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Georgia Elementary Agriculture Education Pilot Program: An Extensive Look into The History, Development, and Success

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GEORGIA ELEMENTARY AGRICULTURE EDUCATION PILOT PROGRAM: AN EXTENSIVE LOOK INTO THE HISTORY, DEVELOPMENT, AND SUCCESS

by

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Dedication

This dissertation is dedicated to my family, especially my children, Colter & Lena, who have been so supportive and patient with me as I worked on graduate school assignments for the past three and half years. They worked independently on homework and chores, so I could work on my homework at night and on Sunday afternoons. I will never forget the morning the grades posted from my first semester at Murray State. I cried. They listened to me and looked at me curiously when I realized I made all A's. It had been exactly 20 years since I had been in school.

I was not sure I could be in graduate school full time while working full time and balancing being a mom and wife. My children have continued to excel in their school work, FFA, and other activities while also working on their livestock show projects. I pray they see their parents working hard and carry that hard work ethic and independence in their own futures. I am so grateful for Murray State's online program that allowed me to meet my graduate school goals.

My parents and my husband, Ted, have always been encouraging, letting me know they love me and are proud of me. Knowing I am loved unconditionally gives me the strength to do hard things every day, like this dissertation. I feel the heavenly peace that only comes from above, as I know my mom is praying for me every step of the way.

My sister-in-law, Beth, started a semester ahead of me and is always one step ahead of me in graduate school. We did it! I am so happy to share this journey with you and end this journey with you. You are an inspiration to me that you did this while rocking being a middle school ag teacher, helping plan a wedding, being a farm wife and mom to a Marine overseas. Thank you for being my friend, sister, and colleague through this journey. I am so proud of you.

I am so thankful for my cohort and other Georgia agricultural education teachers shared this journey with me and ahead of me. You are an inspiration. You amaze me how you balance teaching your students all day, working as an FFA advisor, and excelling in this program. Thank you for answering my questions and making sure I kept up with my deadlines.

"Not to us, Lord, not to us but to Your Name be the Glory, because of Your Love and Faithfulness" Psalms 115:1. Throughout graduate school, my focus is that this work is not for my glory, my purpose is for this degree is not add glory to my name in anyway, but I will use it to more useful in my career and in my life's service. I am so thankful God allows me to work in agricultural education, my prayer is that He leads my work, my path & my decisions daily; and that my life and work glorifies Him in all I do.

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My committee – Dr. Guffey, Dr. Shultz, and Dr. Gilman – were some of my first professors at Murray State University. I have used so much of what you taught me in those first classes at MSU throughout my entire graduate school program and in this dissertation. I saved my work from all your classes and it was a great reference. I am so thankful to share the beginning and the end of this experience with you. And, my final committee member, my boss, Georgia Agricultural Education Program Manager, Mr. Billy Hughes, has been supportive and encouraging for elementary agricultural education research.

"The purpose of life is not to be happy. It is to be useful, to be honorable, to be compassionate, to have it make some difference that you lived and lived well," (Ralph Waldo Emerson). I hope this work, this research, and this dissertation are useful and make some difference in agricultural education.

Abstract

Georgia Elementary Agricultural Education (EAE) was formally introduced through the 2018 Senate Bill 330 (SB33); a two-part bill passed with unanimous support in both the House & the Senate. The first part of the bill included the three-component model of school-based agricultural education for high schools and middle schools which includes classroom/laboratory instruction, supervised agricultural experience, and leadership development through the National FFA Organization. The second part of SB330 introduced an elementary agricultural education (EAE) pilot program. The three-year pilot program started in the 2019-2020 school year with 25 schools; and concluded with 31 schools at the end of the 2021-2022 school year. This research includes the pilot program data collected as part of a program evaluation utilized to assist legislators to create the 2022 House Bill 1303. HB1303 removed the pilot program status; allowing elementary agricultural education to become a permanent option for Georgia's elementary schools. The researcher hypothesized that Milestones mean scores from schools with an elementary agricultural education program would excel over elementary schools not offering elementary agricultural education. Results showed the mean scale score was higher in EAE schools over non-EAE schools in both Title I Schools and non-Title I schools. Statistical analysis of each comparison of mean scale scores showed some significant differences in EAE schools vs non-EAE in Title I schools. As elementary agricultural education grows in Georgia and other states, there is room for other studies into the effects of EAE on other academic assessments, effects of local supplements, specialized facilities and teacher support in elementary agricultural education.

Keywords: agricultural education, elementary agricultural education, three-component model, pilot program, experiential learning, hands-on learning, leadership development, Title I schools

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Chapter I

Introduction

Importance of Agriculture

Agribusiness is the leading industry in Georgia with over $74 billion impact every year (Georgia Department of Economic Development, 2023). Many companies, like Chick-fil-A, Pilgrim's Pride, and Tyson use Georgia agricultural products directly in their foods. Georgia also leads the nation in logistics and infrastructure, offering a good interstate system, rails, airport, and seaport. Hartsfield Atlanta Airport is the busiest airport in the world but also offers more than 2 million square feet of warehousing. The Port of Savannah is the "fastest-growing port in the nation" (Georgia Department of Economic Development, 2023, para. 3).

Agriculture impacts every Georgian daily. The food and fiber production and related industries represented more than 350,000 jobs in Georgia's economy in 2020 (AgSnapshots 2020, 2023). While Georgia is known as the peach state, it offers many diverse agriculture products. Georgia leads the nation in the "production of peanuts, eggs and broilers" (Georgia Department of Economic Development, 2023, para.1). Georgia agricultural production ranks second nationally with cotton lint, cottonseed, and watermelon; third nationally with cantaloupe and peaches; and ranks fourth nationally in blueberry production (AgSnapshots 2020, 2023). "Three out of every four Georgia counties are involved in poultry and egg production" (AgSnapshots 2020, 2023, p. 9).

Agriculture has been a stabilizing and economic growth factor in Georgia's history. Georgia students learn the importance of Georgia agriculture in history and social studies classes beginning in the fourth grade (Georgia Department of Education, 2023). Elementary agricultural

education allows students the opportunity to learn about the diverse agricultural opportunities in Georgia while connecting them with their home life, environment, and other courses.

Future of Agriculture and Food Deserts

Agriculture has played and continues to play an integral part in Georgia's economic success; it is essential future students are prepared to step into the many agricultural opportunities in the future. The future of agriculture is uncertain without the investments in Georgia's youth to help them understand the diverse nature of Georgia's agriculture, including the continued need for farmers to continue farming Georgia's land and producing livestock. In addition to the need to fill the important roles in production agriculture in Georgia, it is essential to invest in students to fill the roles of the many employment opportunities to continue the agriculture logistics and infrastructure that are essential to not only Georgia's economic success, but also to other states and even globally. The opportunities and needs in logistics through Atlanta and Savannah alone in Georgia, emphasize the need for students to fully understand the economic impact and the importance of ensuring the future of Georgia's agriculture.

For the past four decades, farm and ranch families consist of less than two percent of the American population, however, U.S. family farms and ranches produce 86% of agricultural products (American Farm Bureau Federation, 2023). Farmers are true scientists and environmentalists, learning better production practices from harvest season to the next. American agriculture leads in agriculture production and efficiency. One farm in the U.S. feeds 166 people annually (AgSnapshots 2020, 2023). "The global population is expected to increase by 2.2 billion by 2050, which means the world's farmers will have to grow about 70% more food than what is now produced" (American Farm Bureau Federation, 2023, para. 13).

The combination of over 98% of the American population living away from farms coupled with the increased need for agricultural production for the future leads to even more importance for all levels of agricultural education. Another interesting factor that is leading to growth in agricultural education programs in urban areas is food deserts. The United States Department of Agriculture (USDA) defines food deserts as "low-income census tracts with a substantial number or share of residents with low levels of access to retail outlets selling healthy and affordable foods are defined as food deserts" (Economic Research Service, U.S. Department of Agriculture, 2011, para. 5).

Many urban areas and some rural areas in Georgia classify as food deserts. Georgia has the "sixth highest share of low-income areas whose residents also lack adequate access to supermarkets" (Capitol Beat, 2021, para. 5). Often classified as food deserts are food insecurities, where families do not know where their next meal will come from. Feeding America reports over 1 million people in Georgia facing hunger, with at least 1 out of 8 children facing hunger every day (Feeding America, 2023). Georgia's strong history of agribusiness shows a definite need for agricultural education in its truest sense in all areas of Georgia. While Georgia farmers certainly want to help establish a stronger agriculture economy statewide, nationally, and globally, there is certainly a need to invest in Georgia's areas with food deserts to meet the needs of food insecurities.

Since starting the Georgia Elementary Agricultural Education (EAE) pilot program, Georgia has seen growth in urban areas in agricultural education programs in elementary, middle, high school, and adult education. Fulton County, home to Atlanta, is now home to four elementary agricultural education programs; and home to two Georgia Young Farmer Chapters (Georgia Agricultural Education, 2023). Many Georgia school systems now offer agricultural

education from kindergarten through adult education. Gwinnett County, considered an urban school system, is the largest school district in Georgia. Gwinnett County had closed all agricultural education programs over the past two decades; however, Gwinnett County has restarted agricultural education in five of its schools. Since starting the EAE pilot program, Georgia has experienced growth from the elementary level in districts that have not had an agricultural education program in years. There is a renewed interest in schools, teachers, students, and families to reconnect with agriculture. Elementary agriculture provides a way for public education to reach that need for agricultural education.

High School agricultural education courses focus on certain content areas, whereas middle school and elementary school agricultural education programs in Georgia are set up to be exploratory. Since adding the Georgia Elementary Agricultural Education courses, the Georgia Department of Education also added other CTAE elementary courses designed to be exploratory for elementary schools (Georgia Department of Education, 2023). The future for agricultural education in elementary schools in Georgia meets the need to educate students about our state's leading industry.

Agriculture in STEM

STEM (Science, Technology, Engineering, & Math) is not a new concept in education. STEM is a component in many of Georgia's schools offering students hands-on learning opportunities to connect science, technology, engineering, and math in methods that help students develop a deeper understanding of those topics. An easy way to provide hands-on learning in the STEM classroom is the incorporation of agriculture. Planting seeds is a great way to understand life cycles, photosynthesis, parts of a seed, parts of a plant, soil, water, and more.

Through this basic agriculture-related activity, students can use other academic concepts of science & math to determine how much growth, rate of growth, soil chemical analysis, etc.

Many STEM programs in Georgia are using agriculture through school gardens, raised beds, aquaculture, chickens, and other small animals to help students in STEM learning through hands-on applications. Schools in Georgia are scored on a point system that measures a school's success in a performance index, College and Career Ready Performance Index (CCRPI), schools offering STEM receive a certain number of points (Georgia Department of Education, 2023). Schools also receive points for the number of students in CTAE courses, number of students, graduating, number of students in AP courses, etc. The points system certainly gives some schools more incentive to offer STEM to receive more points on the performance index. STEM helps students gain a better understanding of math, science, and engineering and more lifelong skills in those content areas (WhiteHouse.gov, 2018).

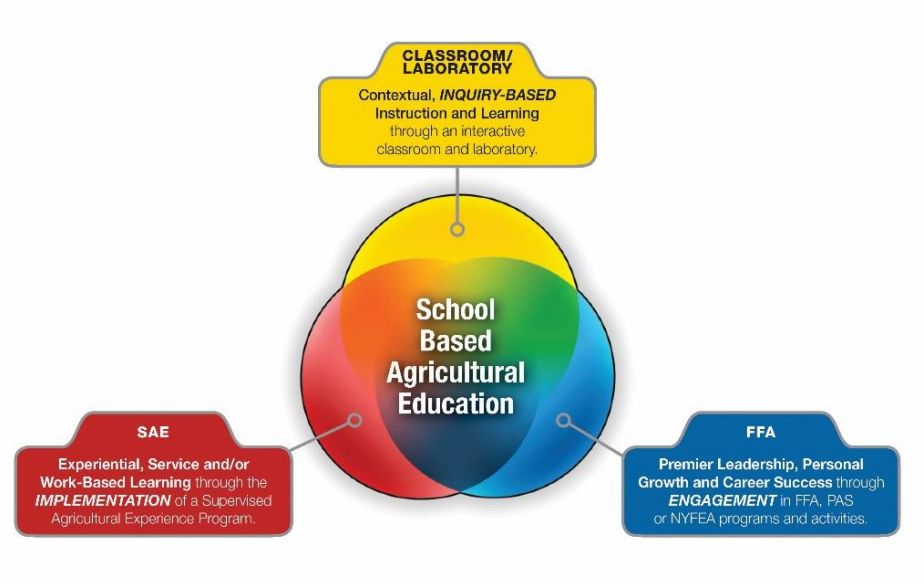
Project Based Learning (PBL) is a similar educational program to STEM. PBL is an educational delivery model often used with advanced learners, where students explore different content on their own or work with other students. This student-led program often helps students set their learning objectives and goals which hopefully gives the student more intrinsic motivation to take the learning process further than the typical classroom group environment. A report on STEM programs in 2018, showed a modest improvement in STEM topics globally. American students are still behind other countries in these content areas, showing the need for further concentration and improvement in helping students understand the concepts in STEM.

Three-Component Model of School-Based Agricultural Education

Agricultural Education has included hands-on learning through experiential learning in the classroom and through Supervised Agricultural Experiences (SAE) since the early 1900s. The three-component model *(see Figure 1)* of school-based agricultural education (SBAE) includes a balance of classroom & laboratory instruction, experiential learning through SAE, and leadership development through FFA (National FFA Organization, 2023). The three-component model is the foundation for each level of agricultural education in Georgia. The proven three-component model of SBAE provides students with the hands-on skills sought after in other educational content areas. Agricultural education is the primary focus, but it also incorporates all other academic areas into each learning process.

Figure 1

School-Based Agricultural Education



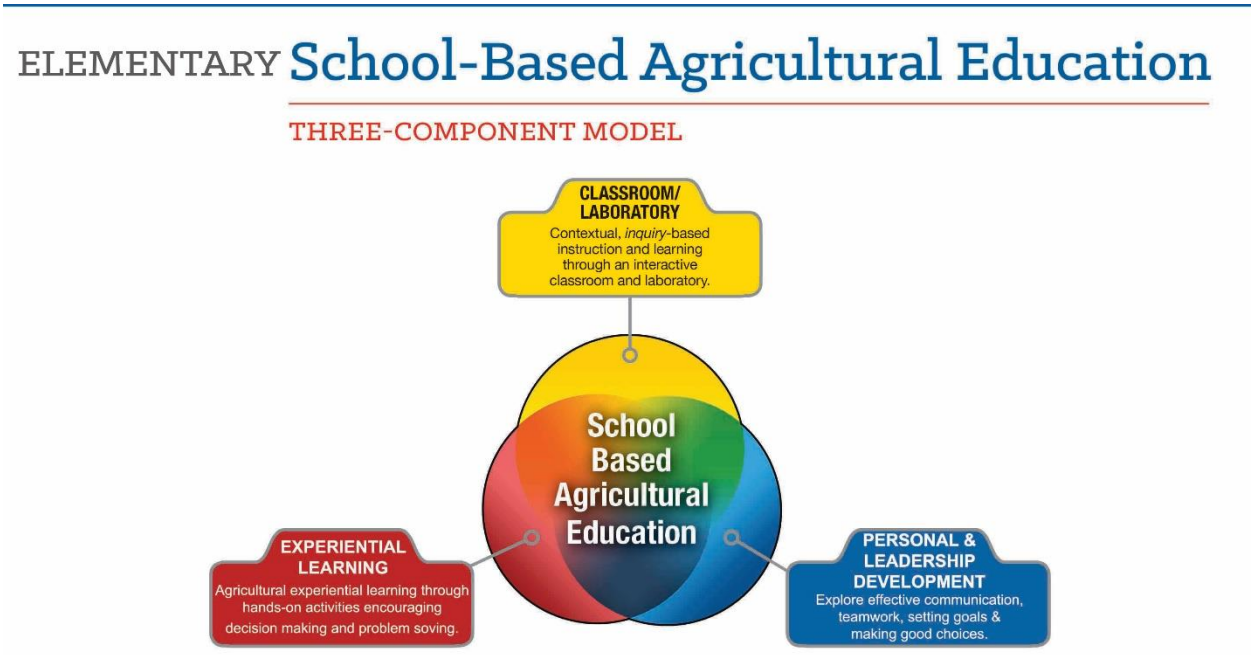
Note: Source (National FFA Organization, 2023).

The SBAE three-component model has been slightly adapted for the EAE program (see *Figure 2*); where SAE is replaced with experiential learning and FFA is replaced with leadership

development . EAE students do not have SAEs in the sense that high school or middle school students do outside the agricultural classroom at home. EAE students are not eligible for FFA membership in Georgia, but they are encouraged to include leadership content in the classroom and have an agricultural club.

Figure 2

Elementary Agricultural Education School-Based Model



Note: Source (Georgia Agricultural Education, 2023)

All agricultural educators are true agricultural enthusiasts who dedicate their careers to teaching students about all that falls under the wide umbrella of agriculture while improving agricultural literacy. The question that comes up with other programs using agriculture to teach other academic content, is if they are truly teaching about agriculture or just using agriculture to teach academic concepts; and does it matter? As agricultural educators and advocates for agricultural literacy, educators know there is a difference between simply learning the parts of a plant and understanding the role that plants play in the agricultural world. The three-component

model of SBAE uses the experiential learning process to provide hands-on agricultural learning for students while building leadership skills.

An Opportunity for Partnership

Two exceptions to the elementary agricultural education school-based agricultural education three-component model exclude FFA and SAE. Georgia high school and middle school teachers are on state-funded extended day and extended year contracts from the state to work with FFA members after school and during the summer. Most Georgia high school and middle school agricultural education teachers are on a twelve-month contract. Some elementary teachers may have a local supplement since many have plants and animals that require 365-day care.

While each elementary agricultural education grade level course includes leadership standards; EAE programs are encouraged to create an agricultural or environmental club for additional leadership opportunities. Since FFA is not offered in Georgia below the sixth grade, Georgia EAE teachers are also encouraged to partner with local extension offices to use the 4-H club experience as part of the EAE program. Georgia 4-H works in every county in Georgia to develop 4-H programs. Georgia 4-H membership is open to students in fourth through twelfth grades. Some counties offer pre-club opportunities to students below the fourth grade.

The 4-H club experience is a natural fit and complements the elementary agricultural education program in Georgia. “Learn by Doing” is a 4-H slogan (4-H, 2023, para. 3); which is very similar to the FFA motto “Learning to Do, Doing to Learn, Earning to Live, Living to Serve” (National FFA Organization, 2023, para. 3). 4-H and FFA have many common goals and interests. 4-H has developed a STEM curriculum for 4-H members to use in schools and at home, which is also an option for elementary agricultural education teachers to use in the classroom.

Georgia Farm Bureau is a partner with Georgia Agricultural Education and Georgia 4-H. They work through the Foundation of Agriculture to promote agricultural education at every level through both programs. Georgia Farm Bureau has led the elementary agricultural platform in Georgia through the Agriculture in the Classroom (AIC) program for years (Georgia Farm Bureau, 2023). The AIC trains volunteers who are ready and willing to visit and assist all elementary school teachers, but especially eager to assist elementary agricultural education teachers. The National Agriculture in the Classroom has a national matrix of agricultural lesson plans designed specifically for students in kindergarten through eighth grades (National Agriculture in the Classroom, 2023).

Lauren Goble, Georgia Farm Bureau, Agriculture in the Classroom Coordinator partnered with Dr. Jason Peake, with the Agricultural Leadership Education and Communication Department at the University of Georgia to offer trainings and workshops for EAE teachers as part of a grant initiative from Dr. Peake. Local Farm Bureau offices offer grants for EAE to attend the National Agriculture in the Classroom conference each year since the pilot program began. Georgia EAE teachers presented and won awards at the National AIC conference.

Another partnership that helps EAE teachers connect agricultural products to foods is the partnership and continued support from the Georgia Department of Agriculture and the Georgia Department of Education through Georgia Farm to School, Georgia Organics, and Georgia DOE Nutrition Education. These groups work together to provide educational content relevant to all grade levels. Kelly Toon, Georgia DOE, Academic Nutrition and Support Manager, works jointly with the Georgia Department of Agriculture to include Georgia Grown products in school nutrition programs. Mrs. Toon works with these groups to offer a complete educational food experience that works well with the elementary agricultural education classroom; that follows

students from the classroom & garden to the lunchroom. Many of the Georgia EAE programs are growing lettuce and other food products for the school food programs.

Purpose of the Study

Statement of the Problem

The 2018 Senate Bill 330 included specific wording that at the end of the three-year pilot program, the Georgia Department of Education would provide a program evaluation regarding the impact and success of the pilot program to the House Committee on Agriculture and Consumer Affairs, the Senate Agriculture and Consumer Affairs Committee, the House Committee on Education, and the Senate Education and Youth Committee (Wilkinson, et.al, 2018). This study includes the information gathered from pilot programs to present the findings to the review committee.

Furthermore, since the elementary agricultural education program is still a relatively new concept in public education, more research is needed to understand all program component needs. Elementary agricultural education is based on the school-based model of the three-component model of agricultural education. The three-component model is heavily influenced by experiential learning. Little research exists on the impact and success of elementary agricultural education. This study includes a study of Georgia Fifth Grade Science Milestones to the year before the pilot program, pilot program years (excluding the 2019-2020 school year due to COVID-19); and the year following the pilot program.

Purpose and Objectives

The purpose of this study is to examine the Georgia elementary agricultural education pilot program by collecting and reviewing descriptive data; as well as a statistical analysis of Georgia Milestones Fifth Grade End of Grade assessments comparing schools that are in the

pilot program to schools that do not offer elementary agricultural education. The descriptive data contains key components of the elementary agricultural education pilot program to form a summary report of the Georgia elementary agricultural education (EAE) pilot program (2019-2020, 2020-2021, and 2021-2022). At the end of the third year, per program requirements set in Senate Bill 330, this researcher as part of the Georgia Agricultural Education state staff collected information from elementary agricultural education teachers in the pilot program to share with Georgia legislators with program updates. The descriptive data is utilized in the legislative summary report required as part of Senate Bill 330. This researcher received prior Institutional Review Board (IRB) approval to also use the information collected in research as part of the Murray State Educational Doctorate program.

The following objectives will be identified to fulfill the purpose of this study.

1. Determine enrollment per grade for each year during the EAE pilot program.
2. Determine class schedules for each year of the EAE Pilot program.
3. Determine the certification type of Georgia elementary agricultural educators during the pilot program.
4. Determine whether specialized facilities are available at EAE pilot programs.
5. Determine if Georgia Milestones scores for fifth graders in schools that were in the EAE pilot program are higher than fifth graders from non-EAE schools.

Theoretical/Conceptual Framework Guiding Research

This study offers significance in terms of essential descriptive data regarding the Georgia elementary agricultural education program; as well as a significant study into the impact of elementary agricultural education on students' success in science assessments. The descriptive data in this study is important to illustrate program growth, school information, teacher certification, and other program components. This study can be instrumental to other states developing elementary agricultural education programs.

The significance of this study in terms of the statistical analysis may help improve the perception that agricultural education provides important agricultural concepts and improves academic rigor in other content areas. This study may be used to help advocate for more elementary agricultural education programs. This program may also help encourage more instructional resources for elementary agricultural teachers that help teach more scientific concepts in the agricultural education classroom at all levels.

Limitations

The Georgia Elementary Agricultural Education pilot program ran 2019-2020, 2020-2021 and 2021-2022. The first year of the pilot program fell during the COVID-19 school year. All Georgia schools closed the second week of March. Some schools were not able to offer EAE after COVID-19. The State of Georgia waived all Georgia Milestones testing for the 2019-2020 school year, so this leaves a gap in research for this study.

Research Questions and Hypothesis

Research Questions

Research Question 1: Is there a significant difference in the mean (M) between end-of-grade science assessments between schools that offered elementary agricultural education and schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years?

Research Question 2: Is there a significant difference in the mean (M) between end-of-grade science assessments between Title I schools that offered elementary agricultural education and Title I schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021 and 2021-2022 school years?

Hypothesis

H=A school that offers elementary agricultural education will score higher on Georgia Milestone Fifth Grade Science Assessments than elementary schools that do not offer elementary agricultural education.

H_0=There is no significant difference in elementary agricultural education student scores than non-agricultural education students on the Georgia Milestone Fifth Grade Science assessments.

Significance of this Study

This study is important to serve as a historical record of the descriptive information from the Georgia Elementary Agricultural Education Pilot Program. The descriptive information shows student enrollment, program growth, teacher certification, and specialized facilities during the specific time during the pilot program. As the researcher learned in this study, agricultural education in elementary school-aged students is not a new concept and one that has been highly

advocated for in many ways. However, this program is the first to be formally adopted in public education with standalone courses in agricultural education in Kindergarten through Fifth Grades.

While the descriptive data is certainly important, studying the academic impact of elementary agricultural education on a school and students' success is equally important. Agricultural education provides hands-on learning opportunities in agricultural content areas that naturally involve and connect easily to science content. This study provides an opportunity to measure the impact of EAE in the science assessments compared to schools that did not offer EAE. Studying Georgia Milestones assessment scores for fifth-grade students in the Georgia EAE pilot program can be useful to see if the EAE programs had a positive impact on science concepts and understanding.

Definitions

Agricultural Education – the systematic program of instruction available to students desiring to learn about the science, business, and technology of plant and animal production and/or about the environmental and natural resources systems ((National FFA Organization, 2023).

Elementary Agricultural Education – a systematic program of instruction available to students in elementary schools to learn about food, nutrition, animal science, plant science, agricultural business, natural resources, engineering, and leadership development.

End of Course (EOC) – Georgia offers EOC summative assessment for high school students completing American Literature and Composition, Algebra, Biology, and U.S. History.

End of Grade (EOG) – Georgia offers end-of-grade assessments for all public students beginning in Third Grade through Eighth Grades; required EOG subject areas may vary by year.

Typically, English and Language Arts (ELA) and Math EOG Milestones are required in third through eighth grades (except 2020 due to COVID-19); Science and Social Studies are given fifth grade through eighth grade.

Experiential Learning – allows students to learn through hands-on application of content studied in the classroom, this allows students to connect what they are learning to life outside the classroom to deepen their educational learning knowledge.

Georgia Elementary Agricultural Education Pilot Program – the Ga EAE pilot program is a result of the 2018 Senate Bill 330 which allowed the creation of pilot programs within elementary schools to teach agricultural education (Wilkinson, et al., 2018).

Georgia Milestones Assessment System – assessment system developed and administered by Georgia's Department of Education. Georgia Milestones Assessment offers different levels of assessments for different age levels; high school students take End of Course (EOC), whereas elementary and middle school students take End of Grade (EOG) assessments through Georgia Milestones. Georgia Milestones data is collected as a school and as a system and is published each year by the Georgia Department of Education (Georgia Department of Education, 2023).

Georgia Young Farmer Association – GYFA - The Georgia Young Farmer program is the adult education component of Georgia's Agricultural Education program. County Young Farmer Programs conduct educational seminars on everything from agricultural technology to legislative issues affecting agriculture. The local advisor plays an instrumental role in providing these opportunities and assisting farmers in the community. Georgia Young Farmer Teachers provide instruction through organized classes on everything from new farming techniques, risk management strategies, water management, and agricultural awareness to legislative issues

affecting agriculture. Providing on-site technical assistance is a strong part of the GYFA program (Georgia Agricultural Education, 2023).

House Bill 1303 – an important historical bill to Georgia's agricultural education history passed in 2022. This bill was a follow-up bill to SB330, which removed the pilot program status from the elementary agricultural education program; which made the elementary agricultural education program a permanent option for any elementary school in the state of Georgia.

School-based agricultural education - Through agricultural education, students are provided opportunities for leadership development, personal growth, and career success. Agricultural education instruction is delivered through three major components: Classroom/Laboratory instruction (contextual learning), Supervised Agricultural Experience programs (work-based learning), Student leadership organizations (National FFA Organization, National Young Farmer Educational Association, and National Post-secondary Agricultural Student Organization) (National FFA Organization, 2023).

Senate Bill 330 (SB330) – a historically important bill to Georgia agricultural education passed in 2018. This bill created a state law that includes the three-component model formally as a part of state law for Georgia's agricultural education programs; this bill also created an elementary agricultural education pilot program for the school years, 2019-2020, 2020-2021, and 2021-2022 (Wilkinson, et al., 2018).

Three-Component Model – a visual display of the school-Based Model of agricultural education, illustrating three distinct circles for Classroom/Lab Instruction, SAE, and FFA/Leadership Development; where circles overlap in the center, showing each circle is equally important but dependent on each other.

Title I Schools – is a federal funded program that helps students, teachers, and parents in elementary, middle, and high school. Title I money is distributed to schools based on the number of low-income students in each district. Title I provides additional funding to provide added educational services to assist students in need of further educational services (Georgia Department of Education, 2015).

Chapter II

Literature Review

Introduction

The purpose of this chapter is to offer a review of the literature related to elementary agricultural education. This literature review will focus on the importance of agricultural education in elementary students. The review is organized into the following segments: (1) Introduction; (2) History of Elementary Agricultural Education; (3) Georgia Agricultural Education; (4) Rationale for Agriculture in Elementary Curriculum; (5) Related Elementary School Programs; (6) Barriers to Agricultural Education Elementary School Programs; and (7) Summary.

History of Elementary Agricultural Education

The importance of teaching agricultural education to all elementary grade levels has been a topic of discussion since the 1700s and 1800s history of the United States. Mr. Alfred True, supported elementary agricultural education in the *History of Agricultural Education in the United States, 1785-1925* (True, 1929). This report emphasizes the passion of early agricultural education supporters for extension and public education programs, “The great awakening of public interest in the teaching of agriculture in the colleges which occurred about 1900 led to an active demand that this subject be taught in the elementary as well as in the secondary schools” (True, 1929, p. 389) . Mr. True refers to a speech by George T. Powell in 1893 where he “made a plea for interesting children in nature study as a first step toward instructing them in agriculture” (True, 1929, p. 384). Mr. True also referenced the Smith-Hughes legislation for helping “stimulated more interest in the elementary instruction” (True, 1929, p. 395).

There is a good deal of research from the early 1900s on the inclusion of agricultural education in public schools. True (1929) reported “in 1915 the teaching of agriculture in public rural elementary schools was required in 22 states” (True, 1929, p. 392). “The states were Alabama, Arkansas, California, Florida, Georgia, Indiana, Iowa, Louisiana, Michigan, Mississippi, Missouri, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Tennessee, Texas, West Virginia, Wisconsin, and Wyoming” (Hillison, 1998, p. 11). Hillison used his research to closely examine the curriculum, projects, uses of nature-study, and types of training for elementary agricultural education teachers, and to use the research to help determine the concepts for the Agriculture in the Classroom program (Hillison, 1998).

Hillison (1998) found evidence of the elementary agricultural education curriculum from Arkansas from the early 1900s. Hillison shared that the Arkansas Department of Education offered a uniform approach to elementary agricultural education. They divided elementary students into four different divisions; the first division included primary and first grades; the second division included second, third, and fourth grades; the third division included students in fifth and sixth grades; while the fourth division included students in seventh through twelfth grades (Hillison, 1998). The Arkansas curriculum also included specific topics for each division.

> Specific examples included suggesting that primary and first-grade students study parts of plants such as roots, stems, and branches. Students at this age could study birds and pets to fit the animal theme. The study recommended that second-division students study the functions of plant parts and learn the uses of specific animals such as poultry, meat, and feathers. Third-division students could conduct experiments in growing cuttings in water and sand as well as classifying the uses of horses, cattle, sheep, hogs, and goats.

> Fourth-division students should have more depth on the same topics of study than the first three division students (Hillison, 1998, p. 12).

Hillison (1998) also cited a publication for elementary schools from the Virginia Department of Public Instruction and the Virginia Agricultural and Mechanical College. The Virginia document included similar topics following the similar topic concentration per division as the Arkansas document. The Virginia elementary agricultural education document included lessons in a monthly sequence plan; so that teachers would have practical classwork promptly while teaching content relevant to seasons, allowing students to work on community farms. Virginia teachers were encouraged to secure technical references and publications to help the teacher build relevant agriculture content (Hillison, 1998).

Hillison (1998) also shared research from the early 1900s where the topic of urban vs rural instruction was discussed, and best practices to include agricultural education in each model. This could have led to the differentiation in state-led legislation where Elementary Agricultural Education (EAE) was required in rural areas and not in all urban areas. Hillison's research also included specific examples of projects from each division or grade level used in the early EAE classroom; which included integrating agriculture into academic courses, hands-on projects with nature and agricultural products, where students learned to classify, count, organize, observe, measure, draw conclusions as well as public speaking (Hillison, 1998).

Hillison (1998) found evidence that EAE programs in the early 1900s were encouraged to have a school garden and include nature for all grade levels. EAE programs were recommended to have a Tomato Club. Students in the Tomato Club would sow seeds, make drawings of their gardens, and use mathematical equations to determine seed population and crop yield. Non-

Tomato club members were suggested to grow their small garden plots at home or school (Hillison, 1998).

Nature study is a commonly recommended topic in elementary agricultural education curricula dating back to the earliest references of elementary agricultural education. Cornell University supported the content of nature in early education, by publishing a 600-page document with nature-study documents for elementary schools in the early 1900s. It appears through readings in the early 1900s that some elementary agricultural education programs became more focused on nature-only programs. The sole focus on nature only instead of a full picture of agriculture caused concerns among agricultural education supporters leading up to the Smith-Hughes Act and after (Hillison, 1998).

With the passage of the Smith-Hughes Act, Garland Bricker warned caution of a need to "define its boundaries and lay down fundamental principles as to what should be, both in content and extent" (Bricker, 1911, p. 1). Bricker (1929) included in his Preface the need for "pedagogical principles" for high school agriculture education (Bricker, 1911, p. viii). He also states "a considerable amount has been written on the methods of teaching nature study in the elementary school," but cited the need for content on teaching methods and curriculum for high school agricultural education (Bricker, 1911, p. viii). Garland Bricker expressed concerns about nature-only elementary teachers becoming high school agricultural education teachers. He also warned science-only teachers teaching agriculture and not to teach agricultural education as any science class, without fully including agriculture content and application. Hillison summarized Bricker's comments that he emphasized the importance of remembering that "agriculture had an economic base and that nature-study did not" (Bricker, 1911), (Hillison, 1998, p. 16).

The Smith-Hughes Act of 1917 legally allowed an avenue for agricultural education in public schools (Texas FFA, n.d.). “Seldom has any segment of the political scene at the Federal level witnessed a coalition as diverse and as successful as the one that supported the Smith-Hughes Act” (Hillison, 1995, p. 10). Support for agricultural education is found in the foundations of the Land Grant Acts to “promote the development of agriculture” (St. John, et al., 2018, p. 22). Support and funding for agricultural education is found in history through early agricultural programs to support agricultural education and research like the work of Alfred True, and agricultural legislation like the Smith-Hughes Act and the Land Grant Acts help support economic stability through science and research (St. John, et al., 2018).

Georgia Agricultural Education

Since the passage of the Smith-Hughes Act of 1917, school-based agricultural education (SBAE) predominantly consisted of high school programs. However, since the 1980s, middle school agricultural education programs have increased throughout the United States. Georgia reported 152 middle school agricultural education programs for the 2022-2023 school year (Georgia Agricultural Education, 2023). While high school agricultural education curriculum consists of specific courses within different pathways. Georgia offers 34 different Agricultural Food and Natural Resources (AFNR) pathways that allow students to choose two courses to take with the foundational agricultural education course (Basic Agricultural Science) in a concentrated content area (Georgia Agricultural Education, 2023). The high school curriculum is designed to allow students to become more proficient in focused agricultural topics. Whereas, the middle and elementary agricultural education programs in Georgia are designed to be exploratory (Georgia Department of Education, 2023).

The Georgia elementary agricultural education program includes three distinct components specified in Georgia 2018 Senate Bill 330 (SB 330) and Georgia 2021 House Bill 1303 (HB1303) which include classroom/laboratory, experiential learning, and leadership development (Wilkinson, et al., 2018); (Dickey, et al., 2022). School-based Agricultural Education (SBAE) model of instruction is based on the three-component model, which includes classroom/laboratory, Supervised Agricultural Education (SAE), and Leadership Development (FFA) (National FFA Organization, 2023). The National FFA is an intra-curricular part of SBAE. While FFA is not offered to elementary school students yet in Georgia, the Georgia elementary agricultural education is based on the same SBAE three-component model.

Georgia is the first state to formally offer elementary agricultural education in public education. When the 2018 Senate Bill 330 passed, Georgia had no elementary agricultural education courses or standards, and there were no formal public education courses or standards in any other state to reference for the courses. A Delphi study was conducted at the University of Georgia in the summer of 2018. This Delphi study led by Dr. Jason Peake included a mix of sixteen agricultural professionals and educators. The study's focus was to determine a list of possible topics to include in an elementary agricultural education curriculum (Peak, et al., 2020). The Delphi study resulted in 52 topics for consideration for elementary agricultural education curriculum standards.

The 2018 Georgia Senate Bill 330 included specific instruction on curriculum development through the Georgia Department of Education (DOE) agricultural education staff and representatives of local elementary agricultural education programs (Wilkinson, et al., 2018). The Georgia Agricultural Education state staff composed a curriculum writing committee in the fall of 2018. The elementary agricultural education curriculum writing committee, per Georgia

DOE requirements, was composed of a mix of elementary agricultural education teachers, secondary agricultural education teachers, as well as business and industry representatives (Wilkinson, et al., 2018).

The Georgia elementary agricultural education writing committee reviewed the findings from the Peake Delphi study from UGA (Peake, et al., 2020). The elementary agricultural education curriculum writing committee met several times throughout the 2018-2019 school year to develop courses and write curriculum standards for the Georgia elementary agricultural education program. The committee developed an elementary agricultural education course for each elementary grade level, Kindergarten, First, Second, Third, Fourth, and Fifth grade. Each grade level includes standards in four major concentration areas: Foundations of Agriculture, Agricultural Systems, Natural Resources and Management, and Leadership and Career Readiness. Each course also includes at least one employability skill standard that is a requirement of Georgia DOE for CTAE courses.

The secondary SBAE three-component model is similar to the elementary components of classroom/lab work, leadership development, and experiential learning, without the specific wording of SAE and FFA. However, there is some mention of FFA in the curriculum standards, as elementary agricultural education is part of Agricultural Education and FFA is an intra-curricular part of secondary SBAE (Georgia Agricultural Education, 2023). The FFA motto "Learning to Do, Doing to Learn, Earning to Live, Living to Serve" is included in the elementary agricultural education standards (National FFA Organization, 2023, para. 3). Some elementary agricultural education programs partner with their local UGA Extension office to include 4-H in the elementary agricultural education classroom. "4-H is delivered by Cooperative Extension—a

community of more than 100 public universities across the nation that provides experiences where young people learn by doing" (4-H, 2023, para. 1).

In 1988, the National Research Council's Committee on Agriculture Education in Secondary Schools advocated for "systemic instruction" in agriculture for all primary and secondary public education students (Committee on Agricultural Education in Secondary Schools, 1988, p. 2). This committee also recommended incorporating agriculture in core subjects like science for "applied learning" (Committee on Agricultural Education in Secondary Schools, 1988, p. 47). Even though agricultural education courses were not officially offered in elementary agricultural education, teachers taught core subjects like science through agricultural concepts since the early 1900s (Adelhardt, 2006).

The 2018 Georgia Senate Bill 330 introduced state legislation to make the three-component-model part of Georgia State law, as well as introduce a pilot program for elementary agricultural education (Wilkinson, et al., 2018). Senate Bill 330 included instructions for the Ga DOE to share a report with an update of the elementary agricultural education pilot program with the State legislature at the end of the third year of the program (the 2020-2021 school year). The data collected for the legislature is shared in this report. Following the data that was shared with the state legislature in the spring of 2021, Representatives Robert Dickey & Terry England as well as several others from the House of Representatives, introduced and passed a new bill, 2021 Georgia House Bill 1303, to remove the "Pilot Program" wording, allowing the elementary agricultural education program to become a permanent component of Georgia Department of Education course offerings (Dickey, et al., 2022, para. 2).

The Rationale for Agriculture in The Elementary Curriculum

Agriculture is a major industry in Georgia, contributing billions of dollars to the state economy, and leading the nation in eggs and poultry (Flatt, 2004). “In 2018, food and fiber production and related industries represented $76 billion in output to Georgia’s $1.07 trillion economy and more than 399,200 jobs in the economy” (AgSnapshots 2020, 2023, p. 2). “Agriculture is Georgia’s oldest and largest industry” (Georgia Farm Bureau, 2023, para. 10). While agriculture is a big business in Georgia and the United States, our population is growing while the number of people returning to the farm is decreasing. We need to teach people about the importance of agriculture for our future generations. “The global population is expected to increase by 2.2 billion by 2050, which means the world’s farmers will have to grow about 70% more food than what is now produced” (American Farm Bureau Federation, 2023, para. 14). In addition, the average Georgia farmer is 58 years old; while most students are “3 to 4 generations removed from the family farm” (Why ag? The state of agriculture in Georgia, 2020, para. 1).

The Agricultural Education Mission "Agricultural education prepares students for successful careers and a lifetime of informed choices in the global agriculture, food, fiber, and natural resources systems” (National FFA Organization, 2023, para. 1). While ensuring the current and future generations learn about agriculture in agricultural education is important, demographics have recently changed in agricultural education in Georgia (Georgia Agricultural Education, 2023). Since Senate Bill 330, Georgia has experienced growth in high school, middle, and elementary agricultural education programs in urban areas where programs have not existed for almost 20 years.

One of the possible reasons for the growth in urban areas is food deserts. Community members, educators, and even legislators in food desert areas are leading supporters of

elementary agricultural education. A food desert is an area where people have restricted access to fresh, healthy & reasonably priced food, specifically fruits & vegetables. “Many factors contribute to the presence of food deserts today, such as the traveling distance necessary to find healthy food options, having a low income, or a lack of transportation” (Daniels, 2020, para. 3).

> The United States Department of Agriculture (USDA) defines low-income tracts in which a substantial number or proportion of the population has low access to supermarkets or large grocery stores. Low-income tracts are characterized by either a poverty rate equal to or greater than 20 percent, or a median family income that is 80 percent or less of the metropolitan area’s median family income (for tracts in metropolitan areas) or the statewide median family income (for tracts in nonmetropolitan areas) (Dutko, et al., 2012, p. 5).

Senator Raphael Warnock and State Representative Mandisha Thomas, who represent constituents in Atlanta urban-based areas, both ran on agricultural platforms (Warnock for Georgia, 2023); (Mandisha A. Thomas: District 65 Representative, 2023). Representative Mandisha Thomas started working on agricultural issues as soon as she was elected (Mandisha A. Thomas: District 65 Representative, 2023). She serves on the House Agriculture and Consumer Affairs Committee, where she advocates for agricultural literacy, agricultural education, and all agricultural issues in her district. She has been an active supporter of the Fulton County (Atlanta area) Young Farmer Chapter. The Fulton County Young Farmer Chapter is the first urban-based Young Farmer chapter in the Atlanta area. Young Farmer teachers teach one high school agricultural education class per day, then work with community agriculturists and farmers the rest of the day (Georgia Agricultural Education, 2023). The Georgia Young Farmer program is the adult education component of Georgia's Agricultural Education program

(Thomas, 2021). Fulton County offers all levels of agricultural education from kindergarten to adults, including three elementary agricultural education programs. Representative Thomas encourages her constituents to be involved in agriculture issues, “We are urban, suburban and rural with the highest potential to be at the forefront of agriculture” (Thomas, 2022).

Georgia has “almost 19% of the state’s population lives in areas that lack access to affordable fruits, vegetables, whole grains, dairy products, and other foods that make up the full range of a healthy diet” (Daniels, 2020, para. 8). The design of elementary agricultural education allows all students in an elementary school to learn about agriculture and gain access to seeing how their food is grown. The elementary agricultural education program can help change the Food Deserts in rural and urban communities.

The passing of the 2018 Georgia Senate Bill 330 was the first official legislation to create agricultural education courses for elementary grades (Wilkinson, et al., 2018). However, even though this is the first official formal elementary agricultural education program in the country, educators and agricultural enthusiasts have worked to include agricultural concepts for elementary students. Agriculture is a great applied option for teaching science (Adelhardt, 2006). The heavy emphasis on STEM (Science, Technology, Engineering and Math) has opened the door for more hands-on agricultural learning. While these courses are not taught by an agricultural education teacher and the primary focus may not be to educate about agriculture, students may still be exposed to agricultural principles and products in a STEM environment (Vallera & Bodzin, 2019).

Agriculture has been a welcome component for many elementary & secondary teachers in a science classroom. As teachers are under more stress to teach more material and meet testing requirements, agriculture allows for a relatable hands-on method for applied learning of science

principles. “Teaching science through agriculture would incorporate more agriculture into curricula, while more effectively teaching science” (Committee on Agricultural Education in Secondary Schools, 1988, p. 11). However, while agriculture is a great tool to incorporate core subjects to give more students a stronger science understanding, this may not truly meet the goal of educating students about agriculture. In Adelhart’s study (2006) he found in 1988, as part of the National Research Council’s Committee on Agriculture Education in Secondary Schools recommended that to achieve agricultural literacy, agriculture education must change…

> `Beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture,’ the report states. ‘Agriculture is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies’ (Committee on Agricultural Education in Secondary Schools, 1988); (Adelhardt, 2006, p. 20).

The Committee on Agricultural Education, 1988, further emphasized the importance of agricultural education and agricultural literacy with a study that found “Most Americans know very little about agriculture, its social and economic significance in the United States, and particularly, its links to human health and environmental quality” (Committee on Agricultural Education in Secondary Schools, 1988, p. 9). This report also pointed out that while agricultural education as an elective in middle and high school is great, it is not enough to reach all students. The report mentioned that “Only a small percentage of students enroll in these programs. Consequently, most high school students have limited or no access to vocational agriculture or agricultural literacy programs. Minority students in urban schools have the least access to these programs” (Committee on Agricultural Education in Secondary Schools, 1988, p. 33).

The Committee on Agricultural Education, 1988, suggested agricultural education be incorporated into other core subjects. The reason was that academic teachers may be stressed teaching a subject out of field, like agriculture (Committee on Agricultural Education in Secondary Schools, 1988). However, Knobloch (2008) found that "teachers' perceptions of the educational benefits and fit within academic content areas are more important factors than their views and attitudes of the careers and industry connected to an enrichment program when teachers choose to adopt and integrate topics and activities that would enrich student learning in their classrooms (Knobloch, 2008, p. 329). While some teachers may welcome using agriculture in the classroom, some teachers may not feel comfortable incorporating a different subject level or a topic they are not familiar with into their curriculum.

Georgia Career Technical and Agricultural Education (CTAE) graduation rate is higher than the overall state graduation rate. In 2021, Georgia CTAE reported a 97.18% graduation rate for students involved in CTAE, whereas the overall state graduation reported rate was "13.38 percentage points, underscoring the relevance and effectiveness of CTAE opportunities" (Frick, 2021, para. 2). Githua and Ricketts (2020) studied the "effects of agricultural education, FFA involvement, and SAE participation on the mathematics performance of secondary students" (Githua & Ricketts, 2020, p. 1). Their study found that agricultural education students had a higher mathematics "mean score (M=12.15, SD=4.61)" than nonagricultural education students "(M=10.67, SD=3.63)" (Githua & Ricketts, 2020, p. 10).

The Githua and Ricketts (2020) study was partly founded on the Third International Mathematics and Science Study, which shows United States students ranking lower in science and math in key grades, like fourth, eighth, and twelfth grades (Institute of Education Sciences: National Center for Education Statistics, 2019). In the 2011 Trends in International Mathematics

and Science Study (TIMMS), Chapter eight considers Classroom Instruction, where they share that students are more successful in subjects when they have a positive attitude, are intrinsically motivated, and enjoy the subject. Mullis et al. (2012) suggest "effective classroom environment for mathematics learning involves using a variety of instructional approaches, capitalizing on technology, and at the eighth grade, extending instruction with homework and regularly assessing student progress" (Mullis, et al., 2012, p. 340). Githua and Ricketts (2020) shared other research connecting students' success when mathematics was connected to real-life situations and problems. Researchers summarized that agricultural education students are allowed to connect math with real-life problems and use math in applied situations (Githua & Ricketts, 2020).

The National Academies of Science, Engineering, and Medicine (2018) guide readers to develop a deeper appreciation for understanding how students are motivated and how student's motivation can have a significant impact on the education process. A student's motivation level can be significantly impacted by how welcome they feel in the classroom and if they identify with the teacher and other students. This text guides teachers to more insight on different education learning methods on how they impact the student in the classroom (The National Academies of Science, Engineering, and Medicine, 2018). SBAE and elementary agricultural education classrooms have a unique opportunity to connect with students in agriculture, something that all people have a connection to daily – where their food comes from.

Bailey (2021) completed a Borich needs assessment of Georgia elementary agricultural education teachers during the second year of the pilot program to "determine demographics, in-service needs, and perceptions regarding suitability of current Georgia state standards" (Bailey, 2021, p. 1); (Borich, 1980). Bailey found that most elementary agricultural education teachers

were female, average of 41.75 years old, and were certified in agricultural education through an undergraduate program. Bailey also referenced several other authors who support teaching agriculture in elementary and the importance of agricultural literacy (Bailey, 2021).

Integrating agriculture in academic classrooms has been a theme dating back to the early days of the report from Mr. Alfred True (True, 1929); and continued through agricultural literacy efforts to find methods for academic teachers to use agriculture to teach core academic concepts (National Agriculture in the Classroom, 2023). Agriculture is known to be welcomed by many educators; however, research shows many educators' willingness to teach about agriculture is highly dependent on many factors, one of which is the comfort and knowledge level of agricultural content (Knobloch, 2008). Bellah and Dyer (2006) looked at the attitudes and stages of concern in elementary teachers regarding teaching agriculture in an academic classroom; the group of teachers they surveyed took a specific course *"Organizing and Teaching K-6 Standards and Awareness in Agricultural Literacy"* (Bellah & Dyer, 2006, p. 16).

Even after completing the course, which gave them tools and knowledge to help implement agricultural literacy into their classrooms, only 22% of the teachers answered "Yes, I am teaching agriculture using the agricultural literacy curriculum package"; 25% reported not using the agricultural literacy curriculum, but integrating agriculture into their lessons in other ways; and 38.9% reported not using agriculture in their classroom (Bellah & Dyer, 2006, p. 18). Bellah and Dyer (2006) used the concerns-based adoption model (CBAM) to measure teachers' perceptions towards implementing the agricultural literacy curriculum in their study. This study further emphasizes the importance of agricultural content training for elementary teachers, especially elementary agricultural education teachers. This study also further illustrates that

while it is great to offer agricultural literacy lessons, this may not be the most effective option for teaching agricultural education in elementary school.

In a study with 407 elementary teachers, Burrows, et al. (2020) utilized a quantitative descriptive study, where they found "elementary grade teachers perceive agriculture education as important and they would be interested in learning more about incorporating it into their curriculum," even though most of the teachers surveyed were not currently incorporating agriculture into their curriculum (Burrows, et al., 2020, p. 358). Burrows et. al research is strongly based on the Stages of Concern framework, where they consider different levels (Unrelated: Stage 0-Awareness; Self: Stage 1-Informational, Stage 2-Personal; Task: Stage 3-Management; Impact: Stage 4-Consequences, Stage 5-Collaboration, Stage 6-Refocusing) (Burrows, et al., 2020, p. 360).

Researchers found that teachers who had previous knowledge about agricultural literacy, but had no formal training in how to teach the material, were lower in the stages of concern; and they found that teachers who had prior knowledge and were competent in teaching the material were higher in stages of concern (Burrows, et al., 2020). The researchers suggest different factors to help influence teachers to help them move up in the six-stage model to be more competent in teaching and including agriculture in their curriculum. Suggestions include improving the ease and accessibility of resources, agriculture professional development for elementary teachers, teaching about the importance of agriculture, and connecting agriculture to other subjects.

In this study, "93.4% of respondents indicated they had not ever used AITC [Agriculture in the Classroom] materials" (Burrows, et al., 2020, p. 364). O a Likert-type scale, the researchers found that 41% of the respondents would strongly agree to be interested in "receiving free curriculum to use in my classroom" (Burrows, et al., 2020, p. 365). The recommendation

from this research is to enhance marketing efforts from AITC to market to elementary teachers, so they are more aware of agriculture resources available for them to use in their academic classrooms (Burrows, et al., 2020).

In a study on "*The benefits of teaching and learning about agriculture in elementary and junior high schools*," Knobloch et.al. (2007) studied 452 teachers in Illinois public schools (Knobloch, et al., 2007). The theoretical framework is based on the concept that,

> teachers are more likely to integrate agriculture in public education if they believe: (a) they have the abilities and knowledge to teach agricultural content, (b) integration will help them achieve teaching and learning goals, and (c) the benefits outweigh the costs of integrating agricultural topics into existing content areas of an often over-crowded curriculum (Knobloch, et al., 2007, p. 26).

"Situatedness" and "instructional resources" were common themes in their first open-ended question, "What is the most beneficial thing you teach about agriculture?" (Knobloch, et al., 2007, p.25-26). Most teachers in the study were not comfortable teaching agriculture topics if they lacked the content knowledge, so the instructional resources were essential. The second open-ended question in the study, "What do your students benefit the most from learning about agriculture," leads to themes of "connectedness and authenticity" (Knobloch, et al., 2007, p. 29). Most teachers who taught about agriculture in their classroom liked that agriculture brought a sense of connection to their local home and community and the agricultural products grown in their area or connected to the students.

Likewise, the teachers shared that teaching about agriculture in their classrooms gave students a chance for hands-on, interactive learning that guided students to a more authentic learning environment. The third question, "What would you like to know more about in

agriculture?" resulted in "topics and resources" as themes for the study (Knobloch, et al., 2007, p. 27). Teachers shared specific agriculture topics needed to deepen content knowledge; teachers also asked for more specific resources, including curriculum units, lesson plans, resources for hands-on activities, and field trip ideas (Knobloch, et al., 2007).

Related Elementary School Programs

National Agriculture in the Classroom (NAIC)

The National Agriculture in the Classroom (NAIC) is a program whose mission is very closely related to agricultural education.

> The mission of Agriculture in the Classroom is to 'increase agricultural literacy through K-12 education.' An agriculturally literate person is defined as "one who understands and can communicate the source and value of agriculture as it affects our quality of life (National Agriculture in the Classroom, 2023, para. 3).

The Agricultural Education Mission is "Agricultural education prepares students for successful careers and a lifetime of informed choices in the global agriculture, food, fiber and natural resources systems" (National FFA Organization, 2023, para. 1).

The United States Department of Agriculture started the NAIC program in 1981 (Adelhardt, 2006). In 1982, the Secretary of Agriculture, John R. Block encouraged every state's governor to form a state committee of educational and agricultural leaders to develop a "state agricultural literacy program" (National Agriculture in the Classroom, 2011, p. 1). The NAIC program is currently supported by the National Institute of Food and Agriculture (NIFA) and the United States Department of Agriculture (USDA) (National Agriculture in the Classroom, 2023). NAIC is implemented on the state level through different organizations. Georgia's AIC is included in the Georgia Farm Bureau (Georgia Farm Bureau, 2023). NAIC may have a state

leader in each state, but most of the AIC work is coordinated by local representatives who work closely with the local school systems and teachers to teach agricultural lessons primarily in kindergarten through eighth grades. The NAIC has a large database of K-8 agricultural lessons available at no cost on their public website.

Agricultural Literacy

Kovar and Ball (2013) studied agricultural literacy research published over two decades through a synthesis of the research, since "*The Committee on Agricultural Education*" report in 1988 (Kovar & Ball, 2013, p. 168). The researchers collected, organized, and reviewed 49 published research on agricultural literacy. The researchers found that most research indicated an improvement in agricultural literacy after agricultural literacy efforts. However, some studies were contradictory in their findings. One specific study found that students in rural areas had less agricultural literacy than students in urban and suburban areas. Researchers noted that most agricultural literacy efforts had been more targeted to elementary-age students; and suggested that could lead to skews in data and in long-term agricultural literacy effects. Even though SBAE is available to middle and high school students, not all students are exposed to agriculture, therefore, agricultural literacy efforts may be effective for all groups, rural, urban, and suburban as well as all age groups (Kovar & Ball, 2013).

> An earlier study by Frick, et al. (1991), established eleven agricultural subject areas needed to achieve agricultural literacy. The 11 areas were 1) relationship with the environment, 2) agricultural processing, 3) public policies, 4) relationship with natural resources, 5) animal products, 6) societal significance, 7) plant products, 8) economic impact, 9) agriculture marketing, 10) distribution, and 11) global significance (Frick, et al., 1991), (Kovar & Ball, 2013, p. 174).

Frick, et al. (1991), used a Delphi panel with 100 respondents including a mix of elementary and secondary teachers along with representatives of the agricultural industry (Frick et al., 1991).

Meischen and Trexler (2003) studied agricultural literacy in rural elementary students in fifth grade to determine cognitive agricultural understanding. The researchers started by sharing a working definition of agricultural literacy; they shared different perspectives and goals over time in terms of agricultural literacy. They discuss meanings of literacy in terms of vocabulary ranging from simple recognition to fully being able to use words interchangeably and developing a full understanding of the meaning and knowledge of the topic. Agricultural literacy helps nonagricultural people gain a basic understanding of agricultural products through basic recognition and further develop a full working knowledge of the importance of multifaceted products and the impact of agriculture. "The National Council on Agricultural Education's 1999 report Reinventing Agricultural Education for the Year 2020 began to expand the definition of agricultural literacy by adding conversational literacy about agriculture as a goal" (Meischen & Trexler, 2003, p. 43).

Science, Technology, Engineering and Math (STEM)

The US Federal STEM "Vision for a future where all Americans will have lifelong access to high-quality STEM education and the United States will be the global leader in STEM literacy, innovation, and employment" (WhiteHouse.gov, 2018, para. 4). The best STEM education approach works across disciplines within a school to offer challenging academic concepts to all students to guide them through "real-world" examples where students use STEM to connect to their home, community, school, and world (WhiteHouse.gov, 2018, p. v).

STEM is a related educational program that often includes agriculture to offer project-based learning examples to students. In Georgia, many STEM programs include raised beds, compost bins, nature gardens, butterfly gardens, and chicken coops.

> Agriculture can serve as a unifying and contextualizing topic that connects science, technology, engineering, and mathematics (STEM) subjects through similar knowledge, skills, and attitudes/beliefs (KSABs) exhibited in each. Agriculture can be an integral part of students' primary-level curriculum, providing authentic and relevant material for STEM exploration (Vallera & Bodzin, 2019, p. 419).

Vallera and Bodzin stressed that for a curriculum to be successful, the curriculum must be well organized and not "fragmented" (Vallera & Bodzin, 2019, p. 420). Their research focused on groups of students who were taught well-organized STEM lessons with agriculture and nature principles embedded vs a control group who was only taught STEM curriculum. Their results found that students in the test group were more positive about agriculture vs the control group (Vallera & Bodzin, 2019).

Smith et al., (2015) studied teacher perceptions regarding effective STEM integration practices in the SBAE classroom. "The purpose of this descriptive study was to describe agriculture teachers' perceptions and confidence levels for integrating the four STEM disciplines in agricultural education courses, along with perceptions and use of instructional methods for STEM integration" (Smith, et al., 2015, p. 182). The researchers found that SBAE had high levels of confidence in integrating science and math into the agricultural education classroom and curriculum, but less confidence in terms of implementing engineering and technology. Researchers also found gender preference differences in implementing engineering. The teachers surveyed were the most comfortable with teaching science (Smith, et al., 2015).

Cooperative Extension Program

In Georgia, the Cooperative Extension Program has similar educational goals as agricultural education. The Cooperative Extension has a county office in every county in Georgia. The Cooperative Extension Service offers youth education through 4-H at the local, state, and national levels. “Cooperative Extension has brought the latest agricultural research and education from land-grand universities to farmers and businesses” (University of Georgia Extension, 2023, para. 9). “Since its inception, 4-H has stood behind the idea that youth is the single strongest catalyst for change” (University of Georgia Extension, 2023, para. 5). County 4-H agents work with local schools to visit schools each month. The Georgia 4-H is also home to several camps, that offer youth educational programming.

School Gardens

School Gardens are a great way for schools to incorporate agriculture-applied science concepts for students. Wisconsin’s Department of Public Instruction partnered with the Wisconsin Team Nutrition to provide funding to start a school garden in twelve schools. The schools used the funding to hire a school garden coordinator, purchase gardening supplies, and garden education materials, and purchase food for classroom taste and demonstrations. Some positives highlighted by the Wisconsin Garden Program: “increased science achievement scores, improved life skills, including working in groups and self-understanding, improved nutrition knowledge, increased appreciation and respect for nature…” (Dill & Williams, 2014, p. 1).

Similar to the school garden project in Wisconsin, Thorp and Townsend (2001) completed “an ethnographic study of a school garden” in an elementary school in Michigan. This study focused on one elementary school with five teachers and 40 students (Thorp & Townsend, 2001, p. 347). The researcher used qualitative in-person interviews as well as observation,

documents, and pictures to document this study. The researcher visited a school in a seemingly rural area that was comprised of students from vastly different demographics and backgrounds. Even though the school is in a rural, very few students live in the rural area, students were bused to the school and the school was "underperforming" (Thorp & Townsend, 2001, p. 353). The researcher uses the ethnographic study to tell the story of the positive impacts a garden had on Jonesville School. The garden became a place of connection for teachers and students and a place of celebration and grace (Thorp & Townsend, 2001).

Hands-on / Experiential Learning

All the programs related to elementary agricultural education have a common thread – they all seek to provide hands-on, experiential learning opportunities for students. All good educators know the best way for students to truly learn a concept or material, is to learn it through multiple modes. Some students can comprehend material simply by reading, others by listening, and some after watching a visual demonstration, but all students can deepen that learning process through inquiry-based learning where students are in charge of the learning process, through experiential learning. Roberts studied "experiential learning theory for agricultural educators" through a synthesis of related content on "experiential learning as a process" (Roberts, 2006, p. 17).

Conner, et al. (2014) looked at a flipped classroom approach in agricultural education classroom in a qualitative study at the University of Florida. Their study focused on undergraduate preservice teachers, an agricultural education teaching methods course, where the students were given materials to study and prepare before class. The participants' comments were mixed. Part of the flipped classroom included online videos, quizzes, lessons, etc. Most reviews or comments regarding the online portions were not favorable. However, the

"participants were satisfied with the course and felt that the flipped classroom approach aided their learning of the teaching methods and the teaching and learning principles presented in the teaching methods course" (Conner, et al., 2014, p. 75).

Experiential learning focus has existed in SBAE since the early 1900s. Experiential learning is the basis for the lab work and SAE (Supervised Agricultural Experience) in the SBAE Three-Component Model; and echoed again in the FFA Motto (National FFA Organization, 2023). Experiential learning is common in other programs, student teaching is experiential learning. Roberts refers to John Dewey in his research as "the father of experiential learning;" Dewey outlined five steps of the learning process "(1) a felt difficulty; (2) its location and difficulty; (3) suggestion of possible solution; (4) development by reasoning of the bearings of the suggestion; and (5) further observation and experiment leading to its acceptance or rejection" (Dewey, 1910/1997); (Roberts, 2006, p. 19). Dewey admitted this learning process to being similar to the scientific method; he later emphasized that each of the steps depends on the "experience" of the learner in the previous step (Dewey, 1910/1997); (Roberts, 2006, p. 18).

Roberts (2006) included work from Joplin who "asserted that all learning is experiential" (Roberts, 2006, p. 18) and suggested that experiential learning should have "sufficient 'Support' and 'Feedback' (Joplin, 1981); (Roberts, 2006, p. 21). The researcher also included the work of Kolb, who introduced a "cyclical model for experiential learning in four stages" with the final stage being "active experimentation" (Kolb, 1984); (Roberts, 2006, p. 21). Roberts also shared the themes of the work of Rogers, Parr, and Edwards all shared a similar ideology of experiential learning including problem-solving and inquiry-based (Roberts, 2006). The models may be slightly different in terms of the steps along the way, but they all end with the final step where the student tests a theory through experienced-based learning. Roberts concluded his work by

reminding readers that the learning process is cyclical where the learner goes through different learning steps, which could happen from “seconds to many years” (Roberts, 2006, p. 26).

Barriers to Agricultural Elementary Education School Programs

Funding

One possible barrier to elementary agricultural education programs as compared to secondary agricultural education programs is funding. In Georgia, the base salary for primary and secondary agricultural education teachers is paid through the local systems (Wilkinson, et al., 2018). Most Georgia agricultural education teachers also serve as the FFA Advisor of the FFA chapter, which requires them to work after school every day and work twelve-month contracts to work with FFA members. The extended day and extended year contracts are funded through Perkins funding through the Georgia Department of Education, routed through local school systems to be included in secondary teachers’ monthly pay. Because FFA membership is not currently offered to Georgia elementary agricultural education students, elementary agricultural education teachers are not eligible for extended day and extended year funds. The National FFA voted to offer membership to students in fifth through twelfth grades at the 2022 National FFA Convention (The National FFA Organization, 2023); however, the Georgia FFA Association has not voted to extend membership to fifth grade.

Specialized Facilities

As elementary agricultural education teachers build their programs, they are adding more specialized facilities that require extra daily responsibilities; this can serve as a barrier to some elementary agricultural education teachers or systems. Some elementary agricultural education systems are implementing local supplements to battle this concern. Another barrier to elementary agricultural education is ensuring local systems include elementary agricultural education

teachers in CTAE. Elementary agricultural education is part of the Georgia Agricultural Education program, which is part of the Career, Technical, and Agricultural Education program within the Georgia DOE. Elementary agricultural education teachers are invited to teacher conferences and trainings. GVATA conference attendance is required for Secondary Agricultural Education in Georgia as part of their extended-year contract, however, conference attendance is not required for elementary agricultural education teachers. Some local systems pay for elementary agricultural education teachers to attend conferences, and some systems will not pay for their elementary agricultural education teachers to attend since it is not required.

Teacher Certification

A barrier faced by elementary agricultural education teachers in the pilot program was elementary agricultural education teacher certification. The 2018 Senate Bill 330 is specific in wording that the elementary agricultural education teacher must be certified in Agricultural Education (Wilkinson, et al., 2018). The Georgia Professional Standards Commission (GaPSC) comprised a task force in 2018 to create certification options for elementary agricultural education teachers.

The GaPSC certification stated elementary agricultural education teachers who were elementary certified would have to take the Georgia Assessment for the Certification of Education (GACE) for Agricultural Education and an elementary agricultural education Endorsement (Georgia Professional Standards Commission, 2019). The elementary agricultural education endorsement included elementary education pedagogy and early childhood development content that elementary-certified teachers did not need. The GACE for Ag Ed contains content specific for secondary teachers including FFA, Ag mechanics, wiring, and small

engines, that most elementary agricultural education teachers do not know or need to know to teach elementary agricultural education.

The GaPSC elementary agricultural education task force convened in the spring of 2022 to listen to elementary agricultural education teachers' concerns on certification options. The GaPSC adopted a new certification ruling that allows the Education Preparation Provider (EPP) to discern if an elementary agricultural education endorsement applicant needs both the agricultural content and the early childhood development and pedagogy (Georgia Professional Standards Commission, 2022). The updated ruling also does not require elementary agricultural education teachers to take the GACE for Ag Ed to obtain the elementary agricultural education endorsement.

Because elementary agricultural education is a new concept in Georgia, at the time Senate Bill 330 was passed in 2018, no EPP in Georgia offered a degree option for elementary agricultural education. Abraham Baldwin Agricultural College (ABAC) started an EAE endorsement in 2021 (Abraham Baldwin Agricultural College, 2020). ABAC also started collaboration agreements with Murray State University and the University of Tennessee (UT), Knoxville, where students enrolled in the ABAC EAE courses could receive graduate credit at either university (Abraham Baldwin Agricultural College, n.d.). Since the completion of the pilot program, three EPPs offer degree options in the state for elementary agricultural education, Abraham Baldwin Agricultural College, Emmanuel University, and The University of Georgia (Abraham Baldwin Agricultural College, 2023); (Emmanuel University, 2023); (The University of Georgia, 2023).

Content Knowledge

Teacher's Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) are concerns for all teachers, but especially for elementary agricultural education teachers. Since Georgia is breaking new ground in the education area with formal elementary agricultural education, there is little research or studies on best practices for elementary agricultural education programs, curriculum, or pedagogy for the elementary agricultural education teacher or student. Kleickmann, et.al. (2013) considered teacher's CK and PCK with math teachers comparing different pre-service training as well as in-service training after the teachers started teaching. The research showed an advantage to teachers regarding pre-service training in both CK and PCK, while in-service training was still useful, but it was less impactful on teachers (Kleickmann, et al., 2013).

Bailey (2021) surveyed Georgia Elementary Agricultural Education pilot program teachers' perceptions in 2021 (the second year of the pilot program). Bailey reviewed survey results and found which standards teachers perceived to be more relatable and competent in teaching and which standards should be removed using the Borich Needs Assessment model with mean weighted discrepancy scores (MWDS). Bailey's research can be utilized in reviewing Georgia elementary agricultural education standards.

Teacher Shortage

Another barrier to elementary agricultural education is a shortage of qualified agricultural education teachers. Georgia has experienced a shortage of secondary agricultural education teachers for almost 40 years (Thompson, 2013). One concern in Georgia is that secondary Ag Ed teachers would transfer to elementary agricultural education. Georgia Agricultural Education state staff reports an average of two or fewer teachers each year switch from secondary to

elementary, however, before the 2022-2023 school year, four secondary teachers changed to elementary agricultural education (Steinkamp, 2023). Agricultural education teacher shortage is an issue for Georgia as well as other states (Hulshof, 2022).

Education Preparation Providers (EPP) are essential to help agricultural education combat the teacher shortage. Abraham Baldwin Agricultural College was recognized in 2023, for their work towards helping with the teacher deficit in Georgia. Over five years, "ABAC AG Ed has prepared over 150 new teachers now working in the public schools" (Moultrie Observer, 2023, para. 5). Over 40% of Georgia Agricultural Education teachers have less than five years' experience (Georgia Agricultural Education, 2023). In comparison of previous years of Georgia Agricultural Education Annual reports this is not a new trend, the number of teachers with less than five years keeps increasing, while the number of teachers with more than 10 years keeps decreasing (Thompson, 2013) (Georgia Agricultural Education, 2023).

Ricketts et al. (2005) studied Georgia agricultural education teachers' pre-service and in-service needs for managing agricultural education programs. The researchers used a Borich Needs Assessment model for the study. According to the results of this study, preparing students for post-secondary careers in agricultural education was the biggest concern, followed by "FFA proficiency award applications and FFA degree applications, developing an effective public relations program, and developing Supervised Agricultural Experience (SAE) opportunities for students" (Ricketts, et al., 2005, p. 46). The study also included demographic data of teachers who responded to the survey. The survey respondents were teaching agricultural education in Georgia in the school year 2004-2005; 74.5% were male, 25.5% were female, and 51.9% had 10 years or less of teaching experience. According to 2022-2023 Georgia agricultural education

teacher demographic data, Georgia secondary teachers were 50.5% female and 49.5% male; and 64.1% of teachers had less than 10 years' experience (Georgia Agricultural Education, 2023).

The teacher shortage is not a problem unique to agriculture education, however, for the short term, one of the reasons some elementary teachers report switching to elementary agricultural education is to give up the extra burden of after-school and weekend FFA activities and responsibilities. The work-life balance is a struggle for secondary agricultural education teachers to balance the extended year and extended day contract responsibilities, in addition to the already taxing job of teaching as well as personal life commitments. Murray et al. (2011) reported that "Georgia agricultural teachers were working an average of 57 hours per week and 39 days per summer, with both genders being similar in the amount of time spent on the job" (Murray, et al., 2011, p. 107). Murray et al. (2011) studied barriers impacting agricultural education teachers for male and female ag teachers outside of the classroom, she found "twenty plus hours per week spent in family responsibilities after a 57-hour work week was demanding schedule for both genders of agricultural teachers" (Murray, et al., 2011, p. 114).

Boone and Boone (2007) identified 20 problem areas reported by new and veteran agricultural education teachers (Boone & Boone, 2007).

> The categories included administrative support, discipline, class preparations, time management, paperwork, facilities/equipment, community support, self-confidence, developing a course of instruction, budgets/funding, the reputation of the previous teacher, faculty relationships, undergraduate preparation, student motivation, guidance counselors, enrollment numbers, balancing school and home, university relations, special needs students, multi-teacher issues, image of agricultural education, financial rewards, and changes in FFA and agriculture" (Boone & Boone, 2007, p. 36).

Most of the concerns except for FFA could be applied to elementary agricultural education teachers. The researchers point out that one of the biggest factors in combatting teacher attrition is to reduce the number of qualified teachers leaving the profession, and to reduce this number, "the profession must continue to examine the problems faced by new and veteran teachers alike and address these problems through the preservice education program and/or teacher in-service" (Boone & Boone, 2007, p. 37).

Boone and Boone (2007) utilized a qualitative survey with open-ended questions, one asking five concerns they faced as a beginning teacher, and the second question asked about five concerns they faced as a veteran teacher. Only teachers with more than three years of experience were asked to complete both questions. The researcher's data consisted of 95 high school agricultural education teachers in West Virginia (Boone & Boone, 2007). Interestingly, administrative support was ranked as the biggest factor for beginning and experienced teachers. Beginning teachers' other top concerns were: discipline, class preparations, time management, paperwork, facilities, and equipment. For teachers with more than three years of experience top concerns behind administrative support were: student motivation, time management, paperwork, budget funding, and community support. Future research suggestions from this article included in-depth interviews with administrators (Boone & Boone, 2007).

Myers, et al. (2010) looked at "*Problems facing beginning agriculture teachers"* to identify factors impacting beginning agricultural education teachers to shine light on solutions for the teacher shortage in agricultural education (Myers, et al, 2010, p. 47). This study used the Delphi method to determine a list of problems. The panel identified 11 major concerns experienced by beginning agricultural education teachers.

> The top five, as rated by the panel members, were: organizing an effective alumni chapter, organizing an effective advisory committee, organizing and planning FFA chapter events and activities, the management of student discipline in the classroom, and recruiting and retaining alumni members (Myers, et al., 2010, p. 53, table 3).

While most of these factors do not impact elementary agricultural education teacher, other factors reported were "managing stress, balancing work and personal life, lack of preparation time at the beginning of the year, and time management" all factors which could also impact beginning elementary agricultural education teachers (Myers, et al., 2010, p. 53, table 3).

Eck et.al. (2019) studied "characteristics of an effective agricultural education teacher" in a national study, where they used a modified Delphi model to identify the top characteristics of a School-Based Agricultural Education teacher (Eck, et al., 2019, p. 1). The third round identified six characteristics "is engaging, demonstrates classroom management, cares about all students, is genuine, prepares students to be leaders, and is helpful" (Eck, et al., 2019, p. 8, table 2). The next five characteristics include "is passionate about agriculture, uses the complete agricultural education model as a guide to programmatic decisions and practices, is motivated for student success, and, is knowledgeable about agriculture" (Eck, et al., 2019, p. 8, table 2). Teacher shortages may force districts to hire teachers who do not have an agriculture education degree or background, while it may not be ideal, this supports the theory that while agriculture knowledge is important, even experienced SBAE placed higher priority on classroom management, personality, and teaching styles over agricultural knowledge.

Summary

Agriculture is a leading industry in Georgia and the United States (AgSnapshots 2020, 2023). Agriculture affects every person daily – the air we breathe, the houses we live in, the food

we consume – we are all connected through agriculture. Agriculturists are passionate about agricultural education and agricultural literacy to ensure the future of agriculture. With less than 2% of the population working, students must be taught about agriculture all along their academic career (AgSnapshots 2020, 2023). Agricultural Education has the unique opportunity to connect academics, STEM, and experiential learning all through the elementary agricultural education and SBAE classrooms through the established three-component model.

A failing school in Michigan added a school garden. The school garden transformed the school in several ways according to the researcher, Thorp (2001). Thorp (2001) includes five points in the conclusion about how the garden transformed the school. One of which:

> The garden connects children to the organizing principle of experience. Our children are starved for experience. We are cutting children off from the very life forces that sustain us: earth, sun, rain, plants, and animals. They are sending us signals as they only know how, they wiggle, they squirm, they 'act out' and tragically we medicate. In the garden children experience comfort, security, belonging, pleasure, and wonder associated with our experience of a living cosmos (Thorp & Townsend, 2001, p. 357).

Georgia elementary agricultural education teachers shared similar testimonies in their request to keep the Elementary Agricultural Education program when the 2021 House Bill 1303 was presented to remove the pilot program wording (Dickey, et al., 2022). 2021 House Bill 1303 passed, and the Georgia Elementary Agricultural Education program is a permanent option for elementary schools in Georgia (Dickey, et al., 2022).

Chapter III

Methodology

This chapter contains information regarding the methodology used to conduct the study. The methodology will provide the structure for the assessment used to determine the relationship between a student's self-efficacy and academic achievement. The methodology is divided into the following sections: research design, subject selection, instrumentation, data collection procedures, data analysis procedures, budget, and schedule.

The target population of the descriptive study is in-service Georgia elementary agricultural education (EAE) teachers varied over the pilot program. Two online-based questionnaires were shared consisting of questions specific to teacher demographics, agricultural education student enrollment, class schedules, and specialized facilities via email with each instructor. The researcher used Google Forms to create and share surveys and to collect data for review.

The researcher accessed Georgia Milestones End of Grade (EOG) Assessment results available from the Georgia Department of Education (GaDOE). The researcher analyzed Georgia Milestones EOG Science Mean Scale Scores for the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years. This researcher used the Excel Statistics data pack to analyze data with a *t*-Test.

Research Design

Design

This research includes two parts, the first part includes surveys to determine descriptive data that serves as important program components including teacher and program information as

well as student enrollment information at each pilot program; the second part includes a statistical analysis of Georgia Milestones Fifth Grade End of Grade Science assessment for pilot programs. Two online-based questionnaires were used in this research; as well as a statistical analysis of state assessment results of pilot program schools. One survey asks teachers for teacher certification type, elementary agricultural education experience, other school responsibilities, pilot program specialized facilities, and elementary agricultural education daily class schedule. The second survey consists of three separate survey links for each year of the pilot program, 2019-2020, 2020-2021, and 2021-2022 that ask teachers to report grade levels taught, as well as total enrollment for each grade level for each respective year.

The statistical analysis of the Georgia Milestones fifth-grade science results is included for each of the pilot program schools as compared to schools that did not offer elementary agricultural education including the pilot program to analyze Mean Scale Score; statistical analysis is also included comparing Title I EAE pilot program schools to Title I non-EAE schools. This study is a non-experimental research study. This study uses causal-comparative research to connect science principles included in elementary agricultural education to student assessment achievement in Georgia Milestones End of Grade (EOG) Fifth Grade Georgia assessment. This study compares Georgia Milestones EOG Fifth Grade science assessment scores in 2018-2019, 2020-2021, 2021-2022, and 2022-2023.

Research Questions and Hypothesis

Research Question 1: Is there a significant difference in the mean (M) between end-of-grade science assessments between schools that offered elementary agricultural education and schools

that did not offer elementary agricultural education between the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years?

Research Question 2: Is there a significant difference in the mean (M) between end-of-grade science assessments between Title I schools that offered elementary agricultural education and Title I schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021 and 2021-2022 school years?

Hypothesis

H=A school that offers elementary agricultural education will score higher on Georgia Milestone Fifth Grade Science Assessments than elementary schools that do not offer elementary agricultural education.

H_0=There is no significant difference in elementary agricultural education student scores than non-agricultural education students on the Georgia Milestone Fifth Grade Science assessments.

Variables

The variables in this study are the differences in each pilot program from teacher certification, teacher experience, facilities included, different schedules, and different grade levels taught in each pilot program. Another variable is that not all schools remained in the pilot program each year, so there is some deviation in schools throughout the pilot program. However, in reviewing of initial EAE program information, the researcher found 17 schools that participated in the EAE pilot program for all three years. The first year of the pilot program was 2019-2020, which is also when schools were closed in mid-March for the remainder of the school year due to COVID-19. COVID-19 certainly impacted life and schools in 2020. In terms of academic achievement, Georgia waived assessments for the 2019-2020 school year, so there

are no Georgia Milestones scores to consider for the 2019-2020 school year (Georgia Department of Education, 2023).

Subject Selection

Population

The target population of this descriptive study includes in-service Georgia elementary agricultural education pilot program teachers (*N*=27). All Georgia elementary agricultural education pilot program teachers received online links via their school email with a request to complete the survey. Surveys were shared with Georgia EAE teachers at the end of the third year of the pilot program.

For review of the science milestones data, the researcher used the list of official EAE programs submitted to the Georgia Agricultural Education state curriculum office each year to determine which schools Milestones science scores to review. The Georgia Milestones Scores are archived online on the Georgia Department of Education website each year (Georgia Department of Education, 2023). The Georgia Milestones Science Fifth End of Grade Scores were accessed for the following years, 2018-2019 (the year prior to the GaEAE pilot program), 2020-2021, and 2021-2022 (excluding the first year of the GaEAE pilot program due to COVID-19) during the pilot program, as well as the year following the pilot program, 2022-2023. In terms of population, the researcher compared Georgia Milestones Assessment Scores of schools offering EAE, as well as schools that qualify as Title I; and all elementary schools included in the Fifth Grade Science Milestones scores for 2018-2019, 2020-2021, 2021-2022 and 2022-2023. The list of Georgia Title I schools is also archived and available for public access on the Georgia Department of Education website (Georgia Department of Education, 2024).

Georgia Milestones Science Mean scores will be compared for schools *(N=varies each year)* who participated in the pilot program during each of the 2019-2020, 2020-2021 and 2021-2022 school years. The number of schools varied in each comparison group each year: 2021 EAE *(N=26) vs* Non-EAE *(N=1167)*, 2021 Title I EAE *(N=23) vs* Title I Non-EAE *(N=852)*; 2022 EAE *(N=26) vs* Non-EAE (N=1213), 2022 Title I EAE *(N=23)* vs Title I Non-EAE (*N*=894); 2023 EAE (*N*=43) vs Non-EAE (*N*=1198); 2023 Title I EAE *(N*=36) vs Title I Non-EAE (*N*=878).

Each year the schools enrolled in the GaEAE pilot program could change, however, there were 17 programs that maintained the EAE program each of the three years in the pilot program. However, one of those programs was not included in the Georgia Milestone Scores database online, so there are only 16 schools included in the data comparing the pre (2019) and post (2023) Georgia Milestones EOG Science Scores.

Instrumentation

Instrument Selection

A teacher survey developed through Google Forms was used in collecting pilot program and teacher information. The teacher demographic survey includes six demographic questions, including teacher certification type, years teaching elementary agricultural education, grade levels taught, and specialized elementary agricultural education facilities available at the pilot program school. The pilot program enrollment form included questions to identify teachers, school, grades taught at each pilot program school, and enrollment totals for each grade level kindergarten, first grade, second grade, third grade, fourth grade, and fifth grade.

The Georgia Department of Education provides Georgia Milestones assessment results available for public download. The reports were download in Excel format. The researcher

downloaded all Fifth-grade Georgia Milestones assessments into Excel to create master files for each year. Once schools were identified for each year for Title I and EAE, then the researcher focused on science mean scores for each respective year using Excel spreadsheets.

The Georgia Milestones assessment scores were evaluated using Microsoft Excel with the data analysis tool pack for further descriptive statistics to analyze data available from Georgia Milestones assessment results for each pilot program. Data was organized by school district and school. This researcher further organized data by each year of the pilot program to calculate an overall mean, total sample size, and means for student learning mastery levels.

Validity and Reliability of Instrument

The researcher developed descriptive surveys. The researcher shared surveys directly with teachers via the state elementary agricultural education listserv. Survey results were collected via Google Forms survey; this researcher is the only person who has access to survey data results online. Some program descriptive data was shared in the Georgia elementary agricultural education pilot program review report. Georgia Milestones data was collected directly from the Georgia Department of Education. All information is kept in the researchers' files. No personal student information was collected during this research.

All Georgia Agricultural Education elementary pilot program teachers were asked to complete surveys in February 2022. The data was used in the pilot program legislative report to review the Georgia elementary agricultural education pilot program. The Georgia Milestones assessment data is available to the public to download on the Georgia Department of Education in Excel format. The Georgia Milestones assessment data was analyzed using the Excel statistics analysis to review the *t*-Test.

Data Analysis

The Georgia Milestones assessment reports includes a summary for each school that includes the Total Students Tested, Mean Scale Score, % Beginning Learner, % Proficient Learner, % Distinguished Learner, % Developing Learner & Above, and % Proficient Learner & Above. The purpose of this research focuses on Science Mean Scale Scores. The researcher compared means between science milestones for each year and performed a *t*-Test and statistical analysis on means available for each year comparing EAE programs vs. schools with non-EAE programs.

The Georgia Milestones data downloaded from the GaDOE website as Microsoft Excel files. Once the data was organized and cataloged according to the different groups, the researcher used the descriptive data analysis pack and *t*-Test within Excel to analyze the data. The descriptive data analysis provided initial descriptive statistics. The researcher used a *t*-Test to compare different means of the different comparison groups. A two tailed (*t*-Test) was used to indicate if there was a difference between the two different groups. A *t*-Test compares the means of each data set and determines if the mean *(M)* is significantly different.

Budget and Time Schedule

Budget

There are no costs associated with this research. The surveys used in this survey are Google-based form surveys and completed during researchers' work, so there are no costs with the survey instrument. Survey results were collected in Google Forms, and then saved in Google Sheets for easy collection and comparison of information. The Georgia Milestones assessment data was downloaded from the Georgia Department of Education website and then downloaded

into Microsoft Excel, where data can be manipulated in Excel. The researcher used Microsoft Excel with the data analysis tool pack for further descriptive statistics.

Time Schedule

The teacher and pilot program surveys were conducted during the 2021-2022 school year. Teacher & program demographic surveys were distributed and asked the pilot program teachers to complete for each academic year for the pilot program. Pilot Program teacher surveys were shared with pilot teachers in the spring of 2022. The results of both the demographic survey and standard survey were shared with the Georgia Senate Ag Committee in the spring of 2022 with a request for formal approval of the Georgia Agricultural Education Elementary program. The Georgia Milestones was accessed by the researcher in the Fall of 2023 as a part of the final work for this dissertation.

IRB Approval

The Researcher completed the CITI (Collaborative Institutional Training Initiative) Program. The researcher completed the application for the Murray State Institutional Review Board and received approval (IRB Reference Number 24-126) to proceed with research in January 2024 with an approved data collection period ending in January 2025. The IRB approval approved the research to be conducted in compliance with Murray State University Guidelines for the protection of human participants.

Chapter IV

Findings and Analysis

This study focuses on the Georgia Elementary Agricultural Education Program. The Georgia Elementary Agricultural Education (EAE) was the first state to introduce formal legislation to initiate a formal agricultural education program in elementary schools. Chapter I introduced the research, problem, and research questions for the importance of studying the GaEAE pilot program. Chapter II includes an in-depth study into the earlier work and literature available focusing on agricultural education and even led to very early research on agriculture education before the 1900s. Chapter III established the methodology, defined the research questions and hypothesis, as well as a description of participants and data collection sources and variables.

The purpose of this study was to study the Georgia elementary agricultural education (EAE) elementary pilot program through descriptive data and statistical analysis of Georgia Milestones science assessments to determine the level of science academic achievement in elementary students. This chapter includes findings and analysis, recap of research questions and hypothesis (as related to findings), procedures, and statistical findings. This chapter answers the following objectives, research questions and hypothesis identified to fulfill the purpose of this study.

1. Determine enrollment per grade for each year during the EAE pilot program.
2. Determine class schedules for each year of the EAE Pilot program.
3. Determine the certification type of Georgia elementary agricultural educators during the pilot program.

4. Determine whether specialized facilities are available at EAE pilot programs.
5. Determine if Georgia Milestones scores for fifth graders in schools that were in the EAE pilot program are higher than fifth graders from non-EAE schools.

Research Questions and Hypothesis

Research Question 1: Is there a significant difference in the mean (M) between end-of-grade science assessments between schools that offered elementary agricultural education and schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years?

Research Question 2: Is there a significant difference in the mean (M) between end-of-grade science assessments between Title I schools that offered elementary agricultural education and Title I schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021 and 2021-2022 school years?

Procedures

The Georgia Elementary Agricultural Education teachers were surveyed in the spring of 2022 for information about each year during the pilot program. The surveys included questions to collect student enrollment information, grade levels taught, teacher certification, years taught EAE, class schedules, and specialized facilities *(N=27).* Separate survey links were shared with GaEAE teachers requesting enrollment information for each year of the pilot program.

In the spring of 2024, the researcher accessed Georgia Milestones Assessment data from the GaDOE website for the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years. The researcher also accessed the Title I Schools listings available on the GaDOE website. The researcher used the assessment scores for each year to create master databases including the

complete listing of all elementary schools, then coded the spreadsheet for EAE schools and Title I schools for each respective school year. In alignment with this research, science milestones mean scale scores were compared between the different groups and corresponding years.

In the EAE teacher demographics, (see Table 1, Elementary Agricultural Education Teacher Demographics), 37% of the teachers *(N=27)* responded that they had been the elementary agricultural education teacher all three years. In response to primary teacher certification type, 44% responded to be certified in Early Childhood Education, followed by 37% certified in Agricultural Education, Grades 6-12. At the time of the survey, February 2022, after the pilot program, when certification options were being re-evaluated, 33% had taken the Georgia Ag Ed GACE, 7% had taken the Ga EAE endorsement and 44% had not taken either the GACE or the EAE Endorsement.

Of the EAE teachers in the pilot program, 55% were teaching EAE full time; whereas 22% were teaching partially teaching elementary ag ed and splitting their time between Elementary and either STEM or Middle School Ag Ed. In terms of specialized facilities, 25 of the 27 schools surveyed reported having raised beds, followed by 17 of 27 having a garden, and 15 of 27 having a greenhouse. In regards to class schedules, 59% of EAE teachers in the pilot program reported seeing students once a week in EAE.

Elementary Agricultural Education Teacher Demographics

Table 1

Elementary Agricultural Education Teacher Demographics

Teacher Information Parameter *(N=27)*	***Frequency***	***Percent***
Agricultural Education Teacher Experience		
1 year	6	22.22
2 years	4	14.81
3 years	**10**	**37.04**
4+ years	3	11.11
No specified EAE teacher	4	14.81
Teacher Certification Types		
Certified Ag Ed Teacher (6-12)	10	37.04
Certified Early Childhood Grades	**12**	**44.44**
Certified Science Teacher	2	07.41
Para-professional	1	03.70
Physical Education	1	03.70
Special Education	1	03.70
Elementary Agricultural Education Certification		
Ag Ed GACE	9	33.33
Elementary Ag Ed Endorsement	2	07.41
Planned to take either GACE or EAE Endorsement	**12**	**44.44**
No specified EAE teacher	4	14.81
Responsibilities outside of EAE		
Full-time EAE teacher	**15**	**55.56**
Partial EAE – EAE & STEM/Middle School Agricultural Education	6	22.22
Other	6	22.22
Specialized Facilities		
Aquaponics/pond	3	11.11
Barn	5	18.52
Bee Hives	2	07.41
Chicken Coop	7	25.93
Forest Plot	4	14.81
Garden	17	62.96
Greenhouse	15	55.55
Outdoor Lab Space	11	40.74
Raised Beds	**25**	**92.59**
Elementary Ag Ed Class Schedule		
EAE is incorporated into academic instruction	1	03.70
EAE once a week	**16**	**59.26**
Every day (2-week rotation)	1	03.70
Every day (6-week rotation)	1	03.70
Other	8	29.63

*Note. Mode in **bold.***

Elementary Agricultural Education Pilot Program Data

In the first year of the pilot program third through fifth grades were the most common grades to be taught with 89.5% of the EAE pilot program schools teaching fifth grade, followed closely with 84.2% teaching both fourth and third grades.

The second and third years of the pilot program had an equal distribution of third-fifth grades taught in the EAE program schools with 89.5% teaching third, fourth & fifth in the 2020-2021 school year; and 93.1% teaching third, fourth, and fifth grades in the 2021-2022 school year. The grades taught are also illustrated in *Figure 3, Georgia Elementary Ag Ed enrollment*.

Table 2

Elementary Agricultural Education Pilot Program Grades Taught

EAE Pilot Program Grades	***Frequency***	***Percent***
2019-2020 School Year *(N=19)*		
Kindergarten	12	63.2
First Grade	12	63.2
Second Grade	13	68.4
Third Grade	16	84.2
Fourth Grade	16	84.2
Fifth Grade	**17**	**89.5**
2020-2021 School Year *(N=19)*		
Kindergarten	14	73.7
First Grade	14	73.7
Second Grade	15	78.9
Third Grade	**17**	**89.5**
Fourth Grade	**17**	**89.5**
Fifth Grade	**17**	**89.5**
2021-2022 School Year *(N=29)*		
Kindergarten	17	58.6
First Grade	17	58.6
Second Grade	18	62.1
Third Grade	**27**	**93.1**
Fourth Grade	**27**	**93.1**
Fifth Grade	**27**	**93.1**

Note. Mode in ***bold.***

Figure 3

Georgia EAE Enrollment

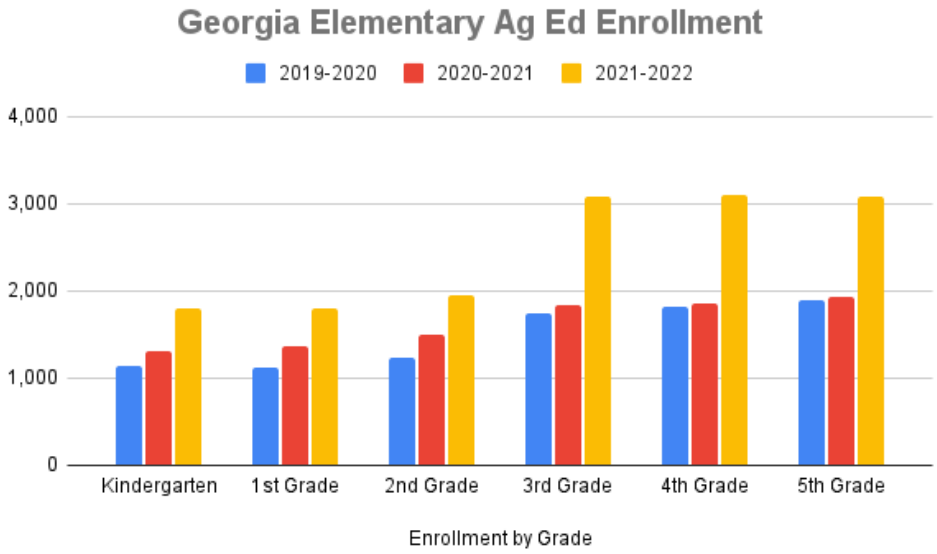


Table 3

EAE Pilot Program Enrollment

EAE Pilot Program Enrollment	***Frequency***	***Percent***
2019-2020 School Year *(N=19)*		
Kindergarten	1,133	12.68
First Grade	1,123	12.57
Second Grade	1,229	13.76
Third Grade	1,744	19.52
Fourth Grade	1,816	20.33
Fifth Grade	**1,888**	**21.14**
2020-2021 School Year *(N=19)*		
Kindergarten	1,307	13.34
First Grade	1,365	13.94
Second Grade	1,502	15.33
Third Grade	1,828	18.66
Fourth Grade	1,857	18.96
Fifth Grade	**1,936**	**19.77**
2021-2022 School Year *(N=29)*		
Kindergarten	1,794	12.12
First Grade	1,799	12.16
Second Grade	1,951	13.18
Third Grade	3,079	20.80
Fourth Grade	**3,099**	**20.94**
Fifth Grade	3,078	20.80

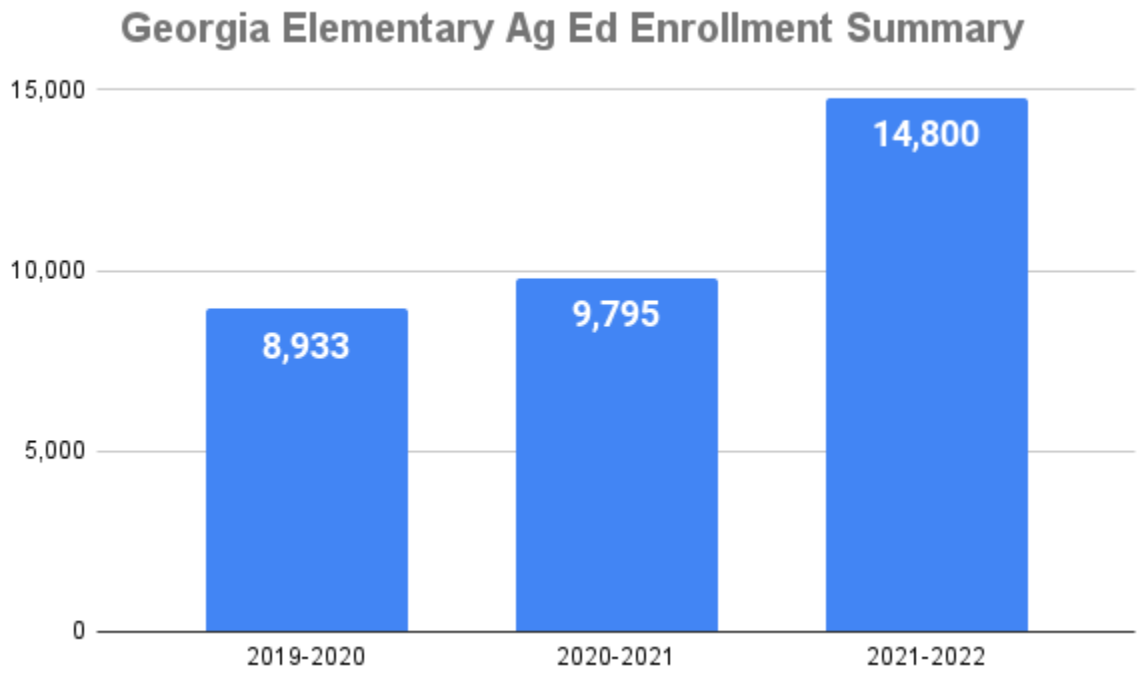
*Note. Mode in **bold.***

Elementary Agricultural Education Pilot Program Enrollment Data

Given the grades taught in Table 2, illustrating the third through fifth grades being the most predominant to be taught, the enrollment data in Table 3, follows the same trends. In the 2019-2020 school year, EAE's total enrollment was 8,933, with the highest enrollment (21%) found in fifth grade with 1,888 students. In the 2020-2021 school year, the EAE pilot program enrollment was 9,795 students with the fifth grade having the highest enrollment with 19.7% of students with a total of 1,936 fifth graders. The 2021-2022 school year saw a 5,000-student increase in EAE with a total of 14,800 students, third through fifth grades had similar enrollment data, but fourth grade had a slightly higher enrollment count with 3,099 students. Georgia EAE enrollment totals are also displayed in *Figure 4*.

Figure 4

Georgia EAE Enrollment Totals



Statistical Findings

Hypothesis

H=A school that offers elementary agricultural education will score higher on Georgia Milestone Fifth Grade Science Assessments than elementary schools that do not offer elementary agricultural education.

H_0=There is no significant difference in elementary agricultural education student scores than non-agricultural education students on the Georgia Milestone Fifth Grade Science assessments.

Georgia Milestones Science Assessment Science Mean Scale Scores were compared and analyzed between schools that offered elementary agricultural education and schools that did not offer EAE; furthermore, Georgia Milestones Science Assessment Science Mean Scale Scores in Title I schools were compared and analyzed between schools that offered elementary agricultural education and schools that did not offer EAE. In each year in both groups, schools that offer EAE scored higher on Georgia Milestones Science Assessment Science Mean Scale Scores. In 2020-2021, 26 elementary schools that offer EAE *(N=26)* were compared to 1,167 schools that did not offer EAE *(N=1,167)*. In Table 4, the EAE mean *(M)* score was 506.87 (*SD*=28.7) whereas the Non EAE mean *(M)* score was 497.85 (SD=35.03). The independent samples t-test results were not statistically significant at the alpha .05 level, $t(27) = 0.86$, $p = .12$. The Cohen's D measure of effect size was 0.05, a value corresponding to a small effect.

Table 4

Descriptive Measures and Results of a t-Test on 2021 Georgia Milestones Science Scores in EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	P
EAE	26	506.85	n/a	443.12	552.17	28.70	27	1.56	0.12
Non-EAE	1167	497.85	500	418.81	597.27	35.03			

In the 2020-2021 school year, in 23 elementary schools that offer EAE and classified as Title I *(N=23)*, were compared to 852 Title I schools that did not offer EAE *(N=852)*. In Table 5,

the EAE Title I mean *(M)* score was 502.97 (*SD*=27.76) whereas the non-EAE Title I mean *(M)* score was 486.41 (*SD*=29.37). The results of the independent samples *t*-Test were statistically significant at the alpha .05 level, *t*(23) =2.82, ***p* = .009. Cohen's D measure of effect size was 0.09, a value that corresponds to a small effect. **P indicates that the *p* value is considered statistically significant with a being less than 0.001.

Table 5

Descriptive Measures and Results of a t-Test on 2021 Georgia Milestones Science Scores in Title I EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	**P
EAE	23	502.98	n/a	443.12	549.74	27.76	23	2.82	.009
Non-EAE	852	486.41	n/a	418.81	566.06	29.37			

In the 2021-2022, 26 elementary schools that offer EAE *(N=26)*, were compared to 1,213 schools that did not offer EAE *(N=1,213)*. In Table 6, the EAE mean *(M)* score was 511.82 (*SD*=22.76) where the Non EAE mean *(M)* score was 505.37 (SD=33.92). The results of the independent samples *t*-Test were not statistically significant at the alpha .05 level, *t*(27)=1.41, *p* = .16. The Cohen's D measure of effect size was 0.03, a value which corresponds to a small effect.

Table 6

Descriptive Measures and Results of a t-Test on 2022 Georgia Milestones Science Scores in EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	P
EAE	26	511.82	n/a	465.96	548.59	22.76	27	1.41	0.16
Non-EAE	1213	505.37	521.95	423.63	626.08	33.92			

In the 2021-2022 school year, in 23 elementary schools that offer EAE and classified as Title I *(N=23)*, were compared to 894 Title I schools that did not offer EAE *(N=894)*. In Table 7, the EAE Title I mean *(M)* score was 508.66 (*SD*=22.09) where the Non EAE Title I mean (*M*)

score was 494.44 (*SD*=27.85). The results of the independent samples t-test were statistically significant at the alpha .05 level, *t*(24) =3.02, **p = .005. The Cohen's D measure of effect size was 0.08, a value which corresponds to a small effect. **P indicates that the *p* value is considered statistically significant with a being less than 0.01.

Table 7

Descriptive Measures and Results of a t-Test on 2022 Georgia Milestones Science Scores in Title I EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	**P
EAE	23	508.66	n/a	465.96	548.59	22.09	24	3.02	0.005
Non-EAE	894	494.44	495.2	423.63	599.42	27.85			

In the 2022-2023, 43 elementary schools that offer EAE *(N=43)*, were compared to 1,198 schools that did not offer EAE *(N=1,198)*. In Table 8, the EAE mean (*M*) score was 512.42 (*SD*=26.27) where the Non EAE mean *(M*) score was 503.98 (*SD*=34.50). The results of the independent samples t-test were statistically significant at the alpha .05 level, *t*(47)=2.04, **p* =.04. The Cohen's D measure of effect size was 0.05, a value which corresponds to a small effect. *P indicates that the *p* value is considered statistically significant with a being less than 0.05.

Table 8

Descriptive Measures and Results of a t-Test on 2023 Georgia Milestones Science Scores in EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	*P
EAE	43	512.42	n/a	463.91	558.39	26.27	47	2.04	.04
Non-EAE	1198	503.98	481.53	427	621.96	34.50			

In the 2022-2023 school year, in 36 elementary schools that offer EAE and classified as Title I *(N=36)*, were compared to 878 Title I schools that did not offer EAE *(N=878)*. In Table 9,

the EAE Title I mean (*M*) score was 509.886 (*SD*=23.64) where the Non EAE Title I mean (*M*) score was 492.98 (*SD*=28.54). The results of the independent samples t-test were statistically significant at the alpha .05 level, *t*(39) =4.15, *p* = .0001. The Cohen's D measure of effect size was 0.11, a value which corresponds to a small effect. ***P indicates that the *p* value is considered extremely statistically significant with a value equal to 0.0001.

Table 9

Descriptive Measures and Results of a t-Test on 2023 Georgia Milestones Science Scores in Title I EAE and Non-EAE Schools

	N	M	Md	Min	Max	SD	Df	T	***P
EAE	36	509.83	n/a	463.91	556.24	23.64	39	4.15	0.0001
Non-EAE	878	492.98	481.54	427	591.25	28.54			

Finally, in review of Georgia Milestones Science Scores between the year prior and post to the Georgia Elementary Agricultural Education Pilot Program (2018-2019 and 2022-2023) of schools that did not offer EAE. In Table 10, the Mean Scores are compared between 2018-2019 and 2022-2023 school years. This comparison considers schools that did not participate in the pilot program consistently from 2019-2020, 2020-2021 and 2021-2022. This table includes a comparison of 1,216 schools *(N=1,216)* in 2018-2019 and 1,224 schools in 2022-2023 *(N=1,224),* while excluding EAE Pilot Program Schools. The mean (*M*) scores of non-EAE schools in 2018-2019 was 510.63 (*SD*=31.24). The mean (*M*) score was 504.11 (*SD*=34.31). The results of the independent samples t-test were statistically significant at the alpha .05 level, t (2420) =4.91, ****p* =. 0.000001 (p<0.001). The Cohen's D measure of effect size was 0.13, a value which corresponds to a small effect. ***P indicates that the *p* value is considered statistically significant with a value equal to 0.000001.

Table 10

Descriptive Measures and Results of a t-Test on 2019 and 2023 Georgia Milestones Science Scores between Non EAE Georgia Elementary Schools.

Year	N	M	Md	Min	Max	SD	Df	T	***P
2019	1216	510.63	513.33	430.32	617.10	31.24	2420	4.91	<0.00
2023	1224	504.11	460.98	427.00	621.95	34.31			

In conclusion, a final review of Georgia Milestones Science scores between the year prior and post to the Georgia Elementary Agricultural Education Pilot Program (2018-2019 and 2022-2023) of sixteen schools who consistently offered EAE each of the three years of the pilot program. In Table 11, the Mean Scores are compared between 2018-2019 and 2022-2023 school years. This table includes sixteen schools *(N=16)* who offered EAE consistently from 2019-2020, 2020-2021 and 2021-2022. This table excludes a comparison of 1,216 schools *(N=1,216)* in 2018-2019 and 1,224 schools in 2022-2023 *(N=1,224).* The mean (*M*) scores of non-EAE schools in 2018-2019 was 514.45 (*SD*=23.47). The mean (*M*) score was 518.82 (*SD*=27.77). The results of the independent samples t-test were not statistically significant at the alpha .05 level, $t(30) = -0.48.$, $p = 0.63$. The Cohen's D measure of effect size was 0.07, a value which corresponds to a small effect.

Table 11

Descriptive Measures and Results of a t-Test on 2019 and 2023 Georgia Milestones Science Scores between EAE Georgia Elementary Schools.

Year	N	M	Md	Min	Max	SD	Df	T	P
2019	16	514.45	n/a	460.47	544.00	23.47	30	-0.48	0.63
2023	16	518.82	n/a	482.10	558.39	27.77			

Summary

In Chapter IV, data collected from elementary agricultural education in the pilot program defined research objectives in compiling important insight into the Georgia elementary agricultural education pilot program. The elementary schools in the Georgia Elementary Agricultural Education pilot program scored higher on Georgia Science milestones each year prior to, during and after the pilot program than other non-EAE elementary schools. Furthermore, the Title I schools offering EAE also scored higher in Science Milestones than Title I schools not offering EAE. Independent *t*-Test were performed on each year to determine if there were significant differences in the Georgia Milestones Fifth Grade Science Mean Scale Scores. 2022-2023 in comparing EAE schools and non-EAE schools indicated a significant difference in scores. The 2020-2021, 2021-2022 and 2022-2023 school years also showed a significant difference between EAE and Non-EAE in Title I schools.

Chapter V

Conclusions and Discussion

This study was designed to provide a detailed overview and insight into the Georgia elementary agricultural education pilot program, as well as provide validation for the success of the EAE programs through the validation of student achievement through the Georgia Milestones. Agricultural Education is based on hands-on experiential learning. Agricultural Education is a unique subject that allows students to explore the basics of our daily life and survival while including all major academic areas. The agricultural education experience naturally includes reading, math, science, engineering, social studies, and technology.

This study evaluates the state science annual assessments of schools offering elementary agricultural education with schools that do not offer EAE in all elementary schools and then specifically in regards to Title I schools. The teacher & enrollment data was collected directly from elementary agricultural education teachers in the pilot program. The Georgia Milestones Science Assessment Scores were downloaded directly from the Georgia Department of Education website. The list of Title I schools was also accessed from the Georgia Department of Education website. The scores are reported as Mean Scale Score for each content area.

Summary of Conclusion for Research Question Number 1

Research Question 1: Is there a significant difference in the mean (M) between end-of-grade science assessments between schools that offered elementary agricultural education and schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021, 2021-2022 and 2022-2023 school years?

H=A school that offers elementary agricultural education will score higher on Georgia Milestone Fifth Grade Science Assessments than elementary schools that do not offer elementary agricultural education.

There is a significant difference in Georgia Milestones Fifth Grade Science mean scores for the 2022-2023 school year compared to schools that did not offer elementary agricultural education. The EAE Mean (*M*) was 512.42 whereas the non-EAE Mean (*M*) was 503.98 for the 2022-2023 school year. The results of the independent samples t-test were statistically significant at the alpha .05 level, $t(47) = 2.04$, $*p = .04$. A $*p$ value of equal or less than 0.05 is statically significant and indicates the Hypothesis is true.

Each of the pilot program years, 2018-2019, 2020-2021, and 2021-2022 showed a higher Mean (M) in EAE schools over non-EAE schools, however, the data did not show a significant difference for those years.

Summary of Conclusion for Research Question Number 2

Research Question 2: Is there a significant difference in the mean (M) between end-of-grade science assessments between Title I schools that offered elementary agricultural education and Title I schools that did not offer elementary agricultural education between the 2018-2019, 2020-2021 and 2021-2022 school years?

In terms of Title I Schools, the data showed a significant difference in the 2020-2021, 2021-2022, and 2022-2023 school years. In the 2020-2021 school year, the EAE Title I mean (*M*) score was 502.97 (*SD*=27.76) whereas the Non EAE Title I mean (*M*) score was 486.41 (*SD*=29.37). The results of the independent samples t-test were statistically significant at the alpha .05 level, $t(23) = 2.82$, $**p = .009$. Cohen's D measure of effect size was 0.09, a value that

corresponds to a small effect. A ***p* value of equal or less than 0.01 is statically significant and indicates the Hypothesis is true.

In the 2021-2022 school year, the EAE Title I mean (*M*) score was 508.66 (*SD*=22.09) where the Non EAE Title I mean (*M*) score was 494.44 (*SD*=27.85). The results of the independent samples *t*-Test were statistically significant at the alpha .05 level, $t(24) = 3.02$, ***p* = .005. Cohen's D measure of effect size was 0.08, a value that corresponds to a small effect. A ****p* value of equal or less than 0.001 is statically significant and indicates the Hypothesis is true.

In the 2022-2023 school year, the EAE Title I mean (*M*) score was 509.886 (*SD*=23.64) whereas the Non EAE Title I mean (*M*) score was 492.98 (*SD*=28.54). The results of the independent samples t-test were statistically significant at the alpha .05 level, $t(39) = 4.15$, ****p* = .0001. Cohen's D measure of effect size was 0.11, a value that corresponds to a small effect. A ****p* value of equal or less than 0.0001 is statically significant and indicates the Hypothesis is true.

Summary of Conclusion for Hypothesis

H=A school that offers elementary agricultural education will score higher on Georgia Milestone Fifth Grade Science Assessments than elementary schools that do not offer elementary agricultural education.

H_0=There is no significant difference in elementary agricultural education student scores than non-agricultural education students on the Georgia Milestone Fifth Grade Science assessments.

The hypothesis was found to be true that schools offering elementary agricultural education scored higher on Georgia Milestones Fifth Grade Science Assessments than schools

that do not offer elementary agricultural education. However, there is little statistical significance difference of the years other than the 2022-2023 school year outside of the Title I school data. The biggest statistical significance is found in the Title I schools. Each year of data compared between Title I EAE schools and Title I non EAE showed a significant statistical significance in the data. The percentage of Title I EAE schools was less than 3% the first two years and less than 4% in the 2022-2023 school year. However, the Title I EAE schools showed a significant difference in Fifth Grade EOG Milestones Sciences scores over Title I non-EAE schools.

One could draw a conclusion that the 2022-2023 fifth-grade science scores reflect the previous years' work of a student in earlier grades and then reaping the benefits as a fifth grader. The 2022-2023 school year is the first full school year after the pilot program, where a student may have possibly been in an elementary agricultural education class for four years. The schools offering elementary agricultural education scored higher on the Fifth Grade Science Milestones. Many of the schools in the EAE program converted a previous STEM lab or other Specials classroom into an elementary agricultural education classroom, these schools whether they are rural, urban, small, large, Title I or not are providing instruction that allows students to be more successful on the science milestones assessment.

In Table 10, the Mean Scores are compared between the 2018-2019 and 2022-2023 school years. This table excludes sixteen schools that offered EAE consistently from 2019-2020, 2020-2021, and 2021-2022. Another interesting data notation is that comparison of the 2019 and 2023 schools that did not offer elementary agricultural education, Georgia Milestones Science scores between the year prior and post to the Georgia Elementary Agricultural Education Pilot Program (2018-2019 and 2022-2023), the scores were lower in 2023 for the whole state in non-EAE schools in Table 10. However, in Table 11, EAE schools had higher milestones Mean

Scores pre and post the EAE pilot program. The mean (*M*) scores of non-EAE schools in 2018-2019 was 510.63 (*SD*=31.24). The mean (*M)* score was 504.11 (SD=34.31). The results of the independent samples t-test were statistically significant at the alpha .05 level, *t*(2420) =4.91, ****p* = 0.000001 (p<0.001). A ****p* value of equal or less than 0.00001 is statically significant. Cohen's D measure of effect size was 0.13, a value that corresponds to a small effect. This is the opposite of all the data including EAE schools, which was higher each year and improved each year. Some educators contribute COVID-19 to lower assessment scores, however, the EAE schools seem to perform better even so.

Significance

The biggest significance of this research is to illustrate that elementary agricultural education can have a positive impact on academic performance. Moreover, this research can give confidence to provide more hands-on exploration of academic concepts, especially science in the agricultural education classroom; while providing more instruction in elementary agricultural education.

Elementary agricultural education enrollment doubled since the beginning of the pilot program. Elementary agricultural education provides a distinct opportunity for educators to truly educate the youngest students about agriculture in the truest sense of providing agricultural education, literacy, advocacy, and knowledge; while also providing hands-on experiential learning to help them further develop other academic concepts. As more farmers are nearing retirement age, we need more people to return to rural areas and more people to go into production farming. Some report that the food supply will need to be doubled by the year 2050, therefore, now is a great time to educate and inform students to help meet the needs of the future (American Farm Bureau Federation, 2023).

P-20 Implications

P-20 education includes learners from Pre-Kindergarten through college and graduate school or adulthood. P-20 education programs /policies encourages the alignment of policies and procedures to guide students through each educational phase. As an educator, it is important to clearly understand the big picture of P-20 education, while considering the backward design of keeping the end in mind of higher education and how it relates back to each step of the education journey. Studying P-20 gives educators a unique insight into each of those links that create a clear chain for student and educator success.

The P-20 program at Murray State University includes four main pillars that serve as foundation for the program with specific Student Learning Objectives (SLO) in Innovation, Implementation, Diversity and Leadership. SLO1—P-20 Innovation: Students will incorporate P-20 concepts, theories and practices of innovation to explore solutions to complex problems. SLO2—P-20 Implementation: Students will demonstrate advanced knowledge and understanding of the integrated P-20 approach to education through the ability to implement related initiatives. SLO3—Diversity: Students will embody principles of inclusiveness and diversity and will apply techniques, tools, and strategies that reflect these beliefs in his/her decision making as a P-20 leader. SLO4—Leadership: Students will build leadership capacity through research, practice and individual professional growth. Leadership in education is often considered to be the administrator or leadership within a school or institution.

Georgia Agricultural Education offers agricultural education programs from kindergarten through adulthood. This creates opportunities for Georgia agricultural educators to create irreplaceable relationships with students, families, and programs focused on agricultural

education. Georgia Pre-K standards also include science standards that allow teachers to teach students agricultural concepts (Georgia Department of Early Care and Learning, 2024). Georgia Pre-K standards includes instruction on plants, animals, living and non-living objects, understanding plant and life cycles, environment, simple machines, seasons, weather and solar systems. Georgia Pre-K offers a Georgia Pre-K is a free program offered to all 4-year-old students in the state (Georgia.gov, 2024).

In terms of higher education, the University of Georgia has created Center for Elementary Agricultural Education Research. Murray State University partnered with Abraham Baldwin Agricultural College to offer Master level credit for students enrolled in the EAE endorsement. As more states adopt elementary agricultural education programs, it will be essential to offer more content and programming in higher education through Education Prepare Providers. The elementary agricultural education offers a unique educational program to meet the four pillars of the P-20 educational pillars, while more importantly the EAE program is an opportunity to prepare more students for careers in agriculture and educate more students from Pre-K into adulthood on the importance of agriculture.

Since the passing of SB330, other states have started EAE programs. Dr. Jason Peake shared that Arkansas, Florida, Missouri, and Texas have added EAE program (Peake, 2024). This researcher has had personal communications with Mississippi and Kentucky who are also working to add EAE. As more states add elementary agricultural education, this creates more opportunities for true P-20 educational programs in other states in agricultural education.

Limitations of Study

The biggest limitation of this study is the newness of the program. Because of the lack of longevity of the program, there is little long term assessment data to review to make conclusive statistical analyses. In terms of studying the assessment data, the fact that the first year of the pilot program was the COVID year, where schools closed early and waived all state-mandated tests, certainly limits part of this study.

Recommendations

Other recommendations would be to analyze other Milestones content areas, like Reading and Math; as well as analyze the different proficiency levels of learners between EAE schools and non-EAE schools. Other recommendations are to look at elementary agricultural education teacher funding. One EAE teacher reported in the demographic data that they were on an extended year contract; another great research area would be to determine types of local funding for extended-year contracts. As the program is new, some school systems are handling EAE differently. Some school systems include EAE in CTAE (Career, Technical and Agricultural Education) budgets and some schools do not recognize EAE as part of CTAE.

Elementary agricultural education is still a relatively new concept in Georgia's public schools and nationwide. Since Georgia started elementary agricultural education, several other states have started similar programs. More research will help determine best practices for the early childhood learner and best practices for the teacher & program to know how to best meet the needs of their students.

This research was completed to help the Georgia Ag Ed state staff better understand ways to support elementary agricultural education teachers, how to provide better information to

administrators, and help identify possible curriculum needs. As Georgia nears five years of using the standards written and adopted in 2018, more research may be needed to help identify the best content and curriculum moving forward. Furthermore, adding more elementary agricultural education programs may put more pressure on the agricultural education teacher shortage. More research on retaining agricultural education teachers is certainly another great topic, as some current teachers in Georgia switched to elementary agricultural education creating more openings in high school and middle school agricultural education programs.

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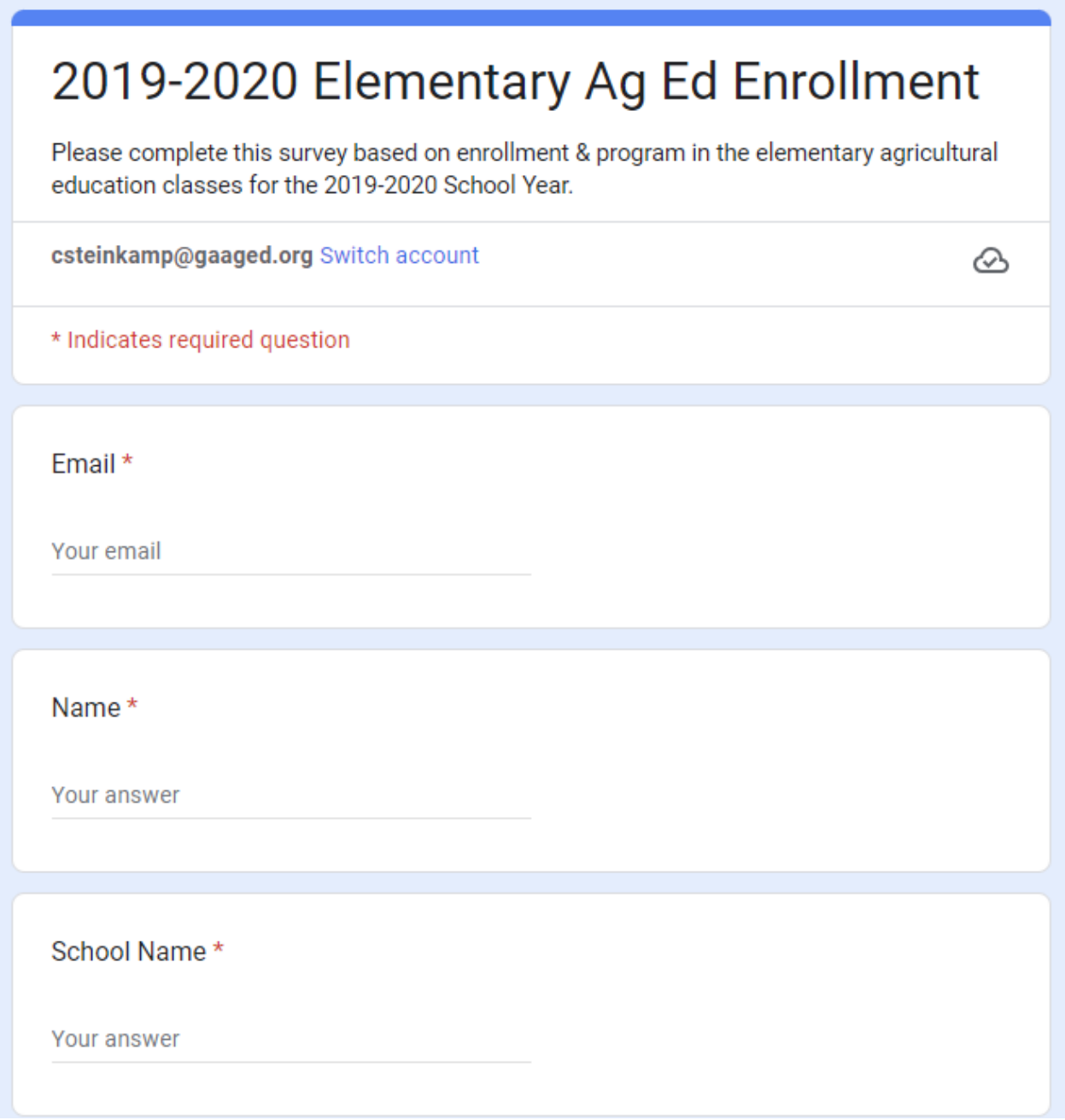
Appendix

Appendix A: 2019-2020 EAE Enrollment Google Form



2019-2020 Elementary Ag Ed Enrollment

Please complete this survey based on enrollment & program in the elementary agricultural education classes for the 2019-2020 School Year.

csteinkamp@gaaged.org Switch account

* Indicates required question

Email *

Your email

Name *

Your answer

School Name *

Your answer

What grades do you teach elementary agriculture education? *

Please select all grade levels you taught elementary agricultural education during the 2019-2020 school year.

- [ ] Kindergarten
- [ ] First Grade
- [ ] Second Grade
- [ ] Third Grade
- [ ] Fourth Grade
- [ ] Fifth Grade

Kindergarten Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

Your answer

First Grade Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

Your answer

Second Grade Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

Your answer

Third Grade Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

Your answer

Fourth Grade Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

Your answer

Fifth Grade Enrollment *

Please include the total enrollment for each grade for the 2019-2020 school year.

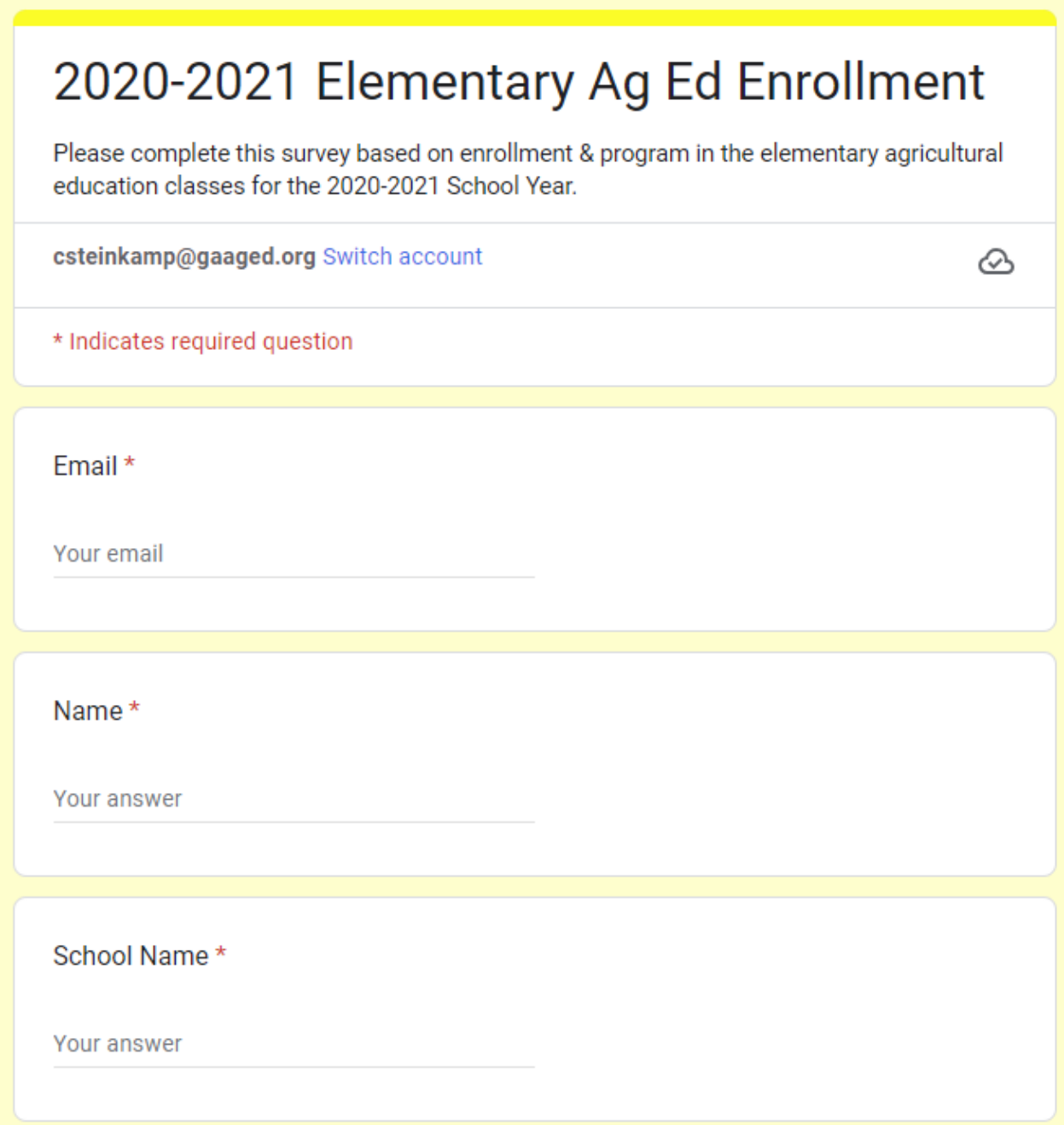
Your answer

A copy of your responses will be emailed to the address you provided.

Submit

Clear form

Appendix B: 2020-2021 EAE Enrollment Form



2020-2021 Elementary Ag Ed Enrollment

Please complete this survey based on enrollment & program in the elementary agricultural education classes for the 2020-2021 School Year.

csteinkamp@gaaged.org Switch account

* Indicates required question

Email *

Your email

Name *

Your answer

School Name *

Your answer

What grades do you teach elementary agriculture education? *

Please select all grade levels you taught elementary agricultural education during the 2020-2021 school year.

- [ ] Kindergarten
- [ ] First Grade
- [ ] Second Grade
- [ ] Third Grade
- [ ] Fourth Grade
- [ ] Fifth Grade

Kindergarten Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

Your answer

First Grade Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

Your answer

Second Grade Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

Your answer

Third Grade Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

Your answer

Fourth Grade Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

Your answer

Fifth Grade Enrollment *

Please include the total enrollment for each grade for the 2020-2021 school year.

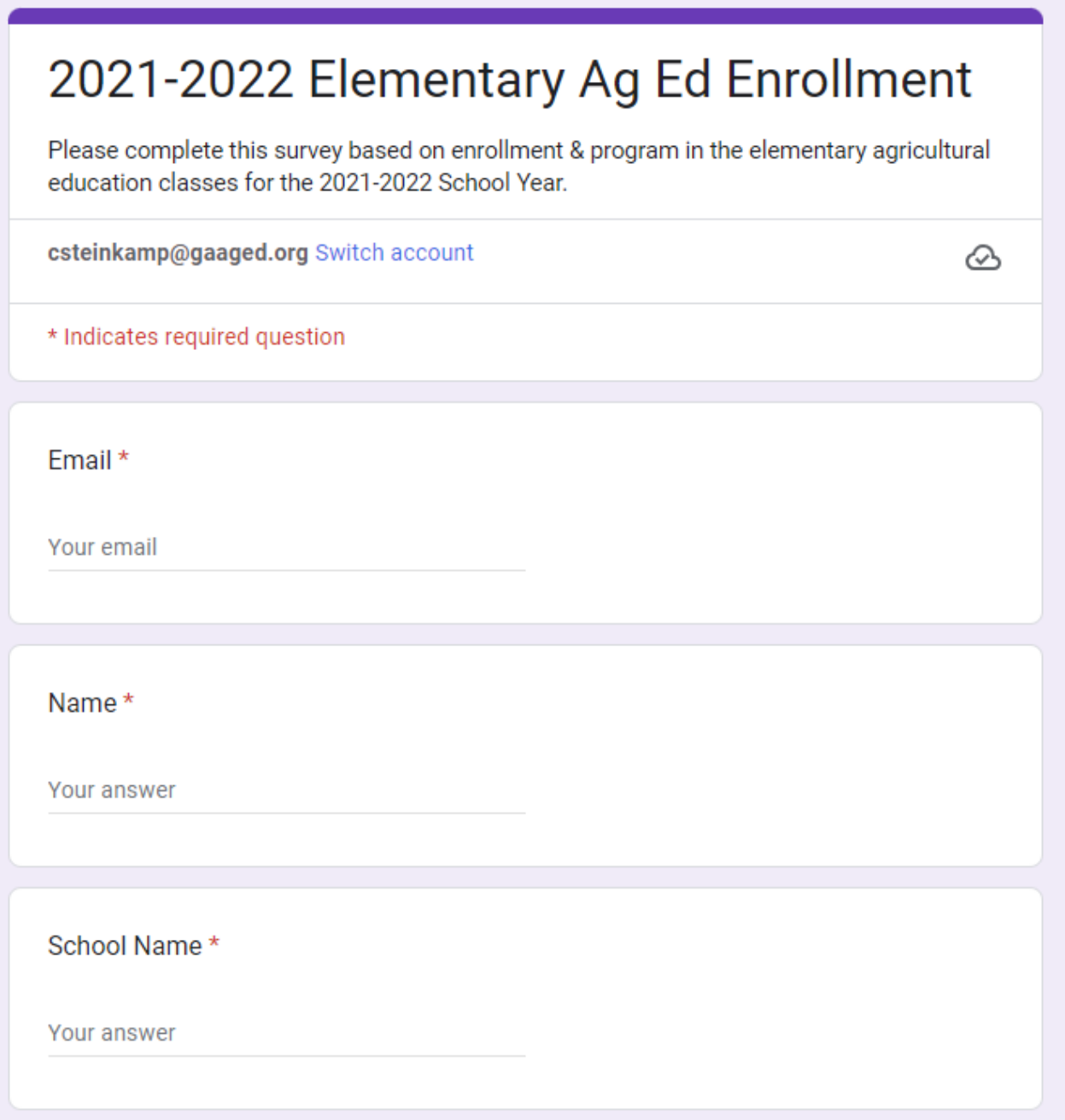
Your answer

A copy of your responses will be emailed to the address you provided.

Submit

Clear form

Appendix C: 2021-2022 EAE Enrollment Form



2021-2022 Elementary Ag Ed Enrollment

Please complete this survey based on enrollment & program in the elementary agricultural education classes for the 2021-2022 School Year.

csteinkamp@gaaged.org Switch account

* Indicates required question

Email *

Your email

Name *

Your answer

School Name *

Your answer

What grades do you teach elementary agriculture education? *

Please select all grade levels you taught elementary agricultural education during the 2021-2022 school year.

- [ ] Kindergarten
- [ ] First Grade
- [ ] Second Grade
- [ ] Third Grade
- [ ] Fourth Grade
- [ ] Fifth Grade

Kindergarten Enrollment *

Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

First Grade Enrollment *

Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

Second Grade Enrollment *

Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

Third Grade Enrollment *

Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

Fourth Grade Enrollment *

Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

Fifth Grade Enrollment *

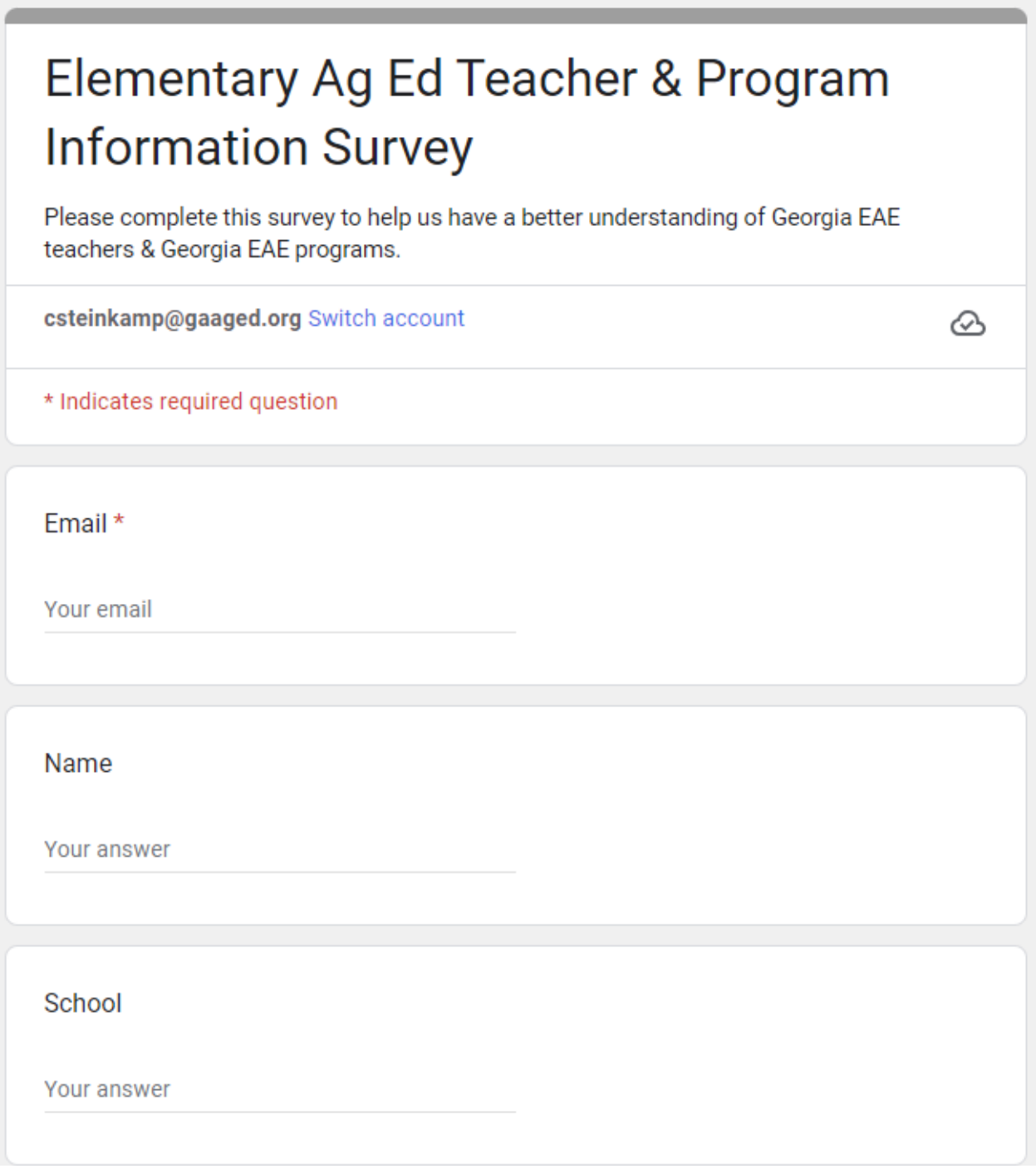
Please include the total enrollment for each grade for the 2021-2022 school year.

Your answer

A copy of your responses will be emailed to the address you provided.

Submit Clear form

Appendix D: EAE Teacher & Program Information Survey



Elementary Ag Ed Teacher & Program Information Survey

Please complete this survey to help us have a better understanding of Georgia EAE teachers & Georgia EAE programs.

csteinkamp@gaaged.org Switch account

* Indicates required question

Email *

Your email

Name

Your answer

School

Your answer

How many years have you taught Elementary Ag Ed?

- ○ 1
- ○ 2
- ○ 3
- ○ Other: _____

Teacher Certification Type

Please choose your current certification level.

- ☐ Certified Early Childhood Grades Teacher
- ☐ Certified Family and Consumer Science Teacher
- ☐ Certified Georgia Ag Ed Teacher (6-12)
- ☐ Certified Science Teacher
- ☐ Certified Special Needs Teacher
- ☐ Parapro
- ☐ Other: _____

Elementary Ag Ed Certification

- ○ I have passed the Ag Ed GACE.
- ○ I have the Ag Ed Endorsement.
- ○ I plan to take either the Ag Ed GACE and EAE Endorsement.

Do you have any other responsibilities during the school day?

We want to know what your day looks like. Are you teaching Ag Ed on a full time or part time basis.

- [ ] Full Time EAE - I only teach Elementary Ag Ed.
- [ ] Partial EAE - I teach Elementary Ag Ed & STEM / Middle School Ag Ed.
- [ ] Partial EAE - I teach Elementary Ag Ed & teach academic one or more academic classes.
- [ ] Partial EAE - I teach Elementary Ag Ed part of my day or week.
- [ ] Other: _____

Elementary Ag Ed Facilities / equipment at your school

Please select facilities available for the elementary agricultural education program at your school.

- [ ] Barn
- [ ] Classroom
- [ ] Forest plot
- [ ] Garden
- [ ] Greenhouse
- [ ] Lab Space
- [ ] Outdoor Lab Space
- [ ] Raised Beds
- [ ] Other: _____

Elementary Ag Ed Class Schedule?

Please help us understand your typical structure – do students go once per week, year around or for a semester/9 weeks? Please check all that apply.

- [ ] Students have Ag Ed once a week
- [ ] Students have Ag Ed for a week at a time
- [ ] Students have Ag Ed two weeks at a time
- [ ] Students have Ag Ed year round
- [ ] Students have Ag Ed a semester
- [ ] Students have Ag Ed for 9 weeks
- [ ] Other: _____

A copy of your responses will be emailed to the address you provided.

Submit Clear form

Never submit passwords through Google Forms.

Appendix E: IRB Consent Form 24-126

Institutional Review Board
328 Wells Hall
Murray, KY 42071-3318
(270)809-2916
Msu.irb@murraystate.edu

Date: 01/09/2024

Principal Investigator: Christa Steinkamp

Faculty Sponsor: Kristie Guffey

IRB Approver: Megan St. Peters

IRB Reference Number: 24-126

The IRB has completed its review of Exempt protocol Georgia Elementary Agriculture Education Pilot Program: an Extensive Look into the History, Development and Success. After review and consideration, the IRB has determined that the research as described in the protocol form, will be conducted in compliance with Murray State University Guidelines for the Protection of human participants.

The forms and materials approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB procedures and Guidelines section 20.3.

Your stated data collection period is from 01/18/2024-01/18/2025

If data collection extends beyond this period, please submit a continuation to an approved protocol form detailing the new data collection period and the reason for the change.

This Exempt approval is valid until 01/18/2025.

If data collection and analysis extends beyond this date, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 01/09/2024. You must reapply for IRB approval by submitting a Project Update and Closure form (available at murraystate.edu/IRB). You must allow ample time for IRB processing and decision before your expiration date, or your research must stop until IRB approval is received. If the research project is completed by the end of the approval period, a Project Update and Closure form must be submitted for the IRB review so your protocol may be closed. It is your responsibility to submit the appropriate paperwork promptly.

This protocol is approved. You may begin data collection now.