to the Agribusiness Systems Pathways is being taught outside of the classroom instruction dimension of the three-circle model of agricultural education (see Figure 2).

Congruently, student and cooperating teachers perceived Biotechnology Systems to exist primarily outside of the classroom, in the FFA portion of the three-circle model.

Learning about Biotechnology Systems is perceived to occur largely through the FFA Agriscience Fair Competition, but also is related to the topics chosen by student participants in the FFA Public Speaking and Agricultural Issues Career Development Events. A lack of community demand and low student and teacher interest results in fewer Biotechnology Systems courses being taught in the classroom instruction dimension of these SBAE programs. This implies a low level of importance placed on teaching certain pathways, such as Agribusiness Systems and Biotechnology Systems, in the SBAE classroom because they are being taught through the SAE and FFA portion of the agricultural education three-circle model (see Figure 2). Perhaps, this implies, some pathways may be better suited to be taught through the SAE and FFA portion of the three-circle model rather than in the classroom instruction portion where they are traditionally expected to be taught.

The existence of community and student demands result in the regular inclusion of the Animal Systems Pathway in SBAE programs in Oklahoma. With a local emphasis on content related to Animal Systems, student teachers require strong competencies in this pathway prior to entering the profession. This implies the high competence of the student teachers in Animal Systems is due to Oklahoma's emphasis on animal science, which is a popular course in high school SBAE programs. Student teachers know Animal Systems is an expected pathway to be taught and have sought out opportunities to be competent in it prior to student teaching. Perhaps, if a culture like this were created in Oklahoma in regard to other National AFNR Career Pathways, student teachers would place a high level of importance on acquiring experiences related to those pathways as well. However, changing the culture to include additional areas of emphasis is an imperative task.

Dewey (1938) stated experiences, at times, might be misinforming. It is implied the student teachers have a high knowledge in Animal Systems because of their experiences related to livestock production and exhibition. But, do we truly understand the breath, depth, and scope of the student teachers’ Animal Systems competence and knowledge? Perhaps, the student teachers’ perceived competence related only to a small portion of the content in Animal Systems.

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APPENDICES

APPENDIX A

Student Teacher Questionnaire

Directions: This questionnaire is designed to help agricultural education teacher educators gain a better understanding of the needs of preservice agricultural education teachers. Please indicate your opinion about each statement below in relation to the two separate columns; competence and importance. Be sure to answer each question set while considering the identified AFNR Pathway. Your responses will be anonymous and confidential. At any time, if you prefer not to respond to a question, you may leave it blank. Circle your responses.

Sample Question

		Importance					Competence				
		How important is it to…					How much can you do to…				
		None at all	Very Little	Some Importance	Quite A Bit	A Great Deal	None at all	Very Little	Some Importance	Quite A Bit	A Great Deal
#	Challenge capable students in your Agribusiness Systems lessons?	**1**	**3**	**5**	**7**	**9**	**1**	**3**	**5**	**7**	**9**
	Explanation: The respondent perceived challenging capable students in agribusiness systems lessons is quite a bit important and perceived they can do very little to accomplish this item.										

Section 1: Agribusiness Systems Agribusiness systems include the study of agribusiness and their management including record keeping, budget management, business planning, and sales and marketing.	Importance: How important is it to… None at all	Very Little	Some Importance	Quite A Bit	A Great Deal	Competence: How much can you do to… Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
1 Respond to questions from your students related to Agribusiness Systems knowledge?	1	3	5	7	9	1	3	5	7	9
2 Gauge student understanding of Agribusiness Systems?	1	3	5	7	9	1	3	5	7	9
3 Craft good questions for your students related to Agribusiness Systems?	1	3	5	7	9	1	3	5	7	9
4 Individualize your Agribusiness Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
5 Use a variety of assessment strategies to assess your students' knowledge of Agribusiness Systems?	1	3	5	7	9	1	3	5	7	9
6 Demonstrate knowledge of Agribusiness Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
7 Create effective and creative Agribusiness Systems lessons?	1	3	5	7	9	1	3	5	7	9
8 Challenge capable students in your Agribusiness Systems lessons?	1	3	5	7	9	1	3	5	7	9

Section 2: Animal Systems Animal systems includes content areas such as life processes, health, nutrition, genetics, management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses, and/or poultry.	Importance: How important is it to… None at all	Very Little	Some Importance	Quite A Bit	A Great Deal	Competence: How much can you do to… Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
9 Respond to questions from your students related to Animal Systems knowledge?	1	3	5	7	9	1	3	5	7	9
10 Gauge student understanding of Animal Systems?	1	3	5	7	9	1	3	5	7	9
11 Craft good questions for your students related to Animal Systems?	1	3	5	7	9	1	3	5	7	9
12 Individualize your Animal Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
13 Use a variety of assessment strategies to assess your students' knowledge of Animal Systems?	1	3	5	7	9	1	3	5	7	9
14 Demonstrate knowledge of Animal Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
15 Create effective and creative Animal Systems lessons?	1	3	5	7	9	1	3	5	7	9
16 Challenge capable students in your Animal Systems lessons?	1	3	5	7	9	1	3	5	7	9

	Section 3: Biotechnology Systems Biotechnology systems include the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food, and natural resources.	**Importance** How important is it to… None at all	 Very Little	 Some Importance	 Quite A Bit	 A Great Deal	**Competence** How much can you do to… Nothing	 Very Little	 Some Influence	 Quite A Bit	 A Great Deal
17	Respond to questions from your students related to Biotechnology Systems knowledge?	1	3	5	7	9	1	3	5	7	9
18	Gauge student understanding of Biotechnology Systems?	1	3	5	7	9	1	3	5	7	9
19	Craft good questions for your students related to Biotechnology Systems?	1	3	5	7	9	1	3	5	7	9
20	Individualize your Biotechnology Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
21	Use a variety of assessment strategies to assess your students' knowledge of Biotechnology Systems?	1	3	5	7	9	1	3	5	7	9
22	Demonstrate knowledge of Biotechnology Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
23	Create effective and creative Biotechnology Systems lessons?	1	3	5	7	9	1	3	5	7	9
24	Challenge capable students in your Biotechnology Systems lessons?	1	3	5	7	9	1	3	5	7	9

	Section 4: Environmental Service Systems Environmental service systems include the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems.	**Importance** How important is it to… None at all	 Very Little	 Some Importance	 Quite A Bit	 A Great Deal	**Competence** How much can you do to… Nothing	 Very Little	 Some Influence	 Quite A Bit	 A Great Deal
25	Respond to questions from your students related to Environmental Service Systems knowledge?	1	3	5	7	9	1	3	5	7	9
26	Gauge student understanding of Environmental Service Systems?	1	3	5	7	9	1	3	5	7	9
27	Craft good questions for your students related to Environmental Service Systems?	1	3	5	7	9	1	3	5	7	9
28	Individualize your Environmental Service Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
29	Use a variety of assessment strategies to assess your students' knowledge of Environmental Service Systems?	1	3	5	7	9	1	3	5	7	9
30	Demonstrate knowledge of Environmental Service Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
31	Create effective and creative Environmental Service Systems lessons?	1	3	5	7	9	1	3	5	7	9
32	Challenge capable students in your Environmental Service Systems lessons?	1	3	5	7	9	1	3	5	7	9

	Section 5: Food Products and Processing Systems Food products and processing systems includes the study of food safety and sanitation; nutrition, biology, microbiology, chemistry, and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry.	Importance How important is it to… None at all	Very Little	Some Importance	Quite A Bit	A Great Deal	Competence How much can you do to… Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
33	Respond to questions from your students related to Food Products and Processing Systems knowledge?	1	3	5	7	9	1	3	5	7	9
34	Gauge student understanding of Food Products and Processing Systems?	1	3	5	7	9	1	3	5	7	9
35	Craft good questions for your students related to Food Products and Processing Systems?	1	3	5	7	9	1	3	5	7	9
36	Individualize your Food Products and Processing Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
37	Use a variety of assessment strategies to assess your students' knowledge of Food Products and Processing Systems?	1	3	5	7	9	1	3	5	7	9
38	Demonstrate knowledge of Food Products and Processing Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
39	Create effective and Food Products and Processing Systems lessons?	1	3	5	7	9	1	3	5	7	9
40	Challenge capable students in your Food Products and Processing Systems lessons?	1	3	5	7	9	1	3	5	7	9

	Section 6: Natural Resource Systems Natural resource systems include the study of the management, protection, enhancement, and improvement of soil, water, wildlife, forests, and air as natural resources.	**Importance** How important is it to… None at all	Very Little	Some Importance	Quite A Bit	A Great Deal	**Competence** How much can you do to… Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
41	Respond to questions from your students related to Natural Resource Systems knowledge?	1	3	5	7	9	1	3	5	7	9
42	Gauge student understanding of Natural Resource Systems?	1	3	5	7	9	1	3	5	7	9
43	Craft good questions for your students related to Natural Resource Systems?	1	3	5	7	9	1	3	5	7	9
44	Individualize your Natural Resource Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
45	Use a variety of assessment strategies to assess your students' knowledge of Natural Resource Systems?	1	3	5	7	9	1	3	5	7	9
46	Demonstrate knowledge of Natural Resource Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
47	Create effective and Natural Resource Systems lessons?	1	3	5	7	9	1	3	5	7	9

48	Challenge capable students in your Natural Resource Systems lessons?	1	3	5	7	9	1	3	5	7	9

		Importance					**Competence**				
	Section 7: Plant Systems Plant systems includes the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants.	**How important is it to…**					**How much can you do to…**				
		None at all	**Very Little**	**Some Importance**	**Quite A Bit**	**A Great Deal**	**Nothing**	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
49	Respond to questions from your students related to Plant Systems knowledge?	1	3	5	7	9	1	3	5	7	9
50	Gauge student understanding of Plant Systems?	1	3	5	7	9	1	3	5	7	9
51	Craft good questions for your students related to Plant Systems?	1	3	5	7	9	1	3	5	7	9
52	Individualize your Plant Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
53	Use a variety of assessment strategies to assess your students' knowledge of Plant Systems?	1	3	5	7	9	1	3	5	7	9
54	Demonstrate knowledge of Plant Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9
55	Create effective and Plant Systems lessons?	1	3	5	7	9	1	3	5	7	9
56	Challenge capable students in your Plant Systems lessons?	1	3	5	7	9	1	3	5	7	9

		Importance					**Competence**				
	Section 8: Power, Structural, and Technical Systems Power, structural, and technical systems includes the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding, and project planning for agricultural structures.	**How important is it to…**					**How much can you do to…**				
		None at all	**Very Little**	**Some Importance**	**Quite A Bit**	**A Great Deal**	**Nothing**	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
57	Respond to questions from your students related to Power, Structural, and Technical Systems knowledge?	1	3	5	7	9	1	3	5	7	9
58	Gauge student understanding of Power, Structural, and Technical Systems?	1	3	5	7	9	1	3	5	7	9
59	Craft good questions for your students related to Power, Structural, and Technical Systems?	1	3	5	7	9	1	3	5	7	9
60	Individualize your Power, Structural, and Technical Systems lessons for your students?	1	3	5	7	9	1	3	5	7	9
61	Use a variety of assessment strategies to assess your students' knowledge of Power, Structural, and Technical Systems?	1	3	5	7	9	1	3	5	7	9
62	Demonstrate knowledge of Power, Structural, and Technical Systems to students who are confused about the topic?	1	3	5	7	9	1	3	5	7	9

63	Create effective and Power, Structural, and Technical Systems lessons?	1	3	5	7	9	1	3	5	7	9
64	Challenge capable students in your Power, Structural, and Technical Systems lessons?	1	3	5	7	9	1	3	5	7	9

Section 9: Personal and Professional Characteristics

Directions: Fill in your response by circling the correct information or writing in your response. If you do not wish to answer a question, you may leave a question blank at any time.

65. What is your current age? (write)____

66. In what state did you attend high school? (write)_________________________________

67. What is your sex? (circle)

    Male   Female

68. What is your ethnicity? (circle)

    White   Native American or American Indian

    Hispanic or Latino   Asian / Pacific Islander

    Black or African American

    Other:_____________________________

69. How many years were you enrolled in middle and/or high school agricultural education? (circle)

    0 years   3 years

    1 year   4 years

    2 years   Other: _________________________

70. How would you describe your level of involvement in middle and/or high school agricultural education/ FFA? (circle)

    No Involvement   Above Average Involvement

    Somewhat Involved   Very Involved

    Average Involvement

71. Indicate your level of past and/or current agricultural work experience. (circle)

    Most Avocational (hobby/minor occupation)

Part-Time Employment (e.g., after school/weekends)

Full-Time Temporary Employment (e.g., one or more summers)

Full-Time Employment (more than 6 months)

Other: ____

APPENDIX B

Cooperating Teacher Questionnaire

Directions: This questionnaire is designed to help agricultural education teacher educators gain a better understanding of the needs of preservice agricultural education teachers. You will answer the questions in reference to what you believe about your student intern. Please indicate your opinion about each statement below in relation to their performance competence. Be sure to answer each question set while considering the identified AFNR Pathway and your current student intern. Your responses will be anonymous and confidential. At any time, if you prefer not to respond to a question, you may leave it blank. Circle your responses.

Sample Question

		Competence How much can your student intern do to…				
		None at all	Very Little	Some Importance	Quite A Bit	A Great Deal
#	Challenge capable students in your Agribusiness Systems lessons?	1	3	5	7	9
	Explanation: The respondent perceived their student intern can do very little to challenge capable students in their agribusiness systems lessons.					

	Section 1: Agribusiness Systems Agribusiness systems include the study of agribusiness and their management including record keeping, budget management, business planning, and sales and marketing.	**Competence** **How much can your student intern do to…** **Nothing**	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
1	Respond to questions from your students related to Agribusiness Systems knowledge?	1	3	5	7	9
2	Gauge student understanding of Agribusiness Systems?	1	3	5	7	9
3	Craft good questions for your students related to Agribusiness Systems?	1	3	5	7	9
4	Individualize your Agribusiness Systems lessons for your students?	1	3	5	7	9
5	Use a variety of assessment strategies to assess your students' knowledge of Agribusiness Systems?	1	3	5	7	9
6	Demonstrate knowledge of Agribusiness Systems to students who are confused about the topic?	1	3	5	7	9
7	Create effective and creative Agribusiness Systems lessons?	1	3	5	7	9
8	Challenge capable students in your Agribusiness Systems lessons?	1	3	5	7	9

	Section 2: Animal Systems Animal systems includes content areas such as life processes, health, nutrition, genetics, management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses, and/or poultry.	**Competence** **How much can your student intern do to…** **Nothing**	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
9	Respond to questions from your students related to Animal Systems knowledge?	1	3	5	7	9
10	Gauge student understanding of Agribusiness Systems?	1	3	5	7	9
11	Craft good questions for your students related to Animal Systems?	1	3	5	7	9
12	Individualize your Agribusiness Systems lessons for your students?	1	3	5	7	9
13	Use a variety of assessment strategies to assess your students' knowledge of Animal Systems?	1	3	5	7	9
14	Demonstrate knowledge of Animal Systems to students who are confused about the topic?	1	3	5	7	9
15	Create effective and creative Animal Systems lessons?	1	3	5	7	9
16	Challenge capable students in your Animal Systems lessons?	1	3	5	7	9

Competence

	Section 3: Biotechnology Systems Biotechnology systems include the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food, and natural resources.	How much can your student intern do to…				
		Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
17	Respond to questions from your students related to Biotechnology Systems knowledge?	1	3	5	7	9
18	Gauge student understanding of Biotechnology Systems?	1	3	5	7	9
19	Craft good questions for your students related to Biotechnology Systems?	1	3	5	7	9
20	Individualize your Biotechnology Systems lessons for your students?	1	3	5	7	9
21	Use a variety of assessment strategies to assess your students' knowledge of Biotechnology Systems?	1	3	5	7	9
22	Demonstrate knowledge of Biotechnology Systems to students who are confused about the topic?	1	3	5	7	9
23	Create effective and creative Biotechnology Systems lessons?	1	3	5	7	9
24	Challenge capable students in your Biotechnology Systems lessons?	1	3	5	7	9

Competence

	Section 4: Environmental Service Systems Environmental service systems include the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems.	How much can your student intern do to…				
		Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
25	Respond to questions from your students related to Environmental Service Systems knowledge?	1	3	5	7	9
26	Gauge student understanding of Environmental Service Systems?	1	3	5	7	9
27	Craft good questions for your students related to Environmental Service Systems?	1	3	5	7	9
28	Individualize your Environmental Service Systems lessons for your students?	1	3	5	7	9
29	Use a variety of assessment strategies to assess your students' knowledge of Environmental Service Systems?	1	3	5	7	9
30	Demonstrate knowledge of Environmental Service Systems to students who are confused about the topic?	1	3	5	7	9
31	Create effective and creative Environmental Service Systems lessons?	1	3	5	7	9
32	Challenge capable students in your Environmental	1	3	5	7	9

	Service Systems lessons?	

Competence

	Section 5: Food Products and Processing Systems Food products and processing systems includes the study of food safety and sanitation; nutrition, biology, microbiology, chemistry, and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry.	**How much can your student intern do to…** Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal
33	Respond to questions from your students related to Food Products and Processing Systems knowledge?	1	3	5	7	9
34	Gauge student understanding of Food Products and Processing Systems?	1	3	5	7	9
35	Craft good questions for your students related to Food Products and Processing Systems?	1	3	5	7	9
36	Individualize your Food Products and Processing Systems lessons for your students?	1	3	5	7	9
37	Use a variety of assessment strategies to assess your students' knowledge of Food Products and Processing Systems?	1	3	5	7	9
38	Demonstrate knowledge of Food Products and Processing Systems to students who are confused about the topic?	1	3	5	7	9
39	Create effective and Food Products and Processing Systems lessons?	1	3	5	7	9
40	Challenge capable students in your Food Products and Processing Systems lessons?	1	3	5	7	9

	Competence				
Section 6: Natural Resource Systems Natural resource systems include the study of the management, protection, enhancement, and improvement of soil, water, wildlife, forests, and air as natural resources.	**How much can your student intern do to…**				
	Nothing	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
41 Respond to questions from your students related to Natural Resource Systems knowledge?	1	3	5	7	9
42 Gauge student understanding of Natural Resource Systems?	1	3	5	7	9
43 Craft good questions for your students related to Natural Resource Systems?	1	3	5	7	9
44 Individualize your Natural Resource Systems lessons for your students?	1	3	5	7	9
45 Use a variety of assessment strategies to assess your students' knowledge of Natural Resource Systems?	1	3	5	7	9
46 Demonstrate knowledge of Natural Resource Systems to students who are confused about the topic?	1	3	5	7	9
47 Create effective and Natural Resource Systems lessons?	1	3	5	7	9
48 Challenge capable students in your Natural Resource Systems lessons?	1	3	5	7	9

	Competence				
Section 7: Plant Systems Plant systems includes the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants.	**How much can your student intern do to…**				
	Nothing	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
49 Respond to questions from your students related to Plant Systems knowledge?	1	3	5	7	9
50 Gauge student understanding of Plant Systems?	1	3	5	7	9
51 Craft good questions for your students related to Plant Systems?	1	3	5	7	9
52 Individualize your Plant Systems lessons for your students?	1	3	5	7	9
53 Use a variety of assessment strategies to assess your students' knowledge of Plant Systems?	1	3	5	7	9
54 Demonstrate knowledge of Plant Systems to students who are confused about the topic?	1	3	5	7	9
55 Create effective and Plant Systems lessons?	1	3	5	7	9
56 Challenge capable students in your Plant Systems lessons?	1	3	5	7	9

	Section 8: Power, Structural, and Technical Systems	Competence: How much can your student intern do to…				
	Section 8: Power, Structural, and Technical Systems Power, structural, and technical systems includes the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding, and project planning for agricultural structures.	**Nothing**	**Very Little**	**Some Influence**	**Quite A Bit**	**A Great Deal**
57	Respond to questions from your students related to Power, Structural, and Technical Systems knowledge?	1	3	5	7	9
58	Gauge student understanding of Power, Structural, and Technical Systems?	1	3	5	7	9
59	Craft good questions for your students related to Power, Structural, and Technical Systems?	1	3	5	7	9
60	Individualize your Power, Structural, and Technical Systems lessons for your students?	1	3	5	7	9
61	Use a variety of assessment strategies to assess your students' knowledge of Power, Structural, and Technical Systems?	1	3	5	7	9
62	Demonstrate knowledge of Power, Structural, and Technical Systems to students who are confused about the topic?	1	3	5	7	9
63	Create effective and Power, Structural, and Technical Systems lessons?	1	3	5	7	9
64	Challenge capable students in your Power, Structural, and Technical Systems lessons?	1	3	5	7	9

APPENDIX C

Participant Consent Form

PARTICIPANT INFORMATION FORM

Agricultural Education Student Teachers' Perceived Competence to Teach Across the National AFNR Pathways: A Needs Assessment.

You are invited to be in a research study of the inservice needs for agricultural education preservice teachers conducted by Carley Snider, an agricultural education graduate student, under the direction of Dr. Shane Robinson, faculty in Agricultural Education. Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time.

If you agree to be in this study, we would ask you to do the following things: Read this form and then detach it from the questionnaire and keep for your records. Then, please review the instructions for the questionnaire and you can indicate your participation by returning a blank or completed questionnaire. Participation is voluntary and will be indicated via the choice to complete or not complete the attached questionnaire.

Compensation: You will receive no payment for participating in this study.

Confidentiality: The information you give in the study will be anonymous. This means that your name will not be collected or linked to the data in any way. The researchers will not be able to remove your data from the dataset once your participation is complete. This data will be stored on a password-protected computer.

Contacts and Questions: If you have questions about the research study itself, please contact the Principal Investigator at (513) 532-3821 or carsnid@okstate.edu. If you have questions about your rights as a research volunteer, please contact the OSU IRB at (405) 744-3377 or irb@okstate.edu.

If you agree to participate in this research, please complete the attached questionnaire.

APPENDIX D

Interview Protocol

Cooperating Teacher Questions:

1) What courses are taught in your program?
    a. Which courses is the student teacher teaching?
2) Why have you have chosen those courses to teach?
3) How many students are in your program?
4) What is the student need/demand for those courses?
    a. What do you focus on in those courses and why?
    b. What is omitted from those courses and why?
    c. What's not 'needed' by students in those courses?
5) What would occur if you introduced courses that are not necessarily perceived as needed by students?
6) How do you describe your general self-efficacy to teach SBAE?
    a. What is your efficacy to teach across the AFNR pathways?
    b. What experiences have led to this?
7) Which pathways do you consider to be the most important to teach and why?
    a. What experiences have led to this?
8) Which pathways do you consider to be the least important to teach and why?
    a. What experiences have led to this?
9) How have your experiences impacted the importance/value you have to teach certain pathways/and courses?
    a. How has it changed over time?
    b. What experiences specifically stand out?
10) Which pathways do you consider yourself to be most competent to teach and why?
11) Which pathways do you consider yourself to be least competent to teach and why?
12) How have your experiences impacted your competence to teach certain pathways/and courses?
    a. How has it changed over time?
    b. What experiences specifically stand out?
13) What is the community demand for pathways/courses?
14) What is the overarching focus of your SBAE program?
    a. Which pathway or pathways do you use to meet this?
    b. Which are omitted?

Student Teacher Questions:

1) What courses are taught in your program?
    a. Which courses are you teaching?
2) Why have these courses been chosen to be taught here?
3) What is the student need/demand for those courses?
    a. What do you focus on in those courses and why?
    b. What is omitted from those courses and why?
    c. What’s not ‘needed’ by students in those courses?
4) How do you describe your general self-efficacy to teach SBAE?
    a. What is your efficacy to teach across the AFNR pathways?
    b. What experiences have led to this?
5) Which pathways do you consider to be the most important to teach and why?
    a. What experiences have led to this?
6) Which pathways do you consider to be the least important to teach and why?
    a. What experiences have led to this?
7) How have your experiences impacted the importance/value you have to teach certain pathways/and courses?
    a. How has it changed over time?
    b. What experiences specifically stand out?
8) Which pathways do you consider yourself to be most competent to teach and why?
9) Which pathways do you consider yourself to be least competent to teach and why?
10) How have your experiences impacted your competence to teach certain pathways/and courses?
    a. How has it changed over time?
    b. What experiences specifically stand out?

APPENDIX E

Bandura (1994) Teacher Sense of Efficacy Scale

BANDURA'S INSTRUMENT
TEACHER SELF-EFFICACY SCALE

This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinions about each of the statements below by circling the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Efficacy to Influence Decision making

How much can you influence the decisions that are made in the school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you express your views freely on important school matters?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Efficacy to Influence School Resources

How much can you do to get the instructional materials and equipment you need?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Instructional Self-Efficacy

How much can you do to influence the class sizes in your school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get through to the most difficult students?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to promote learning when there is lack of support from the home?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to keep students on task on difficult assignments?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to increase students' memory of what they have been taught in previous lessons?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to motivate students who show low interest in schoolwork?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get students to work together?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to overcome the influence of adverse community conditions on students' learning?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get children to do their homework?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Disciplinary Self-Efficacy

How much can you do to get children to follow classroom rules?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to control disruptive behavior in the classroom?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to prevent problem behavior on the school grounds?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Efficacy to Enlist Parental Involvement

How much can you do to get parents to become involved in school activities?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you assist parents in helping their children do well in school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to make parents feel comfortable coming to school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Efficacy to Enlist Community Involvement

How much can you do to get community groups involved in working with the schools?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get churches involved in working with the school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get businesses involved in working with the school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get local colleges and universities involved in working with the school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

Efficacy to Create a Positive School Climate

How much can you do to make the school a safe place?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to make students enjoy coming to school?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get students to trust teachers?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you help other teachers with their teaching skills?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to enhance collaboration between teachers and the administration to make the school run effectively?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to reduce school dropout?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to reduce school absenteeism?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

How much can you do to get students to believe they can do well in schoolwork?

1	2	3	4	5	6	7	8	9
Nothing		Very Little		Some Influence		Quite a Bit		A Great Deal

APPENDIX F

Tschannen-Moran and Woolfolk-Hoy (2001) Teacher Self-Efficacy Scale

Teacher Beliefs - TSES

This questionnaire is designed to help us gain a better understanding of the kinds of things that create challenges for teachers. Your answers are confidential.

Directions: Please indicate your opinion about each of the questions below by marking any one of the nine responses in the columns on the right side, ranging from (1) "None at all" to (9) "A Great Deal" as each represents a degree on the continuum.

Please respond to each of the questions by considering the combination of your *current* ability, resources, and opportunity to do each of the following in your present position.

	None at all		Very Little		Some Degree		Quite A Bit		A Great Deal
1. How much can you do to get through to the most difficult students?	1	2	3	4	5	6	7	8	9
2. How much can you do to help your students think critically?	1	2	3	4	5	6	7	8	9
3. How much can you do to control disruptive behavior in the classroom?	1	2	3	4	5	6	7	8	9
4. How much can you do to motivate students who show low interest in school work?	1	2	3	4	5	6	7	8	9
5. To what extent can you make your expectations clear about student behavior?	1	2	3	4	5	6	7	8	9
6. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
7. How well can you respond to difficult questions from your students?	1	2	3	4	5	6	7	8	9
8. How well can you establish routines to keep activities running smoothly?	1	2	3	4	5	6	7	8	9
9. How much can you do to help your students value learning?	1	2	3	4	5	6	7	8	9
10. How much can you gauge student comprehension of what you have taught?	1	2	3	4	5	6	7	8	9
11. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
12. How much can you do to foster student creativity?	1	2	3	4	5	6	7	8	9
13. How much can you do to get children to follow classroom rules?	1	2	3	4	5	6	7	8	9
14. How much can you do to improve the understanding of a student who is failing?	1	2	3	4	5	6	7	8	9
15. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
16. How well can you establish a classroom management system with each group of students?	1	2	3	4	5	6	7	8	9
17. How much can you do to adjust your lessons to the proper level for individual students?	1	2	3	4	5	6	7	8	9
18. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
19. How well can you keep a few problem students form ruining an entire lesson?	1	2	3	4	5	6	7	8	9
20. To what extent can you provide an alternative explanation or example when students are confused?	1	2	3	4	5	6	7	8	9
21. How well can you respond to defiant students?	1	2	3	4	5	6	7	8	9
22. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
23. How well can you implement alternative strategies in your classroom?	1	2	3	4	5	6	7	8	9
24. How well can you provide appropriate challenges for very capable students?	1	2	3	4	5	6	7	8	9

Subscale Scores

To determine the *Efficacy in Student Engagement, Efficacy in Instructional Practices*, and *Efficacy in Classroom Management* subscale scores, we compute unweighted means of the items that load on each factor. Generally these groupings are:

Short Form	
Efficacy in Student Engagement:	Items 2, 4, 7, 11
Efficacy in Instructional Strategies:	Items 5, 9, 10, 12
Efficacy in Classroom Management:	Items 1, 3, 6, 8

Long Form	
Efficacy in Student Engagement:	Items 1, 2, 4, 6, 9, 12, 14, 22
Efficacy in Instructional Strategies:	Items 7, 10, 11, 17, 18, 20, 23, 24
Efficacy in Classroom Management:	Items 3, 5, 8, 13, 15, 16, 19, 21

Reliabilities

In the study reported in Tschannen-Moran & Woolfolk Hoy (2001) above the following reliabilities were found**:**

	Long Form			**Short Form**		
	Mean	SD	alpha	Mean	SD	alpha
TSES	7.1	.94	.94	7.1	.98	.90
Engagement	7.3	1.1	.87	7.2	1.2	.81
Instruction	7.3	1.1	.91	7.3	1.2	.86
Management	6.7	1.1	.90	6.7	1.2	.86

[1] Because this instrument was developed at the Ohio State University, it is sometimes referred to as the *Ohio State Teacher Efficacy Scale*. We prefer the name, *Teachers' Sense of Efficacy Scale*.

APPENDIX G

Code Book

Table 13

Coding for What drives National AFNR Pathway Selections?

Primary (InVivo Codes)	Secondary (Patterned Codes)	Tertiary (Descriptive Themes)
"depends on where you're at" (+5)	Location	Local community expectations and agricultural presence
"it's important for kids to know where their food comes from" (+7)	Student interest and demand	Student demand
"career readiness" (+1)	Tradition of program	Teacher interest
"connect students to career pathways"	Community expectations and needs	
"helped us with recruitment"	Teacher ability, interest, and choice	
"driven by student interest"	Student career readiness	
“what we think is most relevant to our students”	Agricultural literacy	
"it's an urban area"	Transferrable skills for students	
"the resources here" (+3)		
"it comes with our clientele here"		
"student demand has fostered that" (+8)		
"it's the direction or program has taken"		
"fits what we're doing from a CDE standpoint"		
"life skills"		
"needs for life"		
"it's a natural draw for kids"		
"survivability in rural communities"		
"general interest of students"		
"dual credit" (+3)		
"hands-on" (+3)		
"strength of the teacher"		
"strong livestock showing program"		
"that's what they wanted taught here"		
"try to meet the needs of the students"		
"we teach them life skills"		
"it fits the scheme the best"		
"help prepare students for lifelong careers"		
"something they've always done"		
"something that interests me"		
"the community expects certain things"		
"community expectations"		
"it makes sense for this community"		
"it's what I like"		
"teacher strength and seniority"		
"abilities of the teachers"		
"what was done here"		
"it fits me and my personality		

Note. A primary coding using InVivo was used, followed by pattern coding. The final themes were created using descriptive coding.

Table 14

Coding for What drives teacher-placed importance in the National AFNR Pathways?

Primary (InVivo Codes)	Secondary (Patterned Codes)	Tertiary (Descriptive Themes)
"I think they all have their place" (+5)	Teacher interest and strength	Local community expectations and agricultural presence
"I think it's all important and depends on where you're at" (+8)	Location	Student demand
"student value" (+2)	Agricultural literacy	Teacher interest
"some of what I think is most valuable to our students is not reflected in what I prioritize to teach"	Community expectations and needs	
"what is needed in the community" (+2)	Student need and interests	
"encourage higher-order thinking"		
"transferrable skills" (+4)		
"my knowledge"		
"where my interests lie"		
"basic skills people should know" (+1)		
"need to know where their food comes from"		
"they all play an important role in the big picture"		
"aware of career in agriculture" (+3)		

Note. A primary coding using InVivo was used, followed by pattern coding. The final themes were created using descriptive coding.

Table 15

Coding for What drives National AFNR Pathway Competence and Knowledge?

Primary (InVivo Codes)	Secondary (Patterned Codes)	Tertiary (Descriptive Themes)
"confident to teach things at the introductory level" (+2)	Previous personal experiences	Agricultural personal experiences
"lack of experience"	Experiences at college	Professional work experiences
"I don't have an interest in it"	Teaching experiences	Teacher interest
"I'm confident beccause of my background"	Passion and interest	
"this is the career I'm meant to do"	High school experiences	
"it fits me and my personality		
"that's my passion" (+1)		
"that's what I did in high school" (+3)		
"I need a lot more eduction on it"		
"I've just never had to teach it" (+2)		
"I've developed a significant interest in it" (+2)		
"teaching it for such a long time" (+4)		
"only way to learn anything is to teach it"		
"I'm willing to adjust, research, and upgrade"		
"growing up and my current involvement so my personal experiences" (+8)		
"Teaching experiences and professional development" (+6)		
"Time spent in the classroom at OSU were too quick" (+2)		
"I can tell what they're doing wrong in there but I can't show them"		
"It's not like it's something I've never been around. It's just I've never physically done it" (+1)		
"my past experiences" (+9)		
"all of my electives"		
"family things" (+8)		
"it's mostly what ive' learned at OSU (+8)		

Note. A primary coding using InVivo was used, followed by pattern coding. The final themes were created using descriptive coding.

APPENDIX H

Oklahoma State University Degree Plan for Agricultural Education

Agricultural Education: Multidisciplinary, BSAG

Minimum Overall Grade Point Average: 2.50
Total Hours: 120

Code	Title	Hours
General Education Requirements		
English Composition		
See Academic Regulation 3.5		
ENGL 1113	Composition I	3
or ENGL 1313	Critical Analysis and Writing I	
Select one of the following:		3
ENGL 1213	Composition II	
ENGL 1413	Critical Analysis and Writing II	
ENGL 3323	Technical Writing	
American History & Government		
Select one of the following:		3
HIST 1103	Survey of American History	
HIST 1483	American History to 1865	
HIST 1493	American History Since 1865	
POLS 1113	American Government	3
Analytical & Quantitative Thought (A)		
MATH (A) or STAT (A) [1]		3
(Suggested: MATH 1483 or MATH 1493 or MATH 1513)		
Humanities (H)		
Courses designated (H)		6
Natural Sciences (N)		
CHEM 1314	Chemistry I (LN) [2]	4
or CHEM 1215	Chemical Principles I (LN)	
Any course designated (N)		3
Social & Behavioral Sciences (S)		
AGEC 1113	Introduction to Agricultural Economics (S) [2]	3
SPCH 2713	Introduction to Speech Communication (S) [2]	3
or AGCM 3203	Oral Communications in Agricultural Sciences & Natural Resources (S)	
Additional General Education		
Courses designated (A), (H), (N), or (S) [3]		6
Hours Subtotal		**40**
Diversity (D) & International Dimension (I)		
May be completed in any part of the degree plan		
Select at least one Diversity (D) course (included in Major Requirements)		
Select at least one International Dimension (I) course (included in Major Requirements)		

Code	Title	Hours
College/Departmental Requirements		
Agricultural Sciences and Natural Resources		
AG 1011	First Year Seminar	1
ANSI 1124	Introduction to the Animal Sciences	4
Select one of the following:		3
FDSC 1133	Fundamentals of Food Science	
FDSC 2233	The Meat We Eat	
FDSC 2253	Meat Animal and Carcass Evaluation	
Select one of the following:		3
HORT 1013	Principles of Horticultural Science (LN)	
HORT 3084	Plant Propagation	
HORT 3113	Greenhouse Management	
AST 3011	Ag Structures	1
AST 3211	Engines and Power	1
AST 3222	Metals and Welding	2
AST 4101	Ag Electrification	1
NREM 2013	Ecology of Natural Resources	3
PLNT 1213	Introduction to Plant and Soil Systems	3
SOIL 2124	Fundamentals of Soil Science (N)	4
Biological Sciences		
BIOL 1114	Introductory Biology (LN) [4]	4
Written & Oral Communications		
AGCM 3103	Written Communications in Agricultural Sciences and Natural Resources	3
or ENGL 3323	Technical Writing	
Hours Subtotal		**33**
Major Requirements		
Enrichment Courses		
To include courses from four of the following areas:		12
Agricultural Communications, Agricultural Economics, Agricultural Education, Agricultural Leadership, Animal Science, Biochemistry, Entomology, Forestry, Horticulture, Mechanized Agriculture, Natural Resource Ecology and Management, Plant Pathology, Plant Science, and Soil Science		
International Agriculture		
Select one of the following:		3
AGED 4713	International Programs in Agricultural Education and Extension (I)	
AGED 4803	International Study Tour in Agricultural Education (I)	
AGLE 3803	Global Leadership in Agriculture (I)	
ANSI 3903	Agricultural Animals of the World (I)	
Professional Core		
AGED 3101	Laboratory and Clinical Experiences in Agricultural	1

Code	Title	Hours
	Education	
AGED 3103	Foundations and Philosophies of Teaching Agricultural Education	3
AGED 3203	Planning the Community Program in Agricultural Education	3
AGED 4103	Methods and Skills of Teaching and Management in Agricultural Education	3
AGED 4203	Professional Development in Agricultural Education [5]	3
AGED 4200	Student Teaching in Agricultural Education [5]	9
EPSY 3213 or EPSY 3413	Psychology of Adolescence Child and Adolescent Development	3
SPED 3202	Educating Exceptional Learners (D)	2
Hours Subtotal		**42**
Electives		
Select 5 hours or hours to complete required total for degree [6]		5
Hours Subtotal		**5**
Total Hours		**120**

[1] suggested: MATH 1483 Mathematical Functions and Their Uses (A) or MATH 1493 Applications of Modern Mathematics (A) or MATH 1513 College Algebra (A)

[2] College & Departmental requirements that may be used to meet GE requirements.

[3] suggested: STAT 2013 Elementary Statistics (A); PSYC 1113 Introductory Psychology (S)

[4] If used as (N) course above, hours in this block reduced by 4.

[5] AGED 4203 Professional Development in Agricultural Education & AGED 4200 Student Teaching in Agricultural Education are taken during student teaching semester.

[6] These hours may be applied to the foreign language proficiency requirement per teacher certification

Appendix I

Institutional Review Board Letter of Approval

Oklahoma State University Institutional Review Board

Date:	02/27/2019
Application Number:	AG-19-6
Proposal Title:	Are we preparing agricultural education teachers with the knowledge and performance competence necessary to teach in their own domain? A needs assessment at Oklahoma State University.
Principal Investigator:	Carley Snider
Co-Investigator(s):	
Faculty Adviser:	Shane Robinson
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

VITA

Carley Sue Snider

Candidate for the Degree of

Master of Science

Thesis: PERCEIVED COMPETENCE OF AGRICULTURAL EDUCATION STUDENT TEACHERS TO TEACH ACROSS THE NATIONAL AGRICULTURE, FOOD, AND NATURAL RESOURCES CAREER PATHWAYS: A NEEDS ASSESSMENT AT OKLAHOMA STATE UNIVERSITY

Major Field: Agricultural Education

Biographical:

Education:

Completed the requirements for the Master of Science in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in May, 2019.

Completed the requirements for the Bachelor of Science in Agriscience Education at The Ohio State University, Columbus, Ohio in 2017.

Professional Memberships:

American Association of Agricultural Education