School Gardening as Experiential Learning: A Qualitative Study of Extension Educators' Observations of Youth Learning Outcomes in Alabama

by

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Abstract

The purpose of this study was to examine how school gardening is described as influencing youth learning based on Alabama Cooperative Extension System educators' observations. Specifically, this study explored theoretical perspectives related to student learning, reviewed existing research on garden-based education, and utilized narrative inquiry to examine Alabama Cooperative Extension System educators' stories and observations of in school gardening and how it is described as influencing youth learning and development outcomes. Through an integrative approach, the study synthesized findings from prior qualitative research with interview data collected from seven educators to provide a comprehensive understanding of how gardening functions as an instructional tool in school settings. The researcher identified supporting literature describing student learning and behavior changes associated with gardening experiences and its perceived positive effect. Therefore, the research's use of narratives offers insight on the learning effect of school gardening as told by Alabama Cooperative Extension System team members and Alabama educators working with students. The findings revealed notable similarities between the reviewed literature and the educators' narratives of experience. Consistent with data in this research, interview subjects stated that the schools at which they worked lacked formal in-school gardening curricula, gardening was nevertheless employed to support student learning related to plant growth, scientific processes, and behavioral development. Educators also described observable changes in students' social behaviors, including increased peer interaction, collaboration, and engagement during garden-based activities.

Interview data further indicated that Alabama Cooperative Extension educators frequently described students as understanding scientific concepts while participating in gardening. Participants shared narratives describing how students applied vocabulary, exhibited curiosity, and engaged in hands-on problem solving during garden lessons. Moreover, at least two educators described noticeable behavioral improvements among students who had previously been withdrawn or disengaged from learning. These observations aligned with the broader qualitative literature, which suggests that garden-based learning environments support both cognitive and socio-emotional development.

Overall, the findings from the literature review and educator interviews suggest that educators perceive that in-school gardening programs positively influence student learning and behavior; however, the limited interview data underscores the need for additional research. Broader studies incorporating diverse educational contexts and extended observation periods are warranted to further examine the social and educational effects of gardening on student learning outcomes.

Artificial Intelligence (AI) Use Disclosure Statement

In the preparation of this thesis/dissertation, the following Artificial Intelligence (AI) tools were used: Microsoft Co-Pilot. These tools were used primarily to check spelling, grammar, and formatting. The author acknowledges full responsibility for the intellectual content of this work and has ensured that all AI-assisted sections have been reviewed and revised for accuracy and appropriate academic style. All AI-generated content was reviewed and validated for relevance, appropriateness, and accuracy before incorporation into the final document to maintain the scholarly integrity of this research.

Digital Accessibility Disclosure Statement

In the preparation of this dissertation, the following digital accessibility tools were used to ensure this document complies with federal requirements: Microsoft Word and Adobe. The author acknowledges full responsibility for the intellectual content of this work and has made a good faith effort to comply with digital accessibility requirements in publishing, wherein the nature of the content does not significantly change in order to do so. Furthermore, all content has been reviewed and revised to meet these requirements prior to final publication.

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Chapter 1

Introduction

The Alabama Cooperative Extension System (ACES) provides research-based information in each of Alabama's counties research-based information aimed at helping them reach their goals whether it involves creating home gardens, starting small businesses, or engaging young people in Alabama 4-H (Alabama Cooperative Extension System, 2024). Many teachers note that learning by doing is effective in teaching science to students (Mabie & Baker, 1996). Working as an Alabama Cooperative Extension System Employee in an area designated as a "food desert" (Alabama Department of Public Health, 2026) with Lowndes County residents having limited access to nutritious food sources, interest in teaching components of science to school aged children through gardening complements the Alabama Cooperative Extension Systems' Lowndes County Office team's educational outreach goals. According to the Alabama Department of Public Health, "Alabama is the fifth poorest state in the nation, with 17%of adults and 23% of children (1 out of 4) facing food insecurity, or lack of regular access to enough nutritious food for an active, healthy life" (ADPH, 2026). Sisopiku and Barbour note that Lowndes County is among the poorest counties in Alabama, in which residents have limited access to cars and grocery stores (Sisiopiku & Barbour, 2014). In Lowndes County, for example, stakeholders must drive to neighboring Montgomery County or Butler County for access to shopping for a wide variety of food. Currently, there is not a Farmers Market in Lowndes County, but some farmers sell produce as street venders in certain rural areas. Because of this, gardening

has a wide-ranging appeal among adults hoping to interest students in growing fresh fruits and vegetables as a source of income or to introduce more freshly grown produce into their families' diets. Often, educators incorporate cross curriculum education through gardening, farm visits, nutritional classes, and extracurricular activities at schools including bake sales supporting athletic events.

As part of its community education outreach efforts, the Alabama Cooperative Extension System of Lowndes County offers regular classes on home ground and gardening, 4-H classes on gardening, and workshops sharing research on fruit and vegetable production. As researchers note, Cooperative Extension System teams are often invited to help with in-school gardening projects in schools to help meet needs in their counties (Landry, 2010).

Using gardening in the dual role of providing educational insights and nutritious food is noted by some researchers as a mutually beneficial opportunity for youth, especially those living in areas lacking nutritionally high food sources. Gardening programs present a less costly option that encompasses many science concepts, providing the adaptability that allows teachers to select specific components for integration into the existing curriculum (Dilafruz, Williams, & Dixon, 2013). Gardening activities align with key areas of life science, ecology, chemistry, and physics, creating meaningful instructional connections. Additionally, the tangible outcomes of gardening can be used to teach various topics in health education (Wakefield, Yeudall, Taron, Reynolds, & Skinner, 2007). These connections between science and gardening allow educators to use gardening programs as effective teaching tools that can directly or indirectly impact student health (Bice et al., 2020, p. 5). In a study titled Enhancing Food

Literacy and Food Security Gardening in Rural and Regional Communities, researchers interviewed student participants and found student responses indicated student learning. They wrote, “The attainment of improved food literacy was evidenced by linking curriculum teaching to experiential learning activities. For example, students engaged and participated in various activities such as planting vegetables and fruits from seed, harvesting, and consuming the produce, all while developing a fundamental theoretical understanding of the processes involved,” (Holloway et al., 2023, p.9). Cooperative Extension researchers have noted the benefits of school gardening programs. “Gardening programs come as a result of farm-to-fresh initiatives that aim to link students with food production, increase access to healthy and local foods, and serve as educational opportunities. Gardening programs encompass a public health agenda and facilitate student engagement, incorporate nutrition education, serve as a mode of physical activity, and enrich psychological well-being (Irvin, Johnson & Peters, 1999; Parmer, Salisbury-Glennon, Shannon & Struempler, 2009; Twiss et al., 2011; Wakefield et al., 2007) (as cited by Bice et al., 2020, p. 5). This research is based upon an interest in learning more about how gardening influences learning among students, especially students who participate in gardening programs supported by the Alabama Cooperative Extension System.

This research focuses on the use of gardens in Alabama schools in relation to how students learn. Data was collected through narrative inquiry. Researcher D. E. Polkinghorne describes the use of narrative inquiry as “Narrative-type narrative inquiry gathers events and happenings as its data and uses narrative analytic procedures to produce explanatory stories. (Polkinghorne, 1995, p.5). The purpose of this study is to

review the use of school gardening as a tool for learning and presents narratives of Alabama Cooperative Extension System team members and Alabama teachers on student learning in some school gardens.

Purpose of the Study

The purpose of this study was to explore Alabama Cooperative Extension System (ACES) and ACES -associated educators' perceptions of learning through in-school gardening programs in Alabama. This study sought to (a) describe educators' perceptions of student engagement in garden-based educational activities, (b) document educators' observations of student learning during gardening instruction, (c) examine educators' perceptions of students' understanding of science and STEM-related concepts through garden-based programming, and (d) identify perceived challenges and supports associated with using gardens as instructional tools. Using semi-structured interviews with Alabama Cooperative Extension System (ACES) personnel, the study documented educators lived experiences facilitating garden-based learning across school and community contexts.

Research Objectives

This study was guided by four primary research objectives:

- To explore how in-school gardening influences student learning within Alabama Cooperative Extension System (ACES) contexts.
- Describe ACES associated educators' perceptions of learner engagement with garden-based educational activities.

- To catalog observations of student learning during in-school gardening activities.
- Describe Alabama Cooperative Extension System associated educators' perceptions of students' behavior during gardening sessions.

Significance of Study

This study gives voice to the Alabama Cooperative Extension Systems' agents, employees, and associated county schoolteachers' experiences of planning, organizing, facilitating, advocating, etc., garden-based education experiences for students in schools and communities. Through narrative inquiry, some of those experiences are documented in a way that lends insight to students' learning by using in school gardening activities. Through the recounting of what happens in a student garden, these educators are telling the story of learning. Researchers Rutten ad Soetaert noted while analyzing the work of Jerome Bruner, "Bruner is of course not the only scholar to emphasis that narratives convey a specific kind of knowledge and therefore can be used as 'tools' within education" (Rutten & Soetaert, 2013, p. 331). With the tools of narrative inquiry, this study provides insights into these educators' perceptions of the learning of students across the three domains of learning cognitive, affective, and psychomotor learning, as well as the socio-community development garden-based programming that can provide for students.

Findings from this study will inform the design and implementation of school-based or community-based garden learning programming or environments by documenting the practices educators feel are effective for supporting students in these programs or environments. "School gardens offer one area of agriscience through which

schools can provide opportunities for student-centered, experiential learning. The results of this study showed that the science achievement of students who participated in a hands-on school gardening program was higher than that of students who did not participate in gardening activities as part of their science curriculum. Hands-on, constructivist learning serves as the main idea behind school garden programs. Gardens can serve as living laboratories in which students can see what they are learning and in turn, apply that knowledge to real world situations (Adams and Hamm, 1998)" (Klemmer et al., 2005, p. 452). The results of this research may be useful for systems, the Alabama Cooperative Extension System, or other nonformal education systems in developing professional development or in implementing gardening or garden-based programs as learning environments. This study also supports research examining the practical or pragmatic implementation of experiential and garden-based learning.

Theoretical Framework

This body of work was conceptualized using constructivist philosophy and is pragmatically framed using experiential learning. Experiential learning is a framework advocated by student centered pedagogists that advocates for learners to use experience to reflect on understanding and through this reflection, new understanding can be made (Dewey, 1936). Kolb's (1984) experiential learning model is the most common model used in agricultural education and related social sciences of agriculture and is the primary model used to frame this study. In Kolb's model, there are four primary actions that students must go through. They must have a concrete experience,

they must reflect on that experience, they must use that reflection to create an abstraction or recalculation of their understanding, then they must reapply that new abstraction or understanding to a new concrete experience (Kolb,1984). This practical framework guided the development of the interview protocol as well as the analytical lines by which the interviews were interpreted, thematically analyzed, and reported. It is through this framework that garden-based learning experiences have been understood to be developmental or educational.

Limitations

The research presented in this dissertation is limited to only the participants who participated and cannot be extrapolated beyond this limited context. These are self-reported interviews of the adult facilitators and do not contain any observational or participant (student) data. The study was context specific, focused exclusively on Alabama Cooperative Extension System and associated educators which limits the transferability of the findings. This research is based on the participants' recollections and beliefs of their experiences, and while valid and important, they are based on their own interpretations and personal beliefs.

Organization

This dissertation is organized into five chapters. Chapter one introduces the study, gives background and context, offers the researchers' justification for the topic in a personal narrative, and gives the purpose, objectives, significance of the study, limitations of work, and basic terms used throughout the document. Chapter two

presents a limited review of three research documents specific literature pertinent to the topic of school-based gardening as well as extension education. Chapter three describes the research methods used to collect data and the attempts that were made to ensure the accuracy of the results. Chapter four presents the results of the interview process, and chapter five offers discussions as well as recommendations for further research based on the findings.

Definition of Terms

Alabama Cooperative Extension System (ACES). The Alabama Cooperative Extension System (ACES) is the statewide outreach and educational organization for Alabama, providing research-based information and community programming across all 67 counties. According to ACES, its mission is to “offer educational outreach that will better the lives of stakeholders statewide” and to transform lives through “science-based information, practical solutions, and meaningful experiences.” As part of its educational mandate, ACES supports initiatives such as in-school gardening, youth development, nutrition education, and community-based horticulture programs.

School garden - A school garden is a planned, intentional outdoor or semi-outdoor learning space where students engage in the cultivation of plants to support academic, social, and experiential learning. School gardens function as extensions of the classroom, allowing learners to observe and participate in biological processes, practice hands-on scientific inquiry, develop horticultural skills, and apply concepts from science, mathematics, nutrition, ecology, and related subjects. As described in the literature, gardens serve as curated environments that bridge the

natural world and the structured school setting, providing opportunities for tactile learning, motor-skill development, and exploration of plant growth, soil systems, and environmental relationships. School gardens may include raised beds, in-ground planting areas, containers, or demonstration plots and are frequently used to promote experiential learning, environmental awareness, and food-system literacy among students.

Experiential learning is an educational framework in which learners gain understanding through direct, hands-on experiences followed by reflection, conceptualization, and application. This approach emphasizes learning through active engagement with real-world tasks and environments, allowing students to observe, manipulate, and reflect on processes in ways that deepen comprehension. Experiential learning is grounded in constructivist philosophy and is commonly associated with the work of Dewey and Kolb, who describe learning as a cyclical process involving concrete experience, reflection, abstraction, and reapplication in new situations. In garden-based instruction, experiential learning allows students to interact with living systems, make observations, solve problems, and apply scientific concepts in authentic contexts. STEM- **(**Science, Technology, Engineering, and Mathematics) refers to an integrated educational approach that combines science, technology, engineering, and mathematics to promote problem-solving, innovation, and analytical thinking. Although neither Dewey nor Kolb formally defined the term, STEM education aligns closely with their theoretical foundations of learning. Dewey's philosophy emphasizes learning through meaningful, real-world experiences, reflection, and inquiry-based problem solving, all of which are central to STEM instruction. Similarly, Kolb's experiential

learning model, which includes concrete experience, reflective observation, abstract conceptualization, and active experimentation, supports the iterative, hands-on, and project-based nature of STEM learning. When applied in school gardening contexts, STEM education emerges through student engagement with scientific investigation, measurement, environmental observation, technological tools, and engineering concepts embedded in garden design and maintenance.

Cooperative Extension Educator **–** A Cooperative Extension Educator is a professional employed by or affiliated with the Cooperative Extension System who provides research-based instruction, support, and community programming across a range of educational contexts. Extension educators function as facilitators of nonformal and formal learning, working in partnership with schools, community groups, and local stakeholders to design, deliver, and support instructional activities, including garden-based education. They often bridge formal classroom standards with hands-on, real-world learning experiences, serving as a link between university-generated research and community application. As described in the dissertation text, Extension educators “play a central role in designing, supporting, and delivering garden-based instruction… especially in rural or underserved communities” and frequently serve as advocates for integrating experiential, garden-based learning into PreK–12 settings. Their role includes planning, implementing, and evaluating gardening programs; supporting teachers; and guiding learners as they acquire horticultural, scientific, and practical skills.

Abbreviations

GMO	Genetically Modified Organism
SAE	Supervised Agricultural Experience
SBAE	School Based Agricultural Education
STEM	Science Technology Engineering and Mathematics
SSI	Socioscientific Issues
AU	Auburn University
ACES	Alabama Cooperative Extension System
TUEP	Tuskegee University Extension Program

Chapter 2

Review of Literature

Science in the Garden: A Qualitative Analysis of School-Based Agricultural Educators' Strategies (Cross & Kahn, 2018)

This chapter offers a brief overview of specific literature regarding garden-based education, school-based gardens, community garden programming, and similarities. Additionally, the chapter presents literature on the role of the Alabama Cooperative Extension System service and extension educators, specifically focused on the role these individuals play in designing, implementing, and delivering garden-based programming to school-age learners.

While conducting this research, information gleaned from years of studying how students learned is used to explore the question of how in-school gardening impacts student learning. This section of the research points to different teaching philosophies and strategies used by educators who employ gardening as teaching tools. Researchers note it that discernable changes occur when students are engaged in school gardening programs. "In many cases a garden is more readily accessible than other natural environments, and can offer children infinite possibilities for experiential learning, even in early childhood. This is why gardening has become a popular activity in preschools and schools, giving children the opportunity to gain direct experience, efficiently face challenges, acquire knowledge, and strengthen their self-confidence (Kos & Jerman, 2019, p. 1).

School garden programs have been widely recognized for their ability to integrate core academic subjects while promoting experiential learning. Research has consistently demonstrated that school gardens serve as effective tools for integrating core academic subjects into hands-on learning environments. Graves, Hughes, and Balgopal (2026) emphasized that horticultural and garden-based curricula offer significant promise for helping elementary students engage with the four core academic subjects: science, mathematics, language arts, and social studies, while also developing an understanding of food origins and production (p. 192). Supporting this perspective, Williams and Dixon (2010) highlighted the effectiveness of garden-based learning in reinforcing academic content. Similarly, Mabie and Baker (1996) found that participation in agriculturally oriented experiential activities significantly enhanced elementary students' science process skills.

Research further suggests that elementary teachers view agriculture as a viable interdisciplinary instructional tool when aligned with standards-based learning goals (Bellah & Dyer, 2009), although curriculum materials focused solely on agriculture may be less appealing without clear academic connections (Knobloch, 2008). Hands-on gardening programs, such as the Junior Master Gardener curriculum developed by Texas A&M University, have been shown to increase students' interest in agricultural careers (Dirks & Orvis, 2005; Meyer et al., 2001), though they do not always lead to increased knowledge of diet and nutrition.

Additionally, several studies have documented the positive impact of school gardens on students' understanding of food systems and plant science concepts (Graham & Zidenberg-Cherr, 2005; Koch et al., 2006; McAleese & Rankin, 2007;

Murphy, 2003). For example, Klemmer et al. (2005) found that students in Grades 3 through 5 who participated in school gardening activities scored significantly higher on science achievement tests compared to their peers without such experiences. Likewise, Murphy (2003) reported that participation in a California school garden program was associated with significant gains in students' overall mathematics and science grade point averages (Graves et al., 2026, p. 192).

Beall et al. noted that while school gardens are used to improve student learning about nutrition and diet, educators also use them to enhance academic instruction across multiple subjects, including science, environmental studies, nutrition, language arts, and mathematics. The authors further explained that "this indicates that the garden is being used to teach some of the core academic subjects, possibly with the incorporation of core curriculum standards" (Beall et al., 2005, p. 149). This finding is consistent with prior research demonstrating that gardens can be integrated into the core curriculum within hands-on learning environments. Engaging, experiential activities embedded in subject matter instruction are central to experiential education, particularly within environment-based education programs, which emphasize the development of lifelong learning skills such as problem-solving and critical thinking.

The research titled "Science in the Garden: A Qualitative Analysis of School-based Agricultural Educators' Strategies" offers research related to gardens used in teaching programs at schools. The researchers used qualitative data for their study. "Qualitative data was collected by conducting semi-structured interviews with two Ohio school-based agricultural educators, and data was analyzed using the constant comparative method" (Cross & Kahn, 2018, p. 88). The authors wrote, "This collective

case student investigates how National Future Farmers of America (FFA) Organization teachers utilize school gardens to teach science, including whether and how SSI are utilized as an educational framework," (Cross & Kahn, 2018, p.88).

Cross and Kahn (2018) noted the historical use of gardens as educational tools, emphasizing that school gardens have supported science instruction since the early twentieth century (Greene, 1910). Contemporary data indicate that more than 7,000 school gardens currently exist across the United States (USDA, 2015). Prior research suggests that school gardening programs are associated with improved academic outcomes, including increased standardized test scores (Blair, 2009; Joshi et al., 2008; Smith & Motsenbocker, 2005) and gains in students' science achievement (Klemmer et al., 2005; Smith & Motsenbocker, 2005). However, despite educators' perceptions that gardens enhance academic instruction (Blair, 2009), teachers often report limited content knowledge needed to effectively integrate garden-based activities into formal curricula (Blair, 2009; Dobbs et al., 1998; Graham et al., 2005; Graham & Zidenberg-Cherr, 2005). To address this gap, Cross and Kahn (2018) suggested the use of socioscientific issues (SSI)an instructional framework that engages students in inquiry through socially relevant and complex scientific problems—as a potential context for improving scientific literacy. Citing limited empirical research in this area, the authors advanced two research questions: (a) how high school agricultural educators use gardens to teach science, and (b) how gardens are used as contexts for promoting scientific literacy through SSI-based instruction.

Cross and Kahn's research fit the description of qualitative because the data was collected through recorded, in-person interviews with teachers regarding how gardening

affects student learning. Qualitative data collection is appropriate for this study because teachers answered questions about how they used school gardens to increase high school students' knowledge of science (Cross & Kahn, 2018, p.89). The research includes interviews with two high school teachers, FFA instructors from two different high schools. They were interviewed face-to-face for 50 minutes each, and afterwards the researchers used the constant comparative method to analyze the interviews. The researchers noted, "Following transcription analysis, three themes emerged from the two research objectives: 1) difficulty meeting standards, 2) importance of integrating applied science, and 3) hot topics in the classroom" (Cross & Kahn, 2018, p. 95).

Cross & Kahn discuss the importance of scientific literacy. They note that the process of learning is helpful because the processes require being informed and making decisions based on information. "Being proficient in scientific literacy can help students engage in informal reasoning, make informed decisions, and problem solve. 'Informal reasoning involves the generation and evaluation of positions in response to complex issues that lack clear-cut solutions' (Sadler, Barab, & Scott, 2007). Unfortunately, however, classroom science does not always help students make informed decisions, as overemphasis on scientific content itself does not promote decision making," (Cross & Kahn, 2018, p. 90). Cross and Kahn (2018) noted that, although academic-based curricula for school gardens exist, limited information is available regarding how these curricula are implemented in practice. Their findings suggested mixed results about alignment with STEM standards. Specifically, "the scholars found mixed results on whether school gardens address learning standards related to STEM" (Graves et al., 2016, as cited in Cross & Kahn, 2018, p. 91). In working with two STEM coordinators to

evaluate an edible plant curriculum, one coordinator perceived the curriculum as providing inquiry-based learning experiences that aligned with science standards and connected instruction to students' everyday lives. In contrast, the second coordinator did not view the curriculum as addressing science standards, instead characterizing the gardening activities as enrichment or "special" activities rather than core instructional components (Cross & Kahn, 2018, p. 91). Despite these differing perspectives, the researchers found that educators commonly used school gardens to teach physical science concepts, particularly soil science and plant biology (Cross & Kahn, 2018, p. 91). The researchers proposed that if students had opportunities to discuss science in other settings, perhaps socially, then it might help students increase understanding of scientific concepts. The authors noted in their research that utilizing SSI is beneficial in helping students consider all aspects of a subject when trying to understand it. The noted, "Whereas scientific knowledge and inquiry practices can be used for the negotiation of SSI, scientific practices aloe cannot marshal solutions. Issue solutions are necessarily shaped by moral, political, social, and economic concerns; (Sandler et al., 2007, p.371). Students are encouraged to think critically and engage in informal reasoning before drawing their own conclusions While science in the traditional classroom has often been taught in an autocratic fashion, SSI encourages students to understand and appreciate various perspectives on an issue (Zeidler, Applebaum, & Sadler, 2011)", (Cross & Kahn, 2018, p. 91). They further assert that using SSI helps transform traditional classes teaching science into what they called a "more progressive instructional paradigm" (Cross & Kahn, 2018, p.91). They observed, "On the continuum of instructional paradigms, the progressive method of instruction promotes independent

thinking, which works to create democratic educational experiences. Rooted in experientialism, the progressive method is student centered and focuses on shared social experiences (Zeidler et al., 2011). In contrast, the traditional method is often teacher centric and has roots in social behaviorism (Zeidler et al., 2011). The traditional method is often based on dogma and therefore is often dependent on the teacher (Zeidler et al., 2011, p. 280).

Cross and Kahn note that using the progressive methods of teaching that centers more on student experiences and social interactions are used in high schools, but not often. They cite it is used during discussions about such topics as using GMOs and climate control. Noting that there is not enough data regarding this, the authors cited a study on the included high school students as an example. “Shoulders & Myers (2013) combined the disciplines and quantitatively assessed agriscience content knowledge of high school and middle school students in response to a six-week SSI-based instructional unit intervention, which focused on the introduction of cultured meat in the mainstream food supply. Teachers participating in the study had to be teaching at least one Agriscience Foundations class during the school year. While eleven teachers expressed interest in implementing the curriculum, only four teachers participated for the entirety of the study. As the scholars discussed, this lack of participation inevitably affects the generalizability of the study. Overall, when data analysis was completed, the scholars determined students increased their proximal and distal content knowledge,” (Cross & Kahn, 2018, p.93). As they noted, data indicated an increase in proximal and distal content knowledge among students.

After not receiving enough participation in the study, an additional study was conducted. The researchers conducted interviews and convened a focus group. Cross & Kahn, (2018) noted on page 96:

Various themes were generated after data analysis was completed to attempt to capture teacher and student perceptions on the SSI instructional units. Wilcox, Shoulders, & Myers (2014) state, 'Texts were organized into the following themes: initial excitement, expected uniqueness of agriculture classes, conditioned to need a right answer, loss of connection between content and students' lives, student disengagement, decisions to discontinue, and confirmation of adoptions' (p.11). Students were thought to have lacked engagement during the intervention for several reasons. Some students expected more out of the classroom activities during their agriculture classes, which was not included in the SSI curriculum provided by the scholars. In fear of students dropping out of agriculture programs due to lack of engagement, some teachers decided to stop participating in the study. The thee of 'loss of connection between content and students' lives seems ironic considering SSI scholars often argue students may be more engaged in science education when the topic matter relates to their daily lives, which is an objective of the SSI framework (Zeidler, 2011)". (Cross & Kahn, 2018, p. 96).

Cross and Kahn included some responses from FFA instructors, which included some parents telling the teachers that their children are using what they have learned in school gardens and at home. Both teachers aid that the students needed to have their classes taught. In conclusion, after reviewing the teachers' responses and literature on the topic of using school gardening to teach science to high school students, the

authors suggested that more study is needed. Specifically, they noted, “Teachers may be able to utilize school gardens for SSI based instruction to promote scientific literacy. However, our findings suggest there is a demonstrated need for curriculum and professional development opportunities for agricultural teachers regarding use of the SSI educational framework” (Cross and Kahn, 2018, p. 93). The researchers noted that Socioscientific Issues require students to react according to moral influences and social experiences.

Cross and Kahn stated their purpose as follows: “This exploratory study investigates the following research objectives: 1. Examine agricultural educators’ teaching methods for facilitating science learning experiences in school gardens. 2. Explore agricultural educator’s strategies for facilitating learning experiences in school gardens that relate to SSI.” (Cross & Kahn, 2018, pp. 93-94).

Researchers Cross and Khan conducted 90-minute interviews with two high school teachers (Ohio FFA high school teachers) who were identified as Sam and John (Cross & Kahn, 2018, p.94). In describing the teachers, one researcher wrote, “I have observed both Sam and Jon interact with students in the classroom on a few occasions, both as an agricultural educator in their communities and as a researcher,” (Cross& Kahn, 2018, p. 95). The researchers stated, “The constant comparative method (Glaser, 1965) was utilized to analyze the interview transcription and develop themes. As Glaser explains, the constant comparative methos id used to generate properties about a general phenomenon. The scholar states these properties can include “conditions, consequences, dimensions, types, processes” (Glaser, 1965, p. 438).

The writers noted that they used “semi-structured” interviews to understand how the two teachers were teaching science and to determine how gardens might be used by the two teachers in their classes. (Cross & Kahn, 2018, p. 94). “Participants for this exploratory study included two Ohio FFA high school teachers that utilize school gardens for science instructional purposes…While this list was not comprehensive, other known possible participants that met the study criteria were added to the list. Several possible participants that were geographically closest were emailed and asked to participate. The first two people to respond were chosen as participants,” (p. 94). The two teachers who participated in Cross and Kahn’s interviews taught FFA to students at two different high schools in Ohio. The interviews were conducted face-to-face, and the notes were transcribed. Also, surprisingly, neither teacher offered documentation regarding their gardening lessons. “While this study investigates curriculum being utilized by teachers, I requested school garden curriculum from both participants, however, neither had any materials to share.” (Cross and Kahn, p. 94).

Cross and Khan detailed the constant comparative methos as including four stages of analyses of qualitative data: “(1) Comparing incidents applicable to each category, (2) integrating categories and their properties, (3) delimiting the theory, and (4) writing the theory”. They cited that Glaser suggests breaking up the analysis process.

“The scholar first codes each transcription then compares incidents. This process will help the researcher generate proposed categories and define the theoretical properties for each of them. The analyst then starts to compare each incident to the properties of the categories. During the process, the scholar explores how the

properties of the categories may be integrated. As coding continues, reduction occurs in the third stage. In other words, terminology is reduced, and the set of proposed concepts becomes smaller. This enables the scholar to determine the boundaries of each category and delimit the theory. When the analyst is able to delimit the original list of categories, it becomes easier to compare findings to other pieces of scholarly work found in the interview. Finally, categories will become theoretically saturated, and a theory can be developed" (Cross & Kahn, 2018, p. 95).

After completing this process, the researchers then looked at the existence of curriculum being used by teachers to incorporate gardens in lesson plans, instructing students.

Cross & Kahn reported results of the two instructors having difficulty meeting standards, the need for integrating applied science and key topics between the gardening projects and subjects covered in their classrooms (Cross & Kahn, 2018, p.95). Additionally, in their analysis of data, Cross and Kahn noted that because there was no existing curriculum, two of the instructors who participated in the research "struggled with standardized testing" (Cross & Kahn, 2018, p. 95). They reported that the participant identified as John said,

"….and that's one of the things that I guess frustrates me about education is that we just keep wanting to raise the bar and the kids are getting further and further away from the bar…because they don't read, you know, they only do what they have to do…there's no, there's no reason for them. Most of them don't see any reason to dig and deeper…even, only a few, only the veery few that have a real desire or passion or interest go beyond that," (Cross & Kahn, 2018, p.95).

Cross and Kahn's analysis of the interviews with the two instructors continues with instructor John stating that the students who participated in the gardening program had difficulty applying the science that they learned in class to the hands-on gardening project. John stated, "They don't know how to apply what they know…But they have that little bit of knowledge with I guess that is the kind of thing that frustrates me. It frustrates me a little with education. Kids don't have that desire. Ya know, now the kids that have a true interest in agriculture, yes, but ya gotta show them how it applies to them," (Cross & Kahn, 2018, p.96).

Further excerpts from the interviews revealed that each teacher focused on teaching applied science. John told the interviewer, "They don't know how to apply what they know. But they have that little bit of knowledge about it. I guess that's the kind of thing that frustrates me. It frustrates me a little with education. Kids don't have that desire. Ya know, now the kids that have a true interest in agriculture, yeah, but ya' gotta show them how it applies to them…" (Cross & Kahn, 2018, p. 96).

The interview did yield a compelling response from students when the topic of socioscientific issues (SSI) and GMOs (genetically modified organisms) were introduced in classroom discussions following the gardening projects. "Both teachers talked about SSI topics, use of GMOs, during classroom time. However, these discussions did not seem to be well organized, nor did they promote scientific reasoning. Therefore, the SSI educational framework was not being utilized," (Cross and Kahn, p. 96). The second teacher who participated in the interview states that when discussing with his students whether they should eat "organic food," the responses showed some awareness of social discussions about the topic. Same stated, "Well quite a few of…we get into these

social conversations all the time. We do. We hit the hot topics. We do talk about GMOs …and corn GMOs. And I'll pick whatever sides lose (laughs). Sometimes that's all we talk about," (Cross & Kahn, 2018, p.96). Sam stated that his discussions with students were not part of a planned lesson.

During the interview, researchers asked John about classroom discussions about GMOs. John stated, "Back to the plant that plant and the GMOs and stuff…we talk a lot about how we have advanced, I mean, explain how GMOS are very beneficial. We explain the roundup ready corn and how we don't have to use as many different types, and it clicks with most of the kids. Most of them can figure…most of them have heard of round up and…they know what round up is," (Cross & Kahn, 2018, p. 97). Cross and Kahn observed that while there were discussions surrounding GMOs, however, those discussions did not appear to be scheduled for teaching activities. "Students were not encouraged to make a decision on a controversial topic or critically evaluate the impacts of their decision on society or the environment. Based on these interviews, it seems both teachers could utilize the SSI curriculum on the topic of GMOs," (Cross & Kahn, 2018, p. 97).

In conclusion, Cross and Kahn note that there is a need for organized curriculum to complement agricultural lessons taught in the classroom with school gardening projects. They write, "The first two themes, 'Difficulty meeting the standards' and 'Importance of integrating applied science' align well with findings from other students. Secondary school agricultural education teachers have communicated that it is important to integrate applied science into their agriscience curriculum (Warrick, Thompson, & Gummer, 2004). A study conducted in Oregon found that principals of

secondary schools with agricultural education programs believed that integrating science into the agricultural education curriculum would help students meet mandated standards and advance educational reform (Thompson, 2001). In a later study, Warnick, Thompson, & Gummer (2004) found that most secondary agricultural teachers in Oregon also agreed that integrating science into the curriculum could help students meet standards," (Cross & Kahn, 2018, p. 97).

Cross and Kahn noticed the interviews followed three themes including what the teachers felt were "1) difficulty meeting standards, 2) importance of integrating applied science, and 3) hot topics in the classroom" (Cross & Kahn, 2018, p.95). Both teachers, identified as Sam and John, stated they had difficulties helping their students meet learning standards. They quoted John as stating, "...and that's one of the things that I guess frustrates me about education is that we just keep wanting to raise the bar and the kids are getting further and further away from the bar…because they don't read, you know, they only do what they have to do. There's no reason for them. Most of them do not see any reason to dig any deeper…" (Cross & Kahn, 2018, p. 95). During the interview, the teacher identified as Sam stated that he had experienced difficulty teaching practical skills. "When discussing whether practical science skills were in the mandated science standards, he says, 'They are in there, but ya got so many…. How do ya do it? Ya can't," (Cross & Kahn, 2018, p. 96).

The researchers noted that the "hot topic" discussion on the use of GMOs could have been handled differently and more effectively as a teaching agent. They wrote, "While whether to use GMOS is an SSI, this topic was not discussed in a way that aligns with the SSI educational framework. These classroom discussions did not seem

to promote informal reasoning or scientific literacy as they did not explore the consequences of their actions/inactions or promote perspective taking of those that had differing opinions. A discussion on an SSI should be facilitated or guided by the instructor, who must have the confidence and knowledge base to guide classroom discourse in an open and unbiased manner (Levison & Turner, 2001)," (Cross & Kahn, 2018, p. 97).

Not only did Cross and Kahn note in their research the need for curriculums that integrate gardening into SSI curriculum, but the researchers as well as others (Miller, Clemons, McKibben, & Lindner, 2025) also note that many teachers need training related to gardening as well as specialized opportunities to practice engaging all their students in agricultural content (Miller, Clemons, McKibben, Lindner, & Cletzer, 2025). The researchers overserve, "Teachers may be able to utilize school gardens for SSI based instruction to promote scientific literacy. However, our findings suggest there is a demonstrated need for curriculum and professional development opportunities for agricultural teachers regarding the use of the SSI educational framework. Likewise, there is a need for professional development relating to teaching with school gardens (Blair, 2009)" (Cross & Kahn, p. 98). This research shows that while there is an interest among educators in teaching through in-school gardening programs as part of school based agricultural education (SBAE), there is a need for uniformed applications that can help teachers integrate hands-on gardening with scientific content. The writers also noted that it would appear that SSI using school gardens would be beneficial. There is a lack of sufficient study to support the concept. "SSI based instruction has had positive effects on student learning in the agriscience classroom (Shoulders & Myers, 2013),

and there are several SSI issues that can fit easily into the agricultural education curriculum. While sources of SSI curriculum for secondary education exist (Zeidler & Kahn, 2014), there is a need for SSI curriculum that relates to agricultural topics", (Cross & Kahn, 2018, p.98). In their closing remarks, Cross and Kahn suggest, "Teachers may be able to utilize school gardens for SSI based instruction to promote scientific literacy. However, our findings suggest there is a demonstrated need for curriculum and professional development opportunities for agriculture teachers regarding use of the SSI educational framework," (Cross & Kahn, 2018, p. 98).

Analysis by Cross and Kahn suggest that while teachers are interested in using gardening as teaching tools, they are not doing so because there is a lack of curriculum developed that would guide the effort. Cross and Kahn point to research in Oregon showing educators believed that using gardens in classrooms would be beneficial, but there are some key hindrances to using gardens in schools. The researchers note that gardens are used for SSI based teaching elements, but because there are few teachers being taught how to incorporate gardening in their lessons, there are less occurrences in school gardening than would be thought. Primarily, Cross and Kahn suggest further study is necessary to determine roles of gardening in science classrooms and how they might impact student learning. The writers did observe, however, that "A study conducted in Oregon found that principals of secondary schools with agricultural education programs believed that integrating science into the agricultural education curriculum would help students meet mandated standards and advance education reform (Thompson, 2001)." (Cross & Kahn, 2018, p. 97).

In their concluding comments, Cross and Kahn noted emerging themes in their research pointing to teachers having a problem meeting teaching standards using gardens, and need for applied science being woven into the gardening lessons.

The next chapter of this research presents some of the curricula that have been used nationally, and this researcher will consider the results of the qualitative data related to the impact of in-school gardens and gardening curriculum on student learning. The researchers observed that the two teachers in their study, John and Sam, needed to make changes in their use of gardening in their classrooms. “As John and Sam explained their teaching experiences, it was clear students were infrequently part of the decision-making process…. Furthermore, John mentioned the lack of student decision making. As he was discussing frustrations regarding the lack of critical thinking among students, he paused, looked down, and said…”and I think it’s because we’ve always made all the decisions for them,” (p. 97). Not only did Cross and Kahn make observations about the interviews with the high school's FFA educators, but they also observed the lack of research on the topic of gardening in schools, in general. They observed, “While secondary school agricultural education and SSI may seem like a natural fit. There has been a lack of scholarly work that unites the disciplines. As these scholars suggest, and this study corroborates, there is a need for more research that connects the SSI and secondary school agricultural education. Perhaps more research related to the theoretical framework needs to be conducted with secondary agricultural teachers,” (Cross & Kahn, 2018, p. 98).

Cross and Kahn noted in their conclusion that not only is there a need for curriculum to help agricultural teachers regarding the use of SSI educational tools, but there is also a

need for training and professional development among agricultural educators. “Professional development opportunities can be accomplished using both. It is vital that teachers do not push their beliefs on their students, as we have seen in this study. Doing so aligns with the traditional instructional paradigm, instead of the progressive paradigm,” (Cross & Kahn, 2018, p, 98). The next chapter of this research focuses on the research by Dorothy Blair and qualitative research on in-school gardening programs effect on student learning.

The Child in the Garden: An Evaluative Review of the Benefits of School Gardening, (Dorothy Blair, 2009)

Even with research showing some educators would like connectivity between school gardening and curriculum, there are researchers whose studies reflect the benefits of gardening on learning. While quantifying the amount of learning that gardening produces among students is limited, there is some qualitative research data pointing to benefits of incorporating school-based gardens in the learning process. Researcher Dorothy Blair conducted a review of literature regarding educators and Extension programs encouraging use of in school gardening.

In the work titled *The Child in the Garden: An Evaluative Review of the Benefits of School Gardening,* Blair supported qualitative studies remarking that other published research “. . . showed positive outcomes of school-gardening initiatives in the areas of science achievement and food behavior, but they did not demonstrate that children’s environmental attitude or social behavior consistently improve with gardening. Validity and reliability issues reduced general confidence in these results. Qualitative studies

documented a wider scope of desirable outcomes, including an array of positive social and environmental behaviors," (Blair, 2009, p.15). The researcher noted studies showing that three distinct kinds of curricula captured the interest of educators. "Overwhelmingly, gardens (Waliczek, Bradley, Lineberger, &Zajicek, 2000) and gardening curricula target elementary students. Some of the most popular curricula are the 1978 Life Lab K-5 Science Program (Life Lab, 2006); 1990 Grow Law curricula (National Gardening Association, 2006)'; Texas A&M's Junior Master Gardener Program (Dirks & Orvis, 2005); UC Davis's Curriculum nutrition to Grow On (California Department of Education,2005); Morris & Zidenberg - Cherr, 2004), and New York's curriculum *Kids Growing Food* (Faddegon, 2005)," (Blair, 2009,p. 16).

Blair's research supports the idea that in-school, supervised agricultural experience (SAE) can improve student learning, and it can also improve students' social behaviors. She observed, "The purposes of the redesigned schoolyard are academic, behavioral, recreational, social (increased sense of belonging, self-esteem, and compassion), political (the schoolyard as a visible community asset), and environmental remediation;" (Blair, 2009, p.16). Blair noted research pointing to the combination of school gardening and standardized test results. Blair wrote, "Emekauwa reported that 3 years of place-based learning focusing on local ecology-nature trails, soils, geology, butterfly gardens, and school interactions with community ecological experts- resulted in substantial reductions in unsatisfactory standardized test scores for language arts, math, science, and school studies among fourth-grade students in a poor, rural 80%Afican American, Louisiana school district" (Blair, 2009, p.16).

Additionally, Blair cited research conducted across twelve states in which there were teachers who utilized gardening concepts and teachers who did not utilize gardening in their classrooms. “Those researchers found that enthusiasm for learning, standardized test scores, and GPAs were higher in 92% of the comparisons-particularly in language arts, social studies, science, math, and thinking skills. The National Environmental Education and Training Foundation (2000) stated that the environment ‘from classroom to schoolyard to local nature centers and parks’ enables learning that is problem-based and interdisciplinary, with a significant positive impact on achievement” (Blair, 2009, p.16). The researcher also noted that studies point to gardening as “building blocks for classroom enrichment” (Blair, 2009, p. 17). Blair observed, “A garden is an environment in miniature, and to be successful a gardener must work in sympathy with nature (Demas, 1979). Gardens ground children in growth and decay, predator-prey relations, pollination, carbon cycles, soil morphology, and microbial life: the simple and the complex simultaneously. Gardens are intensely local. Everything except possibly the purchased pants and seeds are part of the natural local environment. The clouds, rain, and sun, the seasonal cycle, the soil and its myriad organisms, the insects, arachnids, birds, reptiles, and mammals that visit the garden teach about place” (Blair, 2009, p. 17). Blair noted that school gardening originally served to beautify school grounds, but it has grown to incorporate educational components (Blair, 2009, p. 17). Blair wrote, “Today’s children lack experience with natural ecosystem complexity. In all, 83% of the U.S. population lives in metropolitan areas (U.S. Department of Agriculture, 2006),” (Blair, 2009, p.17). Because of this, having gardens, according to Blair, would allow an outlet for agricultural learning.

“Gardens adhering to the principles of biodiversity and organic pest management – containing ponds or recycling streams, trees, and butterfly attractors – would be havens for a wide variety of flora and fauna beyond the crops, flowers, and bushes purposedly grown and would demonstrate ecosystems complexity,” (Blair, 2009, p. 17). Blair noted that having areas for students to have experiences in school-based gardens would enrich the learning experiences.

Another area of learning impacted by school gardening, according to Blair’s research, includes an impact on student learning of healthy eating habits. Blair researched the concept of teaching that food does not just arrive in a grocery store, and consequently, that teaching impacts students’ understanding of nutritional benefits of locally grown fruits and vegetables. Blair wrote, “School and youth gardens teach ‘how a plant goes from seed to plate’ (Rahm, 2002, p. 175), as one master gardener said. Such gardens introduce young gardeners to local sustainable food systems, as children eat their own produce, compost cafeteria food waste, and connect with adult growers and market gardeners (Graham et al., 2004; Moore, 1995; Morris, Briggs, & Zidenberg-Cherr, 2000)”, (Blair, 2009, p. 18). Blair observed that having gardens would broaden students’ understanding of how local food systems provide food that offers healthier options. Blair observed, “Anonymous prepackaged food arrives at supermarkets from energy-intensive polluting, and often obesity-promoting industrial food-manufacturing systems. Researchers have estimated that this system consumes 17-20% of American fossil fuel and that 29%of the food is wasted. To decrease the threat of the obesity epidemic, children need to broaden their perspective on what foods are edible and to personalize food,” (Blair, 2009, p. 18).

Blair noted that student gardens also help students concentrate by actively planting seeds and watering gardens. Blair cited research from three different authors supporting the argument. “Kellert argued that because nature changes rapidly, it attracts and simulates a child’s attention. Naming and categorizing objects found in the particularly information -rick and potentially fascinating natural world facilitates children’s capacity to retain information and ideas, a first step in cognitive development, as Bloom’s taxonomy of cognition outlined (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). The experience of nature’s detail, whether direct or vicarious, provokes children’s need to comprehend and make sense of what they have experienced” (Blair, p.19). Blair noted research shows gardens impact students' experiential learning. “Walizeck, Logan, and Zajicek (2003) evaluated the impact of a 4-hr outdoor hands-on nature program regarding weather, insects, water, and soil on the critical thinking and cognition of 175 second (about 6 minutes) – to fourth-grade students from five New Mexico schools. Researchers interviewed students, teachers, and volunteers about the outcomes by using open-ended questions, and then they classified keywords and phrases as one of the six categories by using open-ended questions, and then they classified keywords and phrases as one of the six categories of Bloom’s taxonomy of cognition. In all, 87% of respondents used application terminology, 19% used analysis terminology, and 26% used evaluation and synthesis terms such as problem solving, integrate, plan, test, and support,” (Blair, 2009, p. 19). Blair noted that additional studies point to experiential learning and not gardening have a greater impact on student learning. But there is a difference worth noting in the studies.

Blair wrote “The difference between a structured discrete experiential learning experience and a long-term involvement in a gardening process resides in the multitude of unstructured learning opportunities that are not in the lesson plan, happen spontaneously and nonhierarchically, and involve students and their adult mentors in multidirectional learning. Gardening requires physical labor. Repetitive tasks give ample opportunity for informality, and results happen slowly over a long time. Rahm studied the conversations that six African American 11–14-year-old students held with master gardeners and with each other during an 8-week summer youth-gardening projects in the Midwest, where young interns prepared the soil, started seeds, nurtured, harvested, and marketed their produce. The project embedded informal science education in gardening conversation that flowed in a natural and organic way, involving, as Rahm stated, ‘sense making through discourse’ (p.179),” (Blair, 2009, p. 20).

Blair noted that gardening offers “a potent and multidimensional experiential learning experience” (Blair, 2009, p. 20). Blair reviewed both qualitative methods used by several researchers when evaluating the benefits of school gardening. Blair included descriptions of the qualitative studies in the research under review.

Blair cited two studies on the outcomes of experiential learning of students involving gardening or agriculture projects. One of the studies that Blair cited gardening was not more effective than other “hands-on agricultural projects as a stimulator” (Blair, 2009, p. 19). “Waliczek, Logan, and Zajicek (2003) evaluated the impact of a 4-hr outdoor hands-on nature program regarding weather, insects, water, and soil on the critical thinking and cognition of 175 second- to fourth-grade students from five New Mexico schools. Researchers interviewed students, teachers, and volunteers about the

outcomes by using open ended questions, and then they classified keywords and phrases as one of the xi categories of Bloom's taxonomy of cognition. In all, 87% of respondents used application terminology, 19% used analysis terminology, and 26% used evaluation and synthesis terms such as problem solving, integrate, plan, test, and support" (Blair, 2009, p. 19).

In a second study, Blaire related results from two ten-week studies of different gardening and animal rearing programs to determine the impact on the students' learning of scientific processes. The study was at a middle school in Los Angeles with a control group being taught concepts without the use of gardening or animals to raise (Blair, 200 9, p.19). Blair cited the results, "Qualitative pre-assessment and post-assessments considered written and verbal responses to a series of unrelated hands-on cognitive tests. Both treatment groups improved their posttest scores dramatically, showing an increase in observational ordering, comparison, and communication science-processing skills with neither improvement in the control group nor difference by treatment. From these few studies, researchers can reasonably conclude that experiential learning, rather than gardening per se, improves a child's chances to use higher order cognitive skills," (Blair, 2009, pp. 19-20). After considering the experiments, Blair observed that the two types of learning tested through the experiment might have varied results because of such things a repeating a gardening task which might influence a student's understanding of a scientific process or conversations that students might have with teachers in a garden that might help students better understand a subject being taught.

Blair analyzed research that considered the learning outcomes of students who participated in gardening programs in school. The data was the result of questionnaires completed by seventeen school garden researchers. Blair cited the results as, "…Phibbs and Relf (2005) found that the learning outcomes most often studied were health and nutrition (69%), environmental education (30%), and self-esteem or self-concept (30%). The age group studied was predominantly elementary (85%) or middle school (38%). The present research also shows that among published quantitative studies, science achievement, nutrition knowledge, and change in food behavior have been most frequently measured, preceding environmental attitude change, self-esteem, and life skills," (Blair, 2009, p.20). In conclusion, after presenting these results, Blair noted "The intended research subject of qualitative studies is most frequently agricultural education, but the results are much wider in scope," (Blair, 2009, p. 20).

Blair noted in her article that review of qualitative research conducted by the researchers cited in the article led to results indicating more study is needed. Blair cited, "Short term, quasi-experimental designs are not considered valid or dependable. Systematic biases in data-collection techniques imply that the results reported by the quantitative researchers were more positive than was valid. The quantitative studies I have reviewed suffered from lack of rigorous sampling procedures and random assignments of control and experimental groups," (Blair, 2009, p.34).

Blair presented additional regarding gardening impact on student learning. Studies were included in Blair's research on the responses of teachers and school administrators on the impact of gardening on student learning.

Blair reported on the results of seven qualitative studies of elementary school gardening projects. Observing common themes in research, Blair listed the following:

“1. All seven studies reported that students were delighted and highly motivated by the pleasures of gardening and the opportunity to get dirty outside and were excited by exploratory learning framed in a garden context (Alexander, North, &Hendren, 1995; Brunotts, 1998; Brynjegard, 2001; Canaris, 1995; Faddegon, 2005; Moore, 1995; Thorp & Townsend, 2001).

2. All seven studies reported that students showed improved school attitude and pride in the garden and its produce. The students involved their parents, who became more involved with the school. (Alexander et al., 1995; Brunotts, 1998; Brynjegard, 2001; Canaris, 1995; Faddegon, 2005; Moore, 1995; Throp & Townsend, 2001).

3. All seven studies reported that school gardens had a strong community-building component, promoting teamwork, student bonding, a broader range of interaction with adults, and community outreach (Alexander et al, 1995; Brunotts, 1998; Brynjegard,2001; Canaris, 1995; Faddegon, 2005; Moore, 1995; Thorp & Townsend, 2001).

4. All seven studies found that school gardens provided a diversity of environmental-stewardship, math, and science-education opportunities measuring space, observing and experimenting with natural and plant processes, learning about soil improvement, recycling, creatively reusing materials, propagation, germinating, and saving seeds (Alexander et al., 1995;Brunotts, 1998;Brynjegard, 2001, Canaris, 1995; Faddegon, 2005; Moore, 1995; Thorp & Townsend, 2001).

5. Out of seven studies, four described how vegetable gardens provided holistic food and nutrition education, food-systems thinking, tasting, snacking, cooking dinners, food sales and philanthropy, and good food as reward for good work (Canaris, 1995; Faddegon 2005; Moore, 1995; Thorp & Townsend, 2001).

6. In addition, four of the seven studies reported that a nonstructured, discovery approach successfully provided the students with opportunities to explore natural phenomena (Brynjegard, 2001; Canaris, 1995; Moore, 1995; Throp &Townsend, 2001).

7. Four of the seven studies emphasized that school gardens required dedicated, experienced adult volunteers, master gardeners, or paid coordinators to flourish over time (Alexander et al., 1995; Brynjegard, 2001; Canaris, 1995; Thorp & Townsend, 2001).

8. Last, two of the seven studies noted that many elementary teachers were not agriculture-literate and lacked knowledge of basic plant science or plant-growing skills (Brunotts, 1998; Faddegon, 2005)" (Blair, 2009, p. 31).

The seven qualitative studies of students in kindergarten through 12th grade were evaluation of gardens that the researchers participated in or had a direct connection in establishing the gardens. Blair noted that it was difficult finding gardening programs to evaluate that involved high school students. Blair wrote, "However I found no quantitative and only two qualitative studies connecting gardening with high school students Although they did not fit the pattern of in-school gardening encountered by researchers in elementary schools, those studies showed innovative ways for using gardening with older students" (Blair, 2009, p. 31).

Blair concluded the research by noting that there is a need for more leadership from school leaders to engage students in gardening, and there is a need for more outcome-based development of gardening curriculums. Blair noted that factors influencing whether teachers utilized gardens as learning agents relied upon how enthused or educated the teachers were regarding gardening. Blair noted, “Samples of gardening teachers and teachers with adequate gardening support (Graham et al., 2004) were more enthusiastic about the potential of school gardens than were mixed samples of gardening and nongardening teachers (Graham & Zidenberg - Cherr, 2005). Support may come in the form of (a) enthusiastic principals, (b) effective and credible lead teachers who promote school gardening through contagious student excitement rather than through personal power (Vesilind & Jones, 1998), or (c) the semiretirement-lead gardener programs for teachers, such as the Davis, California, schools (Graham et al.)” (Blair, 2009, p. 35).

Blair stated that studies of school gardening are not addressing problems with starting up gardens and keeping gardens operational. “Studies have not addressed school-garden continuity or failure, but they have addressed the lack of teacher preparation for using gardens in instruction. Portillo (2002) reported that elementary teachers with some agricultural trainings are more likely to use school gardens as a learning tool…School-gardening experience and pant science could become a part of teachers’ preservice education, so that all teachers can feel prepared to use school gardening as a potent form of experiential education,” (Blair, 2009, p. 35).

Blair also stated that more effort should be made to develop curriculum, including gardening, as a teaching unit. “The results of qualitative, quantitative and survey

research have supported the conclusion that school gardening can improve students' test scores and school behavior. Teachers believe that gardens promote academic instruction. However, methodological shortcomings of the quantitative students have reduced faith in these results" (Blair, 2009, p. 35). Blair's conclusions note that using gardens is a useful teaching tool. "Gardens can improve the ecological complexity of the schoolyard in ways that promote effective experiential learning in many subject areas, particularly the areas of science, EE, and food education. Researchers and educators should pay attention to how they design the garden and the learning experience in the garden. Bothe preserve and in-service teachers need more training to effectively use gardening as a teaching tool," (Blair, 2009, p. 35).

The suggestion that Blair makes in the conclusion is that a combination of implementing curriculum and increased study is needed to make gardening a more effective tool. "To improve school gardening outcomes research, researchers need to (a) use well-designed longitudinal studies that combine qualitative and quantitative elements with appropriate sample design, (b) use validated instruments, and (c) control for teacher and ethnicity effects," (Blair, 2009, p. 36). Blair wrote that more research should be done in areas concerning why gardens fail; studies on ways that gardens are maintained. Blaire noted, "Researchers and educators also need to know whether the changes in environmental sensitivity and observation skills reported in qualitative studies of gardening are transient or long lasting, affecting behavior as a child matures," (Blair, 2009, p. 36).

A third article presenting research on in-school gardening programs by Cooperative Extension Systems offers a connection to firsthand learning of STEM.

“Use of Demonstration Gardens in Extension: Challenges and Benefits.” (Glen, et al., 2014).

Overall, the findings reported by Glen et al. (2014) inform several aspects of the present study’s research focus. The extensive use of demonstration gardens to facilitate hands-on and self-directed learning directly aligns with the current study’s examination of educators’ perceptions of learner engagement in garden-based activities. Agents’ observations of participants applying knowledge through maintenance, planning, and problem-solving activities correspond with the study’s objective to document educators’ observations of student learning within garden contexts. Additionally, the emphasis on experiential learning supports the investigation of perceived understanding of science and STEM-related concepts developed through garden-based instruction. Finally, the challenges identified—particularly related to time, funding, and program sustainability—mirror the present study objective to identify perceived challenges and supports associated with using gardens as instructional tools. While Glen et al. provide valuable insight into Extension-led garden programming, the absence of focused examination on school-based curricula and student learning outcomes underscores the need for qualitative research centered on educators lived experiences implementing in-school gardening programs, which the present study seeks to address.

Alabama Cooperative Extension System (Alabama Cooperative Extension System [ACES], 2023) uses firsthand teaching methods including community gardens, and in-school gardening activities through 4-H. The mission of Cooperative Extension is founded in the idea of teaching outside brick-and-mortar classrooms. “The practice of

‘university extension’ or off-campus, noncredit courses began in England and was introduced in the United States through city libraries. By 1890, Extension courses were frequently offered. The agricultural college at Rutgers (New Jersey) was one of the first to offer an agricultural extension program in 1891 with off-campus courses on soil and crops, feeding pants, and animal nutrition”, (Seevers, p.26). Nationwide, the topic of school gardening is one of interest to Extension educators. In their search for effects of gardening on Extension educational classes, four North Carolina State University team members conducted a study titled “Use of Demonstration Gardens in Extension: Challenges and Benefits.”

Researchers Glen et.al explained that gardening provides a unique learning opportunity. “Gardens provide opportunities for direct involvement, enabling the types of sensory, exploratory learning experiences Richardson (1994) recommends for Extension Clientele. In addition, gardens can be a source of the concrete experiences necessary for experiential learning (Kolb, 1984)” (Glen et al., 2014). The researchers note that Extension personnel often use in-school gardens as classrooms and create demonstration gardens for stakeholders to visit to learn concepts during Extension classes. “When properly designed and interpreted, gardens can support self-directed learning that results in both short-and long-term outcomes. These include knowledge gain, increased curiosity, improved skills of problem solving, behavior change, increased confidence, and attitude change,” (Glen et al., 2014). Even with the origins of demonstration education, the researchers discovered a need for documentation of the practice. “While research supports the education effectiveness of gardens, an extensive search of the literature could find no studies of how Extension agents use gardens in

their programming (Glen, p.1). Based upon their lack of data regarding Extension's use of gardening in programming, the researchers surveyed 35 extension agents in North Carolina to find out how horticulture agents with Alabama Cooperative Extension System were using gardens in their program delivery (Glen et al, 2014, p.1).

The research of Glen et.al., included a telephone survey of horticulture agents in North Carolina. The second phase of their research included a web-based survey. "The census study was conducted with thirty-five agents identified in the first part of the study, with thirty agents participating. Because the response rate was over 85%, non-response error was not addressed", (Glen et al., 2014, p. 1). Glen et al. (2014) reported that participants consistently perceived time demands and funding availability as the most significant challenges associated with maintaining demonstration gardens in Extension programming. In explaining their methodology, Glen et al. reported, "Content validity of the instrument was established by a panel of experts that included a county horticulture agent, the North Carolina Extension Urban Horticulture specialist, and two members of North Carolina State University's Department of Agriculture and Extension faculty. Face validity of the web survey was established by field testing the instrument among Florida horticulture Extension agents currently using demonstration gardens. No problems were revealed during the field test, and no changes were made to the web instrument," (Glen et al, 2014, p.1).

In the surveys, Glen, Moore, Jayaratne, Bradley, asked participants about how they used gardening in program delivery. "The most common forms of use were related to supporting education efforts. All study participants indicated gardens were used to enhance non-formal educational efforts, such as classes and workshops, with 97%

indicating that practices and techniques to facilitate self-directed learning are employed," (Glen, et al., 2014, p. 2).

First, the researchers displayed results from the question on how agents used gardens in their programs. "When agents were asked to indicated specifically how they use gardens to support their educational efforts, the top three responses related to the use of gardens to support hands-on leaning by 1) involving audiences directly in the garden's maintenance, indicated by 93%; 2) using the garden during workshops and classes to provide audiences with hands-on experience, 90%: or 3) involving audiences directly in the planning and development of the garden, 83%", (Glen et.al., p. 2). The next question posed to agents asked if their uses of gardens included self-directed learning tactics. "Ninety-seven percent reported using at least one technique for this purpose" (Glen et al, 2014, p. 3). Regarding the issue of programming goals, agents responded to questions about "principles and practices" utilized in their gardens. "Feed production was the most frequently selected principle or practice, indicated by 805 participants. This was followed by 'Water Wise Use/Xeriscaping, and/or Drought Tolerant Plants,' all practices aimed a conserving water in the landscape based on plant selection and placement, and 'Plant Selection for Site Conditions,' both of which were selected by 57% of participants", (Glen et al., 2014, p. 3). On the question about the stakeholders who participated in the gardens, results were from three categories of stakeholders. "The top three audiences were home gardens, indicated by 97% of respondents, Master Gardener Volunteers, 93%, and youth, 77%" (Glen et al, 2014, p. 4).

The researchers' survey next addressed how agents evaluate the effects of the garden on their educational programs. "When asked how they evaluate the impact the garden has on their program, 33% of participants responded they do not evaluate the garden's impact. Sixty-three percent indicated they evaluated the garden's ability to enhance learning when incorporated into non-formal education efforts such as workshops, classes, and tours, while on 20% indicated they evaluate the garden's ability to facilitate self-directed learning" (Glen et al., 2014, p. 4). The researchers then turned their attention to challenges in assessing results. "A Likert-type scale consisting of twelve challenge statements related to developing, maintaining, and using demonstration gardens as part of Extension programming was developed by the lead author. To determine the impact each of these challenges had on agents' ability to develop, maintain, and use demonstration gardens, agents were asked to rate each statement as follows: No impact (1), Very Little Impact (2), Little Impact (3), Some Impact (4), or High Impact (5)", (Glen, 2014, p. 4). The researchers detailed the findings. "Seven of the twelve challenge statements averaged ratings of at least 4.0, "some impact," or higher. The challenge found to have the highest impact was 'Time to manage the gardens' (4.57), followed by 'Availability of funds' (4.50). Another related challenge, 'Time to plan and develop the garden,' ranked third (4.43), while 'Support of Master Gardener volunteers' (4.37) and 'Availability of volunteers to work in the garden' (4.36) ranked fourth and fifth, respectively," (Glen et al., 2014, p. 4).

The researchers included in the survey questions about the challenges of Extension Agents using gardening in their horticulture programs. Glen et al. (2014) reported findings examining Extension agents' perceptions of challenges, benefits, and

professional development needs related to the use of demonstration gardens in horticulture programming. In their analysis, agents consistently identified time demands associated with managing and developing gardens, limited availability of funds, and reliance on volunteer support as prominent challenges to effective garden implementation.

In addition to perceived challenges, the study found that Cooperative Extension agents regarded demonstration gardens as valuable instructional tools that enhance program effectiveness and provide meaningful opportunities for volunteer engagement. Agents' responses indicated strong agreement that gardens support hands-on learning and serve as effective methods for delivering horticultural education. Glen et al. further noted that agents expressed interest in additional professional development, particularly related to evaluating program outcomes and impacts. In contrast, agents reported comparatively less need for additional training in routine garden installation and maintenance activities. Collectively, these findings highlight both the instructional benefits of demonstration gardens and the structural constraints that influence their sustained use in Cooperative Extension programming.

The researchers concluded that based upon their collected data, using gardens in Extension horticulture program delivery is an appropriate teaching device. Based upon the responses of the Extension Agents, the authors noted, "Gardens were used primarily to support educational efforts by providing opportunities for direct involvement with subject matter, as promoted by Richardson (1994) and Kolb (1984). In addition, all but one agent reported incorporating features, techniques, and practices such as plant

labels, interpretive signage, and self-guided tour brochures to enhance self-directed learning," (Glen et al., 2014, p.7).

In relation to Extension Agents using gardens as horticulture program delivery modes, Glen et.al. concluded that youth are among the three most targeted learning groups. The researchers concluded "Demonstration gardens are an effective educational strategy for teaching horticultural principles and practices to extension audiences, particularly homeowners, Master Gardeners, and youth," (Glen et al., 2014, p. 8). In the study conducted by Glen, it appears use of in school gardening does provide an opportunity for learning among students, but because there are no examples of curriculum involving school gardens included in the study, there are no quantitative findings that show the type of impact the school gardens have. By using Extension curricula, educators agree that in-school gardening impacts student learning, but further research is needed.

Getting outside: Three Teachers' stories of using the schoolyard as an integrated tool for elementary teaching. (Feille, 2013)

Teachers observe and often recall stories about student learning and sometimes share them with fellow educators and parents when determining which teaching works best for each student. As a child of a retired educator, I have heard countless examples of students' responses to lessons, school projects, and activities. Researcher Kelly Feille dedicated study to a teacher who uses this technique while teaching in school gardens. In the introduction of her article, Feille wrote, "Using the narratives of teachers allows for an opportunity to understand the context of teaching as well as provide

significance and reflection opportunities for the teacher's experiences (Greensfeld & Elkad-Lehman, 2007) (2013, p. 1)".

In her research, Feille interviewed three teachers (whom she identified as John, Debra, and Sophia) using semi constructed interviews, she and grouped their responses to questions in a manner that linked their beginnings in using student gardens and student reactions during their gardening activities (Feille, 2013, p.6). Her interviews with the teachers revealed a common concern: time for the teaching method and concerns that each teacher shared on whether they knew enough to make the outdoor teaching classroom, the garden, and effective teaching tool. "Not surprisingly, John Sophia, and Debra reported similar barriers to outdoor teaching that multiple researchers have found. Time and teacher knowledge as barriers stand out in research by Blair (2009), Greensfeld, and Elkad-Lehman (2007), and Murakami, Stuart, Witzig, and Waldron (2010). Additional barriers noted by Blair (2009) include funding as well as curricular links to standards, and a lack of teacher training (Feille, 2013, p. 8)". Regarding student learning, one of Feille's interview subjects, Sophia noted that her experiences in outdoor classrooms, student gardening, resulted in a change in her teaching methods. She wrote, "Kids ask questions, you know? And I found out that as I just answered their questions, the learning process stopped. I think it's like that a lot in our traditional classroom. A student asks a question, but the teacher answers, now gets back to work (or at least look like it). When I started asking the kids questions back, their learning got deeper. They wanted to know so much about the things we were seeing outside, and if I just told them, it killed their curiosity and their creativity. I started to use that to help their writing. We'd be out there; they would make observations and

write. And we looked so busy, so everyone was okay with it" (2013, p. 9). Feille went on to note that each teacher's stories revealed a change in their concepts of teaching methods. She wrote, "Sophia's experience as a teacher, watching the difference a change in teaching had on her students served as the catalyst for her self-directed change. John experienced mentoring and guidance that now encourages him to be the same for other teachers on his campus, hoping that change can happen to them too. Debra's beliefs about what a teacher needs to be comfortable teaching outside (prior experience in the outdoors) led her to be more skeptical about teacher change" (p. 11, 2013).

In her research, Feille noted that "garden pedagogy" allows teachers to use unplanned inquiries from students to enhance student learning. She concluded "Teachers act as facilitators rather than conveyors of knowledge. The responsibility of the teacher relies on gained experiences and fostering student inquiry rather than on stored knowledge (Williams & Brown, 2012), p. 13, 2013). By suing narrative inquiry, Feille related experiences of three teachers using student gardening as a tool contributing to the educational arsenal of those hoping to inspire learning. In research comparing effects of community gardens on participants, researchers noted in the increasing draw of gardening as a teaching tool. "In recent times, community gardens, and the act of community gardening, have had relevance in enabling neighborhood networking, improving local environments, establishing functional and recreational green spaces, harvesting fresh produce, and providing education (Guitart et al., 2012; Kingsley et al., 2009)" (Ong et al., 2019, p. 1).

Narrative inquiry was chosen as this design involves exploring and understanding the meanings that humans attribute to the activities they undertake (Josephsson and Alsaker, 2014). Narrative inquiry is: “a research method that focuses on the structure and nature of the narratives, or stories produced,” which was used to elicit the meanings associated with community gardening through exploration of participants’ stories (Howie, 2010, p.78).

Contribution of the Literature Review

Analysis of the literature evaluating school-based agricultural strategies, including in-school gardening, provides relevant context for the present study. The literature reviewed addresses the study’s research question by synthesizing qualitative findings related to theories of learning that explain how students construct understanding and make connections to innovative ideas through experience. For example, Blair (2009) noted that school gardening offers “a potent and multidimensional experiential learning experience” (Blair, 2009, p. 20).

Authors Cross and Kahn write in “Science in the Garden: A Qualitative Analysis of School-based Agricultural Educators’ Strategies” that studies show an increase in student test scores when school gardening programs were utilized. Specifically, they state, “Teachers have facilitated pertinent science learning experiences for students using school gardens, and today there are over seven thousand documented school gardens that exist across the country (USDA, 2015). Research tends to conclude that school gardens can increase student’s test scores (Blair, 2009: Joshi, Asuma, &Feenstra, 2008; Smith & Motsenbocker, 2005)”.

As further research pointing in-school gardening affects student learning, researchers Glenn, et al. presented positive learning effects on students because of the direct opportunities for students to connect the science they are learning in the classroom with real application in gardens. “Gardens were used primarily to support educational efforts by providing opportunities for firsthand involvement with subject matter as promoted by Richardson (1994) and Kolb (1984)” (Glen et al., 2014, p. 7). Collectively, the literature indicates that in-school gardening serves as an effective experiential learning strategy that supports students’ construction of scientific understanding through hands-on engagement and reflection. While prior studies document the educational potential of garden-based instruction, much of the existing research emphasizes program outcomes rather than educators lived experiences implementing these strategies within school and Extension contexts. This gap underscores the need for qualitative inquiry that centers educators’ perspectives, which the present study seeks to address.

Chapter 3

Methodology

Research Design

This study employed a qualitative narrative inquiry approach to examine how Alabama Cooperative Extension System (ACES) educators describe their experiences facilitating school and community gardening programs and how they understand student learning within those experiences. Narrative inquiry is appropriate when the goal is to understand human experience as it is lived and told through stories, rather than to identify a shared essence of a phenomenon. Rather than reducing educator experiences to a common structure, this approach centers individual accounts as narratives, attending to how experiences unfold over time, are shaped by context, and are interpreted by the individuals who live those experiences. In this study, the narratives provided by participants were treated as primary data, with attention given to temporality (past, present, and future), social context, and place, consistent with narrative inquiry frameworks. This study focuses on educators' narratives of their observations and experiences rather than on direct measurement of student outcomes.

Research Objectives

The study was guided by the following research objectives:

- To explore how in-school gardening influences student learning within Alabama Cooperative Extension System (ACES) contexts.
- Describe ACES associated educator's perceptions of learner engagement with garden-based educational activities.

- To catalog observations of student learning during in-school gardening activities.
- Describe Alabama Cooperative Extension System associated educator's perceptions of students' behavior during gardening sessions.

Researcher Positionality

In narrative inquiry, the researcher is not separate from the research process but participates in the co-construction of meaning. The researcher's background in agricultural education and familiarity with Cooperative Extension programming informed both the data collection and interpretation processes. This positionality was acknowledged throughout the study, and reflexive memory was used to document prior experiences and assumptions may have influenced interpretation.

Participants and Sampling

Participants were selected using criterion-based purposeful sampling. Selection criteria included:

- Current or prior affiliation with the Alabama Cooperative Extension System
- Direct experience teaching youth through school or community gardening programs
- A minimum of five years of experience in youth agricultural or Extension education

A total of seven educators took part in the study. These individuals were selected because they have rich experiential knowledge and were able to provide detailed narratives about their work with young people in gardening contexts.

Data Collection Procedures

Data were collected through semi-structured interviews, which served as the primary source of narrative data. Interviews were conducted via phone or video conferencing and were recorded with participant consent and transcribed verbatim. The interview protocol was designed to elicit stories of experience, rather than short responses.

Participants were encouraged to:

- Describe how they became involved in school gardening
- Share specific experiences working with students
- Identify meaningful or memorable moments
- Reflect on changes they observed in student behavior or learning

Follow-up prompts encouraged elaboration, helping participants construct extended accounts of experience over time. Narratives were constructed through interaction between the researcher and participants during interviews. This conversational format allowed participants to clarify, expand, and reflect on their stories in real time.

Data Analysis

Narrative data were analyzed using a combination of restorying and thematic analysis.

Re-storying Process

Consistent with narrative inquiry methods, participant accounts were first reorganized through a process of restorying, in which fragmented interview responses were reconstructed into coherent narratives. Each participant's story was structured to reflect:

- A beginning (entry into gardening or program involvement)
- Key events or turning points (significant experiences, challenges, successes)
- Outcomes or reflections (perceived changes in students or practice)

  This process preserved the temporal flow of experience and allowed each participant's narrative to be understood holistically.

Thematic Analysis Across Narratives

Following restorying, a thematic analysis was conducted across participant narratives to identify patterns of meaning. Analysis proceeded in stages:

1. First-cycle coding to identify meaningful segments of text
2. Pattern coding to group related codes into broader categories
3. Development of themes reflecting common elements across narratives

While themes were identified across narratives, care was taken to preserve the individual's integrity of each narrative rather than treating data as decontextualized excerpts.

Contextual Framing

Narratives were interpreted within the social, institutional, and geographic context in which they occurred. This included:

- The role of the Alabama Cooperative Extension System

- School and community environments in which programming occurred
- Broader issues such as food access, agricultural literacy, and youth development

Attending to context allowed for a deeper understanding of how participants' experiences were shaped by their professional and community environments.

Trustworthiness

To ensure rigor in this qualitative study, strategies aligned with trustworthiness criteria were employed:

- Credibility was supported through prolonged engagement with the data and use of rich, thick description
- Dependability was addressed through consistent data collection procedures and clear documentation of analytic decisions
- Confirmability was enhanced through an audit trial, including coding memos and analytic notes
- Transferability was supported through detailed contextual descriptions that allow readers to assess applicability to other settings

Additionally, participant narratives were constructed in a way that accurately reflected their accounts. Supporting authenticity.

Ethical Considerations

The study received approval from the Auburn University Institutional Review Board. Participants provided informed consent prior to participation. To protect confidentiality:

- Participants were assigned pseudonyms (e.g., Educator A, Educator B)
- Identifying details were removed from transcripts and final reporting

All data were securely stored and accessible only to the researcher.

In this research, the schools which utilized Alabama Cooperative Extension System in-school gardens or community gardens for teaching methods were primarily located in rural Alabama including Lowndes, Lee, Marion, and Walker County. Additionally, Extension in-school gardens information was gained from programs offered in Urban Montgomery, County, Alabama. While the Alabama Cooperative Extension System offers educational outreach and the opportunity for in school gardening and community gardens in all 67 Alabama counties, for this research, ACES employees working in select counties agreed to participate to share their educational experiences. According to the Alabama Department of Public Health, Montgomery, Marion, and Lowndes Counties have schools which are in areas considered to be food deserts in which residents in those areas have limited access to fresh produce from either local farmer's markets or grocery stores (APH What is a Food Desert). This food desert designation sparks interest among stakeholders in growing vegetables and fruit in such areas.

Interview Subjects' Backgrounds

The interview subjects are represented with a letter in accordance with IRB and best practices to ensure confidentiality. The characteristics and information are in Table 1. The interview participants represented a range of professional roles and backgrounds among Alabama Cooperative Extension System and Extension-associated educators who use gardening as an instructional tool. The group included both black and white educators and included both men and women. Program emphasis also varied across participants, with some educators leading school and community gardening programs

directly and others assisting with Cooperative Extension-supported gardens in schools and communities. Collectively, the educators' program focus reflects the use of gardening as a teaching strategy that extends beyond plant production to include science learning, nutrition education, and community engagement.

Participants also varied in tenure and geographic scope. Two educators (R and M) reported 20 and 17 years of experience, respectively, with primary work in the Alabama Black Belt Region, including Lowndes County and surrounding central Alabama counties. Another participant (D) reported more than 47 years of educational experience with statewide reach, while participant T reported more than 20 years of horticulture teaching experience and worked with Alabama Cooperative Extension System across two universities. In north Alabama, educators G, J, and B served schools in two neighboring counties (Walker and Marion) and each reported dozens of years of experience, illustrating sustained, long-term engagement with garden-based programming across multiple school settings. Each educator described using gardening in school and/or community settings to teach concepts related to science and nutrition. Participants drew on experiences with raised bed gardens, container gardens, and community gardens when responding to the guided interview questions, and their reflections provide context for the findings presented in Chapter 4. Participant demographic characteristics are summarized in Table 1.

Table 1.

Interview Participants' Characteristics

Name	Race	Gender	Program focus	Counties/ Service area	Years	Scope
R	Black	Male	Taught gardening	Lowndes, Autauga, and Montgomery	20	Horticulture education; primarily in the Alabama Black Belt Region
M	White	Female	Taught community gardening	Lowndes and Montgomery	17	ACES in the Black Belt Region
D	White	Male	Led gardening programs	Lee and statewide	47+	Statewide educator; latter 20 years with ACES
T	Black	Male	Led gardening programs	Montgomery and the Black Belt Region	20+	Teaching horticulture; worked with ACES at two universities
G	White	Female	Led community gardening to teach nutrition	Walker and Marion	Dozens	Teaching gardening programs in schools (two neighboring counties)
J	White	Male	Assisted with Extension community gardening programs	Walker	Dozens	Teaching gardening programs in schools (two neighboring counties)
B	White	Male	Assisted with Extension in-school and community gardening programs	Walker	Dozens	Teaching gardening programs in schools (two neighboring counties)

This researcher collected data using a qualitative method of narrative inquiry or more accurately question-led discussions with each subject. The relevant responses to the interview questions are presented in this work.

Archived audio interviews were presented for the dissertation committee chair to ensure integrity of the research. This researcher recorded telephone and zoom interviews with each participant while taking notes. Researchers Leu et al. noted in school gardening programs provide data on student learning. They wrote, “Across these studies, gardens supported cultural continuity by enabling intergenerational exchange, shared food practices, and locally grounded forms of knowledge. Adolescents learned from elders and circulated knowledge amongst peers. One student reflected: ‘A lot of the stuff my grandfather showed me are pretty simple things that gave me a little head start with teaching the kids… It’s easier in the garden to talk about and learn about other people’” (Lue et al., 2026 p. 19).

1. Each participant was asked to participate in this study based upon the following connections they had with either in school gardening programs or community gardening:
2. Each was responsible for helping students build and grow food in school or community gardens.
3. Each participant had a connection (either full time or temporary employment) with the Alabama Cooperative Extension System (ACES) or served as a full-time teacher for a local board of Education in Alabama.
4. Each participant was aware of Extension goals, expected conduct for teachers, and Extension personnel working with youth.

5. Each interview subject was aware of the research and reporting practices for ACES regarding in-school and community gardening results.
6. Each participant had more than five years' experience organizing community or in-school gardening for teaching.
7. None of the interview participants received compensation for their participation in this research.
8. Each participant received a copy of the IRB when consenting to being anonymous for interview subjects.
9. Each interview for this research has been saved and shared with the chair of this research effort.

Research Questions

This researcher conducted interviews among seven educators who work with youth and community gardens I different counties of Alabama. Interviews were conducted online with the permission of the participants. Participants' names were changed to alphabetical letters in data presentation.

Approved interview protocol:

Background and Program Overview

1. How long have you been an educator?
2. What age groups of community members do you serve?
3. What influenced your decision to use community gardens to teach your community members?
4. Describe the curriculum used in your community garden. How did it work?

5. Tell me about your program.
6. What is an average community gardening program like?

Impact on Community Members & Learning

1. What do you observe among community members that indicate they were actively engaged in the learning process during community gardening sessions?
2. What changes have you observed in your community members' comprehension of scientific processes during gardening lessons?
3. What changes have you observed in how community members participated in the learning process?
4. In what ways do you think that a gardening project affects your community members' overall learning experience?
5. Did you observe community members making connections with gardening and any other topics, such as art or music?
6. What do you think they got out of the experience?
7. Do you think that the gardening impacted the food choices the community members later made?

Feedback and Challenges

1. What are two questions that community members most often ask their teacher/instructor/extension educator while working in their community garden?
2. What comments do your community members make about their gardening experiences?

3. Is there anything that you would change while using community gardening to instruct people?
4. What was the buy-in from communities like?
5. How did you overcome the financial aspects of gardening?
6. Did the community members value your input into the gardens?

Future and Broader Implications

1. Do you think more communities should include community gardening, and why?
2. Moving forward, what should come next after having a community garden?
3. What should communities do next?
4. What should Extension do next to continue learning through community gardens?

Open-ended/Concluding

1. Is there anything that I have not asked about your community members' community gardening experiences that you would like to discuss?
2. What did I not ask you if you really want to share about community gardening?

Researcher Positionality and Reflexivity

The researcher brings professional experience as both a former broadcast journalist and a current Extension professional working in a rural Alabama county with socio-economic challenges. These experiences influenced the selection of qualitative interviews as the primary data collection method. In journalism, the researcher routinely relied on open-ended questioning to elicit detailed accounts from individuals with first-

hand experience of events, a practice that informed the design of the semi structured interviews used in this study. Additionally, using narrative inquiry granted access to working Cooperative Extension System employees during non-working hours and allowed them to participate in interviews via zoom and telephone interviews. Their recollections through story provide data needed to further contemplate school gardening activities as it relates to student learning. Researcher Sabrina Syed observed, “Narrative inquiry offers a way to engage deeply with participants’ lived experiences by revisiting past events and integrating them into meaningful learning” (Syed, 2026, p. 168).

The researcher also has professional familiarity with Alabama Cooperative Extension programming and garden-based education, including direct experience engaging with educators and community members through gardening initiatives. This positionality provided contextual understanding of the setting but also introduced the potential for assumptions regarding the value and impact of garden-based instruction. To address this, reflexive journaling (Creswell, 2013; Lincoln & Guba, 1985) was used throughout data collection and analysis to document assumptions, reactions, and interpretive decisions.

The researcher acknowledged prior experience and maintained reflexive awareness throughout the study. Consistent with qualitative inquiry practices, reflexive journaling was used to document assumptions, reactions, and interpretive decisions during data collection and analysis (Creswell, 2013). Interview questions were designed to allow participants to guide the discussion, and analytic decisions were documented through an audit trail to support confirmability.

Limitations

This study is limited to the specific educators' perspectives and descriptions of the learner's engagement or learning included in the sample. This study did not include any direct observation or assessment of student outcomes. Findings are limited by a reliance on self-reported data and the contextual specificity of the Alabama Cooperative Extension System and associated programing.

Institutional Review Board

In accordance with Auburn University Policy Institutional Review Board was consulted and evaluated for this project to ensure participants were protected. All policies and procedures were followed including giving all participants the information letter outlining that participation was completely voluntary, that their answers would be kept confidential, that they could stop the interview at any time and it would not affect their relationship with Auburn University, Alabama Cooperative Extension System, or the researcher. They were informed that every attempt would be made to ensure that their identity and participation was kept confidential and that pseudonyms would be used to keep their names separated from their responses.

As part of this qualitative research, interviews were conducted via zoom with educators in Alabama who use gardening to instruct adults and youth. Neither the names of the participants nor specific information regarding their schools or service areas is being revealed in this study to protect privacy. The researcher transcribed each interview, removing extraneous conversations. It was noted that each participant was

very eager to share recollections about experiences, and they were very descriptive about sharing stories about times when they felt they were able to teach a particular concept to a student.

Chapter 4

Findings

In keeping with narrative inquiry, this chapter presents findings as individual participant narratives constructed from interview data. The research analysis focused on interpreting participants' stories and identifying patterns across those narratives. Coding Procedures were used to organize narrative accounts and support the development of themes across the participants' individual narratives (Creswell, 2013; Creswell, 2007; Saldaña, 2016). Consistent with narrative inquiry, data analysis focused on interpreting participants' stories and identifying patterns across narratives (Creswell, 2007). Constant comparative was used as an analytic method to support coding and identify patterns across narratives, rather than to develop a formal theory (Saldaña, 2016).

The constant comparative method of data analysis, as described by Creswell (2013), is an iterative qualitative analytic approach in which segments of data are continually compared to one another to refine codes, categories, and patterns. In this study, constant comparison was applied to responses to interview questions and relevant portions of interview conversations. Initial coding was used to identify meaningful units of data related to participants' descriptions and observations. As additional data were reviewed, segments were continually compared with previously coded data to clarify meaning, refine categories, and identify similarities and differences across participant responses. Through this ongoing process of comparison, categories were consolidated and refined into broader themes that represented patterns evident across the dataset. Although constant comparison is historically associated with

grounded theory, it was used as an analytic technique to support category refinement and theme development rather than to generate a formal theory or explanatory model. This analysis resulted in overarching themes representing a pattern of shared or similar experiences across participant narratives for the educators interviewed and will be presented in Chapter 4 findings and discussed in Chapter 5 discussion and conclusions.

This chapter presents the findings as participant narratives drawn from interviews with educators involved in school and community gardening programs in Alabama. Consistent with narrative inquiry, each section presents the educator's experience as a story situated in time, place, and professional context, followed by a synthesis of patterns that emerged across narratives.

Individual narrative: Mr. R.

Mr. R. has a doctorate in education and is an Alabama Cooperative Extension System urban agent with more than 20 years of experience in garden-based education. He has been a certified educator since 2001. Mr. R. works in central Alabama in an area referenced as the Black Belt region because of historically rich soil.

Mr. R. began working with youth in Lowndes County upon this researchers' request nine years ago to lead student construction of raised bed gardens in two public housing areas and at three elementary schools. In addition to presenting classes to adults on horticulture, Mr. R. also trains educators statewide on how to lead students in constructing school gardens at their schools and how to use school gardens as outdoor classrooms.

One of the clear indicators of learning that Mr. R. said he has observed working with students in school gardens in Lowndes County is students demonstrating correct usage and understanding of new scientific vocabulary and botanical processes. During his interview, Mr. R. said, "Some did not know the difference between male and female parts of a plant…The light goes off in their head. They also stop calling it ‘dirt’ and start saying ‘medium.’ Participants began starting plants at home, adopting low-cost seed-starting strategies, and sharing photos of their progress. These behaviors indicated internalization of skills and confidence. “People start texting pictures of cucumbers they are starting indoors instead of buying transplants… they start saving money. They are changing their behavior.”

Mr. R. stated during the interview that he noticed the students were learning by doing and that physical activity is key to teaching younger generations. During his interview, Mr. R said that he consistently emphasized that gardening is most effective when taught through hands-on, tactile experiences. He linked his approach to experiential learning theory and stressed the need for active engagement due to short modern attention spans. “I’m a true believer in hands-on experiential learning… Kids today have short attention spans, so it’s important to get them engaged with something hands-on and then give them the opportunity to reflect on what they’ve learned.”

Mr. R. described gardening as a counterbalance to youth's expectations for instant gratification. Students learned to wait, observe growth, and engage in caretaking behaviors.

“They want instant gratification… but gardening forces them to slow down. Over 90–115 days (about 4 months) they watch something grow, and it changes their mindset.” He

observed that Gardening contributed to improved behavior, especially when students who previously had frequent outbursts began showing calmness and focus. “Students went from having behavior outbursts to having none. They realize a garden takes time, and it calms them down.”

During the interview, Mr. R referred to a widespread lack of hands-on training for teachers, particularly early-career educators. He emphasized the potential for interdisciplinary integration, noting opportunities in math (measurement, conversions), science (ecosystems, water quality), history (Victory gardens), literacy (journals), and physical education (pedometers). “Teachers do not feel they have the resources… Pre-service teachers have not learned much about hands-on instruction. Math, social studies, language arts, PE—all of them have connections in the garden.” School gardens often lack stable financial support, requiring reliance on grants, donations, or reclaimed materials. Mr. R. frequently obtains lumber, soil, and other materials via partnerships with local businesses. “A lot of times I must beg, borrow, and steal. Lumber companies let me sift through boards they cannot sell… We write grants whenever we can.” Mr. R. proposed the creation of a statewide database or app cataloging active garden beds, needs for materials, and volunteer opportunities, which would streamline support for schools. “We need a database of gardens—active and inactive—so agents and volunteers know where help is needed. Even an app would work.” Mr. R strongly advocated for beginning garden education at the Pre-K level, emphasizing Alabama’s nationally recognized early childhood programs as an ideal entry point. “We have one of the best Pre-K programs in the U.S. The initiative should start there. Make the garden a center point of the school.” Across the interview, Mr. R presented a coherent argument

for garden-based instruction as a versatile, developmentally responsive, and cross-disciplinary educational method. His observations offer strong experiential evidence that gardening:

- enhances scientific understanding
- supports socio-emotional development
- builds self-efficacy and behavior change
- offers pathways for curricular integration
- requires structural and administrative support
- aligns especially well with early childhood education

These findings contribute directly to the study’s purpose of understanding educator perceptions of garden-based learning within Alabama Cooperative Extension System contexts.

Individual narrative: Ms. M.

This summary presents the observations of the narrative interview conducted with participant Ms. M., a Master Gardener Program educator with Cooperative Extension who supports community and school-based horticulture instruction. Ms. M. has a master's degree in horticulture and has been a horticulture educator for approximately 17 years. She serves stakeholders in central Alabama, a region known as the Black Belt region because of its rich soil.

Her Cooperative Extension role includes leading community learning gardens, delivering horticulture workshops, and occasionally teaching in school settings through

Cooperative Extension partnerships. Ms. M. became involved in this research after teaching classes to elementary school students on soil testing, seed starting, transplanting, plant diseases and health for students at an elementary school in Lowndes County.

During the interview, Ms. M. emphasized that she has observed that youth working with plants in gardens appear to develop deeper understanding when they can see, touch, and compare real plant material. She described “light-bulb moments” when students recognized botanical structures such as compound leaves, or alternating versus opposite leaf arrangements. These hands-on encounters caused students to “slow down and pay attention to the detail,” strengthening observational skills.

Her “learning gardens” incorporate multiple growing formats—raised beds, in-ground plots, container gardens, tires, and grow bags—allowing learners to compare outcomes and adapt strategies for home use. Ms. M. said this variety of gardening activities with youth in schools supports experiential learning through repeated trial, variation, and application.

Ms. M. has seen that student and adult learners showed increased horticultural literacy as they adopted more precise terminology when identifying plants. She said recognizing leaf morphology moved learners from casual classification (“just a leaf”) to structured, scientific categorization.

Ms. M. noted that participants, especially adults in community learning gardens—often attempted new methods at home, applying strategies such as new trellising systems, seed starting, and crop variety trials. This application reflects internalization of skills and increased self-efficacy in gardening practices. She noted during the interview

that youth gained awareness of local food seasonality, distinguishing when peaches, apples, pears, muscadines, or blueberries are available locally versus imported. This knowledge helped participants make more informed decisions about produce selection.

Through gardening and discussion, participants developed greater appreciation for the labor, inputs, and environmental factors needed to produce food. Ms. M. saw that this led to a deeper understanding of the food supply chain, including crop losses, pest pressures, and the distinction between local and imported produce. Ms. M. said that participants often asked, “What is organic?” and expressed curiosity about organic production in the Southeastern climate, which presents challenges such as heat, humidity, and fungal pressure. Ms. M. stated that these questions showed interest in environmentally oriented food decisions and agricultural sustainability.

Learners also posed questions about genetically modified or engineered foods, which Ms. M. reported were often prompted by grocery store labels. During the interview, Ms. M. suggested that gardening can be a starting point for broader socioscientific inquiry. Ms. M. identified funding as a significant barrier for school and community gardens. Soil, equipment, amendments, and ongoing maintenance costs limit sustainability. While adult Master Gardener groups often offset costs using plant sales, schools and churches often lack these mechanisms.

Sustaining gardens requires continual weeding, pest management, replanting, and soil care. Ms. M. reported that gardens often “fizzle out” when labor is insufficient or when daily/weekly caretaking is not assigned. She said that gardens placed in low-visibility areas are easily forgotten— “out of sight, out of mind.” Ms. M. noted that

gardens located at building entrances or near high-traffic walkways receive more consistent attention and care.

The analysis of Appendix B shows that Ms. M.'s instructional experiences highlight the strength of experiential, sensory-rich learning in promoting scientific understanding. Learners' cognitive engagement was shown through improved vocabulary, careful observation, and application of methods to home contexts. Gardening also fostered critical thinking about food systems, seasonality, and agricultural sustainability. In conclusion, Ms. M. noted that persistent challenges to having in school and community gardens including funding, maintenance, and visibility— must be addressed before measuring long-term gardening program success can be assessed. These findings corroborate study-wide themes of experiential learning, cognitive development, socio-emotional benefits, and resource-centered barriers.

Individual narrative: Ms. G.

This summary presents the observations of Ms. G., who serves as an Alabama Cooperative Extension System educator focusing on human nutrition, diet, and health education through the Expanded Nutrition Education Program (EFNE)) Ms. G. serves two northwest Alabama counties and helps with a school garden and student operated fruit and vegetable market. Ms. G. was invited to take part in this research because of her extensive work with youth gardening projects. She has worked over a dozen years with Cooperative Extension and dozens more gardening. Ms. G. has worked with several Alabama Cooperative Extension System programs—including EFNEP,

SNAP-Ed, 4-H, and “Grow More Give More”—implemented gardening initiatives independently, often without communication or coordination. According to her account, this lack of collaboration led to duplicated efforts and uncertainty surrounding program ownership and long-term accountability.

She emphasized that gardens cannot survive as “one-person projects.” Without a committed team or advisory board, gardens often deteriorate when the lead teacher or staff member leaves the school. Ms. G. recommended clearer communication and coordination between Extension programs to ensure alignment of goals and responsibilities when establishing school or community gardens. In responses to interview questioned, she encouraged school leaders and Alabama Cooperative Extension System program leaders to develop advisory committees that can maintain continuity, oversee long-term planning, and prevent gardens from falling into disrepair.

The analysis of Ms. G.’s interview highlights the complexity of implementing and sustaining school gardening programs. While she strongly values experiential, integrated learning, she identifies substantial barriers—particularly teacher engagement, funding, and organizational coordination—that influence the long-term success of gardening initiatives. Her insight underscores the need for collaborative structures, integrated curriculum approaches, and sustained community and institutional support to maximize the educational benefits of school gardening.

Individual narrative: Mr. T.

Educator Mr. T. is a Tuskegee University Cooperative Extension Program employee who holds a Bachelor of Science degree in agriculture education and

counties in the Black Belt region of Alabama. Mr. T. is also a retired Coordinator of a county office of the Alabama Cooperative Extension System. He works in the areas of horticulture, row crops, and animal science (cattle production). Educator T. has more than 20 years of experience leading gardening demonstrations, teaching agricultural education through Cooperative Extension classes, and growing produce on his family's land.

During his interview, Mr. T. described becoming involved in school gardening as part of his broader work in youth programming through Extension. He said that gardening offered a practical way to connect students to agricultural concepts and provided an opportunity to move beyond traditional classroom instruction. As Mr. T. noted, gardening allowed students to actively participate in the learning process rather than simply receive information.

A key experience described by Mr. T. involved working with students during gardening activities where they were asked to observe plant development and participate in maintaining the garden space. During these activities, he observed a shift in how students interacted with the content. Students who were previously less engaged in traditional instruction began to participate more, showing interest and asking questions. Mr. T. said, "that student couldn't wait to get there," demonstrating sustained interest and ongoing learning in the school garden.

Although his work centered on youth, Mr. T noted that gardening also serves as a powerful educational tool for adults. Adults involved in community gardens developed observational and problem-solving skills like those of students. This cross-generational

engagement reinforced his view that gardening is not only an instructional method but also a family and community learning process.

Mr. T reported that gardening allowed students to understand plant science in a way that formal instruction alone could not be achieved. Tasks like checking soil moisture, identifying pests, or comparing plant growth gave students opportunities to apply scientific vocabulary and concepts.

In his concluding reflections, Mr. T expressed dedicated support for increasing the number of gardens in schools. He believes that gardening enhances student learning, fosters hands-on understanding, and provides experiences that students remember long after instruction ends. He stated that gardening “positively” affects learning because it allows students to connect knowledge with real-world tasks.

Mr. T’s interview highlights the significant role of experiential learning in promoting student engagement, scientific understanding, and long-term interest in gardening. His insights demonstrate how garden-based instruction supports cognitive development, fosters behavioral engagement, and strengthens community connections. As a veteran Extension educator with decades of experience in Tuskegee University Extension and ACES, Mr. T emphasized that gardening is a powerful, hands-on instructional approach that benefits youth development and contributes to lifelong learning across families and communities.

Individual narrative: Mr. J.

Mr. J. works with a Cooperative Extension System school garden alongside an Extension employee in Walker County. He has worked teaching vocational education

classes and gardening to students for dozens of years. Mr. J. described how gardening began with small outdoor vegetable carts (“veg trucks”) and eventually grew into raised beds and a greenhouse. These spaces became extensions of the classroom where students could observe, interact with, and manipulate real living systems rather than solely learning from textbooks.

During his interview, Mr. J. noted that he observed gardening impacts on student learning when behavior changed among the participants. For example, Mr. J. noted that his students enjoyed growing plants that supported butterfly growth in their greenhouse garden. Although Mr. J did not rely on a formal curriculum, he aligned garden activities with his fifth-grade science course of study. Students applied academic content through observations. Mr. J. noted that the greenhouse and garden created natural environments for students to communicate-an instructional practice that is often restricted in traditional settings. This fostered an exchange of ideas and peer-to-peer instructions. Mr. J. said that students verbalized observations, negotiated tasks, asked questions, and discussed their work, strengthening communication skills, and scientific reasoning.

Individual narrative: Mr. B.

Mr. B. is an educator in Walker County who asists with an Extension directed in a school garden and produce stand operated by his students. Mr. B said he has over a dozen years' experience as an educator in Walker County. Mr. B. collaborates with Ms. G. and Mr. J. who teaches students using the greenhouse garden and fruit and vegetable stand that students at his school run.

Mr. B described a clear trajectory of student learning: initial uncertainty in planting techniques was followed by procedural mastery and peer instruction. Students who had learned correct techniques (e.g., proper seed depth, number of seeds per cell, appropriate soil volume) began correcting their classmates, demonstrating internalized knowledge and confidence.

Mr. B. noted that because of the gardens, his students became more engaged in learning the scientific process of growing fruits and vegetables. Mr. B. also noted that there was a change in behavior among students who became less introverted. Both educators discussed the profound impact gardening had on students who previously struggled academically or socially. Students who “didn’t fit in” found success in the greenhouse. Mr. B described a student who had been in special education for most of her academic career and who not only excelled in the greenhouse but also developed ownership, independence, and pride in her role, arriving to school eager to work with plants each day.

Mr. B echoed this idea, explaining that the greenhouse provided continuous opportunities for hands-on engagement through planting, watering, transplanting, and monitoring plant development. Both educators incorporated full-cycle learning experiences. Mr. J’s classes engaged in butterfly rearing projects where students handled larvae, tracked metamorphosis, and observed emergent butterflies within greenhouse conditions. Likewise, greenhouse seed propagation required students to learn about planting depth, spacing, germination timing, and early plant care. The process allowed students to connect early scientific concepts (life cycle, growth patterns, system inputs) with lived experiences.

Gardening served learners across the achievement spectrum. Mr. B noted that valedictorians, average students, and students with learning challenges all found meaningful engagement. Gardening disrupted stereotypes about agricultural programs and validated multiple ways of being smart, further reinforcing the equity potential of hands-on, student-centered instruction.

Students from housing authorities often questioned how they could garden at home with limited space. School gardens provide equitable access to hands-on agricultural experiences and exposure to fresh foods they may not otherwise encounter. In turn, students were more willing to try to produce what they had personally grown.

Through greenhouse management, students learned financial literacy (calculating sales), entrepreneurial skills, responsibility, and teamwork. These real-world applications supported workforce readiness, aligning naturally with Mr. J's career-technical education focus.

Through the interviews, gardening emerged as a dynamic instructional tool that supports cognitive, social, and emotional learning for students of all backgrounds. Mr. J and Mr. B described rich, hands-on learning environments that not only strengthened students' scientific understanding but also enhanced confidence, ownership, and motivation. The greenhouse and garden projects fostered inclusiveness, provided real-world skills, and connected learning to lived experiences. Their reflections demonstrate how in-school gardening initiatives, when supported by strong partnerships and vision, can transform educational environments and deepen student learning.

Cross-Narrative Themes

After examining individual narratives, patterns across participants' stories were identified (Creswell, 2013).

Theme 1: Hands on engagement as a condition for learning

Educators consistently described direct interaction with plants, soil, seeds, or garden tasks as the moment when students became more engaged. During the interviews major themes and associated subthemes emerged from the data including perceived effectiveness of "hands on" experiences in learning, in-school gardening impacts on student behavioral and a need for curriculum incorporating in-school gardening programs. Across all interviews conducted with Extension and vocational educators, several clear patterns emerged indicating that the educators described in-school gardening as positively influences student learning. Although each educator worked in different counties, age groups, and instructional contexts, their descriptions consistently demonstrated that gardening enhances cognitive learning, social and emotional development, and behavioral engagement. These findings mirror the broader research examined earlier in this study, which shows that experiential gardening programs foster increased motivation, improved attitudes toward learning, and deeper understanding of scientific concepts. However, as noted in both the literature and the present study, the degree to which school gardening improves measurable academic performance remains uncertain, requiring further quantitative research.

Theme 2: Observable changes in the behavior and participation

Several educators described students becoming calmer, more patient, more focused, or more persistent while gardening. The interviews revealed compelling evidence that gardening supports socio-emotional growth, especially for students who struggle in conventional academic environments. Mrs. G., Mr. J., and Mr. B. each described students—particularly those receiving special education services or those who felt disconnected from academic success—who developed confidence, independence, and a sense of belonging through gardening. One student, previously in special education for most of her academic career, thrived in the greenhouse, taking complete ownership of daily operations and demonstrating leadership and pride in her work. Mr. R noted significant behavior improvements among students, including reduced classroom outbursts and increased patience as they learned that gardening requires time, care, and delayed gratification. Mr. T. described gardening as an activity that sustains student motivation over months, with students eagerly awaiting their weekly gardening sessions and taking pride in the gardens they built and maintained.

Across all educators, gardening served as a tool for promoting emotional regulation, collaboration, responsibility, and positive identity development. These socio-emotional outcomes often occurred even when cognitive learning gains were more subtle or difficult to measure. Several educators reported that gardening helped their students connect school learning to their family culture, agricultural heritage, and community. Mr. R reported that students shared stories about grandparents' gardening traditions, blending Indigenous and familial agricultural knowledge with what they learned in their school gardens. Ms. G noted that gardening increased students' willingness to try fresh foods, particularly important in communities where many

students qualify for free or reduced lunch and may have limited access to fresh produce. Mr. J and Mr. B. described community and family involvement in greenhouse sales and garden-based events, emphasizing that gardening can become a school-community bridge. These findings align with the literature, which highlights gardening's ability to nurture environmental awareness, cultural continuity, and community engagement.

Theme 3: Growth in scientific vocabulary and conceptual understanding

Participants described students asking more questions, using more precise language, and connecting gardening tasks to scientific ideas. All educators observed notable gains in students' scientific understanding derived from hands-on gardening. Mr. R. documented improvements in scientific vocabulary and conceptual understanding, noting that students stopped calling soil "dirt" and began using the scientific term "medium," demonstrating increased precision and comprehension. This movement toward more precise disciplinary language is consistent with research identifying that development in agricultural language takes application within context (Clemons et al., 2024; Clemons et al, 2026). Students also asked increasingly complex questions about plant growth, nutrient cycles, and environmental conditions, linking what they learned in the garden to formal classroom lessons such as soil minerals and plant biology. Ms. M. emphasized botanical identification skills, describing "light-bulb moments" when students recognized structures such as compound leaves, alternate leaf patterns, or germination characteristics. Mr. T. observed strong cognitive engagement in seed germination experiments, where children dissected seeds,

examined internal structures, and logged germination times. These activities strengthened scientific reasoning and understanding of life cycles. Mr. J. and Mr. B. saw students deepen cognitive learning by taking ownership of tasks such as seeding, transplanting, measuring growth, and raising butterflies. Procedural mastery led many students to teach those skills to their peers, demonstrating internalization and transfer of learning. While each educator approached gardening through different instructional strategies, all agreed that experiential, tactile learning was essential for helping students grasp scientific concepts that are often abstract or difficult to understand in traditional classroom settings.

Theme 4: Structural barriers and sustainability

Educators also consistently identified funding, labor, visibility, and institutional support as major factors influencing whether gardens continued. Although their overall observations aligned, educators differed in instructional context with (Mr. R, Ms. M, Ms. G, and Mr. T) often supported multiple schools and community gardens. Vocational educators (Mr. J and Mr. B) embedded gardening deeply into daily school culture through greenhouse programs. The interview subjects also differed in the scale of their gardening program. For example, Mr. B's greenhouse served as a fully operational agricultural enterprise that funded program costs while Mr. R and Mr. T relied more heavily on community donations and small-scale beds.

In summary, each participant in the inquiry noted various ways in which school gardening affected student learning. Capsulizing the primary emphasis of each interview showed variations on observation of student learning:

1. Mr. R stressed behavioral and linguistic changes.
2. Ms. M emphasized botanical literacy and diligence.
3. Ms. G focused on inclusion and sustainability.
4. Mr. T highlighted foundational scientific processes and early STEM engagement.
5. Mr. J and Mr. B underscored ownership, identity, and peer teaching.

These differences in the narratives reflect diverse program structures but ultimately support the same conclusion: the educators perceived that gardening enhances learning in ways that traditional instruction often cannot.

The collective findings support the overarching conclusion that the educators perceive that in-school gardening positively influences student learning across cognitive, social, behavioral, and developmental domains. The educators believe that students learn scientific concepts more deeply through hands-on experiences, demonstrate increased motivation and engagement, and develop important life skills such as patience, responsibility, collaboration, and problem-solving. Furthermore, the educators perceived that gardening provides inclusive, accessible learning experiences that benefit students of all academic levels, including those who traditionally struggle in classroom settings. However, consistent with the literature and the educators' narratives, the results suggest that more rigorous research is needed to measure the actual academic impact of gardening on grades, standardized test scores, and long-term learning outcomes for students. The narratives suggest that educators believe that gardening enriches learning, but future mixed-methods and longitudinal studies will be necessary to quantify the full educational value of school-based gardening programs.

Educators also observed that students transferred gardening skills and knowledge beyond the school setting. Mr. R's students began starting seeds at home using inexpensive household materials, reflecting both economic awareness and practical application of knowledge. Ms. M's community participants and students applied plant identification techniques to their home environments, deepening their scientific literacy. Mr. T described parents and adults participating alongside students, turning gardening into an intergenerational learning experience. Mr. B found that greenhouse revenue projects (e.g., plant sales) taught students mathematics, entrepreneurship, and customer service, demonstrating transfer of school learning into real-world skills.

Across educators' responses to interview questions, evidence of transfer strengthened the conclusion that the educators believe that gardening does not merely enhance learning inside the garden, it fosters practical skills that students can carry into adulthood. All educators reported that:

- Firsthand learning was the most effective instructional approach.
- Students displayed increased engagement, curiosity, and motivation.
- Gardening benefits students across performance levels, including high-achieving, average, and special education students.
- Students demonstrated behavioral improvements, including patience, responsibility, and reduced disruptive behaviors.
- Gardening enhances vocabulary development, scientific reasoning, and observational skills.
- Resource challenges (funding, time, materials) persisted across counties.

Chapter 5

Summary, Conclusions, Recommendations

This section utilizes narrative inquiry and offers a comparison of each interview subject's responses to questions regarding what they observed among students that indicated active learning occurred. These gardening programs offer opportunities for unique one-on-one discussions. While the entire transcription of each interview is available in the appendices section of this work, what follows is a capsulation of responses that most support the research question of whether gardening influences student learning.

Each interview subject was asked the same question; however, some did not directly answer the questions but instead told stories about how students changed after working alongside their peers constructing raised bed gardens. The indirect answers, however, support this research premise that school gardening programs do affect student learning. A few of the respondents told stories about student activities related to their observations, and small portions of the interviews were omitted if they referenced information that would make it easy for the reader to identify the school, or even the students involved in the gardening program. Interestingly, there were more affirmative answers to the question of whether each educator noticed gardening affecting student learning.

Research participants uniformly described behavioral indicators—such as increased attentiveness, inquiry, and application of new terminology—that reflected students' construction of meaningful learning connections.

The Alabama Cooperative Extension System has as its mission the pledge to offer educational outreach that will better the lives of stakeholders statewide. On its website, ACES states its mission includes “Transforming lives through science-based information, practical solutions, and meaningful experiences,” (ACES.edu). As an ACES employee, it is paramount that we work to turn research-based material into comprehensible ideas that stakeholders may use to reach whatever goals they may have. This chapter will include information about some of the theories of learning and the Cooperative Extension practices with regard to gardening instruction; a review of three bodies of work analyzing how in-school gardens affect student learning, and a summary analysis of the methods used by Cooperative Extension System educators and results documented in research literature.

When studying how students learn, several tenets are presented by researchers on the “how” of student learning and its connection to career choices. For example, in the work titled “Constructivism: The Career and Technical Education Perspective,” authors Doolittle and Camp note that learning involving a “stimulus response” setting denotes behaviorism which had been the “go-to learning theory” that career and technical education utilized in the past, but now, the researchers note, educators are more open to using cognitive constructivism in career and technical education programming (Doolittle, pp. 9-10). “All three types of constructivism emphasize the concept that knowledge serves as an adaptive function. If knowledge is to enhance one's adaptation and functioning, then the knowledge attained (i.e., content and skills) must be relevant to the individual's current situation, understanding, and goal. This

relevancy is likely to lead to an increase in motivation (Pintrich & Schunk, 1996), as the individual comes to understand the need for certain knowledge. Ultimately, experience with relevant tasks will provide the individual with the mental processes, social information, and individual experiences necessary for enhanced functioning within one's practical environment. In agricultural education, for instance, a problem-solving approach to teaching (Hammonds & Lamar, 1968) has long emphasized the importance of personal relevance in learning. The concept of the farm project program, called for in the Smith Hughes Act, was designed specifically to provide a real-world, personal application for each student for the direct purpose of making the in-class instruction more relevant to the student (Camp, 1982). In the same light, cooperative education programs in career and technical education emphasize the importance of the teacher providing classroom instruction to meet the student-trainees' on-the-job needs. Vygotsky (1978) emphasized need and relevancy in learning to read and write, "Teaching should be organized in such a way that reading and writing are necessary for something...writing must be 'relevant to life'" (pp. 117-118). Content and skills should be understood within the framework of the learner's prior knowledge" (Doolittle, pp. 9-10).

In *The Impact of Extension Gardening Programs on Healthy Attitudes and Behaviors,* Odera et al. (2013) suggest exposing students to in-school gardening might influence how students learn nutritional value. In their recommendations, the researchers noted that there were some changes that could be incorporated in the gardening program to improve participants' understanding of nutrition and fresh foods' impact on health. For example, they wrote, "Including a taste test during class could introduce participants to new vegetable and fruit choices to which limited resource

students are not normally exposed, starting them off on the right food practices. Should this be implemented, research could be conducted examining participants' willingness to try fruits and vegetables, both before and after the program, to see if exposure and preparation lessons changed their healthy eating behavior" (Odera et al., 2013, p. 59). Arguably, teaching middle school aged youth requires a special skill set. Teachers must harness the boundless energy that young learners have and find a way for their students to learn concepts that will help them become life-long learners. In *Foundations of Agricultural Education*, we learn that methods of teaching vary, but in the case of agricultural education, there are common goals for agricultural teachers including being able to:

Provide preparation for students to pursue education in agricultural areas beyond high school.

Promote the use of sustainable resource practices in agriculture, horticulture, forestry, and other areas. Provide related education to promote achievement in science, mathematics, reading, and other academic areas. (Talbert, Vaughn, & Croom, 2014, p. 6).

The authors note that teaching agricultural concepts can be enhanced by using various methods, including using laboratories that offer students opportunities to put into practice the theories and formulas learned in classroom study (Talbert, Vaughn, & Croom, 2014, p. 17). For this study, it is proposed that raised bed gardens located on school grounds and taught by educators who are knowledgeable about the growing patterns, soil, rain patterns, etc. will serve as laboratories for students to help them learn basic gardening concepts. The theory that will be researched is that using Indigenous

knowledge in school gardens helps students make better connections with the science of gardening and, therefore, better learn the tenets of gardening.

According to a two-year study of students who participated in a gardening and cooking program at several Australian schools, results point to benefits of youth raising and preparing their own vegetables. Researcher Lisa Gibbs noted in “Expanding Children’s Food Experiences: The Impact of a School-based Kitchen Garden Program” that includes foods that children are familiar with in the educational process is beneficial. "A primary outcome of the program and subsequently the program evaluation was children’s appreciation of a diverse range of foods, as indicated by an increased willingness to try new foods. A secondary outcome of the program and the evaluation was an increase in children’s capacity to describe foods, as a way of demonstrating food knowledge and sharing experiences and appreciation of food” (Gibbs et al., 2013, p. 1380). The question of influence of school gardening on student learning as studied by international research supports the need for more study after concluding there are definite benefits to school gardening. “In conclusion, this study gives a further justification for inclusion of agriculture in the school curricular, especially in less developed countries like Uganda” (Okiror et al., 2011, p. 33).

During Alabama Cooperative Extension System (ACES) in-school gardening programs in Lowndes County in 2020, this researcher observed students sharing gardening knowledge with peers and teachers that they had learned from family members, particularly related to planting tomatoes and collards. Many of these students, who were predominantly African American, described practices passed down through family members who had worked on farms in the region for generations. This

exchange of intergenerational gardening knowledge constituted a vital component of students' learning experiences and reflects what researchers have identified as culturally grounded learning, in which children acquire and transmit knowledge through familial and community traditions. Observations of these interactions, as noted by researcher Michael Quinn Patton, provide descriptive qualitative data that can strengthen research by capturing observed behaviors (Patton, 2015, p. 74).

Pedagogy of the Oppressed, Paulo Freire discusses the struggle of the oppressed who are forced to assimilate to the degree that they lost much of their cultural knowledge. Freire argues that a part of the issue with oppression is that the oppressor or invading culture believes that its culture is more entitled to lead or determine another culture's fate, almost treating the subjugated culture as one that would treat an animal that doesn't possess human capacities (Freire, 1921/1993, p. 57).

In the American educational system, inclusion of indigenous knowledge has not always been sourced when developing curriculum or instructing for multi-cultural audience diverse, multicultural student populations. In the forward to *Pedagogy of the Oppressed*, Richard Shaull wrote, "Unfortunately, in the United States, many educators who claim to be Freirean in their pedagogical orientation mistakenly transform Freire's notion of dialogue into a method, thus losing sight of the fact that the fundamental goal of dialogical teaching is to create a process of learning and knowing that invariably involves theorizing about the experiences shared in the dialogue process" (p.17). Shaull is clearing up a misunderstanding that trying to educate multicultural classrooms without including multi-cultural histories, ideals, even language, is ineffective.

If self-realization of culture is significant in the learning process, then when working in specific study areas, such as agriculture, this inclusion of Indigenous knowledge could be beneficial to the learning process. In their research titled “Words Speak Louder than Action? A Mixed Methods Case Study,” Vincent and Kirby present research showing that multicultural students who feel their indigenous culture is reflected by teachers or educational surroundings test better (p. 32). Vincent and Kirby point to research that supports the concept that diverse classrooms perform better when teachers are aware of their cultures and incorporate diverse cultures into agricultural education instruction. They argue that there are several characteristics that teachers exhibit when they are aware of their students’ diverse backgrounds including their students’ cultures in their curriculum and by making connections that bridge what the students learn at home from family with what they learn at school. By following these steps, the teachers become transformative:

“A transformative teacher not only respects and acknowledges other cultures, but he or she uses those cultures as meaningful resources when teaching. Transformative teaching does not negotiate academic success but instead makes academic success an attainable goal for every student. The teacher recognizes strengths in culturally diverse students and teaches them to be proud of their cultural background rather than ashamed (p. 33).” It is the observations students make based upon familial and social interactions in gardening which bears consideration.

Educative experiences connect with past and future experiences and enable students to make meaningful connections among phenomena and issues. In contrast, a mis-educative experience is limited in scope and functions as an isolated event that does

not contribute to a coherent understanding. Although students may still learn something, such experiences are not cumulative; rather, they are fragmented and disconnected from both prior and subsequent learning (Howes, 2011). For an experience to demonstrate continuity, it must not only provide new knowledge but also allow subsequent experiences to build upon that knowledge, creating an ongoing chain of learning.

Furthermore, an educative experience extends beyond the individual learner and influences others and the surrounding environment. An experience is considered educative when it allows students to recognize the outcomes of their interactions with both the physical and social world. For example, students develop a deeper understanding of plant biology through hands-on gardening experiences, particularly when they observe the effects of actions such as watering or neglecting plants. Additionally, collaborative discussions about these experiences enhance learning, fostering both scientific understanding and social skills such as communication, argumentation, and cooperation.

These characteristics—interaction and continuity—are closely interconnected and reflect Dewey's holistic view of educative experiences (Ansbacher, 2000; Hohr, 2013; Kruckeberg, 2002; Shyman, 2005). Interaction promotes continuity by creating opportunities for further learning, while continuity encourages deeper engagement and ongoing inquiry.

Dewey (1933/1997) also identified reflection as a critical component of an educative experience. He defined reflection as the "active, persistent, and careful consideration of any belief or supposed form of knowledge" in light of its supporting evidence and

implications (p. 6). Reflection completes the learning process by transforming experience into meaningful understanding (Rodgers, 2002). Through reflection, learners evaluate their experiences, form reasoned conclusions, and connect new knowledge to future actions.

Helping students of diverse backgrounds to connect with subject matter is the goal of many successful agriculture teachers. As an example, in this case study, Master Agent George Hunter, with the Tuskegee University Extension Program, talked with students about soil on his farm. He discussed with the students the importance of rotating crops and using the correct fertilizer. He told of how his father taught him to select the best Collard transplants and how to plant them all by hand- just as his grandfather taught him. The students connected with Hunter when he talked with them about his farm in Mount Willing, Lowndes County, Alabama. The students knew where it was and expressed interest in visiting his farm. Hunter connected with the student by talking about a way of life the students had heard about from their grandparents-farming in small communities. The connection on how students understand concepts and exhibit critical thinking is part of the continuum's instructional paradigm. Researchers Cross and Kahn reference Zeidler, et al. in explaining the connectivity of learning through the continuum of instructional paradigms. “The progressive method of instruction promotes independent thinking, which works to create democratic educational experiences. Rooted in experientialism, the progressive method is student centered and focuses on shared social experiences. (Zeidler et al., 2011). In contrast, the traditional method is often teacher centric and has roots in social behaviorism. The traditional method is often based on dogma and therefore is often dependent on the teacher. The scholars state a

clear difference in knowledge between the methods of instruction. For the progressive method, knowledge is ‘derived from the collective meanings of shared social experiences ‘action and deeds’ (Zeidler et al., 2011, p. 280).

Teachers may be categorized as either constructivist or behaviorist educators. Authors Doolittle and Camp define Constructivism as “a theory of learning that has roots in both philosophy and psychology. The essential core of constructivism is that learners actively construct their own knowledge and meaning from their experiences. One of the goals of the Alabama Cooperative Extension System is to teach stakeholders beginning at their level to help them reach a level of desired understanding. The approach that many Cooperative Extension System associates use to disseminate information includes hand-on activities in community-based learning settings. All interview participants relate to their experiences either as Alabama Cooperative Extension System employes or Cooperative Extension associates, or teachers who work with the Alabama Cooperative Extension System.

Conclusions

The totality of the narratives reviewed in this research supports the conclusion that educators perceive that in-school gardening influences student learning across cognitive, behavioral, and socio-emotional domains. Although the present study did not measure academic achievement quantitatively, the qualitative evidence drawn from interviews with Alabama Cooperative Extension System (ACES) personnel and vocational educators indicates that gardening enhances cognitive, behavioral, and socio-emotional dimensions of learning. The degree to which these effects translate into

measurable academic gains remains a key area for future research; however, the consistency of educator observations suggests that school gardening is a meaningful instructional tool that warrants further scholarly attention.

Across interviews, educators described clear indicators of cognitive growth as students engaged with garden-based tasks. Participants noted that students asked increasingly complex questions about plant growth, soil conditions, and environmental factors, demonstrating an ability to connect hands-on gardening experiences with classroom instruction in science and mathematics. One educator explained that students spontaneously linked their gardening observations to a science lesson on soil minerals, signaling that experiential learning strengthens conceptual understanding. These findings align with literature highlighting the value of experiential learning in promoting deeper comprehension of scientific concepts.

Educators also reported behavioral and linguistic changes that contributed to learning. The use of more accurate terminology could be the development of agriculturally specific literacy in which students learn concepts by being both exposed to the correct words and applying those words during authentic experiences (Clemons et al, 2024). For example, several interviewees noted that students began using more precise scientific vocabulary, such as referring to soil as “medium”, and took ownership of their learning through note-taking and home application of gardening skills. Students often shared photographs of seeds they started independently or explained cost-saving strategies learned in gardening sessions, illustrating that learning extended beyond the classroom setting. These behavioral shifts demonstrate that students were not only absorbing content but were internalizing and transferring skills to their everyday lives.

Consistent with past research on college age students authentic or difficult experiences have been shown to help students increase their own perception of their ability, capabilities, and confidence when applying information to real world experiences (McKibben, Hyjeck. et al, 2024)

Socio-emotional development also emerged as a significant outcome. Multiple educators described students—particularly those who struggled academically or socially—finding confidence, purpose, and belonging through gardening. One ACES educator shared that students who were previously withdrawn or uninterested in school began actively participating, telling stories about family gardening traditions, and engaging joyfully with peers during garden tasks. Another educator described a student with special learning needs who thrived in the greenhouse environment, demonstrating independence, leadership, and pride in her work. These examples support the growing body of literature documenting the socio-emotional benefits of garden-based learning, including increased confidence, perseverance, patience, and collaboration.

The practical implications of gardening were also evident in students' changing attitudes toward food. Educators described students who were more willing to try fresh fruits and vegetables after growing them, reflecting a shift in nutritional awareness. These findings align with previous research showing that gardening can improve students' understanding of food systems and encourage healthier eating behaviors. Personal professional experiences further reinforce these conclusions. As an Alabama Cooperative Extension System County Director, the researcher has observed similar patterns in county gardening programs. Whether in raised-bed gardens at schools, container gardening projects, or community garden initiatives, participants frequently

display visible excitement when a scientific concept “clicks.” Moments such as witnessing a child's taste of kale for the first time, especially the kale she planted and harvested herself—highlight the power of experiential learning to motivate curiosity and foster meaningful connections to academic content.

In summary, the findings of this study suggest that in-school gardening supports student learning by strengthening scientific understanding, promoting hands-on engagement, enhancing socio-emotional development, and encouraging real-world application of skills. While the qualitative nature of this research limits generalizability, the convergence of educator perspectives across diverse counties and grade levels underscores the potential of gardening as an effective, interdisciplinary instructional approach. Future studies incorporating quantitative measures will be essential in determining the extent to which these qualitative benefits translate into measurable academic outcomes. Nonetheless, the results of this study indicate that gardening is a promising educational practice that enriches student learning and supports holistic development.

When reviewing the research of three published studies and analyzing the observances of educators who use raised bed gardens around the state to help students learn, it is important to note that in school gardening was consistently described as beneficial to teaching; however, more research is needed to analyze the full impact of in school gardening on student gardening. While there is no question that in-school gardens as well as other aspects of agriculture offer students an opportunity to make the connections between what they are learning in science and math classes (Hendrix et al, 2024; McKibben et al, 2021; McKibben, Hancock, et al., 2024) there is a

disconnect in having enough data to point to a measurable impact on student learning (grades or academic performance) as it relates to using in-school gardening. For example, one interview subject shared that his students asked questions about why and how plants grow best in certain conditions and linked it to a class on soil minerals taught in science class. Another Extension educator whom I interviewed noted that students who had previously not shown interest in class work were happily chatting about stories that their grandparents shared about gardening. These conversations indicated active learning because students were able to link indigenous family knowledge to what they had learned in class and while digging into soil and planting seeds. One respondent noted that evidence of gardening impacting learning was noticeable when students changed their attitudes about fresh vegetables and fruits and how they arrived at grocery store chains in urban settings. For example, Mr. R stated, “Well, a lot of them, some of them, some of them come in and they take notes and then at the same time, you know, I don't consider myself the know all, begin all and whatnot. So, it's a terrific opportunity to listen to some of the things they have to offer as they're listening to me as well. But I see a lot of changes in behavior, a lot of people. You know, they'll come to a community garden project, and they'll Work in it and they'll raise a fruit and vegetables. But next thing you know, I'll throw out there a small fruit and vegetable garden workshop for people that live in garden homes and patio homes and all they have is that little, small postage stamp worth a yard to Work in. And we talk about 5-gallon bucket garden, how to start seeds and toilet paper rolls and how to do sub irrigated planters and that kind of different thing and. You know, next thing you know they're e-mailing and calling and texting pictures of something they've tried where they've taken a toilet paper roll

and put a couple of seeds in and a starter mix and you know now they're starting their cucumbers indoors as opposed to running by the farmers feed and seed store. And don't get me wrong, there's nothing wrong with Walmart, Home Depot, Lowe's, farmers feed and seed store. But when you're buying seeds by the house and you're starting to seize that way as opposed to buying transplant where you know you're saving a good deal of money, and that's keeping money in their pocket. So, they change their behaviors," (Appendix A).

The fact that students are taking notes and applying what they have learned at home indicates an interest in continuing the learning process in an outdoor class. Additionally, as Mr. R stated, participants in both his in-school gardens and community gardens are showing a change in behavior by considering ways to save money purchasing and germinating seeds instead of buying transplants. Additionally, overall, Mr. R said the students are making behavioral changes, showing that because they have learned how to do better, they are choosing to do better. Mr. R stated, "It's a slow process a lot of the time too. And you know that you could see a change of behavior associated with how those kids are observing the garden and participating in the garden as well. So, they look at the soil differently. It's not called dirt anymore, and you know they're using the word medium now. So, you got this increase in vernacular, and they are using all these unfamiliar words that they had never seen before and it's an amazing transformation and stuff, it makes you smile on the inside that you know that they're learning something. They may never work in Ag Sciences; they never may may never work in a lab looking at different varieties of fruits and vegetables, but there are some life skills that they're picking up on that that may be imperative to them surviving or, you

know, being able to, you know, get those nutritious fruits and vegetables that they're going to need in the near future," (Appendix A).

Educators, Ms. G and Mr. B, shared observations about learners who were designated as being learners with special needs coming into their own during their in-school gardening programs. Mrs. G stated, "It is extremely rewarding. Mr. J. will talk about a kid he had in special ed. in a minute, but it is an extremely rewarding experience when you can tap into every kid. Because again, you have kids who you know that school isn't necessarily what they live for every day. Some of them, you know, I lived for the social aspect of school when I was in school. That was kind of my thing. It was a social aspect. That and playing ball. I wanted to play ball, eat lunch, and go for a break. But you know, when you see a kid transition from feeling like they don't fit in or feeling like they don't excel at something, but to watch them be able to not just survive in something but thrive in it," (Mrs. G, Appendix E). Mr. J observed learning in a student who had learning challenges but found confidence in gardening. Mr. B stated, "There was one girl a few years back. She was specially at her entire educational career. She got to the 11th; 12th grade and tested out a special ed, but [she] had been special at her entire career. Um. When we started in the greenhouse, she told me, "I don't know if I'm going to like this." I said, "Well, that's OK, you know, just try it." Well, it became what she locked that particular year. I had her in the morning first period and I had her again in the afternoon during the last period. And she would walk in the door in the morning and say I'm going to the greenhouse and walk out the door. Also, in the afternoon when she came back, she'd say I'm headed outside. I'll see you when you get out of there. She took ownership of it, and] learned how to do everything in it, from planting the

seeds, transplanting plants to selling plants to people and adding up their bill. Just an outstanding tool for a kid like that. I have another young man who is not special Ed, but he is very direct and was worried. He goes to a Community College to do automotive, and he was worried because he wouldn't be in FFA, and he said can I come to work in the greenhouse? Even if I'm not an FAA in your class, I said absolutely. So last year, every moment he could get out of a class, be it math or PE or whatever, during greenhouse season, he was with me and working. He wasn't with me goofing around. He would go out the door and into the greenhouse. He was doing whatever watering, seeding, [caring for] transplants, you know, whatever had to be done. So, it is an excellent tool for kids, you know, like I said, special Ed. lower achieving and even I've seen this with higher achievement kids. It is a great tool for all of them."

During her interview, Ms. M. noted that she sees indications of learning when students can touch pieces of living leaves and plants that they have read about in classrooms. She said, "I have done plant identification and just explaining to them they might not get it, but when they see the plant it's like, oh wow, that's not just a leaf or this is, oh, that's a compound leaf. This is like they all do look quite different when you really pay attention to the details of plants, not just if it Flowers or not, but oh, those leaves are alternating or they're opposite or oh, that's a compound leaf. So, it's many leaflets instead of just one leaf. It's like a light bulb moment, even for kids, but especially for adults, you know, they're like, what? Like, [the child says] I didn't realize how you identified a plant, you know, um, and how intricate it is. It slows you down and, you know, pay attention to the details. Not just if it's a red flower or pink flower kind of thing. So that really connects people more so to nature, I feel like," (Ms. M, Appendix B).

Each educator responded that they noticed changes in students' comprehension of horticulture topics during gardening. For example, Mr. T. noted students learned to grow plants from seed to help them learn the process of seed germination. Several educators stated that students became interested in the different vegetables they grew and were eager to take the vegetables from the gardens home to eat them with their families. All educators said they noticed signs of active listening, which is a component of learning, when students took notes and asked questions about the in-school gardening process. So, there is evidence that the in-school gardening sessions are having an impact, but further research is needed to show to what degree gardening is affecting student learning.

The totality of data reviewed in this research supports that in-school gardening programs do affect student learning. To what degree those effects are made is a subject that needs further research. The interviews presented in this study support the research question that student learning is affected by gardening. In one interview session with an Extension employee, the interview subject observed that one of her pleasures in gardening with students is seeing the look of understanding on faces of students when a scientific concept "clicks" with what they are doing in a garden. Another school administrator who worked with an Extension employee noted that one of his students had a noticeable change in behavior and interest in learning when introduced to in-school gardening. Another interview subject shared that students were eager to tell other students what they learned about growing food in their gardens, pointing to peer-to-peer educational opportunities. I have also observed similar patterns in my own practice, further supporting participants' descriptions of experiential learning outcomes. I

recall my first in-school gardening program at a school in Lowndes County with a student who had never tasted kale. The expression on her face when she picked a stem from the plant she grew in their in-school raised bed garden is something that motivates my desire to research this matter further.

Recommendations for Further Study

The findings from this qualitative study indicate that in-school gardening influences student learning across cognitive, behavioral, and socio-emotional domains; however, the magnitude of these effects and their relationship to measurable academic outcomes remain unclear. Given the limitations of self-reported data, the Alabama-specific context, and the absence of direct student performance measures, several areas for future research are warranted.

Across educator interviews, participants consistently described cognitive gains—such as vocabulary development, scientific reasoning, knowledge transfer, and increased curiosity—yet no standardized assessments or grade-related measures were collected to confirm these outcomes. Future studies should employ a broader qualitative testing field with data collected statewide.

Educators such as Mr. T. and Mr. B. emphasized that sustained, multi-year gardening experiences deepen learning and strengthen student engagement. Longitudinal research tracking the same students over multiple seasons or school years would provide insight into whether gardening's cognitive and socio-emotional benefits endure, expand, or change over time. Such research may also capture long-term

influences on environmental attitudes, health behaviors, or academic choices (e.g., STEM interest).

Multiple participants—including Ms. G., Mr. J., and Mr. B.—shared compelling narratives of students with learning disabilities or behavioral challenges thriving in garden settings. Future research should explore the effectiveness of school gardening for students with diverse learning needs, including special education populations, English language learners, and students with behavioral or attention-related challenges. Mixed-methods designs may offer a fuller understanding of how gardening supports differentiated learning pathways.

Educators reported that gardening naturally lends itself to interdisciplinary teaching, but most schools lack formal curriculum alignment. Further research is needed to examine how structured gardening curricula can integrate science, mathematics, history, nutrition, literacy, and environmental education in intentional and standards-based ways. Studies comparing classrooms with structured garden curriculum to those with informal or teacher-created approaches may reveal meaningful differences in learning outcomes.

Through interviews, educators described socio-emotional benefits such as increased confidence, responsibility, cooperation, emotional regulation, and belonging. Future research should investigate how specific gardening activities contribute to SEL development, how these outcomes compare to other experiential learning programs, and whether gardening offers unique SEL advantages for rural, underserved, or economically disadvantaged student populations.

Several educators noted that students were more willing to taste fresh vegetables they had grown and expressed newfound interest in healthy foods. Future research should examine how gardening influences food literacy, nutritional knowledge, and dietary behaviors, particularly in communities with limited access to fresh produce. Partnerships with school nutrition programs could provide valuable data on consumption patterns and meal acceptance.

Interviews revealed that the success of gardening programs depends heavily on supportive teachers, volunteers, community partners, and stable funding. Future studies should investigate which organizational models, staffing structures, and community partnerships produce the most sustainable gardening programs. Research should also explore the impact of teacher turnover, administrative support, advisory committees, and cross-organizational communication among Extension programs.

Because Extension educators play a significant role in school gardening, particularly in rural, underserved areas, future research should examine how their expertise, program models, and community relationships influence student learning. Comparative studies of Extension-led versus teacher-led gardening programs could yield valuable insights into best practices and resource needs.

Educators across the state reported inconsistent curricula, reliance on personal expertise, and varied access to resources. Research is needed to develop, pilot, and evaluate a standardized gardening curriculum aligned with Alabama’s academic standards. This may include experiments testing the impact of structured lesson plans, teacher professional development modules, and statewide support systems such as digital garden databases or resource networks.

Given that this study focused solely on Alabama schools served by ACES, future research should compare gardening outcomes across urban, suburban, and rural contexts; across states; and across differing socioeconomic settings. Comparative studies could clarify which conditions enhance or limit the effectiveness of garden-based learning.

Future Implications

The results of this study indicate that school gardening contributes meaningfully to student learning; however, the full scope of its academic effects remains unclear. The qualitative findings—derived from interviews with the Alabama Cooperative Extension System (ACES) educators and vocational educators—consistently demonstrated improvements in student engagement, vocabulary development, curiosity, and socio-emotional growth. Yet, because these findings were based on educator observations rather than direct academic measures, the degree to which gardening influences measurable academic performance remains unknown. Future research should expand methodological approaches, incorporate quantitative evidence, and examine long-term outcomes to build a more comprehensive understanding of how garden-based instruction contributes to student learning.

A key implication for future scholarship is the need for broad scaled qualitative research among multiple Alabama school systems served by the Alabama Cooperative Extension System. Although Extension educators described increases in attention, comprehension of scientific processes, and the ability to make connections between

gardening activities and classroom science lessons, none reported collecting standardized test data or structured assessments. A statewide study tracking the relationship between participation in school gardening programs and students' science, mathematics, or literacy performance would contribute significantly to academic literature. Similarly, mixed-methods research—integrating observations, interviews, surveys, and achievement data—would provide a more complete view of gardening's educational impact.

Longitudinal research is also necessary to determine whether the cognitive and behavioral changes reported by educators persist over time. Several interview participants described students who became more focused, confident, and invested in learning because of gardening. Determining whether these benefits extend beyond a single school year, influence long-term academic trajectories, or affect later interest in STEM fields would broaden understanding of gardening's developmental role.

Another important implication relates to curriculum development and integration. Because the Alabama Department of Education does not require school gardening as part of the curriculum, participating teachers and educators relied primarily on Extension-developed materials. The absence of standardized gardening curriculum limits consistency in instructional quality and creates disparities among schools. Future research should therefore explore how gardening can be intentionally incorporated across subject areas—particularly science, mathematics, and nutrition—and how statewide curriculum support could enhance both teacher implementation and student learning outcomes.

This study also highlights the potential for gardening to support nutrition education and food literacy, particularly in communities with high rates of food insecurity. Students not only learned where food comes from but also displayed increased willingness to try fresh vegetables; they grew themselves. Future research should investigate whether school gardening programs can influence broader dietary behavior, health outcomes, or family food practices.

Finally, emerging educational initiatives in Alabama, such as Montgomery Public Schools' plans to operate a farmers' market that sells fresh produce to students and families, demonstrate a growing recognition of the connection between gardening, community health, and education. Future research could examine how such initiatives influence student learning, community engagement, and perceptions of agriculture and nutrition. Investigating how school-based gardens contribute to local food systems—and how students participate in or benefit from these systems—would enrich the understanding of gardening as both an instructional and community-building practice.

Taken together, these implications underscore the importance of expanding research on garden-based learning beyond descriptive accounts of educator experiences. By integrating qualitative methods, longitudinal designs, and cross-disciplinary frameworks, scholars can more fully examine how gardening supports academic achievement, health, and lifelong learning among Alabama's youth.

The results of this study show that school gardening contributes meaningfully to student learning; however, the full scope of its academic effects remains unknown. Future research should expand methodological approaches, integrate quantitative measures, examine long-term impacts, and explore broader contexts to strengthen the

evidence base. By addressing these areas, researchers can build a more comprehensive understanding of how gardening can best support student learning, health, and development in Alabama and beyond.

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Appendix A

Transcript of interview with Mr. R.

Conducted: July 26, 2025, 3:30 PM

Question: So how what exactly is your role as an educator? How long have you been an educator, and what age groups or community members have you been serving?

Response: I've been a certified educator since 2000, 2001. As an urban extension agent, I serve across the lifespan. So, one day I could work with preschoolers. Next day I could be working with senior citizens. Yeah, it could be on the same day.

Question: OK, what influenced your decision to start working with gardens to teach community members?

Response: Well, I've always worked with my grandmother and my great aunt raising fruits and vegetables when we were coming up. So, it was always second nature to me to raise fresh fruits and vegetables. But, when you think about a lot of the health disparities that you see in the Southeastern United States and particularly in our great state of Alabama, I just found it inspirational to be to work with people and show them how to save 10 to 15 to 20% of their gross yearly income by raising their own fresh fruits and vegetables.

Question: Excellent. Um, would you tell me about the curriculum that you use in your gardens? Um, or just tell me about the program in general?

Response: Well, there's a plethora of diverse types of curricula we've used. I've used everything from Project Learning Tree. I've used the what's it called? Garden STEM out

of Clemson University. I've used some stuff about kidsgardening.org. It depends on the age group that I'm working with. Again, if these are preschoolers or they're senior citizens, millennials, of course you'd have to adjust the pre and post assessment to the group that you're working with and then a lot of times the curriculum may have bits and pieces that you want. So, you cherry pick the things that you need and the points that you want to make. And then on top of that, as an extension agent, you learn certain things that are easy to teach to certain groups of populations. So, you kind of insert your own years of experience and introduce certain bits and pieces of curriculum. So just kind of taking like, again, bits and pieces from other things and mixing it with what I've done before in the past and what I've seen other agents do from various professional developments that I've attended over the years and all that I've held, and it's like I said, it's a plethora of different things that we may use.

Question: And I have witnessed much of your teaching, so I know the answer to this, which I think is amazing. I cannot brag enough about you enough to anybody. I brag on you to everybody, and I try to get people to use it. Well, you do such a wonderful job getting the youth engaged. How would you describe it?

Response: Well, I'm a true believer in firsthand experiential learning. I was not the kind of kid that, you know, you give me a worksheet, and I read it and do it, and you know, I retain the information. I was more of a tactile learner. So, there are lots of kids out there like me.

Well, considering that the average attention of an average human's attention span is 8 seconds. A goldfish has a greater attention span than we do. So, it's important to get the young people engaged with something direct and then give them the opportunity to

reflect on what they've learned, give them the opportunity to go out in the community and share what they've learned with others. So, like I said, I'm a huge fan of that type of engagement. Of course, there must be some sort of lecture and assessment that goes along with it. But most things I like to do have to be hands on and to keep them engaged, to keep me engaged, and again you know if you look back on a lot of famous researchers and like guys like Kolb, who did great research on firsthand experiential learning. I'm surprised more schools don't spend a greater amount of their time introducing direct learning in the classroom.

Question: I've noticed that too, that when you came to our county's schools to work with our students, there doesn't appear to be any curriculum within the schools involving gardening. What do you, what are your thoughts about that? I mean, I know we're not the people that do the plan to work for public schools, but what are your thoughts about that?

Response: More professional developments for the educators is one thing [that is needed]. A lot of the teachers don't feel like they get the resources that they need, particularly those pre-service educators who are just leaving the university. They don't know anything about hands-on learning, or they may have learned a little bit about it while they took a class, or they heard a little bit about theory, that kind of thing. But I think there needs to be a greater shift towards that type of learning. You want to talk to a kid about a forested watershed, or you want to talk to them about Water quality, Water chemistry or oh, there's micro invertebrates in the water. They get a chance to see them in the book. That's, you know, that's OK. But then when you take them outside and give them the opportunity to really look at it, you pique their interest. Now you start

introducing different types of career options. You know, do I want to go on to a two-year degree or four-year degree program? This is what that's going to require. You know, it opens a whole new door of options for them. So, for me, I think it revolves around professional development and urban extension. We offer a lot of teacher education workshop series, especially during the summer months, but we're trying to do it now where we don't want to take up an educator's entire summer. So we're in the process of putting together a series where we can those times when they have those professional development days where the students aren't there and they're just on campus, like during the months of October and parts of November, December, that kind of thing, even the spring part of the year to give them those professional development opportunities so they can see the things they can't introduce that will help supplement what they're doing with the curriculum.

Question: So, what do you observe among the students and the community members who are engaged in this process? What is it that you observe that they're doing when they're learning in your processes?

Response: Well, a lot of them, some of them, some of them come in and they take notes and then at the same time, you know, I don't consider myself the know all, begin all and whatnot. So, it's a great opportunity to listen to some of the things they have to offer as they're listening to me as well. But I see a lot of changes in behavior, a lot of people. You know, they'll come to a community garden project, and they'll Work in it and they'll raise a fruit and vegetables. But next thing you know, I'll throw out there a small fruit and vegetable garden workshop for people that live in garden homes and patio homes and all they have is that little, small postage stamp worth a yard to Work in. And

we talk about 5-gallon bucket garden, how to start seeds and toilet paper rolls and how to do sub irrigated planters and that kind of different thing and. You know, next thing you know they're e-mail and calling and texting pictures of something they've tried where they've taken a toilet paper roll and put a couple of seeds in and a starter mix and you know now they're starting their cucumbers indoors as opposed to running by the farmers feed and seed store. And don't get me wrong, there's nothing wrong with Walmart, Home Depot, Lowe's, farmers feed and seed store. But when you're buying seeds by the house and you're starting to seize that way as opposed to buying transplant where you know you're saving a good deal of money, and that's keeping money in their pocket. So, they change their behaviors. What I really don't like to see because particularly in the rural areas, those food deserts where you[have] got young people out there that can run to the grocery store and buy chips and soda pops and candy bars and ice cream and whatnot, but then it's great to see them get a little 5 gallon bucket, a little e plot outside grandma's back door, and they're raising some of their favorite fruits and vegetables, cucumbers and tomatoes and Peppers and that kind of different thing. So, you know, then we kind of hopefully knock a hole in childhood obesity, and you know, give them the opportunity to see, you know what it's going to be like a little later down the line. I talked to a lot of young people, and we let them know that there's going to be a food shortage and a water shortage during their lifetime, and they have got to find a way to adjust to that. And if we don't prepare them for it now, it's going to be rough on them a little later down the line. So, I think for me it's the change of behavior, to seeing people who have, always thought I don't have a green thumb and you know, maybe six months, a year, maybe sometime longer or sooner, they consider

themselves Master Gardeners because they started a few seeds and you know they don't see a couple things come to fruition and did a little harvest. So, for me it's the change of behavior.

Question: And you mentioned that that's a change that you notice, but are you, are you noticing that they're understanding scientific processes any better among them, I guess that would be young people?

Response: Oh, absolutely. Or that in the older people as well too, because we know we a lot of times we say that, well, just cause she's 67 years old, she should know how to raise fresh fruits and vegetables. Maybe her life wasn't the way she lived her life, she didn't have to raise fresh fruits and vegetables. Maybe she was, as my grandma would say, well off to do.

And then some of them are just now getting it to the point where they're raising fruits and vegetables. Some of them don't know the difference between the male and the female parts of the plant or they don't know that with this particular variety of fruit or vegetable, I may need two different types of plants so that way it can cross-pollinate and stuff. So, you know, it's just some of the small things that people pick up on at a workshop, and say, man, I never knew that I.

I didn't know I had to do that or oh, I didn't know I could do that with this right here. And you know it. It's just that light goes off in their head and you can kind of see it in their eyes because you know you have a person in the workshop. This guy, he's been in there for the third session. You have got three more to go. He hadn't said anything. You know, all of a sudden, you say this one little thing and next thing you know you can't shut him up. You know he's got something to say every series only because. You know,

you ask something he'd never considered, something he never thought of before. It never crossed his mind, and you gave him something new to think about. But don't get me wrong, I'm not always doing that to them. Sometimes they're doing that for me so I can learn something new and that way, you know, we can continue that whole sharing of knowledge across the across the lifespan and you know, it's really amazing to work with the. Younger and the older learners can then be able to come back with some information of your own that you maybe you didn't know or better get a different way of presenting some information to make it easier for the next group of people you Work with to understand what you're discussing.

Question: Mm-hmm. Do you observe that the people who are participating in your programs at the community gardens or at the school gardens are making some kind of connection with anything other than the science of gardening?

Response: Well, and definitely in the schools and whatnot, because again, we talk about that food shortage, nutritional food shortage, young people are going to go through. But yeah, it goes in and it helps supplement the curriculum and whatnot. But a lot of these young folks, they never nurtured anything before. You know, you and I, we grew up, you know, working in a garden or maybe we had a dog or a cat. Something that we nurtured, and these kids, they want that instant gratification. They want to snap their fingers like going to the grocery store, pick up the tomatoes, Peppers and peas and bring them home. But to actually see them slow down a little bit and start the seeds in the classroom and take them outside and transplant them from there into the ground and Watch the plant grow 2 foot, 3 foot, 4 foot, whatever variety we may be growing and then it's 90 to 115 days (about 4 months) later, they're actually harvesting something to

eat and you know, it kind of changes the mind state. I found it very beneficial at one of my schools where they separated the girls from the boys and how, you know, you got girls on one part of the school, boys on the other side of school and stuff to see that the change in behavior, they go from having net number of behavior outbursts. To actually having none because they're a little calmer now and they realize that, you know, garden is one of those things that's not going to happen overnight. It takes time. It's a process. It's a slow process a lot of the times too. And you know with that you could a lot of times you can see change of behavior associated with how those kids observing the garden and being and actually participating in the garden as well. So, they look at soil differently. It's not called dirt anymore and you know they're using the word medium now. So, you got this increase in vernacular and they using all these new words that they had never seen before, and it's an amazing transformation and stuff and you know I you know it makes you smile on the inside that you know that they're actually learning something. They may never work in Ag Sciences; they never may may never work in a lab looking at different varieties of fruits and vegetables, but there are some life skills that they're picking up on that that may be imperative to them surviving or, you know, being able to, you know, get those nutritious fruits and vegetables that they're going to need in the near future.

Question: Is there anything that you would like to change while you're using these type of community and in school gardens?

Response: As far as the in-school gardening is concerned, I wish there was some sort of way to sit down with all the teachers. You got a social studies teacher, you got a math teacher, you got the science teacher. The one that I used to meet with the most is the

science teacher. That's the one that wants to garden because it fits into what she's teaching, so on and so forth. But there's math in there. As well too, one of the things that I see a lot of kids struggling with is conversions in the metric system and that kind of different thing. And we're out there looking at, you know, square footage and cubic feet of soil and that kind of different thing. It would be nice to get the math teacher at the table, then get the social studies teacher at the table, the language arts, the language arts teachers, the one I really want to draw to the table because that's the area that I. I struggling most in trying to integrate that particular program area into the things that I do. Get the physical education instructor at the table as well too, because at one time we used to wear pedometers and see how many steps the kids were taking. Cause I think it was in 2008 or 2018, can't remember what year it was, Montgomery, AL was the fattest city in the US. So, we were looking at ways to get these kids moving, you know. So, we put pedometers on their hips and try to track the number of steps they were taking and equate that to how many calories they were burning and how many pounds they could potentially lose throughout the school year.

But we were doing it on our own. If the physical education teacher was giving us a little bit of their time to sit around the table to what part they could bring in, maybe you know, looking at the kids increase or decrease in weight or something like that, I mean, if we can get everybody around the table at one time, the people I used to get around the table are all science teachers. They're just all science teachers and I understand that part. But in order for a school garden to be, I think to be effective, we're going to need all subject matter experts around the table so everybody can get [his or her] pound of flesh. Because when we think about social sciences, you know, we can talk to them

about the victory guards and during the warring times and how the Native American shows the three sisters, three sister guarding, that kind of stuff. There's so many different things that could be done. But you got to get everybody around the table. Now I understand it's very difficult. Most teachers in Alabama are starting to report next week because the kids go to come back the following week. Well, next week you would think that would be a great time to talk to teachers. That's the worst time in the world because they're just now getting back to the classroom, getting the classroom set up, making the copies that they need. They got all these departmental meetings and whatnot. And here you come in, you're talking about getting all the teachers together at one table to talk to them and that kind of stuff. That's going to be difficult. They're not going to have that time for you. And if they do have the time for you, their minds on everything but listening to what you got to say. So if I had it my way, there would be some time where I can get all the teachers from every subject matter at a particular school to sit down, write it all up, maybe pilot it for a couple of years and then write something up that could be shared with all schools across the US and show them, hey, this is what we did here in Alabama and this is something you guys can do to get everybody, all subject matters involved.

Question: See, you're thinking outside the box. That's one of the things that we studied in one of my classes, and I'm sure you know, as a doctoral student, you know this. That's one of the things that educators have complained about that they're, you know, not only is gardening is good for the science teachers, like you said. But there's so many aspects that tie in, like the social development that you mentioned, seeing the children change their behaviors because they're nurturing. I mean, there's so many

things that tie into how this can impact their studies. So, you're cutting edge.

Response: Yes, ma'am.

Question: Among the research that I've read, you're doing things that that are not being done nationwide. So, you're on the cusp of doing very, very innovative work. And I've attended one of your teacher education programs. That was phenomenal.

Response: Yeah, we had a great time and, and a lot of those teachers are still reaching out to us now to see you know what we can do to help them more. The only problem you have is you know it as a as a county extension director that you know we know we're just one person trying to serve the counties that we're supposed to serve. But then you got 60-some-odd counties that you would like to help as well too. So, there's only 24 hours in a day. So, you know, you know you do the best you can, and you know and try to you know what you do out there and what not. But I think if we can get all the teachers around the table, man, and just have a just a power of what a community garden is, a school garden is and what it could, how it could benefit the school. I think every school in the US or at least the majority of them would jump on board.

Question: Yeah, I'm thinking that it may be it may be more advantageous to try to work with the administrators and let it trickle down to the teachers, because if the administrators are more aware, they may allow more time for this kind of curriculum development with the teachers.

Response: Yes, ma'am.

Question: But one of the things that I find is funding issues. The schools want gardens, but I have to try to come up with ways to I don't want them to incur the cost. What about your concerning funding for these gardens?

Response: Yes, ma'am. A lot of times for me, I hate to say it like this, and it may be wrong. I got to beg, borrow, and steal a lot of the time to get what I need. We've got some decent relationships with the city. Certain cities don't have that. They don't have recycling initiatives where they cut a tree down. They, you know, they mulch it up where you can come and get free mulch in a week. We're blessed to have that, but it's not with the city. But there's a lot of major cities in some of the counties I serve. They don't have any sort of initiative like that at all. So, you know, we find ourselves writing grants or we try to partner with to have the same mission and hopefully they got a few dollars, and you know we can kind of piggyback, or partner with them on some things. But yeah, funding is a is a huge issue. But a lot of times we reach out to those larger, larger retailers, the Lowe's, the Home Depot, the Aces, those types of stores we reach out to those guys. When it comes to doing raised beds, I work with a lot of lumber companies. I didn't know how many pieces of lumber that come off the truck that are bowed or they're not of good quality, or at least good quality to them, or the guys who are trying to sell it versus those who are trying to buy it. And they'll pile that junk up in a pile back there and they'll let me come through and sift through it and get the pieces that I want to, you know, help.

We build a few raised beds here and there. So again, the whole big borrowing still works for me. We've written plenty of grants before in the past. We got a lot of those grants approved, but we're dealing with a different administration now. So, you know, things are, things are a little different.

Now, because of how things are, but we'll we're gonna, we're gonna come through it just fine. And yeah, we're gonna come through it just fine, yeah.

Question: I too have done that. I haven't gone to lumber companies, but I've gone to different small entities like the Ace Hardware in Lowndes County donates tons of things to us. Yeah, that's a blessing.

Response: International Paper's been really kind to us. Bear Lumber Company here in Montgomery's been really, really kind to us. And a lot of time they'll call us up and say, hey, you know, we got some, you know, some two by sixes here, man, what you thinking? It could be, you know, it could be 9:00 at night up the gates open. I'm coming and I just got to find somewhere, got to find somewhere to storm and whatnot and eventually they'll.

Question: So, is there anything that Extension should do you think in the next level of using gardening to help in education?

Response: I would like to see a nice little database, a database of gardens. It would be nice to have some sort of database of how many raised beds that you have, and whether those raised beds are active or inactive. It would be nice to have something like that, even if it's not nationwide, but something just for Extension agents, you know, traditional and urban agents willing to share that information as what. It'd be nice to know where those were and you know how effective and how good we've done at, you know, providing teachers with an opportunity to supplement the things they're doing in the classroom with those hands-on learning that we offer through extension. So maybe some sort of database or something like that or even an app.

Where you know, people could kind of look and see a lot of times our Master Gardeners and people who aren't Master Gardeners are looking for opportunity to volunteer on something, and if they had access to an app or something like that and maybe they had

a few funds or that they want to donate or maybe some lumber or some soil or something, some mulch and they were looking for somewhere to donate. If there was an app for something like that, maybe they could.

Reach out and, you know, find some kind of way to get those supplies, those materials there.

Question: That's a good idea. I mean, I think you should. I would work with you to try to get that app done, because that sounds like something we could do with an Extension.

Response: Yes, ma'am. Yeah, I think so. And then some sort of seamless hybrid delivery where, yeah, clearing house, yes, ma'am, where everything is right there and you know, you got to go looking for it.

Question: Yeah, a clearing- house so that people can go there, and sponsors who are willing to, you know, it's not if we could go one stop shop, we could go with an extension to find which of these stores are willing to help and you know like lumber companies, um grants that are available and if we can make those funds available to all the counties.

Response: Yes, ma'am. Yes, ma'am.

Question: Yeah, a final question. I'll let you go because I don't want to keep you on your free day. Is there anything that I haven't asked you about regarding the gardening experience among community members and among schools that you want to talk about?

Response: Nothing I can think of, Miss Tana, other than just one thing. You know, we got one of the best pre-K programs in the in the United States. It's not just one of the best in the Southeast. It's one we got one of the best pre-K programs and not the best

pre-K program in the United States. And you know, I would like to see that start there. I'm doing a STEM in the garden series in September, and we're bringing teachers in for a professional development opportunity. It's called Nature Saturday and we're all going to concentrate on in-school gardens, and I think the initiative should start with those preschoolers and give them an opportunity to start there. From there they're going to kindergarten. They need to be in the garden. I understand once they get to middle school and you're teaching the test and all that kind of different stuff. I imagine middle schools won't have one, but there should be one, even if it's a 21st century after school program like that. I just think that we.

Start with pre-K and work our way up and make that garden a center point for that school for everything from the math that they teach the science they're trying to teach those kids to the physical education they get when they're outdoors. I'm thinking that we start with pre-K and work our ways because I mean pre-K is one thing that Alabama does well. We do it really, really well. I just don't see why we can't do some other things and add to the success we're already having with our pre-K programs. But I'm working on that right now. Again, I'll be putting we'll be starting on September the 6th. We'll be doing a half a day workshop where you know we talk about gardens, but also, we're going to put in some raised beds so the teachers can see how it goes. We'll talk about small space fruit and vegetable gardening as well. For those who may not have the space or may not even want a raised bed garden, but they may want to do something like 5-gallon buckets or decorative pots or that kind of different thing. So you know we're going to spend a whole spend a half a day doing that on that Saturday and just to get the pre-K programs and get them started and once the other people hear about it,

they're going to want one and it spreads and next thing you know they can, you know, stamp that and say, “Hey, our pre-K programs are really good and here's one of the reasons why”. And perhaps it'll be the Extension community or just the Extension school gardens, and we'll get a little feather in our cap, maybe.

Appendix B

Transcript of interview with Ms. M.

Conducted: August 8, 2025, 5:56 PM

Question: How long have you been in your current position?

Response: OK, I have been in this position since 2009, so I believe it's right about 17 years and I work with the Master Gardener program, which is the volunteer arm of Alabama Extension in the field of horticulture and then also with the general public doing garden consults as well as just informational lunch and learn public, you know, workshops as well.

Question: What are some of the influences in your decision to use gardens to teach community members? What do you think makes your work effective?

Response: Well, gardening does. It is a special interest. I would say we will start with that, that people are either they grew up around, and they didn't learn from parents to grandparents.

Question: So, is there a curriculum that you use when you're teaching that you refer to? Is there one that's developed by your program?

Response: We have the Alabama Master Gardener curriculum, which is different chapter sections on different subjects that we teach in the program where we instruct people about gardening and then they have that as a reference manual to refer to. We also have it now.

Since COVID, the Auburn University Canvas class portal has 45-minute lectures that people progress through as they finish one little section. It moves them to the next that lasts about 45 minutes on about 14 different. Subject areas from soils to vegetables,

trees, shrubs, annuals, perennials, herbs, flowers. You know, we had all the different subjects each week on that online module as well. But that is the main curriculum for the Master Gardener program.

Question: Awesome. Now you're able to do something that a lot of educators cannot do; you can see the food produced from your lessons. You can go in and see what the groups are producing. Can you give us some idea of what your programs in different communities are producing.

Response: The Montgomery group, we partner with Eat South and so there is produce there that's given away. They do CD Saturday programs; they do seed exchanges. Things like that where you know the produce is benefiting the community. It's mostly vegetables, maybe some herbs there. And then food-wise, food production gardens, and then prep the demonstration vegetable garden in downtown Prattville. It is also a vegetable garden with seasonal vegetables. So, like right now, tomatoes, Peppers, eggplants, zucchini, cucumber, and squash are nearing their end but are in production right now. But we are producing things based on the season, and that goes to [an inter-faith agency] for people that are needy and provides them with fresh produce.

Question: So, what are some of the responses that you get from people who participate in community gardens? What do you observe from them that lets you know that they're engaged in the learning process?

Response: Well, the Master Gardeners are really the ones that run the community garden of which we call the demonstration garden to really show people how they can do it on their own at home. So, it's more of a teaching component, but what we grow from it, we give away, but the teaching component is also there for the gardeners. So,

they are able to become master gardeners. They are learning from just having that availability and trying something new, trying a new method. You know, trellising in a new way or new varieties and things they maybe don't have space for in their home garden. So um, it's also a good teaching tool for them as well. We call them the Learning Gardens. A little bit of everything from shrubs to a water feature perennial herb, perennial color beds to herb bed and then vegetables as well. And that also is more of like a teaching garden where we'll demonstrate different methods of ways to grow in the ground in a raised bed, in tires, bags, you know, different methods that people can see use in practice and learn how they could maybe adapt it to grow in their own garden.

Question: With your younger audience, your school students, I know you've taught some classes in Lowndes County. What do you observe among the students making a connection? Do you observe them making a connection between what they're learning in class and what they're learning in an actual garden?

Response: You know, just saying I don't have a lot of kid interaction, but you have afforded me that opportunity and the Master Gardeners do from time to time in special settings work with 4H and the teachers will come in and teach some classes to the kids there. Um, but I would say I have done plant identification and just explaining to them they might not get it, but when they see the plant, it’s like, oh wow, that's not just a leaf, or this is, oh, that's a compound leaf. This is like they all do look quite different when you really pay attention to the details of plants, not just if it Flowers or not, but oh, those leaves are alternating or they're opposite or oh, that's a compound leaf. So, it's many leaflets instead of just one leaf. It's like a light bulb moment, even for kids, but especially

for adults, you know, they're like, what? Like, [the child says] I didn't realize how you identified a plant, you know, um, and how intricate it is. It slows you down and, you know, pay attention to the details. Not just if it's a red flower or pink flower kind of thing. So that really connects people more so to nature, I feel like.

Question: So, so being responsible for those community gardens, those learning gardens, are you noticing any changes among the people, the adults who work in those gardens, any change in their perspective regarding food? Anything that you notice that they're doing differently that you could possibly relate to what they're learning through school gardening?

Response: Yeah, I think people don't realize the inputs that it takes to be successful, how you must, you know, scout regularly; you must adjust fertility. The spraying for insects and diseases and things like that really gives people an appreciation for the farmer, for the grocery store when you go in and see the produce that's available, understanding more of what it took to produce. That crop that we take for granted, you know when you go in and are able to get broccoli 12 months out of the year. It definitely puts a different perspective and more of an awareness of what it takes to produce it, but also like maybe even what it has.

It has potentially been sprayed on it or hasn't. Just a more connection to their food source.

Question: Do you think that gardening is impacting the food choices that they're making?

Response: Yeah, I think so because you learn like what's in season and what isn't, what would be more local, locally produced to support your local farmers, you know,

growing, I mean.

Right now, we're ending the Peach season. Apples and pears are starting to come in, so we're transitioning there, but moving into muscadines and things. But blueberries, we've passed the blueberry season, so you're not really buying any local blueberries.

You're growing them and what you're getting is coming from the Northeast or even from a different country for that matter. So, it does give more awareness when they're educated on what is seasonal. Um, how far their foods have to travel and things like that.

Question: Think for a minute about the feedback that you get from the Master Gardeners and the community gardeners. Is there anything or any question that stands out in your mind that they seem to want to ask a lot about when you're working with them?

Response: Yeah, well, there's always talk about like organics. What is organic? Realizing the inputs again that it takes to grow things organically in the southeastern United States due to our heat and humidity and fungal diseases and that type thing. So, like realizing what that is, what that really means, and then the genetically modified or genetically engineered food and what that means, which you know. They have become more aware of when they are at the grocery store looking for, you know, canned corn or beans or things like that. It seems to be more where you see that, but um, so those aspects of gardening, um and produce. But like varieties, learning what varieties do best, growing from seed like you said, with learning to propagate, but also seeds and varieties that do well. In our area, I would think there's those are kind of the main things

that stand out beyond like what is this disease or what can I do to spray and kill leaf footed bugs or stink bugs and things like that.

Question: What do you find is one of the biggest challenges in keeping the community gardens going? Do you think finances, you know, finding the money to purchase supplies for it is a problem?

Response: Yeah, yeah, it could. I mean, we really haven't had those issues with being that it's Master Gardener supported. They have had enough funds from plant sales and things like that that they used and put back into it but absolutely liked it. Church and community gardens, school gardens. That is the limiting factor is how much it takes to get the best soil and the equipment and things to. To maintain it, then the labor force, people don't realize, you know that weeds are going to continue to grow and they've got to be sprayed, or it's got to be tilled or and it's got to be replanted and then it's got to be pulled out and cleaned up and mulched and all that can get very expensive. So, if you don't have a long-range plan. In a community garden, that yes, it's a big investment to get it started, but it usually will fizzle out and not be successful, you know, two and three years down the road if you don't have a lot of long-term investment from people and resources. Not just money resources, but actual labor.

Question: Labor time, people putting time in it. That's one of the problems in this county. I have people who call me and say they want a community garden, but that once I explain to them that I won't be the person gardening, the community has the garden, they stop calling

Response: Right.

Question: What do you think that extension should do next regarding teaching through community gardens, both adults and youth?

Response: Well, the trick to community gardens is that if it's not super visible like at the entrance of their school, you know where if it becomes ugly, it would even be an eyesore like you know. But where people are literally walking through it and past it every day, um, that's really the struggle. Um, because out of sight, out of mind for sure, people get busy and um, so I would say. I don't know.

Question: Is there anything about gardening and teaching that I haven't asked you about that you think is important for people to understand in regard to how gardens can be used to teach both adults and youth?

Response: I think the main thing is just planting the first seed. You know, everybody wants to know everything about gardening today and it really is a learn as you do process. You're not, you're not going to be successful right off the bat on everything that you attempt or put in the ground, so. Learning what and even in certain soil conditions or environments, the plant will act totally differently. So, finding the right spot, you know, for say Rosemary for instance, that's a plant that you know, I've moved and killed probably three or four just in my yard, you know, but.

Until you find that right spot, it's on that corner of the house or this side of the house or oh, that soil is sandier or that stayed too wet or that's a low area or whatever. Like finding the right spot, even just on a small landscape. So, realizing it's just really you just got to get out there and do it and start small. Replicate what works. Figure out, you know, if the ground is too hard, well, quit digging holes, build berms, just bag, bag, good potting, good soil and build up a little mound and plant in the mound. But then you

got to mulch it and water it, you know? Adapting to the situation and then learning what works and what does not work, you know, in A and again, just starting small where you can maintain it and be successful.

Appendix C

Transcript of Interview Subject: Ms. G.

Conducted on July 26, 2025, 3:30PM

Question: Pease tell us just a little bit about your background. How long have you been an educator and what groups of people do you serve in the community regarding either school gardens or community gardens?

Response: 44 years of education. So, I've been around.

Question: Could you describe a little bit about your curriculum that allows the children to learn more by doing it?

Response: Um, the curriculums that we've developed; they all allow the child to, in some cases, start from the seed. In other words, you know, get or even before that, getting the soil ready, the garden ready, you know, then then they can plant seed or you know, a lot of people buy the starter plants, I like them to be able to start from seed at least something because then they go through the whole process and you know, so, so all of that involves that. One of the important things that we have about it is participants in any of the projects; they are supposed to keep a journal, and in the journal, they are supposed to write and just nothing more. And that is a way of, you know, having taught in public schools, we always talk about children needing, you know, more reading, more math, more language arts. And a lot of times people want to say, well, it's so important that they learn to read and do math, that if we need to take time from other subjects like science and social studies, then we need to take that time and use it. I believe you can multidisciplinary. You can involve writing and science together. You do not teach them

separately. You know everything we do is, you know, integrate things. And so, we need to, you know, I like to integrate all of that. So, the journal allows them to, you know, go out to do something, but then they write about what they did. They could take measurements on, you know, or count the number of leaves on the plant or how tall the plant has grown, you know. How much is the plant grown in the last, you know, week or how much rainfall?

Question: What have you observed among students who have been involved in gardening that shows you that they are actively listening, and they are active in the learning process?

Response: Well, you know, part I think with a lot of them. The downside to any of these projects is that you have to have adults that will help the youth stay focused and stay on task.

And that is one of the problems we run into. You know, I have seen a lot of things people have tried to do, and I and I see down, you know, areas where I almost want to say you are wasting your time. You hear a lot of people talk about how they want to put in a community garden, OK, and I understand the desire. Normally it is a master gardener or something and their goal, their thought is, well, if we put it in this garden, we can get local people to come and work in it for a portion of the produce. No, they want you to do it for them. They are glad to get vegetables. The hardest part for me with school gardens is getting teachers who are willing to go out there with them. The problem I run into always is, well, we do not have time, and I and I taught in public schools.

Question: What about communities?

Response: I have heard that so many times, and I want to say “no.” You have time for what you value. If you do not value something, you will find a reason not to do it. If you value it, you will find a what reason? Like I told him, I said OK, all it takes is if you are taking the children to recess, walk by the garden and have them take two minutes to check out their plants. You know they can carry water jugs with them when they do that. If it needs watering, you know it does not take long. But the other part I always run into is, well, you know, it is hot out there. So, you have that teacher that is willing. There is a community garden at the Auburn campus here, but one person can pay a small fee. I do not know what it is. I think one of the, you know, AG sororities or fraternities' runs it as a fundraiser, but you rent the space. They are renting the space, and they have their own garden here, but it is called a community garden because anyone in the community who wants to rent a spot can get a spot as long as they are available.

Question: OK. Now, what about the financial aspects of gardening? I know that when you worked in the school system, you were on a limited budget of what you could do. How have you found ways to overcome those kinds of problems?

Response: That is the biggest one because you know, trying to find a grant. But the problem with the grant is it is good this year, but next year can you get it again? You know, so the idea of continuing to fund it is. Now I was lucky when I was teaching that my PTA.

They saw a value in what I was doing, so they put a line item in their yearly budget to buy stuff for the garden, you know? So that is one way to school.

Is to you know to you know if they are willing to come, you know, commit money to yearly to the library, to different programs, you know, let us put it in the budget, you

know, you know, whatever.

$500 for the gardens and that $500 can be used to buy supplies, to do repairs, whatever, you know, and that was one way I found to do it. But you have a PTA-PTO that will value it and want to go on finding it. Like I said, finding grants, building relationships with local nurseries like the Farmers Co-op in a rural area, sometimes they are willing to provide something if you can, if you talk to them about what you were trying to do.

Question: Awesome. What do you think are the next steps that Extension should take requiring learning through gardening?

Response: One thing I've said is we need to really understand with an Extension is what distinct groups provide or programs they have. For example, I mentioned it before when they started to give more, grow, grow more, and give more. But we already had something we started in 4H to do something like that. But they never talked to us about blending it. It was like “we'll do our program.” And then I talked to them, well, what if we do this? Oh yes, you can. They can have one of our signs to put up that they are participating if they donate. But it's like SNAP Ed; they've gone around and put gardens at schools. But I'm kind of going. Once again, is there communication? What did they, you know, who's taking care of the garden? Well, a lot of times it's the SNAP Ed person that's doing it, taking care of it. In other words, I think we need to make sure that we are not creating redundant programs that all have gardens.

Question: Thank you. I understand. And finally, do you have anything that you would like to mention or discuss regarding school gardens or community gardens that I haven't asked you about?

Response: It doesn't work for it to be a one-person show project. You've got to have more people. Now if that's all you've got at school, then I'd go with one person. But it really, you know, what happens if that person moves, leaves, whatever? Everything that was accomplished is gone. It's amazing how quickly gardens can be torn out at a school, you know, or you know, or like I'll, give or schools have got greenhouses. I've seen a seen greenhouses at schools and they had a great, you know, plan to use them. But suddenly you realize it's just a storage area for the custodians or whatever to store their equipment in because, you know, the person who thought about it. It is not there anymore. And so that's the biggest thing is developing some type of advisory board, a committee.

Question: Awesome. Well, thank you so much for your time. Thank you so much for all of that knowledge. I hate that you're retiring, but I appreciate it. Um, so much.

Appendix D

Transcript of Interview with Mr. T.

Conducted on September 6, 2025, 7:00 PM

Question: Thank you so much for taking time out of your Saturday to talk with me about this.

First of all, would you tell me a little bit about your experience as an educator in horticulture?

How long have you been working in this area?

Response: Well, I worked in several capacities. I started out in Extension education with Tuskegee University back in the early 90s. I was a farm management specialist with Tuskegee.

And after then, I transferred over to ACES. I joined ACES staff in 94 and retired in 2016. I've been around 27 years old.

Question: I'm looking to find out how agents and educators who work with youth, what do they observe among those youth that they're working with in terms of [learning through] gardening?

First, do you have any curriculum that you've used to help teach gardening to youth?

Response: Early on, there weren't a lot of curriculums available. There were groups like the Heifer Project, which were out of Arkansas, who used to donate bags of seeds. And then they would have a little curriculum that goes with those seeds to teach youth and to

help communities start basic community gardens, everything from community gardens to container gardens.

And we used some of that curriculum to start with youth, the lower grade youth, 2nd, and 3rd grade before we started with the 4th grade, which is basically the age that the four-age program started. So, we started with some small kids. You know, we would take those seeds, and they would send seed boxes, which is like a milk carton almost. And we would start identifying the parts of the germinating seed. We will cut a seed open, let's say it like a butterbean seed, and you can see the small leaf inside the seed. That teaches them a little bit about the seed itself. And then you know, and then we describe the other contents in that seed. And then we will plant them, and they will keep a log on how much time it takes for a seed to germinate. And then they will start measuring the germinating plant or the growing plant after that, which peaks their inches early. And then we will start by taking those seed plants out of the garden and putting them in a small pot. So, and that was in the lower grades and then as we progressed, we would take those seeds and then start a container garden. If the school didn't have space for an in-ground garden, we would grow a container garden. But then we started with a raised bed garden.

We would get donations from lumber supply companies, and we would get material like potting soil from places like Bonnie Plant Farm or farm feed and seed stores; they would donate stuff.

So, to make a long story short, there are a lot of systems out there, especially when you show that you're trying to teach kids the scientific process, how to grow a plant, what a

plant develops into, how long it takes for a plant to age from seed to maturity to start. So, I'm talking too much.

Question: No, this is perfect because you went into the other area that I was going to ask you about, which was about cost. If that deterred you from trying to teach this way, because I don't know that schools had the funding to help you with setting up those in school gardens.

Do any of the schools have any money to help?

Response: Most schools do not. Basically, as outreach educators, our test has been to locate funding sources in communities. It’s not hard finding individuals who will volunteer if you show a concerted effort that you're trying to improve a child or a family’s lifestyle, you know; they will donate something. It goes back to teaching a person to do rather than giving them; they would rather give; they would rather give you something to teach them than to, just to grow something and hand it out.

Question: I see. Now, as far as you've explained about what you did with the students, for example, teaching them about the seed germination process. What did you notice among the kids that indicate they were learning what you were trying to teach them?

Response: With my years of experience, a child gets engaged when you give them something in their hands that they can look at, that they can touch and feel. Now, some kids will get kind of bored as you just send that and lecture them. But when you give them direct experience, 9 out of 10 will be directly engaged, and that's how they prefer to learn. The old 4-H motto is you learn by doing, and that's what that, that's how that affects them. The more they can do hands-on, the more they'll learn. And the more that

they can share back with you what they've learned, because they've experienced it, rather than telling them or teaching them something about a topic or a subject.

Question: And a final question, Mr. Looking at what Extension does now and what educators are doing now in terms of in-school gardening, what would you like to see happen going forward?

Response: Keep gardening with the students. I think most schools, well, I retired in 2016, so I've been out just about nine years, but I still work with community gardens. I think gardening is, going back to what I said earlier, it's a hands-on learning experience for students. And students really get engaged. But now, and we did a raised bed at the elementary school, but at the middle school, we had a quarter acre of land that the school was on the school property that grew up, and we promised them that we would cut it and maintain it. We had the utility board donated the water line, and we paid the water deal from some funds that we raised within extension to water, and we put in drip irrigation system. We grew collards. But anyway, the school and the students couldn't wait because we would meet with them in each grade once a month, and they couldn't wait to get there.

Question: So, would it be safe to say that having more, uh, gardens in schools would help students learn?

Response: I think so positively. Students love hands-on activities, and the more firsthand activity, the more that they not only learn, but they develop an experience that goes along with learning. So, they can say, you know, that I planted this, or I checked this for insects, or I looked for a disease or I pulled weeds, that's something that they can say that they have done based on their experience. So, I think the more we can

give children, and not only children, but I also have adults participating in our garden projects, and they go out and check the soil. If the soil is dry, they will turn the water on and sit around and wait till it waters. So, it's, I mean, it's not only youth, but youth, they have more energy and they learn, and it's a lifelong learning process with them. But a lot of our adults have gotten away from gardening and eating homegrown vegetables and that kind of thing. So, I think it could be a family learning process. The more we can do directly, the more we can get families and kids engaged, the better we will be overall.

Appendix E

Transcript of Interview with Ms. G., Mr. J., Mr. B

Conducted on Sept. 10, 2025, 2:30 PM

Question: Mr. J., please tell us about your educational experience.

Response: Alright, OK? So, I taught for 10 years and then I started my 11th year as principal at an elementary school, and I did that for 12 years. Currently, I am a career tech director.

Question: Ms., please tell us about your educational experience.

Response: I have been in Extension for eight years. I do pre-K through 12.

Question: Mr. J., how did you get started using gardening as a teaching tool?

Response: Well, my good friend here, Mrs. G, was very influential. There's several of us in the county that she kind of brought her expertise and showed us kind of you know, some ideas to do around campus. So, we started doing some of the outdoor gardens, you know, just what do you call those veg trucks? Well, we did the veg trucks and then we did the raised beds and then we went from there and we did the greenhouse.

Question: Mrs. G., how did you get started using gardening to teach?

Response: So, I was raised with two sets of grandparents and parents with three gardens. So, in the summertime, that's what we did. One of my grandparents would plant fall crops, but summer gardens, you know, and that's what we did. That's what I was raised in. I love it. I love being outdoors. I love gardens. So, one of the one of the purposes of school gardens is for kids to learn about sustainability because we would go into schools that are 50% or more free and reduced lunches. So, it teaches kids how

to grow their own foods, sustainability and increase their access to fresh fruits and vegetables, and so, I got excited. I get really excited about stuff. When I get really excited, I think that everybody needs to do it. And so, I cover 2 counties, and so I have a talented group of principals and administrators and teachers to work with, and they're always looking for opportunities to increase the hands-on learning experience for their kids. You know, I'm a kinesthetic learner and rhythmic, so I'm not a reader. So, for me, I learn better with its hands-on opportunities and so just creating. That outdoor lab space, that classroom space for kids to get outside, and their education expands past the four walls of a classroom to teach them about sustainability. And it's, you know; kids love it. We would do; we plant with all age groups and so students learn about the full process with the school gardens. We've used the greenhouse and their gardens and some pretty fun stuff we'll talk about in a minute. But it's just something that was important to me. And the one thing in my program is they give us guidance on how to do things and with policy systems and environmental changes.

You know, gardens are, they're an environmental change. And so, starting at the environmental change, you put it into their systems to where they, you know, they know they're getting the education part of it and they know that you're going to plant in the spring or in the fall or whenever you're going to do certain things and then. Creating a policy, you know, trying to create a policy around lunchrooms, being able to use those, which is one of the things we were still working on when we are where we, you know, currently are with our positions. And so, it’s just one of my passions.

Response: (Mr. J): [Gardening is an] opportunity to think creatively and it's not a one-size-fits-all. It's like education. Contrary to widespread belief, it's not a one-size-fits-all

thing for kids. And so, if my need here was like in another county, but some of their needs are different, so it's how to fill that need, and what can I do to be able to help them with that experience? And so, you know, it was fun for me.

Response: Mrs. G: And then it spread like wildfire because I would go to one and be like, hey, you want to do this? Yeah, it sounds great. How do we do it? And I'll go to another one, hey, do you want to do this? And then you realize, before you realize that, you realize you've got 16 schools and community gardens between 2 counties. And so, we grew a lot of partnerships out of that, and those partnerships grew into others like one of our huge partnerships that Mr. J. and I both have is [grants] and those projects have led to other projects like playground renovations and some different things inside the school. So, one opportunity leads to another opportunity, but it was important for, you know, kids' limited space is a point that a lot of kids have made to me. Kids who live in the Housing Authority ask how am I going to have a garden? I have limited space and so to provide them with something at school that they did not necessarily. I grew up on a farm and so I had the space for it. A lot of these kids do not have space. And so, to be able to do that and then kids eat; they're more apt to eat things if they plant it.

Question: What are some of the signs that you get that children are learning, and what are they learning?

Response: Mrs. G.: It is extremely rewarding. Mr. J. will talk about a kid he had in special ed. in a minute, but it is an extremely rewarding experience when you can tap into every kid. Because again, you have kids who you know that school is not necessarily what they live for every day. Some of them, you know, I lived for the social aspect of school when I was in school. That was my thing. It was a social aspect. That

and playing ball. I wanted to play ball, eat lunch, and go for a break. But you know, when you see a kid transition from feeling like they do not fit in or feeling like they, that is they do not excel at something, but to watch them be able to not just survive in something but thrive in it. Uh, it is extremely rewarding.

Question: What curriculum did you use with your in-school gardens?

Response: Mr. J.: We did not necessarily have a curriculum, but we did follow a lot of what she (Mrs. G.) said, and she would bring in people like the garden club, Master Gardeners, and so they would come in and work with our kids. But you know, we had, I really wanted my fifth-grade science class to lead the group. So of course, they had their course of study and they could use that. And then we had one of the activities that I tried to do there was our new kindergarten every year trying to do butterflies. So, we tried at least once, twice, to raise butterflies within the greenhouse. And so, the kids will all get excited. They may start them in their room, and we would go around, pass them out, the little larva and whatever. And so, they could take them out, and we would tape their little paper to the wall when they hatch out, and they could come in and see that. So, it was, I guess, a course of study driven. But you know, I'm trying to have some fun with it as well.

Response: Mrs. G.: Yeah, there is this misconception in general in education about learning is not fun. It is like adults, I think a lot of times in our work environments, people assume that if you are having a fun time, you are not working. And so, education is the same way. And I think exactly the opposite. You are learning best when you are having fun and you are enjoying what you are doing, whether it is reading or hands-on. And so, with these kids, you know, they looked forward to it. They loved it. They loved the time

in the greenhouse. We spend so much time telling kids to be quiet and sit down and pay attention and do this that sometimes they for those of us who are talkers and kinesthetic is that we kind of lose, feel like we've lost an outlet. And so, to be able to have those conversations on the way to the greenhouse, listen to the kids talk, listen to them.

(((Mr. B. joined the interview via Facetime))))

Question: Mr. B. Thank you for joining us. I'm sorry I couldn't get you on the zoom link. Would you tell us how long you have been an educator?

Response: Mr. B.: Well, I am not a classically trained ag teacher. I am a science teacher by trade and I went in 2019 and took the practice and passed it and I opened this ag program back up in 2020 and when you when you think about an AG program, you got to think about how to pay for it first off, and a greenhouse is a great way to fund a high program. So, working with Mrs. G and a grant and all kinds of groups came together and built us a greenhouse, and it is not only does it fund our program. It is becoming the face of our program. Our kids do the work, but they also reap the benefits of every everything we make out of it. They reap the benefits.

Question: Mr. B., why did you decide to build a greenhouse?

Response: Mr. B: You know, from me, my standpoint, I saw it in the beginning as a money maker, just to be honest with you. But as we got into it, it turned out more of a thing that kids are deeply passionate about. And you know, a lot of people get this stereotype of, oh, you're the ag teacher. You got those kids out there that can't do anything else, but Ag. So, you know, they need to be out there, those poor kids that can't read or write or whatever, you know, they need to be out there playing in the dirt. That's not the case. I learned that we have students that are valedictorians that enjoy

the greenhouse, and we have kids that are in the middle of the road that enjoy the greenhouse. And we have kids that are that special Ed top struggle academically that love it too and vice versa.

I've had really smart kids that hate it, middle of the road kids that hate it, and kids that are struggling academically that hate it. So, it is just an outstanding, outstanding tool to teach with.

Question: What shows you that the students are learning?

Response: Mr. B: Really, if you want to talk about learning, you show them a skill. For instance, put seeds in a tray in the greenhouse. At first, they were very unsure. You know, is this deep enough? Is it too deep? Am I covering it up enough? Am I doing it right? Then after they really do it one time, maybe another time, it turns out they take it over. Lots of them. And they're the teachers. They're there. Oh, you're putting that in there too deeply. Oh, we need to only put one seed in a hole. We need to put more dirt in this pot. When the kids take ownership of it and start instructing the other kids, you know they have, they have grasped it and they're learning. They've learned what to do and how to do it.

Question: What were some of the challenges that you had to overcome [financially]? Well, you know, initially getting to the greenhouse was a huge challenge because I think ours was somewhere in the ballpark of $80,000. So, it took a lot of groups to come together to raise money to do that. And you know [grant money] was involved. I know there's probably some COVID money involved. So, lots of groups come together to get the initial building done.

Question: Mr. J shared a story about how gardening helped one of his special needs students. Do you have a similar story to share on how gardening helps someone learn?

Mr. B's Response: I've seen that happen multiple times. There was one girl a few years back. She was specially at her entire educational career. She got to the 11th; 12th grade and tested out a special ed, but [she] had been special in her entire career. Um. When we started in the greenhouse, she told me, "I don't know if I'm going to like this." I said, "Well, that's OK, you know, just try it." Well, it became what she locked that particular year. I had her in the morning first period and I had her again in the afternoon during the last period. And she would walk through the door in the morning and say I'm going to the greenhouse and walk out the door. Also, in the afternoon when she came back, she'd say I'm headed outside. I'll see you when you get out of there. She took ownership of it, and] learned how to do everything in it, from planting the seeds, transplanting plants to selling plants to people and adding up their bill. Just an outstanding tool for a kid like that. I have another young man who is not special education, but he is very hands on and was worried. He goes to a Community College to do automotive, and he was worried because he wouldn't be in FFA, and he said can I come to work in the greenhouse? Even if I'm not an FAA in your class, I said absolutely. So last year, every moment he could get out of a class, be it math or PE or whatever, during greenhouse season, he was with me and working. He wasn't with me goofing around. He would go out the door and into the greenhouse. He was doing whatever watering, seeding, [caring for] transplants, you know, whatever had to be done. So, it is an excellent tool for kids, you know, like I said, special Ed. lower achieving and even I've seen this with higher achievement kids. It is a great tool for all of them.

Appendix F

IRB Image

INFORMATION LETTER

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

Title of research study: *Community Gardens in Alabama*
Investigators: Tana Shealey, *Jason Mc Kibben*
Sponsor: none

You are invited to participate in a research study to outline the practices of current practitioners and extension educators in facilitating community gardens.
The study is being conducted by Tana Shealey under the direction of Jason Mc Kibben in the Auburn University Department of Curriculum and Teaching. You were selected as a possible participant because you are known to participate in community gardening.

***What will be involved if you participate*?** If you decide to participate in this research study, you will be asked to participate in an interview. Your total time commitment will be approximately 30 – 60 minutes.

Are there any risks or discomforts? The risks associated with participating in this study are a breach of confidentiality. To minimize these risks, we will be using pseudonyms in any report and in our notes.

Are there any benefits to yourself or others? There will be no direct benefit from participation in this study.

Will you receive compensation for participating? To thank you for your time, but you will not receive any compensation for participating.

Are there any costs? If you decide to participate, there will not be any cost, outside of your time.
If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Agricultural Education, Leadership, and Communications group, or the Alabama Cooperative Extension Service.
Any data obtained in connection with this study will remain confidential. We will protect your privacy and the data you provide by not using any identifiable information about you in our write-up and will not disclose that you are a participant in this study. Information collected through your participation may be (e.g., used to fulfill an educational requirement, published in a professional journal, and/or presented at a professional meeting, etc.).

If you have questions about this study, please ask them now or contact Jason Mc Kibben, PhD. at jdm0184@auburn.edu or Tana Shealey at tjs0032@auburn.edu

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334) 844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Appendix G

Interview Questions

This researcher conducted interviews among seven educators who work with youth and community gardens I different counties of Alabama. Interviews were conducted online with the permission of the participants. Participants' names were changed to alphabetical letters in data presentation.

Approved interview protocol:

Background and Program Overview

1. How long have you been an educator?
2. What age groups of community members do you serve?
3. What influenced your decision to use community gardens to teach your community members?
4. Describe the curriculum used in your community garden. How did it work?
5. Tell me about your program. What is an average community gardening program like?

Impact on Community Members & Learning

1. What do you observe among community members that indicate they were actively engaged in the learning process during community gardening sessions?
2. What changes have you observed in your community members' comprehension of scientific processes during gardening lessons?
3. What changes have you observed in how community members participated in the learning process?

4. In what ways do you think that a gardening project affects your community members' overall learning experience?
5. Did you observe community members making connections with gardening and any other topics, such as art or music?
6. What do you think they got out of the experience?
7. Do you think that the gardening impacted the food choices the community members later made?

Feedback and Challenges

1. What are two questions that community members most often ask their teacher/instructor/extension educator while working in their community garden?
2. What comments do your community members make about their gardening experiences?
3. Is there anything that you would change while using community gardening to instruct people?
4. What was the buy-in from communities like?
5. How did you overcome the financial aspects of gardening?
6. Did the community members value your input into the gardens?

Future and Broader Implications

1. Do you think more communities should include community gardening, and why?
2. Moving forward, what should come next after having a community garden?
3. What should communities do next?
4. What should Extension do next to continue learning through community gardens?

Open-ended/Concluding

1. Is there anything that I have not asked about your community members' community gardening experiences that you would like to discuss?
2. What did I not ask you if you really want to share about community gardening?