A Qualitative Study of Agricultural Lessons Used by Texas Teachers in Elementary Classrooms

by

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ABSTRACT

Research shows that many citizens have misconceptions about the source of their food and fiber. Several organizations have developed agriculture-based curriculum in an effort to increase agricultural literacy. Although there are a number of resources available to teachers, it is unclear which resources are being used and how often they are being used.

The purpose of this study was to examine the perceptions of Texas elementary school teachers toward the use of agriculture-based lessons as a resource in teaching elementary science. To answer research questions, a qualitative approach was implemented using snowball sampling and interviews. The interviews sought to determine basic demographics and identify the agricultural resources being used. Findings from the study were compiled based on the *Pillars of Agricultural Literacy*. It was found that participants in this study focused on plant aspects of agriculture and most commonly used Agriculture in the Classroom, Learn, Grow, Eat, and Go, and several non-agricultural resources such as Pinterest and Teachers Pay Teachers.

Based on data gathered from the study, it is recommended that further study should be conducted to determine why certain resources are being used more frequently, how to increase use of agriculture-based lessons, and what other avenues of distribution could be used. It would also be beneficial to solicit the expertise of classroom teachers when developing curriculum to better align and increase rigor of lessons. Participants seemed to be favorable in using agriculture-based curriculum but did voice that modifications need to be made. There is opportunity for further research in this area that could benefit teachers and curriculum developers moving forward.

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CHAPTER 1

INTRODUCTION

Background

As the farm population began to decrease in the early 1900s, the emphasis on agriculture in educational curriculum also declined (Spielmaker & Mitsuoka, n.d.). However, a few individuals recognized the importance of educating the public on agriculture and its role in society. This small group of educators and others "kept education in agriculture and the environment alive during a period when interest by the public as a whole was decreasing" (Spielmaker & Mitsuoka, n.d., para. 3). By 1981, a task force was created through the United States Department of Agriculture to discuss agricultural literacy and how to help states create programs and classroom curriculum to promote agricultural education.

Education Trends and Standardized Testing

In 2002, the introduction of the No Child Left Behind (NCLB) Act put standardized testing requirements into place to measure student achievement in a number of content areas (Murnane & Papay, 2010). In 2015, No Child Left Behind was replaced by The Every Student Succeeds Act (ESSA), which gives states authority to choose their own goals, encourages student progress and increased graduation rates, and provides increased intervention for low performing and disadvantaged students (Klein, 2016). Even though more responsibility is being given back to the states through ESSA, standardized testing will still be required (Klein, 2016). As a result, "accountability [has become] the driving force behind the focus of

the educational system in the United States today" (Johnson, Zhang, & Kahle, 2012, p. 1), and teachers are feeling the pressure.

The goal of ESSA is to provide a well-rounded education for all students. In order to meet these goals, ESSA developed four variables, which are used to measure accountability in school districts. These are:

1. academic achievement
2. student growth
3. graduation rates
4. English proficiency (Mathis & Trujillo, 2016).

Accountability measurements do not rely solely on standardized testing; however, they do require that at least 95% of students be tested (Mathis & Trujillo, 2016). These variables may also be influenced in other areas, such as teacher qualifications and curriculum.

Teachers and administrators are continuously searching for research-based best practices to educate students in core subject areas, due to accountability being linked to so many attributes of education. In the United States, education has shifted toward meeting higher standards, particularly in the area of science, technology, engineering, and math (United States Department of Education, 2015). Part of this shift has educators moving away from "traditional ways of teaching [which] are not producing the desired results" (Witt & Ulmer, 2010, p. 269). Instead, teachers are implementing more constructivist approaches to assist in increasing student achievement (Witt & Ulmer, 2010).

According to the National Science Education Standards, teaching science should include inquiry-based investigations for students (National Research Council, 1996). Based on constructivist ideology, this means that students take more responsibility for their own learning through "an experiential process of learning by doing" (Priest, 1986, p. 13). Science trends continue to move in this direction, as beginning teachers are trained to have an accurate understanding of science content and processes, as well as training in age-appropriate, inquiry-based approaches (Allen, 2006).

Science as a Platform for Agricultural Education

Effective teaching requires the use of a variety of resources and the implementation of meaningful learning opportunities for students (Fraker, 2018). Research suggests that agricultural education provides students with an opportunity to experience learning of scientific principles in an agricultural context, as well as providing the potential to increase student achievement (Warner, Thoron, & Israel, 2017). It can "link these topics by providing relevant, authentic, and familiar examples and connections students recognize by acknowledging the resources and products people consume [and] involve sustainable scientific processes" (Vallera & Bodzin, 2016, p. 103-104). By using agriculture to teach science concepts, teachers can build agricultural literacy and scientific knowledge in their students while still fulfilling the educational standards set forth by the state (Spielmaker & Leising, 2013).

The term agricultural literacy came to the forefront in the mid-1980s, during a time of reform in agricultural education. There were many concerns at this time about "declining profitability and international competitiveness of American agriculture, as

well as concerns about declining enrollments, instructional content, and quality in agricultural education programs" (National Research Council, 1988, p. v). The Committee on Agricultural Education in Secondary Schools was created to research trends and develop a report on agricultural education needs. The report, *Understanding Agriculture: New Directions for Education*, states that the committee "envision(ed) that an agriculturally literate person's understanding of the food and fiber system would include its history and its current economic, social, and environmental significance to all Americans" (NRC, 1988, p. 8-9). Providing agricultural literacy programs at a young age, such as in elementary school, encourages creation of consumers who are proficient in making educated decisions regarding their health, the environment, and the future (Frick, Kahler, & Miller, 1991).

Agricultural Literacy Programs and Curriculum

Kovar and Ball stressed the development of "programs in urban and suburban settings, as well as broadening of agricultural instruction" (2013, p. 168). It was also suggested that curriculum be aligned with science methodologies (NRC, 1988). Several programs, such as Agriculture in the Classroom and Junior Master Gardener, have been developed using agriculture-based lessons aligned to the Texas Essential Knowledge and Skills or TEKS (Texas Farm Bureau, 2018; Junior Master Gardener, n.d.). However, a study by Knobloch and Ball recommends that curriculum analyses be conducted to "determine relevance and fit of agriculture topics and activities in the elementary curricula" (2013, p. 16).

Problem Statement

In the United States, agricultural education in schools initially fell within the context of natural sciences (True, 1976). The introduction of the Smith-Hughes Act of 1917 moved agricultural education away from the traditional classroom to a vocational setting. Later legislation further supported this move and as a result, "agricultural education caused a shift in how the subject was presented in the classroom, as well as limit the overall access the average public-school student would have to agricultural principles" (Ingold, 2014, p. 1). Ingold states, "Instead of basic agricultural knowledge integrated into the primary and secondary interdisciplinary curriculum, the focus moved instead toward specialized vocational courses for secondary education students" (2014, p. 1). Then in the 1980s, *Understanding Agriculture: New Directions for Education* was released, leading to the development of agricultural literacy programs. However, research indicates that the general population still has misconceptions of what agriculture is (Frick et al., 1991). "Limited knowledge makes [people's] views uncertain and malleable," lending to reinforcement of those misconceptions through media and public perception (Doerfert, 2011, p. 12).

This lack of agricultural literacy, coupled with high-stakes testing and accountability demands, provides a canvas for improving science curriculum (Anderson, 2011). The National Research Council in 1988 suggested "the most realistic way to teach science through agriculture is to introduce modules, or units of instruction that supplement and eventually replace existing curricula and textbooks" (1988, p. 40). Elementary science in particular provides a relevant medium to promote agricultural literacy through the use of many state and national agricultural education

programs. Educators have suggested that integration of agriculture into elementary and junior high curricula "would help students learn based on arguments of experiential learning, a community-based curriculum, and authentic or applied learning in real-life situations" (Knobloch, Ball, & Allen, 2007, p. 25).

Although there are a number of programs available to teachers, such as Agriculture in the Classroom and Junior Master Gardener, students still show lack of agricultural literacy (Kovar & Ball, 2013). These programs have been developed to encourage promotion of agriculture while providing teachers with experiential, hands-on lessons. However, it is unclear which programs are being used and how frequently they are used, particularly in Texas elementary science classrooms.

Purpose and Research Questions of Study

With a variety of resources available to choose from, it is unclear what drives teachers to use agricultural-based lessons with their elementary curriculum. The purpose of this study was to examine the perceptions of Texas elementary science teachers toward the use and value of agriculture-based lessons as a resource in teaching elementary science. To guide this study, the following research questions were considered:

1. Are Texas elementary teachers using lesson resources that promote agricultural literacy?
2. Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?

3. Do teachers feel these resources meet the needs of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?
4. Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Based on information from the literature, teacher perceptions of agriculture-based lessons for use in Texas elementary science classrooms have not been studied extensively.

Definition of Terms

- Agriculture in the Classroom (AITC)- The Agriculture in the Classroom (AITC) programs, which are developed in conjunction with the United States Department of Agriculture, are implemented by individual states in attempts to improve student achievement by providing authentic, agriculture-based content as the context to teach core curriculum concepts in the areas of science, social studies, language arts and nutrition (Spielmaker & Mitsuoka, n.d.).
- Agricultural literacy- Individuals possessing agricultural literacy are defined as knowing and understanding basic food and fiber systems, as well as being able to use this knowledge in decision-making and communication of basic agriculture (NRC, 1988, p.8).
- Every Student Succeeds Act- Replaced the No Child Left Behind Act for providing assurances in standardized testing while giving authority back to the states. This was implemented beginning in the 2017-2018 school year (Klein, 2016).

- Junior Master Gardener- This is an international youth gardening program carried out through universities and cooperative extension services (Junior Master Gardener, n.d.).
- No Child Left Behind Act of 2001 (NCLB)- This act was implemented to ensure that all children, including those of underserved groups, have the same opportunity to obtain a high-quality education and to meet proficiency on challenging state academic achievement standards through state standardized assessments (Lee, n.d.).
- Pillars of Agricultural Literacy- a tool developed by Farm Bureau to help educators and education systems design curricula and programs that lead to agriculturally literate citizens (American Farm Bureau Foundation for Agriculture, 2015).
- State of Texas Assessments of Academic Readiness (STAAR)- The STAAR is an annual assessment of academic skills including:
  - reading and mathematics, grades 3–8
  - writing at grades 4 and 7
  - science at grades 5 and 8
  - social studies at grade 8
  - End-of-course assessments for English I, English II, Algebra I, biology, and U.S. history (Texas Education Agency Student Assessment Division, 2016).
- Texas Education Agency (TEA)- The Texas Education Agency is a branch of the state government of Texas in the United States responsible for public education (Texas Education Agency, n.d.a).

- Texas Essential Knowledge and Skills (TEKS)- These are the state standards for what students should know and be able to do in each academic area and grade level (Texas Education Agency, n.d.b).

Limitations

This study was qualitative in nature, and therefore was not intended to be generalizable. It was instead developed to gather information from experienced participants in the best position to offer perspective.

Assumptions

For the purpose of this study, it can be assumed that teachers were honest in answering interview questions and had a sincere interest in participating in the study without any outside or ulterior motivation.

Significance of Study

Elementary classrooms provide a considerable outlet to promote agricultural literacy in a science setting through the use of the agriculture-based lessons. However, research on teacher perceptions and use of these types of lessons is limited. Data collected from this study could provide useful information on satisfaction/dissatisfaction of lesson materials, usefulness of lessons in teaching elementary science, and overall areas in need of improvement.

Summary

The need for agriculture in education is becoming more prevalent. “Fewer citizens than ever before now play a role in agriculture, and public understanding of what is involved in the food and fiber system has decreased” (NRC, 2009, p.17). Through the use of agriculture-based lessons, elementary science teachers have the

opportunity to promote agricultural literacy while using real world, hands on lessons. This study provides a basis for teacher input toward accessible, agriculture-based resources used to teach science and promote agricultural literacy.

CHAPTER 2

LITERATURE REVIEW

Introduction

For this study, a comprehensive literature review was conducted. Based on information from the literature, I found teacher perceptions of agriculture-based lessons for use in Texas elementary science classrooms has not been extensively studied. Data collected from this study sought to identify themes in teacher perception of agriculture-based lessons being used in their elementary classroom. This literature review provides background for the need to promote agricultural literacy at the elementary level.

With a variety of resources available to choose from, it is unclear what drives teachers to use agriculture-based lessons with their elementary science curriculum. The purpose of this study was to examine the perceptions of Texas elementary science teachers toward the use and value of agriculture-based lessons as a resource in teaching elementary science. To guide this study, the following research questions were considered:

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A Push Toward Agricultural Literacy

During a time from the 1920s through the 1940s, farm populations decreased, as did the emphasis on agriculture in schools and educational materials (Spielmaker & Mitsuoka, n.d.). Then in the 1960s and 1970s, educators indicated a need for better agricultural materials (Spielmaker & Mitsuoka, n.d.). Businesses, foundations, non-profit groups, and state/federal agencies answered the need by creating a number of classroom resources (Spielmaker & Mitsuoka, n.d.). These efforts led up to 1984 when the USDA created a committee to perform a study on agricultural literacy and its role in education (Pope, 1990).

In 1988, the National Research Council published a report entitled *Understanding Agriculture: New Directions for Education*. The report indicated, "agriculture is too important a topic to be taught only to the small percentage of students considering careers in agriculture and pursuing vocational agricultural studies" (NRC, 1988, p. 1). Traditional agricultural education programs have seen a decline in participation based on a misconception that these programs were designed specifically to train students to do production agriculture (Reis & Kahler, 1997). This has spawned a movement away from secondary agricultural programs, such as vocational classes in high schools. New programs pushed for an understanding of agriculture at all levels of education beginning in kindergarten through 12th grade (Pope, 1990).

The reinvention of agricultural education as fundamental for everyone, not just those involved in vocational agriculture, led to the development of the term agricultural literacy. According to the NRC report, agricultural literacy is defined as an "understanding of the food and fiber system [including] its history and its current economic, social, and environmental significance to all Americans" (NRC, 1988, p. 1). In theory, people who are agriculturally literate are able to use this "practical" knowledge to make informed decisions on nutrition, policies, and the environment (NRC, 1988). With such a broad definition of agricultural literacy, efforts to teach this solely in a vocational agriculture setting would be futile. It was concluded that "at least some instruction should be offered to all students, regardless of their career goals or whether they are urban, suburban, or rural" (NRC, 1988, p. 8).

Agricultural education should complement instruction in other subject areas, rather to be a separate entity. Based on the finding in the NRC report, recommendations were published to assist in bridging the gap in agricultural knowledge. The following are some of the recommendations found in the report:

- All students should receive at least some systematic instruction about agriculture beginning in kindergarten or first grade and continuing through twelfth grade. Much of the material could be incorporated into existing courses and would not have to be taught separately.
- Teachers should be encouraged to modify lesson plans to incorporate materials about scientific, economic, and public health aspects of agriculture and related topics in accordance with school policy. To accomplish the goal of agricultural literacy, teachers need resources and training.

- Curriculum development projects funded by the National Science Foundation and U.S. Department of Education should include the development of instructional modules and material leading to agricultural literacy.
- National agricultural community and vocational education organizations should develop new links with national education, teacher, and environmental education organizations, with a goal of facilitating progress in the teaching of agricultural literacy (NRC, 1988).

As a result of the recommendations from this report, a number of collaborations and programs were developed.

Goals of Agricultural Education

Organizations from across the United States have used *Understanding Agriculture: New Directions for Education* report to set goals and priorities that frame the future of agricultural education:

1. American Association for Agricultural Education National Research Agenda 2016-2020
2. National Agricultural Literacy Outcomes
3. Pillars of Agricultural Literacy
4. Reinventing Agricultural Education for the Year 2020

The goals and objectives set forth by these documents support the purpose of this study in determining the use of agriculture-based lessons in elementary science classrooms.

American Association for Agricultural Education National Research Agenda 2016-2020

Beginning in 2006, the American Association for Agricultural Education set forth to develop a research agenda designed to guide those in the organization in their research efforts (Roberts, Harder, & Brashears, 2016). The first version of this agenda was a success and set the platform to continue with these efforts. Then in 2010, a second agenda was introduced and used until 2016 when a third version was developed. This third agenda establishes "an effective and efficient process for developing a consensus of the Research Priority Areas for the next five years" (Roberts et al., 2016, p. 7).

The current AAAE National Research Agenda consists of seven research priorities to be used from 2016-2020:

- Research Priority 1: Public and Policy Maker Understanding of Agriculture and Natural Resources
- Research Priority 2: New Technologies, Practices, and Products Adoption Decisions
- Research Priority 3: Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21st Century
- Research Priority 4: Meaningful, Engaged Learning in All Environments
- Research Priority 5: Efficient and Effective Agricultural Education Programs
- Research Priority 6: Vibrant, Resilient Communities
- Research Priority 7: Addressing Complex Problems (Roberts et al., 2016)

This study addressed Research Priority 4: Meaningful, Engaged Learning in All Environments, due to its application in this study.

According to Mercier (2015), there is a lack of coordination in terms of curriculum development, program implementation, and monitoring success, which likely reduces the potential for impact. Mercier goes further by expressing that,

> to remedy this issue, it is necessary to explore opportunities in all areas of education including a) traditional settings such as high school and post-secondary schools, as well as elementary and middle schools where curriculum is intertwined into existing curricula, b) educational systems including private/charter school and rural/urban settings, c) nonformal settings such as FFA, 4-H, and other out-of-school programs (2015).

These are the issues encompassing Research Priority 4 and helped to structure the research questions for this study.

National Agricultural Literacy Outcomes

The NALOs were the result of a synthesis of research and agricultural literacy frameworks, which resulted in the development of five themes:

1. Agriculture and the Environment
2. Plants and Animals for Food, Fiber, and Energy
3. Food, Health, and Lifestyle
4. Science, Technology, Engineering, and Math
5. Culture, Society, Economy, and Geography (Spielmaker & Leising, 2013).

These themes have been further organized into grade level benchmarks for grades K-12 and aligned with national education standards (Spielmaker & Leising, 2013).

The Pillars of Agricultural Literacy

Developed by the American Farm Bureau Foundation for Agriculture, the *Pillars of Agricultural Literacy* (See Figure 1) were designed to help those planning and managing agricultural literacy programs, as well as assist educators in implementing formal agricultural learning in their classrooms (American Farm Bureau Foundation for Agriculture, 2012). It further describes Foundational Knowledge of:

1) definition of agriculture
2) industry terms
3) agricultural history
4) identification
5) production awareness (American Farm Bureau Foundation for Agriculture, 2012).

This applies those to grade level expectations building on progressive cognitive development of learners (American Farm Bureau Foundation for Agriculture, 2012). The information provided by the *Pillars of Agricultural Literacy* also provided the conceptual framework for this study.

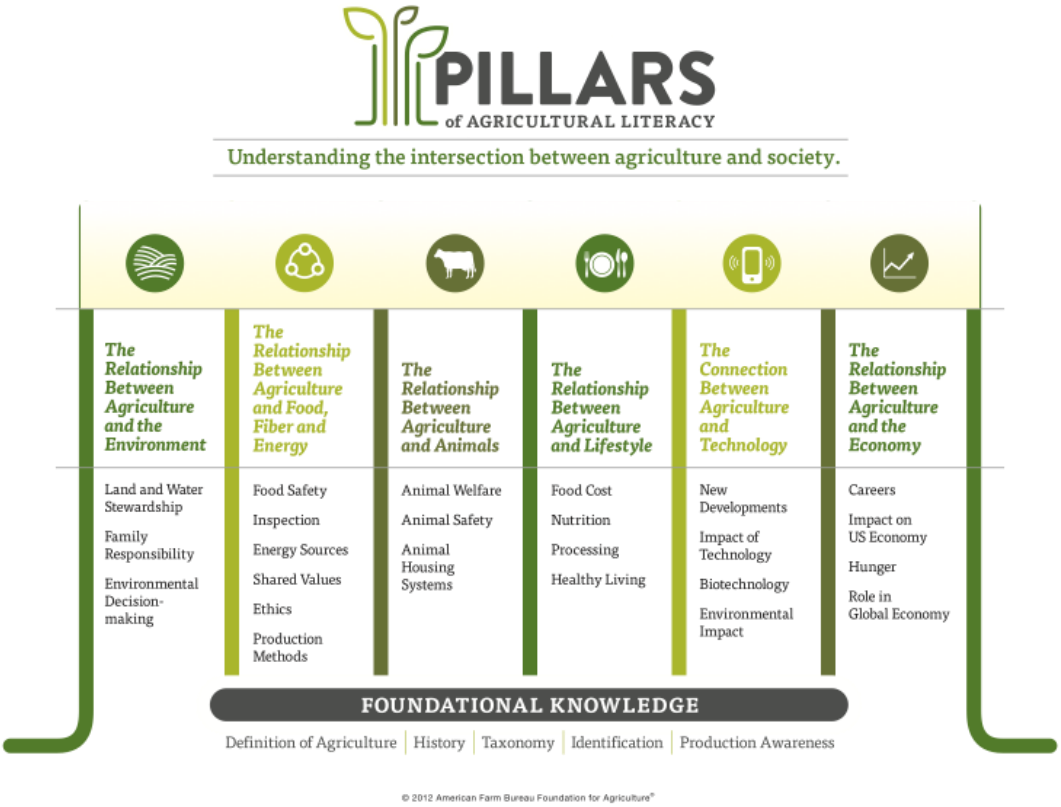

Figure 1. *Pillars of Agricultural Literacy*. Retrieved from http://www.agfoundation.org/files/PillarsPacket062016.pdf. Copyright 2012 by American Farm Bureau Foundation for Agriculture.

Reinventing Agricultural Education for the Year 2020

The National Council for Agricultural Education led the initiative for Reinventing Agricultural Education for the Year 2020, which resulted in a new vision, mission, and goals for agricultural education (2002). The vision and mission incorporate the idea of educating people on the value of agriculture and to make informed choices about global agriculture, food, fiber, and natural resources (NCAE, 2002). The strategic plan works to align activities and programs with their vision and directives from stakeholders using the following four goals:

> Goal 1- An abundance of highly motivated, well-educated teachers in all disciplines, pre-kindergarten through adult, providing agriculture, food, fiber and natural resources systems education.
>
> Goal 2- All students have access to seamless, lifelong instruction in agriculture, food, fiber, and natural resources systems through a wide variety of delivery methods and educational settings.
>
> Goal 3- All students are conversationally literate in agriculture, food, fiber, and natural resource systems.
>
> Goal 4- Partnerships and strategic alliances ensure a continuous presence of education in and about agriculture, food, fiber, and natural resources systems (NCAE, 2002, p.4-5).

Each goal has a connection to agricultural literacy in elementary classrooms, either by teacher expertise, lesson development and use, or partnerships with agricultural literacy programs.

Inquiry-Based Instruction in Science and Agricultural Education

Science education, similar to agricultural education, is focused on disseminating knowledge in order to develop citizens capable of making informed decisions and engaging in major public policy issues (NRC, 2012). In 2012, the Committee on a Conceptual Framework for New K-12 Science Education Standards, released a report outlining a vision and goals for the future of K-12 science education. The committee determined that "learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions" (NRC, 2012, p. 9). This statement

aligns with the current trend toward inquiry-based instructional practices, which are advocated by those in science education (NRC, 2012).

Inquiry-based instruction is constructivist in nature and can be defined as using various teaching strategies to guide students through investigations which allows them to question, design, and create their own knowledge based on findings (Lee & Shea, 2016; NRC, 2012; Qablan & DeBaz, 2014). According to the NRC, classrooms should practice five essential features of inquiry:

1. Learner engages in scientifically oriented questions.
2. Learner gives priority to evidence in responding to questions.
3. Learner formulates explanations from evidence.
4. Learner connects explanations to scientific knowledge.
5. Learner communicated and justifies explanations (2012).

Inquiry-based instruction "stimulates students' conceptual understanding by building on prior knowledge and encourages them to actively engage with the subject matter and apply their learning in real life situations (Qablan & DeBaz, 2014, p. 4). Inquiry-based instruction also provides a guide for agricultural education as more and more science is being tied into agricultural education programs (French & Balschweid, 2009).

Agriculture in the K-12 Setting

According to *Understanding Agriculture: New Directions for Education*, "beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture" (NRC, 1988, p. 2). Based on this report, several programs and curriculum were developed in order to reach a

broader audience. However, a review of the literature presents a number of factors that influence the integration of agricultural literacy into elementary curricula. Those factors include teacher perceptions of agriculture, teacher knowledge and comfort level toward agricultural concepts, and increased accountability/time restraints.

Perceptions, Attitudes, and Beliefs

Many studies have concluded that teachers commonly have positive perceptions, attitudes, and beliefs toward agriculture. In 2009, Bellah and Dyer conducted a study on teacher attitudes and stages of concern when teaching agriculture in an elementary classroom. This study found that "elementary teachers…expressed generally favorable attitudes and perceptions toward agriculture and its use as an integrating context to teach across content area standards" (Bellah & Dyer, 2009, p. 21). Other studies conducted by Knobloch and Martin came to similar conclusions that teachers, in general, have positive attitude/perceptions toward agriculture (2000; 2003). However, recommendations from these studies suggest that further investigations should be developed to determine if results would vary by geographical location and to measure changes in attitudes and perceptions after additional exposure to agricultural literacy programs (Knobloch & Martin, 2000; Bellah & Dyer, 2009).

Knowledge and Comfort Level

Knobloch and Martin suggested "a teacher's background and experience plays a significant role in educating students about agriculture" (2000, p. 16). Another study conducted by Trexler and Suvedi (1998) found that teachers lacked understanding of agricultural concepts, and therefore lacked comfort with those concepts. In a 2003 study, Knobloch and Ball found that teachers "expressed a need to feel comfortable to

integrate agriculture more frequently into their curriculum" (p. 15). The implications are that teachers who know less about agriculture are less likely to teach agriculture than those teachers who have some agricultural background. Because of these findings, it has been recommended that teachers attend professional development to increase their knowledge of agriculture and to train them in using available resources (Knobloch & Ball, 2003; Anderson, Velez, & Thompson, 2014).

Increased Accountability and Time Restraints

Frequently noted as reasons for teachers not integrating agriculture-based lessons into their curricula are limits in time and resources, as well as an increase in accountability pressures. Teachers have indicated that resources are either inaccessible or irrelevant to their instructional needs (Knobloch, 2008; Graves, Hughes, & Balgopal, 2016; Vallera & Bodzin, 2016). Studies also indicate that teachers are concerned with time constraints and feel that instructional planning to include agriculture is time consuming (Knobloch & Martin, 2000; Graves et al., 2016). These findings lead into the notion that accountability has increased pressure on teachers to cover required content. In a qualitative study, by Knobloch et al. reported that a teacher revealed, "I have to prepare my students for the state tests. I haven't found time to teach anything about agriculture" (2007, p. 28). Recommendations originating from these concerns indicate a need to assess how elementary teachers believe that agriculture could be best integrated into their instruction (Knobloch & Martin, 2003) "If teachers are more likely to teach content and use activities that they believe would be beneficial to their students, it is imperative that an investigation of what elementary

and junior high teachers think and believe about integrating agriculture be conducted" (Knobloch et al., 2007, p. 26).

Many of the studies mentioned above note that teachers are willing to implement some agricultural concepts into their science curricula despite concerns. Teachers also voiced support of using agriculture-based curriculum because it coordinates with the science goals of using real world, authentic examples. "The most realistic way to teach science through agriculture is to produce modules, or units of instruction that supplement and eventually replace existing curricula and textbooks" (Trexler & Suvedi, 1998, p. 28). A number of these types of modules or units have been developed to assist teachers in implementing agriculture into their science curricula. A few examples of curricula developed for this purpose come from Agriculture in the Classroom, Project Wet, Project Wild, Project Food, Land, and People, and Project Learning Tree (Bellah & Dyer, 2009). These programs provide lessons to "assist teachers in integrating agricultural concepts and providing contextual experiences for students" (Bellah & Dyer, 2009, p. 13).

The next issue for teachers is that once these modules are developed, they are of little use unless they are adopted. The United States Department of Education (1994) identified teachers and principals as the primary change agents when it comes to science education (United States Department of Education as cited in Trexler & Suvedi, 1998). In order to get adoption, it may be necessary to provide training on these newly developed modules. Eighty-five percent of elementary school teachers in the Knobloch and Martin study were neutral or agreed that "elementary school teachers were not trained in agriculture" (2000, p. 21). Adoption of the modules

should be treated as a change, and without ongoing resources and support, it would be difficult to sustain the use of agricultural curriculum in science (Bellah & Dyer, 2009).

Modules/units could also help to alleviate concern over time management. The Knobloch and Martin study further describes teacher concern about having time to integrate agriculture instruction and also with having up to date educational resources (2000). Writing and developing units of study takes extensive time to complete. As discussed by a teacher in the study by Trexler and Suvedi, designing lessons and gathering materials was a concern (1998). The same study also suggested that teachers were interested in finding innovative ways to teach science (Trexler & Suvedi, 1998). Aligned, relevant instructional units are also necessary to meet teacher needs in regard to accountability.

Accountability and Educational Standards

Accountability

In addition to concerns about comfort level, adoption of agricultural curriculum, and time management, teachers must keep in mind the needs for accountability and teaching the standards. From 2010 to 2015, No Child Left Behind (NCLB) was implemented in K-12 education as a way of holding schools accountable for the performance and achievement of students (Lee, n.d.). This law significantly affected schools. Because of NCLB, schools were required to give annual testing in math and reading, were measured to determine Adequate Yearly Progress (targets for improvement) and were penalized for being a Title I (low income) school that did not meet AYP (Lee, n.d.).

After many years of NCLB, the law was revised and in 2015 was replaced by the Every Student Succeeds Act or ESSA. Like NCLB, ESSA is a test-based accountability system intended to close the performance gaps between disadvantaged students and their peers (Mathis & Trujillo, 2016). However, a significant difference between the two laws is that ESSA gives more power back to the states to revise and implement their accountability programs (Mathis & Trujillo, 2016).

Each state is subject to the law as a guideline for planning accountability for their state. ESSA requires states to adopt accountability systems based on the challenging state academic standards in reading/language arts and math, and on state-designed long-term goals for all students and then again for each subgroup of students ("Revised State Template for the Consolidated State Plan", 2017). In September of 2017, Texas submitted its final ESSA State Plan to the United States Department of Education, which included long-term goals for academic growth, graduation rates, college/career/military readiness, and student success indicators ("Revised State Template for the Consolidated State Plan," 2017). The effort put forth in this plan resulted in the development of a mission, which included four strategic priorities and three enablers (see figure 2).

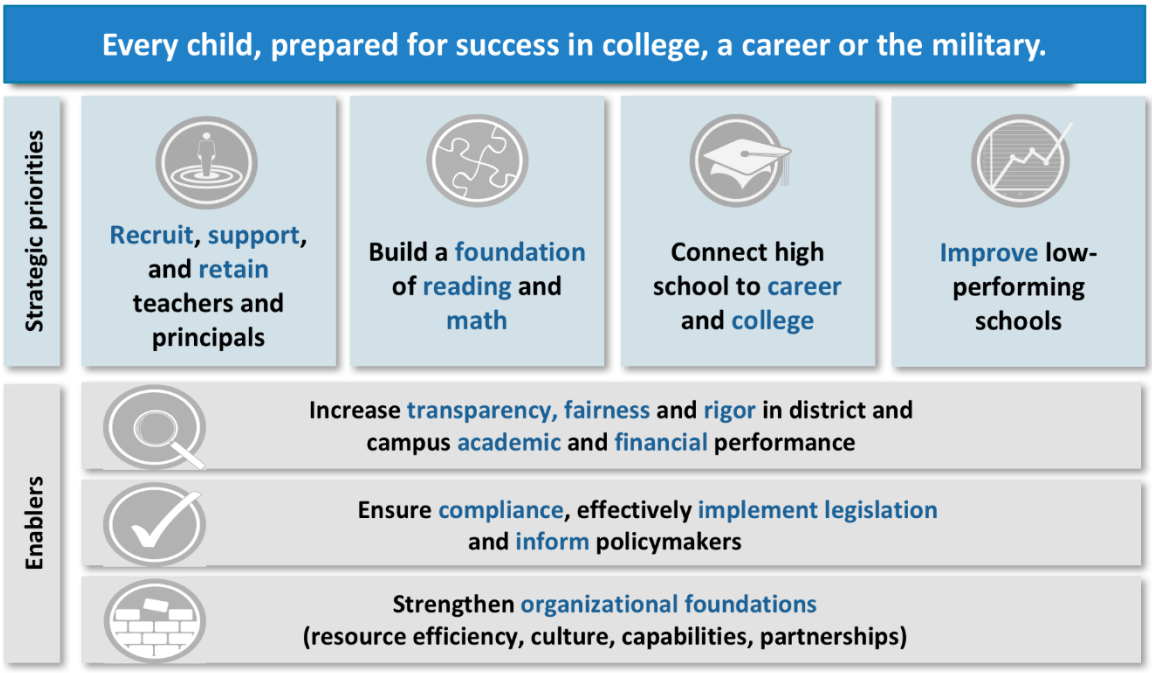

Figure 2. Texas Education Agency Strategic Priorities and Enablers by Heather Christie. Retrieved from http://search.tea.state.tx.us/search?q=cache%3AjPIPUaTTMPkJ%3Atea.texas.gov%2FWorkArea%2FDownloadAsset.aspx%3Fid%3D51539613895%2B4%2Bpriorities%2B3%2Benablers&access=p&output=xml_no_dtd&client=default_frontend&ie=UTF-8&proxystylesheet=default_frontend&site=default_collection&oe=UTF-8. Copyright 2018 by Texas Education Agency.

This mission, priorities, and enablers provide a foundation for implementing ESSA. Key initiatives supported by the new policy framework implemented by ESSA and directed by the work of the strategic plan include a re-designed certification framework, aligned technical assistance and interventions for low-performing campuses, and a network of supports for the most vulnerable student populations (Christie, 2018).

Educational Standards

The State Board of Education nominates educators, industry members, parents, and others to serve on committees to review educational standards to be adopted for use in public schools (Texas Education Agency, n.d.b). These standards are referred to as the Texas Knowledge and Skills or TEKS. They outline what students are expected to learn in each course and grade level (TEA, n.d.b) The TEKS are also divided into four parts regardless of subject or grade level:

1. The Introduction- provides brief information and overview of the content to be addressed according to subject and grade level
2. The Strand- TEKS that share a common theme
3. The Knowledge Statement- this provides the overall idea or concept being addressed
4. The Student Expectation- explains what needs to be known in relation to the knowledge statement (San Antonio Independent School District, n.d.)

It is expected that students can demonstrate skills outlined by the TEKS when performing on standardized tests (SAISD, n.d.).

Why Agricultural Literacy?

Research shows that agriculture is not a primary focus of K-12 curricula in the United States, and as a result elementary, middle, and high school students have limited understanding and misconceptions about our food and fiber systems (Hess & Trexler, 2011). While those involved in agricultural education dealt with defining agricultural literacy, “several groups forged ahead with programs to bring agricultural education into the classroom, especially at the primary grade levels where the need is

great" (Powell, Agnew, & Trexler, 2008, p. 88). From this, several programs, such as AITC and JMG, were developed to educate students about agriculture rather than in preparing them to work in the field of agriculture (Vallera & Bodzin, 2016).

Additionally, those involved in agricultural literacy began devising frameworks and models to guide in the development of these programs. One such framework is the Food and Fiber Systems Literacy Framework (FFSL). "It was the first known effort utilizing a curriculum framework model as a means of guiding instruction and assessing learning in agricultural literacy" (Igo, 1998, p. 25).

From this model came eight objectives that were developed to assist in designing and implementing agricultural literacy curriculum. The objectives were as follows:

1. Align the food and fiber systems framework and learner outcomes with national education standards, instructional activities, and resource materials.
2. Develop food and fiber systems learner outcomes for grades 9-12.
3. Establish field tests in four geographic regions of the United States.
4. Establish a comprehensive food and fiber systems teacher training model.
5. Establish a working relationship between science and teaching professionals for the dissemination of the food and fiber systems framework, standards, benchmarks, and instructional materials.
6. Develop assessment instruments and conduct project evaluation.
7. Develop an electronic clearinghouse and data base support system.
8. Provide an annual project evaluation that clearly describes the achievement of each objective (Leising and Igo, 1997, as cited in Igo, 1998).

For this study, as the primary research, I modeled the instructional design based on objectives 1 and 5. Additionally, from this framework, I derived a series of interview questions based on the FFSL teacher feedback form (Igo, 1998)

Theoretical Framework

The *Pillars of Agricultural Literacy* were designed as a tool to distinguish what is important for all people to know, understand, and appreciate about agriculture (AFBTA, n.d.a). Agricultural leaders and educators are encouraged to use the pillars in planning and implementing lessons in agricultural literacy. It is suggested in planning agricultural literacy outreach, developers should:

1. Select a pillar to focus on
2. Identify goals and objectives of the lesson
3. Develop lessons/activities appropriate for the target grade level (AFBFA, n.d.b)

The American Farm Bureau Federation for Agriculture also provides additional worksheets and tutorials to assist in the development of agricultural literacy lessons.

The *Pillars of Agricultural Literacy* framework includes expectations of what participants in four age groups should know and be able to do, reflecting levels of cognitive development (AFBFA, 2012). Each expectation identifies key areas that should be known by the particular age group. The Pillars of Agricultural Education expectation are as follows:

1. Early Childhood through 3rd grade- Awareness is the key objective at this age level's standards. Learners should become aware of how they

are connected to agriculture. Leaners will also become more familiar with general farming practices, and basic processes of farm-to-plate.

2. 4th through 8th grade- Discovery is the key objective for this age group's standards. Leaners begin to discover how farmers complete key responsibilities including production, processing, and sustainability.
3. 9th through 12th grade- Knowledge building is the key objective at this level. Leaners should build upon prior knowledge by adding specific examples of agricultural practices to what they already know.
4. Early Adult- Analysis is the key objective for early adults. Leaners at this level should be able to analyze the impact of agricultural practices on everyday life and use this knowledge to make informed decisions. (AFBFA, 2013).

As learners move through development, the knowledge builds becoming more complex with each stage.

The stages that lay the foundation for the Pillars of Agricultural Education closely mirror Piaget's Theory of Cognitive Development. Piaget concluded that children construct knowledge at different cognitive development levels (Ültanir, 2012, p.202). These four main periods of cognitive development are as follows:

- Sensorimotor begins when children are first born to 2 years of age. Children at this age are spontaneous and are trying to understand the environment around them.

- In preoperational stage (age 2-7), children are making judgments based on what they perceive. They are able to reflect on past events and look toward the future.
- Beginning in the concrete operational stage (grades 3, 4, and 5), children begin to show accelerated cognitive growth. Children begin to think more abstractly and draw on their experiences.
- The final stage is developed based on skills and knowledge gained in the concrete operational stage. It is here, in the formal operational stage (adolescence to adulthood) that children learn to think hypothetically and are able to make decisions based on reasoning (Schunk, 2012).

Piaget's ideas are beneficial in helping us understand the interaction between a child's development of learning and their cognitive levels (Ültanir, 2012, p.203).

Summary

Based on findings in the literature, it can be concluded that additional research should be conducted on using agriculture to teach elementary science. Though many research studies have quantified teacher's perceptions of this, few have qualitatively studied teachers' use of resources in the classroom, particularly in Texas. It would be beneficial to assess current resources for these teachers based on their perceptions, determine alignment of the resources currently being utilized, and determine the usability of these resources in elementary classrooms. Agricultural literacy curriculum must meet teacher needs to be successful.

CHAPTER 3

METHODS

Introduction

Teachers are faced with a variety of resources to choose from when creating lessons to cover the required standards each year. With so much variation of curriculum at their disposal, it may be difficult to classify suitable resources to cover these standards. It is crucial that teachers use research-backed curriculum to insure the rigor of the lessons they choose to teach. This qualitative study involved examining the use of agriculture-based lessons in elementary science classrooms in the state of Texas.

Purpose and Research Questions of Study

With a variety of resources available to choose from, it is unclear what drives teachers to use agriculture-based lessons with their elementary curricula. The purpose of this study was to examine the perceptions of Texas elementary science teachers toward the use and value of agriculture-based lessons as a resource in teaching elementary science. To guide this study, the following research questions were considered:

1. Are Texas elementary teachers using lesson resources that promote agricultural literacy?
2. Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?

3. Do teachers feel these resources meet the needs of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?
4. Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Research Design

This study implemented a phenomenological qualitative research design using interviews. In phenomenological interviewing, I used primarily open-ended questions and sought to reconstruct the experiences of participants based on the research focus (Seidman, 2013). This approach best fit the needs of the study due to its focus on:

1. The experience of the participants
2. The point of view of the participants
3. How participants understand and interpret their role
4. How meaning is derived from the experiences (Seidman, 2013)

Phenomenological interviewing of participants in this study inquired about participants' experiences as teachers using agriculture-based lessons and their perceptions of how the lessons fit into their classrooms. Once interviews were completed and transcribed, data were analyzed for patterns and coded accordingly.

Participants

Participants in this study were recruited using a snowball sampling method because it was necessary to be purposeful in selecting participants who were elementary teachers in the state of Texas. Snowball sampling is used when recruiting participants is difficult. It involves first selecting a few participants that fit the study

criteria, and then having them refer additional participants (Merriam & Tisdell, 2016). For this study, an exponential discriminate snowball sampling method was used (see figure 3).

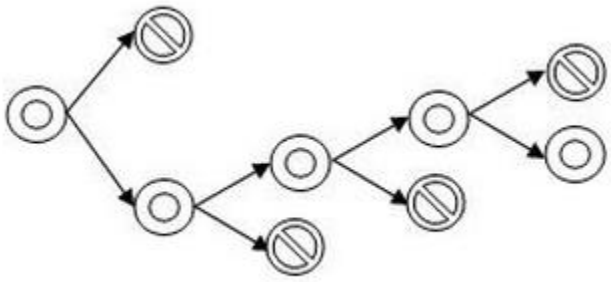

Figure 3. Exponential Discriminate Snowball Sampling Method Model by Dudovskiy, 2018, Retrieved from https://research-methodology.net/sampling-in-primary-data-collection/snowball-sampling/. Copyright 2018.

In this method, participants contributed multiple referrals; however, recruits were chosen only if they fit the goals and objectives of the study (Dudovskiy, 2018).

For the purpose of this study, I began by recruiting a teacher known to use agriculture-based lessons in her elementary classroom and fit the criteria set forth by the study. Participants were recruited for this study based on the following criteria:

1. They were a certified teacher in the state of Texas.
2. They taught at the elementary level, which includes grades K-5.
3. They include some type of agriculture-based lessons in their teaching.
4. They are willing to participate in the interview process.

Once selected, the initial participant was provided with additional information describing the background of the study and compensation for participation (Appendix A), as well as an informed consent sheet describing what to expect during the

interview process (Appendix B). Upon completion of the interview, the participant was asked to refer additional teachers who might be interested in participating in the study. These references were solicited based on the study criteria and followed the same interview process as the initial participant. At the conclusion of the interview, participants again had the opportunity to suggest others who might show interest in participation in the study. From that information, I sent out e-mails to establish contact with additional participants (Appendix C). In total, twelve e-mails were sent and seven responded back indicating a desire to participate in the study.

Data Collection

Once communication was established with participants, interviews were scheduled to best fit the needs of the participants. Most interviews were completed during the teacher's conference time and took 10-25 minutes to complete. Two interviews were completed at times after school. Of the seven interviews, 4 were completed by phone call, and 3 were face-to-face. All teachers seemed enthusiastic in sharing their classroom experiences.

Those selected for interviews met the criteria as detailed in the section above. Once it was determined that those recruited fit the goals and objectives of the study, then interviews were scheduled. Before doing the interview, participants were given background information and informed consent. This information made participants aware that the interviews would be recorded and what the interviews would be used for. Interviews took approximately 10-25 minutes to complete and each interview was recorded with participant knowledge. Participants were also given the opportunity to quit at any point during the interview or to skip any questions they felt uncomfortable

with as part of their informed consent (Appendix B). However, all seven participants completed the interview process and received compensation for their time in the form of a $50 Teachers Pay Teachers gift certificate.

I completed seven interviews from April of 2017 until May of 2018. At this point data became repetitive or met saturation. This number also met the suggested number of qualitative interviews to meet saturation, which is six to twelve (Namey, 2017).

To guide me during the interview process, a series of questions were developed (Appendix D). The development of these questions was based on the research questions and interests of the study. The first part of the questions guide focused on demographic information commonly found in most data collection instruments. These included questions on education, agricultural background, and self-perceived agricultural knowledge. This allowed me to build a background of the participant. The second part of the questions were left open ended which allows the participants to contribute as much detailed information as they desire, and it also allowed me to ask probing questions as a means to follow up (Turner, 2010). By doing this, I practiced the use of a standardized open-ended interview method (Turner, 2010). This means that all participants were asked identical open-ended questions which allows them to answer in as much detail as they wish to provide, while also allowing further probing questions by me as the primary researcher (Turner, 2010). These questions sought to discover information about agriculture-based curriculum being used in elementary classrooms, the grade levels this was being taught in, and teachers' feelings toward using such curriculum.

Data Analysis

Analysis of the data began with transcription of each interview. Information recorded from the transcriptions was then doubled checked by listening to the interviews once more and making sure the information matched. Demographic data were not coded but used to build a background of the teachers in the study. Data on curriculum use were analyzed according to the following table:

Table 1

Data Analysis of Research Questions

Research Question	Analysis
Are Texas elementary teachers using lesson resources that promote agricultural literacy?	Criteria for participation in this study included that teachers are using some type of agricultural lessons in their classrooms. In analyzing data for this question, I compared answers to the Pillars of Agricultural Literacy, looking for key terms and identification of known agricultural literacy resources.
Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?	For this question, a list was compiled of resources that participants reported using in their classrooms. Comments from participants on their use of these resources were coded according to the Pillar that most appropriately aligned to their comments. These were coded based on key terms identified in the Pillars of Agricultural Literacy.
Do teachers feel these resources meet the need of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?	Comments from this question were compiled according to teacher perceptions of the curriculum he/she uses in the classroom. From that, commonalities could be identified.

Table 1 Continued

Are there areas teachers feel lack rigor in the agricultural based lessons, and if so, which areas need improvement?	Comments from this question were compiled according to teacher perceptions of the curriculum he/she uses in the classroom. From that, commonalities could be identified.

As the primary researcher, I identified statements from the transcribed interviews according to the categories above. The data were then sent to Dr. Ricky Coppedge for crosschecking through the use of analyst triangulation. In this case, two or more people independently analyzed the same qualitative data and then findings were compared (Merriam & Tisdell, 2016). Dr. Coppedge was selected for this task due to his expertise in agricultural education and previous experience as an educator. Discrepancies in data coding were reported as dual coded.

Trustworthiness

Trustworthiness refers to the way qualitative researchers ensure that the findings in their study are worthy of reporting (Universal Teacher, 2018). Lincoln and Guba devised criteria for establishing trustworthiness in qualitative design, which included credibility, transferability, dependability, and confirmability (1985). Trustworthiness for this qualitative study was determined based on the following evaluative criteria.

Credibility

Credibility establishes that findings from the study come from the participants' own data and represent their own views on the topic being studied (Korstjens & Moser, 2017). In order to increase credibility of the study, I employed the strategies of triangulation, and tactics to ensure honesty from the participants (Shenton, 2004). Data

from this study were cross-referenced using analyst triangulation, where two or more people interpret the data independently of one another and then compare their findings (Merriam & Tisdell, 2016). So, as the primary researcher, I first coded the data and interpreted them based on the analysis criteria found in Table 1. Dr. Ricky Coppedge was chosen as a second analyst based on his expertise in agricultural education and experience in a public-school setting. The data were coded and interpreted by Dr. Coppedge, independently of me, in this study. Findings from this were then compared with the original findings. Similarities in findings increased credibility of the data, while discrepancies in findings were reported as multiple ways of interpreting the data.

To promote honesty in answering interview questions, I provided opportunity for participants to quit at any point in the interview process. Participants were informed of this option through informed consent. It was also important that the I built rapport with participants. This was done by providing background information about myself and the study to participants prior to the interview. By implementing these strategies, I attempted to "involve only those who were genuinely willing to take part and willing to offer data freely" (Shenton, 2004, p. 66).

Transferability

Transferability is the level to which others can apply results to his or her own context (Universal Teacher, 2018). Recruitment for this study came from an exponential discriminate snowball sampling method resulting in seven participants. However, to insure transferability, I also used homogeneous sampling. In other words, the sample was chosen because the research questions being addressed were specific to the characteristics of the group of interest (Laerd Dissertation, 2012). In this

particular study, the characteristics of participants included that they were elementary teachers in Texas who used agriculture-based lessons in their science classrooms. In discussing transferability in qualitative research, it is also important to remember that it is "not the naturalist's task to provide an index of transferability, it is his or her responsibility to provide the data base that makes transferability judgments possible on the part of potential appliers" (Lincoln & Guba, 1985, p. 316).

Dependability

Dependability means "the procedure by which results are produced, must be explicit and repeatable whenever possible" (Universal Teacher, 2017, para. 3). For the purposes of this study, dependability was determined using a physical research audit trail which documents stages of the study and reflects key decisions (Carcary, 2009). I developed interview notes on each of the interviews, as well as a physical research audit trail (see appendix E and F). It should also be noted that triangulation of the data further supports dependability of the study by establishing themes and the use of comparison by an additional analyst.

Confirmability

"Confirmability is concerned with establishing that data and interpretations of the findings are not figments of the inquirer's imagination, but clearly derived from the data" (Korstjens & Moser, 2017, p. 121). Again, triangulation is necessary to support confirmability of the study. As part of the triangulation, an analyst outside of the dissertation committee determined if he could "come to equivalent findings given the same data and research context" (Universal Teacher, 2017, p. 2). The analyst considered the following as part of the research process:

1. Transcriptions from interviews
2. Data reduction and analysis products- summaries and notes
3. Data reconstruction and synthesis products- theme classifications
4. Process notes- information to determine trustworthiness
5. Instrument development- development of guiding questions (Lincoln & Guba as cited in Universal Teacher, 2017)

In addition to triangulation, notes and an audit trail provided needed information to support confirmability of the data in this study.

Ethical Considerations

Participants in the study were informed of all steps taken to complete the interview process and were given the option to drop out of the study at any time with no implications. To assist in confidentiality, respondents were kept anonymous. In some cases, names were replaced when transcribing interviews to insure anonymity. Upon completion of the study, all data were erased or destroyed.

Because human subjects were used in the study, it was also necessary to get approval from the Institutional Review Board (IRB) at both Texas Tech University and Texas A&M University. This was in compliance with policies to protect the rights and well-being of the human subjects used in this study, even though there was minimal risk to participants. As part of the joint doctoral program in agricultural education, Texas A&M University recognized the approval of the IRB by Texas Tech University (see Appendix G and Appendix H).

CHAPTER 4

FINDINGS

The purpose of this study was to examine the perceptions of Texas elementary science teachers toward the use and value of agriculture-based lessons as a resource in teaching elementary science. To guide this study, the following research questions were considered:

1. Are Texas elementary teachers using lesson resources that promote agricultural literacy?
2. Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?
3. Do teachers feel these resources meet the need of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?
4. Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Additional information was collected: educational level, grade level and subject being taught, agricultural background, and perceived agricultural knowledge.

Researcher Background

In determining the direction of this study, I reflected on my own experiences and expertise. I had a strong interest in entering the agricultural field having grown up in a small rural farming community. After high school, I attended Texas A&M University where I earned a bachelor's degree in Agricultural Development. I was planning to follow a career in extension, so I stayed at Texas A&M University where I

completed a master's degree in Agricultural Education. I knew that I wanted to work with children, but several circumstances led me in a new direction. From this point, I went through an alternative certification program at Wayland Baptist University where I earned another master's degree in elementary education. I have now been teaching elementary science for almost fifteen years. During this time, I had an opportunity to teach a course as an adjunct professor on methods for teaching elementary science. From this experience, I decided to earn my doctorate. I chose a joint agricultural education program between Texas Tech University and Texas A&M University because I wanted to focus on both my interest in agriculture and in elementary education.

Participant Descriptions

Data for this study were collected from April 2017 to May 2018 from seven elementary teachers certified to teach in Texas. Table 2 provides a brief background of each participant.

Table 2

Demographics and Background of Participants

Participant	Gender	Education	Grade Level/ Subject
1	Female	Bachelor's Degree, Master's Degree, Alternative Certification	3rd grade science and language arts
2	Female	Bachelor's Degree	1st grade self-contained
3	Female	Bachelor's Degree, Alternative Certification	4th grade reading, social studies, and science
4	Female	Unspecified	5th grade science

Table 2 Continued

5	Female	Bachelor's Degree	4th grade reading and science
6	Female	Bachelor's Degree	3rd, 4th, and 5th grade science and social studies
7	Female	Bachelor's Degree, Alternative Certification	2nd grade self-contained

Participant 1

Participant 1 earned a bachelor's degree in landscape architecture, which was housed in the Department of Agriculture at her university. After deciding to start her family, she completed an alternative certification program in order to obtain certification to teach. Currently, she teaches 3rd grade language arts and science in a school district that is in a suburb of a larger metropolitan area and has approximately 1,200 students. She also recently earned a master's degree in Instructional Design and Technology.

When asked about her agricultural background, Participant 1 stated that she grew up in a rural area, although she went to high school in an urban area. Growing up, her parents owned about 67 acres, and she now runs a cattle business on 16 acres with her husband. As for her perceived knowledge of agriculture, Participant 1, includes:

> I probably have more knowledge now than when I was younger, especially now that my children are showing. I also help my husband put on two production sales a year for registered show cattle. I guess it is really more of

> the animal side of it. We do have a small garden, so I guess I know a little about crops, too (IT1, para. 8-10).

Participant 2

Participant 2 has a bachelor's degree in elementary education. She teaches 1st grade self-contained, or all subjects. The district she teaches in has approximately 5,500 students. Although it is a larger community, surrounding communities are rural and rely heavily on agriculture. Her agricultural background consists of growing up partially on a farm, showing animals in 4-H and FFA, and doing a crop project with her brother in FFA. When asked about her knowledge of agriculture, she felt that her knowledge was pretty extensive based on her background.

Participant 3

Participant 3 has a bachelor's degree in agricultural communications, but later went through an alternative certification program resulting in certification for agriculture and EC-6. She teaches 4th grade reading, social studies, and science at a rural school district with around 600 students.

Her agricultural background involves growing up in a rural community and on a farm/ranch where she helped work. Participant 3 also did horse judging in FFA, showed steers in FFA, and did several things in 4-H such as food shows. When asked about her perceived knowledge of agriculture, she shared "I would say it is pretty extensive with a degree in agricultural communications, and I grew up in FFA, 4-H, and helping on the farm" (IT3, para. 8).

Participant 4

Participant 4 has a degree (unspecified) in education with a minor in math. She is certified in several areas including math and journalism, but currently teaches 5th grade science. Her district has approximately 1200 students and is located near a large metropolitan area. Although she grew up in a rural setting, she did not have experience on a farm or ranch. When asked about her perceived agricultural knowledge, Participant 4 states a love for flowerbeds, but according to her, "I know nothing about the animal side of it, I guess you could say" (IT4, para. 10).

Participant 5

Participant 5 worked full time while she earned a bachelor's degree in interdisciplinary studies. Currently, she teaches 4th grade reading and some science. Her district is a larger district with approximately 5,500 students. However, the community she lives in relies heavily on the agriculture which surrounds them. She spent part of her time growing up in an urban setting, and part of her time in a rural setting. Although she did not raise animals, she was close to family members who did, and gained some experience through them. She says, "I would like to say that I know enough [about agriculture], and I could always learn more" (IT5, para. 14).

Participant 6

Participant 6 has a bachelor's degree in elementary education and teaches 3rd, 4th, and 5th grade science and social studies. Growing up in a large city, she has had minimal experience with agriculture, until she moved into a small farming community as an adult. Her district only has a total of 91 students in the entire district. She said, "I

thought a tractor was a tractor; I didn't know what all these different things are out here" (IT6, para. 14).

Participant 7

Participant 7 has a bachelor's degree in Criminal Justice with a minor in Spanish. She completed an alternative certification program online in order to teach elementary school. She is a 2nd grade self-contained teacher in a school district of approximately 5,000 students.

She grew up in a small urban town, and spent some time growing up on her father's ranch. Her experience there was minimal and did not include working on any part of the ranch. When asked about her knowledge of agriculture, she said, "I'm familiar with some things that go on around the area, but I'm not too familiar with hands-on, or worked in it" (IT7, para. 12).

Findings Related to the Research Questions

The background information for each participant helps to build a picture of their experiences and provides for better understanding of the findings in this study. The following will provide findings based on each of the research questions.

Research Question 1: Are Texas elementary teachers using lesson resources that promote agricultural literacy?

This question seems like a simple yes or no question, however, this question infers what teachers perceive as lessons promoting agricultural literacy. By accepting an offer to interview, all seven participants imply that they are in fact using agriculture-based lessons in their classroom. However, each teacher had her own ideas about what that entailed.

Participants were asked to describe how they include agricultural lessons in their classrooms. The following are responses based on this question.

Participant 2 stated that in first grade any agriculture taught had to do with plants (IT2, para. 14). Participant 7 had a similar response stating that they did a hands-on activity growing a bean seed (IT7, para. 14). While Participant 2 focused solely on identifying specific plant parts, Participant 7 also included making detailed observations such as measuring plant growth and days to germination. It should also be noted that both of these participants teach in a self-contained (teach all subjects in one classroom) lower-level elementary environment.

The remaining participants (1, 3, 4, 5, and 6) teach upper level elementary grades from 3rd grade to 5th grade and are not self-contained. These participants described using a variety of agricultural resources including:

- Participant 1- school garden, Junior Master Gardener, Agriculture in the Classroom, Learn, Grow, Eat, and Go (IT1, para. 12-14)
- Participant 3- discussion along with reading to relate science with agriculture, Ag in the Bag, community ag days, Agriculture in the Classroom (IT3, para. 12-18)
- Participant 4- school garden, hatching chicks (IT4, para. 14)
- Participant 5- use of agriculture with reading and current events, use of Learn, Grow, Eat, and Go program through county extension (IT5, para. 18-24)
- Participant 6- school garden, Learn, Grow, Eat, and Go, and Agriculture in the Classroom (IT6, para. 16-25)

Of these participants, all but one of them described using some type of previously developed agricultural literacy program that was brought to their school by an outside organization.

Research Question 2: Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?

Participants in this study described using several different programs that promote agricultural literacy. These programs were developed in conjunction with various organizations across the state including Texas AgriLife Extension and Texas Farm Bureau (see Table 3).

Table 3

Frequency of Agriculture-Based Resources Being Used by Elementary Teachers

Curriculum Resource	Description of Resource	# of Participants Using Resource
Learn, Grow, Eat, and Go	Curriculum developed as part of Junior Master Gardener Program to promote healthy habits such as exercising and eating right. This program is managed through Cooperative Extension (Junior Master Gardener, 2016).	3
Junior Master Gardener	This program through Cooperative Extension promotes hands-on learning experiences that provide a love of gardening and appreciation of the environment. It is also the umbrella for which other programs fall under (Junior Master Gardener, 2016).	1
Agriculture in the Classroom	This program is supported through Farm Bureau and educates students on where their food and fiber come from and the people involved in farming and ranching (Texas Farm Bureau, 2018).	3

Table 3 Continued

Ag in the Bag	This was a program that used a bagged lunch for participants and consisted of stations that students rotated through describing where their lunch came from. This was a three-day event rather than school curriculum (Musico, 2016).	1
Teachers Pay Teachers	This is a website that provides free and paid educator created resources for teachers to use in their K-12 classrooms (Teachers Pay Teachers, 2017).	2
Pinterest	This resource provides pictures and links to inspire ideas that can be shared, saved, and organized (Pinterest, 2018).	2
CScope/Teacher Resource System	This is a curriculum management system created by content experts (Ratcliffe, 2018).	1
Adopted Textbook	These textbooks are currently approved by the state and adopted by the school district (Texas A&M University Libraries, 2018).	1

It should be noted that some teachers reported using more than one resource. In some cases, the organizations managing these programs also provided funding to the schools to assist in using their programs. The following describes the use of these programs by study participants.

Participant 1

Programs used by Participant 1 include Agriculture in the Classroom and Junior Master Gardener. Most recently, she has used the Learn, Grow, Eat, and Go Program provided by her county extension office. For this program she describes:

> We have two raised beds, about 6 by 8 feet. We really don't have a set schedule that we go out to the garden. We just try to take some time each week

> to go out there. We journal and do a few lessons over nutrition and making smart choices. (IT1, para. 16)

In addition to the gardening supplies, the local extension office also required Participant 1 to complete a 3-hour training over the curriculum and provided her a binder of program materials.

Participant 3

Participant 3 has been a part of agricultural literacy programs both as a teacher and as a facilitator. While in college, she helped pack lunches and speak with students about how agriculture affects their daily life through Ag in the Bag. As a teacher, she has taken her students to an agriculture day put on by her county extension office, where she said she felt like the kids learned a lot (IT3, para. 18). She has also completed training for the Agriculture in the Classroom Program provided by Farm Bureau.

Participant 4

Although Participant 4 described using a school garden, she did not indicate using a specific curriculum to do so, but rather using a variety of resources including Teachers Pay Teachers, Pinterest, and her school-adopted textbook. However, in her classroom she does indicate hatching chicks provided free of charge by her county extension office. She expressed during her interview, “I am probably not the prime teacher to do them, but no one else wants to do them; the kids love it” (IT4, para. 14).

Participant 5

Participant 5 described using the Learn, Grow, Eat, and Go program provided by her county extension office. For this program, the extension agent came to the

school every week or two. During that time students would eat samples and learn about nutrition and food safety. She indicates that the parents also got involved with the program. “They did do a drive one Saturday…just a market type thing out here in the parking lot” she said (IT5, para. 26). Participant 5 feels that,

> It is so important for kids to know and to see this stuff. Especially the low-socioeconomic kids. Maybe they just can’t buy, but they can grow their groceries. And they saw that (IT5, para. 26).

Participant 6

Participant 6 indicated using two specific agricultural literacy programs regularly throughout her school year. She admits that her role is more of an assistant to representatives sent out by the corresponding organizations. The first program she described is the Learn, Grow, Eat, and Go program provided by her county extension office. As part of this program, her county extension agent facilitates lessons based on nutrition and food safety called My Plate. The other program used was Agriculture in the Classroom, provided by Farm Bureau. This program looks at more of the actual farming aspects of agriculture. Participant 6 includes that she feels both programs have been beneficial. “It’s a little extra support other than what we do in our room” (IT6, para. 16).

Participants 2 and 7 reported using resources that were not directly related to agriculture. Resources mentioned included Teachers Pay Teachers, Pinterest, and CScope. Again, these participants were lower elementary, self-contained teachers.

Research Question 3: Do teachers feel these resources meet the need of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?

In response to questions related to research question 3, participants had varying degrees of thought about needs, usefulness, and adapting lessons to better suit their students. Many were positive, but teachers did report areas in need of improvement.

Participant 1

Participant 1 reported that lessons she used are aligned to the science TEKS, and also included some health and physical education. She felt the lessons were also effective because they are set up by weeks and include a literary component. "They can read the books and even take AR tests on it," she said (IT1, para. 24). Lessons are included in a binder along with recipes and a newsletter written in English and Spanish.

As far as what Participant 1 would change, she stated a need to start earlier due to testing at the end of 3rd grade. She also felt it would have been helpful to be better prepared. She said, "we had a lot of prep work that took some time, so I don't feel we got to cover as much" (IT1, para. 28). She also stated wishing the extension agent would have done more taste tests with her students.

Overall, Participant 1 voiced that she would like to see more agricultural knowledge with elementary kids. "It seems like they are unaware of where their food comes from," she stated (IT1, para. 33). She felt that students just don't have awareness. Her hope is that she can eventually transition to a community garden. However, she did add that including these lessons can sometimes be overwhelming

because it is difficult to find time to use it, and other subjects often push back the science.

Participant 2

With the types of lessons used by Participant 2, she felt the lessons were aligned to the TEKS. However, she expressed that some lessons may be a little out of a first graders realm of understanding. For example, in a lesson about terrariums, she stated, "they didn't understand how the worm is really helping the plants and stuff" (IT2, para. 28). She did feel like it was just enough to give them a basic understanding, but she has had to adjust lessons some because of the expense involved in getting plants.

Participant 2 also stated students need to know more of how agriculture is intertwined with our survival. She stated, "I don't think they get, if we don't get all of this, then we aren't living" (IT2, para. 38). She felt that students just don't understand how important agriculture is (IT2, para. 38).

Participant 3

Participant 3 reported that she felt lessons might not always be directly aligned to the TEKS. "Sometimes you'll hit something…like using Agriculture in the Classroom, sometimes you'll hit a couple of those lessons, that don't have the TEKS aligned, but they are usually pretty easy to match up" she said (IT3, para. 20). However, Participant 3 did suggest that she felt overall the lessons were effective and that students "come out with a good understanding of the agricultural concepts of science using those lesson plans" (IT3, para. 28).

Areas she would like to see improved are with assessment. She included that "as a teacher, we are constantly struggling to get a grade, and a way to test what we just learned" (IT3, para. 28). She would like to see a way to measure knowledge in order to know if there was a change in their knowledge of agriculture.

In addition, she stated a desire to see more science and agriculture integrated into other subject areas such as reading. She felt like this was difficult to do because there seems to be less time for science with testing in reading. She also felt that more time and funding would be beneficial.

Participant 4

Participant 4 uses some gardening lessons when covering life cycles because she said that it is something that seems to always show up on tests. During these lessons, she covers basic plant needs and growth of the plant beginning as a seed to a mature plant. She stated that "we're basically just reviewing third grade TEKS" (IT4, para. 16). She also covers the life cycle of a chicken by hatching chicks in her classroom. However, this again is not aligned with her [5th grade] TEKS.

She also indicated having to adjust her lessons at times to better fit her students' needs. This may include pulling from additional resources such as Pinterest, Teachers Pay Teachers, and the science textbook adopted by her district.

Like many other respondents, Participant 4 voiced a need for more resources to cover agriculture at the elementary level. She felt that "they really don't talk much at this level, at the elementary level, about growing or harvesting, taking care of the Earth and soils, and retention" (IT4, para. 28). She would like to see more resources addressing these areas.

Participant 5

Participant 5 felt the TEKS for the lessons she used were very well aligned and indicated that the materials she used had a manual with corresponding TEKS listed. The manual also provided her with the lesson content to review before the representative (county extension agent) came to facilitate the lesson.

Overall, Participant 5 felt that the lessons were beneficial because there are so many families involved in agriculture where she lives. She shared,

> We're very agricultural. They just need to know about it. To bring that into science lessons, or reading lessons, or math lessons, these kids need to hear a lot about agriculture (IT5, para. 34).

However, she also added that it would be beneficial to do more field experience type lessons to get kids out and seeing the real world. It would also be beneficial, in her opinion, to bring in community members and parents, too (IT5, para. 36).

Participant 6

Participant 6 felt that the lessons she used did align to the TEKS, which allows her to continually refer back to examples when she hits those TEKS. The students will say, "oh, yeah, we talked about something like that a few weeks ago," (IT6, para. 36). However, she stated that she would not use these programs by themselves.

She also indicates that she would like to be able to take students out to see some of the places discussed in lessons. "To take them to the gins, or to the fields would be really cool where they actually get to see something, cooking or harvesting, or something like that" she added (IT6, para. 40). She also felt it would be beneficial for students to be able to speak with the farmers in the community.

Participant 7

Participant 7 indicated that she put together her lessons using Teachers Pay Teachers and Pinterest to best fit the needs of her classroom. Because she is developing the lessons on her own, she is able to ensure that these lessons align to the TEKS. She also indicated "the hands-on lessons are effective, especially when they are able to make observations, and see the actual process" (IT7, para. 26). Participant 7 also included that she changes the lesson yearly depending on the changing needs of her students.

Overall, participants showed satisfaction with the curriculum they chose to use. However, they also voiced the need to pull from multiple resources to make the lessons fit the needs of their classrooms.

Research Question 4: Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Again, the participants interviewed had mixed opinions on the rigor of the agriculture-based lessons they used in their classrooms. Though many responses were favorable, several indicated a lack of rigor. Participants also included areas they would like to see improved or changed (See Table 4).

Table 4

Responses to Research Question 4

Participants who felt the agriculture-based lessons used in their classroom provided the rigor needed to prepare students for STAAR testing and/or passage to next grade level.	Participants who felt the agriculture-based lessons used in their classroom DID NOT provided the rigor needed to prepare students for STAAR testing and/or passage to next grade level.	Suggestions/needs made by participants to improve the use of agriculture-based lessons in their classroom.
Participant 1- Students get to be hands on, make observations, and do garden maintenance Participant 2- Rigorous enough for first grade; gives them basic understanding Participant 7- lessons are rigorous enough	Participant 3- some are rigorous enough, some are too rigorous or high for grade level Participant 4- rigor is there only because of additions made by participant Participant 5- lessons are generic; one size fits all Participant 6- lessons not rigorous enough on their own	• Better timeline/more time • Needs more preparation before starting programs • Better assessment/ measurement of knowledge • Needs more field experience type lessons • Get more community involvement • More technology and visual aids

Results in Relation to the Pillars of Agriculture

Transcriptions from the participants' interviews were coded in order to identify areas that contribute to agricultural literacy based on the *Pillars of Agricultural Literacy*. Table 5 describes comments made by participants and the pillar under which they were coded. It should also be noted that similar comments were not duplicated, and some comments were dual coded.

Table 5

Comments Made by Participants Coded According to Pillars of Agricultural Literacy

Pillar of Agricultural Literacy	**Participant Comments (Coded)**
The Relationship Between Agriculture and the Environment • Land and Water Stewardship • Family Responsibility • Environmental decision-making	• Students get to be hands-on. They are making observations and have to do maintenance. They are living it. • The binder includes recipes and newsletters (in English and Spanish) that can be sent home. * • We used hay for compost. • A lot of parents and families are involved in agriculture in the area.
The Relationship Between Agriculture and Food, Fiber, and Energy • Food safety • Inspection • Energy sources • Shared values • Ethics • Production methods	• We have two raised beds, about 6 X 8 feet. • We had a lot of preparation with the beds and planting. • I received a grant for a greenhouse but didn't get to use it much. • Any of our agriculture has to do with plants. We do the parts of a plant, the leaves, the stems, the roots, the flowers, and the seeds. • We always take our kids to an Ag Day program put on by county extension. * • If we are talking about circuits, I go for the electric fence idea rather than string lights because that is what I grew up with. • One program talks about the actual farming of it. *
The Relationship Between Agriculture and Animals • Animal welfare • Animal safety • Animal housing systems	• We have had some other programs, and one showed a dairy cow. • I have done chicks in the classroom. We studied life cycles.

Table 5 Continued

The Relationship Between Agriculture and Lifestyle • Food cost • Nutrition • Processing • Healthy living	• She is doing a program called Learn, Grow, Eat, and Go. They actually helped pay for our garden here at school. • We journal and do a few lessons over nutrition and making smart choices. • The lessons are definitely aligned to science TEKS, but also physical education and health. • The agent did taste tests with the students. • I talked to the kids about agriculture and how it affects their daily lives.
The Connection Between Agriculture and Technology • New developments • Impact of technology • Biotechnology • Environmental impact	• There is also a literature link to it, so they can read books and even take AR tests on it. • We did a terrarium, but they didn't understand how the worm is really helping the plants and stuff. • I participated in the Farm Bureau Agriculture in the Classroom training.
The Relationship Between Agriculture and the Economy • Careers • Impact on US economy • Hunger • Role in global economy	• The binder includes recipes and newsletters (in English and Spanish) that can be sent home. * • An agronomist came to talk to the students. • I hope to eventually make it a community garden. • We always take our kids to an Ag Day program put on by county extension. * • One program talks about the actual farming of it. *

* Comments that have been dual coded.

Chapter Summary

This chapter presented the qualitative findings based on interviews of seven elementary teachers and their use of agriculture-based lessons. Participants

represented a variety of backgrounds, agricultural experiences, educational levels, and grades/subject areas. Transcripts and triangulation led to the identification of themes derived through the interviews. Comments made during the interviews often shared similarities. Some comments were dual coded according to the pillars because they were broad enough to cover more than one pillar, or because of discrepancies with triangulation.

This chapter also described findings in relation to the research questions. Themes were identified for each research question and will be discussed further in Chapter 5. These data were also used to provide a basis for recommendations, implications, and conclusions.

CHAPTER 5

DISCUSSION

Overview

The purpose of this study was to examine the perceptions of Texas elementary science teachers toward the use and value of agriculture-based lessons as a resource in teaching elementary science. To guide this study, the following research questions were considered:

1. Are Texas elementary teachers using lesson resources that promote agricultural literacy?
2. Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?
3. Do teachers feel these resources meet the need of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?
4. Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Summary of Study

Agricultural literacy encompasses an understanding of not only the interactions between agriculture and the environment, but also understanding where food and fiber come from, the role of technology in agriculture, how agriculture affects our economy, and agriculture's influence on our lifestyle (American Farm Bureau Foundation for Agriculture, 2018). A need to promote agricultural literacy was brought to the forefront with the release of *Understanding Agriculture: New Directions for*

Education in 1988. From this, a number of programs were developed to educate people and move toward a more agriculturally literate society. Kovar and Ball stressed the development of "programs in urban and suburban settings, as well as broadening of agricultural instruction" (2013, p. 168). It was also suggested that curriculum be aligned with science methodologies (NRC, 1988). Several programs, such as Agriculture in the Classroom and Junior Master Gardener, have been developed using agriculture-based lessons aligned to the Texas Essential Knowledge and Skills (Texas Farm Bureau, 2018; Junior Master Gardener, n.d.).

Based on the literature review, this study was developed. The design followed qualitative research methods to determine the use of agriculture-based lessons in elementary classrooms. This included recruiting through snowball sampling and interviewing participants to collect data. These data were then coded according to the *Pillars of Agricultural Literacy*, and then crosschecked using analyst triangulation. Data was also used in identifying themes. Trustworthiness was determined using credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Additional data collected included participants' demographics, perceived agricultural knowledge, use of agriculture-based lessons, and classroom needs.

Discussion of Findings

Research Questions 1: Are Texas elementary teachers using lesson resources that promote agricultural literacy?

The National Agricultural Literacy Curriculum Matrix has a lesson entitled *A Day Without Agriculture* which provides a background of what agriculture is:

> When you think of agriculture, you probably think of people growing crops or raising cows, pigs, sheep, and chickens on a farm. However, agriculture includes much more than that. The people who work in factories building tractors and other farm machinery play an important role in agriculture. People in universities who research new agricultural products and new ways to grow food and fiber are involved in agriculture, too. The grocer must buy agricultural products to fill the grocery shelves. The restaurant owner must buy agricultural products to prepare and serve his or her customers. The clothes you wear and the furniture on which you sit were probably made from agricultural products (Spielmaker & Mitsuoka, 2013, para. 9).

Teachers in this study had varying ideas about what it meant to be teaching agriculture-based lessons and seemed to focus on a minimum of areas mentioned in the lesson above. However, each participant did include some form of agriculture in the lessons they discussed with me.

Theme 1: Lower grade levels (K-2) focused on lessons about plants.

I found that participants in the lower grade levels (grades K-2) used the least variation in their lessons and had the fewest areas of agriculture incorporated. These lessons included plant growth and identification of plant parts. Although these lessons provided information on how plants develop and their needs in order to grow, the lessons were very basic and singular. "Mainly in 1st grade, any of our agriculture has to do with plants" (IT2, para. 14). The lower grade levels also failed to include lessons associated with other areas of agriculture.

Theme 2: Upper grade levels (3-5) included other areas of agriculture more that lower grade levels (K-2).

Participants in the higher-grade levels (grades 3-5) were more inclusive of a variety of agriculture in their lessons. Participant 1 told me that she has included some things she learned from Agriculture in the Classroom and the Junior Master Gardener Program (IT1, para. 12). Four of the participants in these grade levels discussed the use of school gardens which brings in not only the basic plant needs and development from the lower grade levels, but can also include food safety, production practices, and how these gardens can affect the community and environment. However, participants again failed to include much from other areas of agriculture, although one participant did mention hatching chicks as part of life cycle review.

Research Questions 2: Which resources are being used most often in these classrooms and under what Pillar of Agricultural Literacy are they categorized?

A Google search on agricultural education resources for elementary students brings up approximately 184,000,000 results; however, participants in this study mentioned very few.

Theme 3: Teachers reported using Agriculture in the Classroom and Learn, Grow, Eat, and Go most often.

The more frequently mentioned resources included Agriculture in the Classroom through Farm Bureau, and Learn, Grow, Eat, and Go through Texas A&M AgriLife Extension. Both of these resources were developed by organizations committed to implementing programs supporting agricultural literacy. Participant 6 mentioned using both of these programs and stated that representatives from the

respective organizations came to her school to assist in implementing the programs (IT6, para. 16). Participant 1 mentioned similar experiences by telling me that her extension agent came to her school to work with students, help her set up her garden, and supplied resources for the Learn, Grow, Eat, and Go program (IT1, para. 14-20).

Theme 4: The Pillars of Agricultural Literacy represented in the agriculture-based lessons being used are not equally distributed.

Further exploration of the data shows that there is an uneven distribution of the *Pillars of Agricultural Literacy* being covered. Of the seven pillars, "The Relationship Between Agriculture and Animals" was least often represented when participants discussed the lessons they were using. However, participants most often included discussion falling under "The Relationship Between Agriculture and Food, Fiber, and Energy" and "The Relationship Between Agriculture and Lifestyle." The Agriculture in the Classroom and Learn, Grow, Eat, and Go programs tend to also fall under these pillars.

Theme 5: Teachers are using non-agricultural resources to find agriculture-based lessons.

Participants also discussed using searchable resources that may be more unconventional for finding agricultural literacy resources. When developing lessons, Participant 7 told me she combined resources from Pinterest and Teachers Pay Teachers (IT7, para. 18). Participant 4 also mentioned that she uses these resources in addition to her textbook to modify and strengthen her lessons (IT4, para. 20). Both Pinterest and Teachers Pay Teachers allow teachers to search specifically for their needs, similar to Google. However, Pinterest results include ideas that others may

have found useful, while Teachers Pay Teachers include actual lessons and resources developed by fellow teachers.

Research Questions 3: Do teachers feel these resources meet the need of their classroom based on TEKS, usefulness across subject areas, adaptability to various learning types, and organization/ease of use?

Several participants in the study voiced concern over the amount of time they had to implement any type of agriculture-based lessons. I received several positive comments from participants about the alignment and use of agriculture-based lessons, but many teachers included that lessons, as a whole, did not fit all of their classroom needs.

Theme 6: Teachers are modifying lessons to better fit the needs of their classrooms.

Participants voice having to adjust or modify lessons to fit the needs of their classroom because, as Participant 5 put it, "the lessons can be a little bit generic" (IT5, para. 30). Participant 4 also included that some of the lessons really were not aligned to her grade level, however, she included them as part of review and made them fit the needs of her classroom (IT4, para.14). Participant 6 told me that these lessons on their own did not have enough rigor (IT6, para. 30).

Theme 7: Teachers felt many lessons they used were aligned to the TEKS and beneficial to their students.

Participants stated that curriculum developed through organizations dedicated to agricultural literacy did have some alignment to the TEKS. Participant 5 told me that representatives were able to share resources and to confirm with participants the

specific TEKS for the lessons being used (IT5, para. 28). Participants also indicated that the use of these hands-on activities were beneficial.

Theme 8: Participants were able to use agriculture-based lessons despite teaching in a variety of subject areas.

It should also be noted that many of these participants were not subject specific to science. Two of them were self-contained, while others taught reading or math with limited science. Because of this, the curriculum could be aligned in areas other than science.

Research Questions 4: Are there areas teachers feel lack rigor in the agriculture-based lessons, and if so, which areas need improvement?

Upper level teachers in grades 3-5 were more vocal about the amount of rigor involved in the agriculture-based lessons they used. This could be due to high stakes testing demands in these grade levels.

Theme 9: Lessons may need to be modified in order to increase rigor.

Participants indicated that the lesson plans alone were not enough to meet the needs of their classroom. Participant 4 communicated that much of the rigor from these lessons were because of what she put into them (IT4, para.20). Participants in the lower grade levels seemed less concerned about the level of rigor in the lessons they used. However, they also indicated a need to modify the lessons to better fit their classroom needs.

Theme 10: Teachers indicated that there are areas in the agriculture-based lessons in need of improvement.

Participants in the study also included areas that they would like to see improved or further developed:

- Include more hands-on lessons and activities (Participant 2, 3 and 7).
- Tie activities and lessons into other subject areas such as reading (Participant 3 and 5).
- Provide more opportunities to include community involvement (Participant 1, 5, 6, and 7).
- Make more resources and funding available (Participant 5).
- Develop assessments to measure knowledge growth (Participant 3).

Conclusions

In discussing transferability in qualitative research, it is important to remember that it is "not the naturalist's task to provide an index of transferability, it is his or her responsibility to provide the data base that makes transferability judgments possible on the part of potential appliers" (Lincoln & Guba, 1985, p.316). Therefore, results from this study are transferable only due to the interpretation of others. The following conclusions were made in accordance to the research questions:

1. Texas elementary science teachers are using lessons to build agricultural literacy; however, the expanse of use is unclear. They are also using lessons which cover a minimal amount of agricultural knowledge and tend to cover primarily plant aspects of agriculture.
2. Resources being used most often by participants in this study were Agriculture in the Classroom and Learn, Grow, Eat, and Go. Participants also use non-

agriculture-based resources such as Pinterest, Teachers Pay Teachers, and in some cases CScope (which is now Teacher Resource System).

3. Teachers were able to use these resources across subjects; however, they indicated that modifications were necessary to meet the needs of their classroom. It was also indicated that many of the resources used did align with TEKS.
4. Participants discussed that rigor in the lessons was a result of the modifications that they put into them. This seems to be of particular concern to upper level elementary (3-5) teachers.

Implications

Results from this study indicate that teachers are willing to and interested in implementing agriculture-based lessons in their classrooms. There is an opportunity for organizations such as Farm Bureau and Texas A&M AgriLife Extension, to coordinate with teachers as experts to develop better aligned, more rigorous curriculum. Involvement with teachers in the development of their programs provides a positive promotion of agricultural literacy while giving teachers more ownership of the lessons.

Additional training for teachers would provide them with the knowledge and tools they need to implement agricultural literacy-based lessons. It also increases communication and builds connections between those involved in developing agricultural literacy and elementary education communities. This could lead to increased promotion of agricultural literacy and education in elementary schools.

Exploring other avenues to distribute agricultural literacy materials could also increase connections and awareness of materials available. It could be beneficial to include materials in locations that teachers access more often.

There are also implications for those not currently using agriculture-based resources in their classrooms. With the amount of resources available, these teachers could be missing out on some valuable lessons. There could also be argument that by not using agriculture-based lessons, teachers are inadvertently adding to the misconceptions people have about where their food and fiber come from.

Recommendations for Research

Based on the results of this study, the following recommendations for further research have been made:

1. Further studies should be conducted to determine what agriculture-based lesson resources are being used, and why those resources are being used most frequently.
2. It should be determined how to increase usage of lessons, and to give teachers knowledge and training of resources available.
3. Additional study should be done to determine why teachers are using particular resources and not using others.
4. Those developing agriculture-based resources should look into other avenues of distribution such as Pinterest and Teachers Pay Teachers. They should also seek the expertise of classroom teachers to assist in development of curriculum.

Recommendations for Practice

These recommendations for continuing practice by teachers using agriculture-based lessons is as follows:

1. It should be determined, by a panel of expert teachers, what in those lessons is beneficial and what is in need of modification.
2. Efforts should be made to increase the rigor and alignment of resources to better fit the needs of grade levels and subjects being targeted.
3. Lessons developed to promote agricultural literacy should include assessment or some measurement of knowledge growth.

Summary

Using qualitative methods, this study investigated elementary teacher use of agriculture-based lessons in their classroom. Participants in the study provided valuable insight into what resources they are using from a practicing teacher perspective. These participants also seemed to look at using such curriculum favorably but did voice a need to modify and make the curriculum better fit their needs. There is opportunity for further research in this area that could potentially benefit teachers and curriculum developers moving forward.

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Appendix A

Background

Background: A Qualitative Study of Agricultural Lessons used by Texas Teachers in Elementary Classrooms

Hello! My name is Leigha Pate, and I am a doctoral student with the Doc at a Distance program through Texas Tech and Texas A&M Universities. I am also a fellow elementary school teacher. You have been chosen to participate in this study because you stated interest and because you currently use agriculture-based lessons in your teaching. Before we get started with the interview, please allow me to give you some background on this study.

My passions are both elementary teaching and agriculture. I have an extensive background in both areas. In my experience and in my research, I have found there may be a need to develop more lessons or to update existing lessons promoting agriculture, particularly at the elementary level. In this interview, I ask that you keep the following in mind:

- This is a semi-structured interview, meaning that I have a series of questions to guide this interview, but I would like for you to please include additional comments you feel are important at any time.
- I would like for this information to remain anonymous, so please try to refrain from including any identifying information during the interview.
- This interview should take approximately 20-45 minutes depending on the amount of discussion you would like to include.
- You may quit at any time if there is a need.
- This interview will be recorded so that you may have my full attention throughout this process.

At the conclusion of the interview, you will receive a Teachers Pay Teachers gift certificate in the amount of $50 as compensation for your time. If you have any questions before we get started, please let me know.
Thank you for your time!

APPENDIX B

Informed Consent

Informed Consent: A Qualitative Study of Agricultural Lessons used by Texas Teachers in Elementary Classrooms
Please review this information sheet about the study. This copy is yours to keep.

What is the purpose of this study?
This study is designed to gather information on the use of agriculture-based lessons used in elementary school classrooms. Information from this study will help determine what types of lessons and resources are being used and will also help to identify areas in need of further development.

How do you participate?
You will be participating in a one-on-one interview. Some questions will be about your use of agriculture-based lessons in your teaching and your thoughts on what could be changed. A few questions will also help determine your demographic background.

Can I quit if I become uncomfortable?
Your participation in this interview is completely voluntary, and you may stop at any time. You may also skip any questions that you do not wish to answer. You will still receive compensation if you choose to skip any questions or if you choose to stop. However, these questions have been carefully structured so that you may answer them comfortably. Any information you are able to provide is greatly appreciated.

How long will participation take?
The interview will only take 20-45 minutes of your time, depending on the depth of answers you provide.

How is your privacy protected?
Your answers during the interview will remain completely anonymous. Any identifying information will be deleted from the study.

How will I be compensated for my participation?
Upon completion of the interview, you will be receiving a $50 gift card to use as you wish on Teachers Pay Teachers.

If I have questions about the study, whom may I contact?
This study is being conducted by Dr. Scott Burris and Leigha Pate in the Department of Agricultural Education and Communications at Texas Tech University. Please direct any questions to Dr. Burris at (806)-834-8589.

TTU also has a Board that protects the rights of people who participate in research. You can call to ask them questions at 806-742-2064. You can mail your questions to the Human Research Protection Program, Office of the Vice President for Research, Texas Tech University, Lubbock, Texas 79409, or you can email your questions to www.hrpp@ttu.edu

Appendix C

Solicitation Email

Dear (insert participant name),

Hello, my name is Leigha Pate and I am a doctoral student with the Doc at a Distance Program through Texas Tech and Texas A&M Universities. I am also a fellow teacher, and I would like your input in my research study. This study combines two of my passions, elementary teaching and agriculture. I have selected you for the opportunity to be involved in this research because of your teaching practices and inclusion of agriculture into your curriculum.

I know as teachers, we have a great responsibility to choose effective teaching resources for our particular set of students. I also feel that students need to know where their food and fiber come from. This is where you come in. I would like to know about the curriculum or lessons you are currently using to promote agriculture in your classroom, and if you feel that the curriculum or lessons are effective for your needs.

If you are interested in participating in this study, I would like to set up an interview with you at your convenience. Interviews should take 20-45 minutes, and there will be compensation for your time in the form of a $50 gift card to Teachers Pay Teachers. Please respond with your interests to leigha.pate@ttu.edu. Feel free to forward this information to other teachers who may be interested and also use agriculture in their classrooms. If you have any further questions or concerns, please contact Dr. Scott Burris or me at Texas Tech. Thank you for your help!

Dr. Scott Burris
Associate Department Chair
Ag Education and Communications
Email: scott.burris@ttu.edu
Phone: (806) 834-8689

Leigha Pate
Doctoral Student
Agricultural Education
Email: leigha.pate@ttu.edu
Phone: (806) 549-3810

Sincerely,

Leigha Pate

Appendix D

Interview Guiding Questions

Interview Guiding Questions: A Qualitative Study of Agricultural Lessons used by Texas Teachers in Elementary Classrooms

Without identifying yourself, please describe your educational background.

What grade level and subjects do you teach?

Without identifying yourself, or where you are from, please describe where you grew up. Was it rural or urban? Farm or ranch?

How extensive is your knowledge of agriculture? Why?

Please describe how you include agriculture in your teaching?

Where do you get your agriculture resources/lessons?

Are the lessons you use aligned to the TEKS?

Do you feel the lessons you use have the rigor to prepare students for the next grade level? STAAR?

How often do you teach agriculture-based lessons?

Do you feel the lessons you have are effective? Why or why not?

What would you change about the lessons you use?

Have you had any training on the lessons you use?

What would like to see in regard to agriculture lesson/curriculum use in elementary classrooms?

Before concluding this interview, is there anyone you can recommend me contacting who might also like to participate in this study?

Are there any additional comments you would like to include?

Appendix E

Interview Notes

Interview Notes

Interview 1

- Participant has degree in agricultural related field (part of dept of ag).
- Certification was through alternative certification program.
- Has Bachelor's and master's degree.
- Teaches 3rd grade science and language arts
- Grew up in rural area. Now owns and helps run cattle business.
- Participant seems more knowledgeable with animal production (cattle) than crop production. However, grows small garden at school. Previously had a greenhouse.
- Has used Ag in the Classroom, Junior Master Gardener, and Learn, row, Eat, and Go programs. Had some training for these programs.
- Participant for interview 1 discussed several different topics that involve agriculture. She also seemed passionate about the things she discussed. Most of her lessons came directly from programs that were already established. She felt the lessons were of high rigor and effective in her teaching.
- Participant voiced a desire to see more agricultural knowledge at the elementary level because she said kids don't know where their food comes from. They need more awareness.
- Voiced concern that it can be a little overwhelming to keep up the garden.

Interview 2

- Participant has a bachelor's degree in elementary education.
- Teachers 1st grade self-contained.
- Agricultural background includes being raised partially on a farm and showing animals in 4-H and FFA.
- Did a crop project in FFA with sibling. Overall, seems to have an extensive knowledge of agriculture.
- Does minimal agriculture–based lessons. As part of CScope curriculum (which is now TEKS Resource System), students planted and identified parts of a plant.
- No program training.
- Taught 4th grade previously and participated in Ag in the Bag.
- Participant feels that lessons are rigorous, but feels students have some difficulty in understanding the whole concept being taught.
- Participant has also taught about terrariums but feels students don't understand the relationship between plants and organisms.
- Would like to see more of how agriculture and life are intertwined. We need it for survival.
- Participant seems interested in agriculture and lessons on the classroom.

APPENDIX E CONTINUED

Interview 3

- Participant has bachelor's degree in agricultural communications and did a post bacc in agricultural education in order to earn her teaching certificate. Certified ag teacher and EC-6.
- Teaches 4th grade reading, social studies, and science.
- Grew up on a farm/ranch where she helped a lot.
- Also grew up showing steers in FFA, horse judging in FFA, and food shows (etc.) with 4-H.
- Agricultural lessons consist of reading assignments and discussing how that applies to science. She feels kids can understand the science when related to agriculture because it is what they've been around.
- Did AITC training.
- Did Ag in the Bag with students and took them to an ag day put on by extension.
- Feels lessons are aligned with TEKS for the most part. Some are not always (AITC), but it seems easy to align them.
- Feels some lessons are a little too rigorous for the grade level.
- Often applies lessons toward agriculture because that is what she grew up learning.
- Feels lessons are effective for this area.
- Would like to see more hands on and more assessment pieces.
- Liked Ag in the Classroom but found it hard to bring back to the classroom.
- Would like to see more lessons that integrate agriculture and science into reading.
- Participant seems passionate about agriculture.

Interview 4

- Degree in education (Bachelor's?) and minor in math. Certified in several areas (none ag).
- Teaches 5th grade science
- Grew up in a rural setting, no farm or ranch.
- Participant does not feel like she had extensive knowledge of agriculture but expressed liking to garden.
- Agriculture lessons include working in a school garden during life cycles unit. Students have planted sorghum, wheat, corn, and other "crop" plants. Extension helps with chicks in the classroom. Ties it to life cycles even though it doesn't really match the curriculum.
- Did not specify any programs being used, but does pull from science textbook, Pinterest, and TeachersPayTeachers.
- Feels lessons are only rigorous because of what she puts into them.
- Participant attended a program with Texas Parks and Wildlife that discussed animal adaptations and range management types of stuff.

APPENDIX E CONTINUED

- Would like to see more on taking care of the earth and soils, growing and harvesting, animals and ecosystems.

Interview 5

- Bachelor's degree in interdisciplinary studies.
- Teaches 4th grade reading and science
- Lived in city, but stayed with dad some in the country growing up
- Some experience with farm life/animals
- Says she knows enough about agriculture, but could learn more
- No experience with FFA or 4-H
- Did program with extension agent (Learn, Grow, Eat, and Go). Felt kids got really excited about gardening. Parents were involved, did "farmers market"
- Felt it was good for low socioeconomic kids saw that they can grow their own food.
- Felt the program she used was well aligned to TEKS. Came with manual that showed TEKS alignment.
- Felt lessons lacked rigor; were very generic.
- Would like to see more field experience types of lessons. Get kids out to see real world. Would also like to see more community members working with kid son agriculture.
- 30-45-minute training on curriculum.
- Participant seems interested in using agriculture-based curriculum in her classroom.

Interview 6

- Bachelor's degree in elementary education certified 1-8
- Teaches 3-5 science and social studies
- Grew up in large city. No agricultural background until she moved to small farming town.
- Uses Ag in the Classroom and Learn, Grow, Eat and Go programs. Both send representatives out, so teacher doesn't really do the teaching herself.
- Feels lessons are aligned to TEKS, but really don't show much rigor in and of themselves.
- No training for these programs because she is really just assisting when representatives come out.
- Would like to be able to take the kids out to the field, farms, gins, etc. Show them cooking, harvesting…
- Participant was lacking in agricultural knowledge but seems interested in learning more and exposing her students to it.

Interview 7

- Bachelor's degree in criminal justice and minor in Spanish
- Went through post bacc online to get certification

APPENDIX E CONTINUED

- Grew up in smaller town and some on a ranch, but did not work on ranch
- Familiar with some areas of agriculture, but never has worked in it
- Agricultural lessons include planting a bean seed, discussing its parts, and making observations
- Lessons come from Pinterest and TeachersPayTeachers
- Feels these lessons are rigorous for her classroom. Changes them each year to meet needs.
- Would like to see more hands-on lessons, and possibly easier access to them.
- Participant seemed to have limited knowledge but showed interest in having more agriculture-based lessons to use.

First Impressions of Data

- 3 participants had alternative certifications
- all seem interested in using agriculture-based lessons
- several would like to see more hands-on lessons
- AITC and LGEG were mentioned by several participants
- Several mentioned having to adjust lessons to their needs
- Lessons being used reflected plants more than animals
- Several have school gardens

Questions I Have

- Why are teachers drawn to the plant/crop side of agriculture rather than animals?
- What other programs are available for teachers to use?
- Why aren't teachers using other programs?
- What would make these lessons more usable?
- What grade levels are these programs meant for?

Appendix F

Physical Research Audit Trail

Physical Research Audit Trail

Development of Research Idea: My first career interest was in agriculture. I earned a Bachelor of Science degree in Agricultural Development and a Master of Science degree in Agricultural Education. I also had interest in working with youth, which lead to my elementary education certification. After teaching for a number of years, I decided I wanted to continue my education by earning a doctorate. This provided me with the opportunity to combine both of my interests, agriculture and elementary education. I also had experiences with various agriculture-based curriculum, and often wondered if other teachers used or had interest in using this type of curriculum. Therefore, I decided to research agriculture-based curriculum and develop a study that would examine teacher usage of such curriculum.

Reviewing the Literature: A review of the literature revealed limited studies on the use of agriculture-based lessons in use by elementary school teachers. The studies included in the review did indicate teacher interest in using agriculture-based lessons but did not extensively reveal the curriculum being used and how well it addressed teacher needs. Review of the literature also indicated a need to promote agricultural literacy. Based on information found in the literature review, I determined a need to study use of agriculture-based lessons by elementary teachers in order to promote agricultural literacy.

Submission of IRB: After determining the research problem, I began designing the study and IRB proposal. The proposal was submitted for review at Texas Tech and approved by the IRB committee on 09-08-2016. After having some issues with data collection, the study was modified. These modifications were included in the IRB and again approved. This IRB was later accepted and approved by Texas A&M as part of the Doc at a Distance Program.

Research Design: This study used a qualitative design. Data was collected using interviews with participants being chosen using snowball sampling.

Interview Process: The initial participant that agreed to interview was chosen based on my knowledge of her use of agriculture-based curriculum. Upon completion of her interview (and all interviews afterward), the participant gave me contact information of teachers they may also be interested in participating in the study. Each interview was recorded with participant knowledge and then transcribed. Interviews took approximately 10-25 minutes to complete.

Data Analysis: After transcribing participant interviews, I reviewed the transcripts looking for key words/phrases related to agricultural literacy. Coding was then done according to the Pillars of Agricultural Literacy. Once coded, I solicited the expertise of Dr. Ricky Coppedge to triangulate the data. In total, there were 7 participants in this study, all of whom were elementary teachers in the state of Texas.

Conclusions and Recommendations: Based on the data themes, I was able to make conclusions and recommendations for each of the research objectives.

Appendix G

IRB approval from Texas Tech University

IRB approval from Texas Tech University

Date: 6-2-2018

IRB #: IRB2016-665
Title: A Quantitative Analysis of Texas Elementary School Teachers Using the Agriculture in the Classroom Curriculum After Attending the Summer Agricultural Institute
Creation Date: 7-5-2016
End Date:
Status: Approved
Principal Investigator: Scott Burris
Review Board: Institutional Review Board
Sponsor:

Study History

Submission Type Initial	**Review Type** Exempt	**Decision** Exempt
Submission Type Modification	**Review Type** Exempt	**Decision** Approved
Submission Type Modification	**Review Type** Exempt	**Decision** Approved

Key Study Contacts

Member Scott Burris	**Role** Principal Investigator	**Contact** scott.burris@ttu.edu
Member Scott Burris	**Role** Primary Contact	**Contact** scott.burris@ttu.edu
Member Leigha Pate	**Role** Investigator	**Contact** leigha.pate@ttu.edu

Appendix H

IRB Reciprocity Agreement between Texas Tech University and Texas A&M University

IRB Reciprocity Agreement between Texas Tech University and Texas A&M University

DIVISION OF RESEARCH

TEXAS A&M UNIVERSITY

PERMISSION TO RELY

April 25, 2018

Type of Review:	Initial Review
Title:	A Qualitative Study of Agricultural Lessons used by Texas Teachers in Elementary Classrooms
Investigator:	Timothy Murphy
IRB ID:	IRB2018-0460
Reference Number:	075730
Documents Received:	UT Centralized IRB Review Agreement; IRB Application Version 1.0; Leigha Wood (Pate) initial IRB Approval Letter; TTU IRB approval modification 1/31/17; TTU IRB approval modification 3/28/18; Leigha Wood (Pate) IRB; information sheet; background of qualitative study-pate; Interview Guiding Questions

Dear Timothy Murphy:

The Texas A&M University HRPP reviewed the above submission and determined on 4/25/2018 that this research meets the criteria for being reviewed under the UT System Reciprocity Agreement by Texas Tech University.

This research study should not be initiated until Texas Tech University has approved the conduct of the research study and all other ancillary approvals have been obtained.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,
IRB Administration

750 Agronomy Road, Suite 2701
1186 TAMU
College Station, TX 77843-1186

Tel. 979.458.1467 Fax. 979.862.3176
http://rcb.tamu.edu