Examining Characteristics and Barriers on the Adoption of School Gardens among Agricultural Education Teachers

by

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ABSTRACT

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The overall purpose of this study was to understand the influence of selected factors on the adoption of school gardens by Agricultural Science teachers in Alabama. This study looked at how the relationships between characteristics of teachers, characteristics of innovation, and barriers to adoption affected the diffusion of school gardens. A random sample of 117 Agricultural Science teachers was selected for participation in the study. A majority of Agricultural Science teachers reported they were in the confirmation/implementation stage (40.5%); 4% had no knowledge of the innovation; 6% were in the persuasion stage; 4% were in the decision stage.

Overall, Agricultural Science teachers showed a positive attitude toward school gardens. Agricultural Education teachers perceived two primary barriers to the adoption of school gardens. Removing these barriers, time constraints and lack of financial support, would be expected to positively affect the rate of adoption.

Based on these findings, offering monetary incentives may increase the rate of adoption, and decrease teachers' financial concerns. These findings show that female teachers have a more positive attitude towards school gardens, compared to males. Allotting more resources to the hands of female teachers, and including them in the decision-making process about school garden sustainability, may increase school garden diffusion.

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CHAPTER I

INTRODUCTION

Background

The school garden has had a nonlinear evolution. There have been at least four phases of school garden development. Lawson (2004) found that each phase was determined by different socioeconomic conditions. The first phase started with the end of the American Civil War (1861-1865) with the urgent need to reconstruct the regional economies and territorial assets of the country. The second phase emerged as a response to food insecurity during the two main world conflicts of the twentieth century. This phase lasted for at least two decades from 1917 till 1946. Events such as the Great Economic Depression of 1929 indirectly contributed to the dissemination of school gardens, which were mainly used for unemployment relief through vacant lot cultivation.

The emergence of industrialized agriculture in the 1950s created a gap in the linear evolution of school gardens in the United States. The introduction of new farming technologies, which favored intensive cultivation methods, contributed to the decline of the number of school gardens. However, the last three decades have seen a renewed interest in school gardens. This renewed interest is due to the growth of four factors: organic agriculture; sustainable agriculture; environmental conservation; and to the increasing awareness of real and potential threats of industrialized agriculture to global health security (Desmond, Grieshop, & Subramanian, 2004; Lawson, 2004; Thorp & Townsend, 2011).

A school garden is an important educational tool because it provides great opportunities for engaging in agricultural production and land cultivation. Education on school gardens will stimulate future sustainable agriculture, new technology use, and prepare future generations of farmers (Duncan, Collins, Fuhrman, & Berle, 2016). This researcher believes that it is now time to reconsider school gardens as; a) effective learning tools; b) strategic places to teach sustainable agriculture; c) places to teach the use of new technologies; d) places to reflect on where we are today and where we go during the next thirty years; and e) strategic places to educate a new generation of farmers. To advance the development of school gardens, this researcher believes that it's important to study Agricultural Science teachers' perceptions of school gardens. Agricultural Science teachers have been actively participating in the success of school gardens since the 1920s. Agricultural Science teachers could have a role in using school gardens as instructional tools for agricultural education.

Rationale

The Food and Agricultural Organization of the United Nations (FAO) (2006) states that food security is an emerging issue of modern society with world population at approximately 7.5 billion people. The United States Department of Agriculture (USDA) (2015) reported that in 2015 there were 2.2 million farmers representing less than 1% of the US population. Other countries also have a low number of people farming. How will the world population be fed? A cogent task is a question of how to increase worldwide access to food for individuals.

Agricultural Science teachers are called to adopt innovative measures to help policymakers implement strategic programs that incentivize the local production of food. Agricultural Science teachers can help redefine the relationship between individuals and the outdoor/natural environment. Schoolyards offer a valid opportunity to experiment with new ways to grow food in confined spaces. School gardening can offer an opportunity to enhance food production in congested urban environments while offering an alternative solution for those individuals living in rural areas (FAO, 2005).

In numerous cases, school gardens can offer a model of food self-sufficiency, which is defined as a realistic strategy to enhance the resilience of food systems and sustainable agricultural practices in schools. Small spaces such as school gardens can be seen as an opportunity for a food production solution (FAO, 2010). The study of adopting school gardens will define a set of innovative educational practices intended to strengthen connections between people and agriculture. The spaces of the school gardens can be rethought of as the spaces where Agricultural Science teachers train a new generation of farmers, and agriculturally minded people (FAO, 2017).

According to the National Association of Agriculture Educators (NAAE) (2017) Agricultural Science teachers hold a unique set of characteristics that are both practical and theoretical, moreover, teachers are the main promoters of school gardens (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016; Roberts, Harder, & Brashears, 2016).

According to Lawson (2004) “typically, a teacher […] would start a garden with the expectation that the local school board would see its merits” (p. 157). Previous research has identified a set of factors that determined the positive perception of school gardens among Agricultural Science teachers, namely opportunity to link garden and lunchroom, gardening education, distraction and subsistence, the opportunity for establishing community gardens and community projects, and other factors (Lawson, 2004; Thorp & Townsend, 2011). A significant number of previous studies focused on the diffusion of agricultural education (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016). However, there are no studies about school gardens based on Rogers’ (2003) diffusion of innovation theory. Based on the rationale provided above, this research was conducted on Agricultural Science teachers’ perceptions of school gardens based on Roger’s (2003) diffusion of innovation theory.

This study compared teachers’ perceptions of school gardens utilizing the five characteristics Roger (2003) describes for diffusion of innovation: relative advantage, compatibility, observability, complexity, and trialability. In addition, this study investigated perceived barriers to the dissemination of school gardens based on demographics of Agricultural Science teachers (Harder & Lindner, 2008; Li & Lindner, 2007). The results of this study will help predict the openness to the future dissemination of school gardens by Agricultural Science teachers.

Purpose and Objectives

The purpose of this study was to investigate the influence of selected factors on Agriscience Education teachers' perception of school gardens in Alabama. Six research objectives guided this study:

1. Describe personal characteristics of Agricultural Science teachers in Alabama.
2. Describe Agricultural Science teachers' stage in the innovation-decision process, based upon Harder & Lindner's (2008) adaptation of Rogers' (2003) stages in the innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation).
3. Describe Agricultural Science teachers' perceptions of school gardens based on Roger's (2003) characteristics of innovation (relative advantage, compatibility, observability, complexity, and trialability)
4. Describe Agricultural Science teachers' perceptions of potential barriers (concerns about time, concerns about incentives, financial concerns, planning issues, and outdoor teaching concerns) to the adoption of school gardens.
5. Describe the relationship between Agricultural Science teachers' perception of school gardens based on Roger's (2003) characteristics of an innovation and selected participants' individual characteristics such as age and ethnicity, years of experience and size of the program, gender, and educational level.
6. Describe relationships between Agricultural Science teachers' perceptions of school gardens based upon Rogers' (2003) characteristics of an innovation and their perceptions of potential barriers to the adoption of school gardens.

Significance of the Study

Diffusion of innovation is a strategic concern for a variety of organizations. The findings from this investigation provided an up-to-date survey of the development of school-based gardening practices in the State of Alabama and of characteristics of the gardens that may influence their dissemination to other educators. From the organizational development perspective, this study may offer insights to help administrators better understand employees' intention to keep the school garden as part of agriculture education and factors that may affect gardens' long-term sustainability.

A deeper understanding of those factors and relationships will help to strategically use human and monetary resources and select successful practices that may influence school gardens' retention and dissemination into urban and suburban areas. This study may influence community development practices and strategies and may impact food safety and health disparity in urban areas. Furthermore, the results of this study will help plan more economically sustainable urban gardens by promoting strategic local schools and local community development based on empirical knowledge.

Definition of Terms

Agricultural Education: An inclusive and interdisciplinary field of study that encompasses a variety of academic subjects and programs with a focus on agriculture and food production. Agricultural education is based upon theory and teaches students through practical experience (Doefert, 2011).

Agricultural Science Teachers: Professional instructors hired to teach learners about agricultural-related subjects including subjects related to food security and natural resources. Through these focusses, Agricultural Science teachers instruct students in a variety of skills including cognitive and practical skills. The words agribusiness, agriscience, and agriculture are interchangeable in this study (National Association of Agriculture Educators, 2017).

School Garden: A plot of land that lends itself to a multiplicity of uses a) educational, b) recreational, c) gardening d) food and fiber growing. The garden is usually an extension of the school building – within the school property boundaries. The school garden's dimension may vary in relation to the density of the neighborhood in which the school is placed, and other economic and safety parameters (Thorp, 2006).

Innovation: "an idea, practice, or object that is perceived as new by an individual or other units of adoption" (Rogers, 2003, p. 12).

Food Security: An umbrella term indicating a wide array of solutions, politics, plans, and strategies conceived, designed and implemented to: (a) reduce and, eventually, stop global hunger; (b) advocate and promote the right to food for all individuals and; (c) promote global access to nutritious food. (FAO, 2006)

Compatibility: "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 15).

Complexity: "the degree to which an innovation is perceived as difficult to use" (Rogers, 2003, p. 16).

Observability: "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 16).

Relative Advantage: "the degree to which an innovation is perceived as better than the idea is superseded" (Rogers, 2003, p. 15).

Trialability: "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16).

Theoretical Framework

This study is based on the literature reviewed on Rogers' (2003) Theory of Diffusion of Innovation. A theoretical model of the potentially possible relationships among the main set of variables to this study is shown in Figure 1. This theoretical framework draws upon three sets of variables including; (a) perception of school gardens; (b) barriers to school gardens and; (c) participants' individual characteristics. The perception of the school garden is measured by five indicators of perception. These indicators include relative advantages, complexity, compatibility, observability, and trialability.

This framework described; (a) participants' perception of their gains for adopting a school garden; (b) participants' perception possible complications coming from dealing with a school garden; (c) participants' perception of possible compatibility of the school garden with their set of values; (d) participants' perceived observability of the school garden; and (e) participants perceived trialability of the school garden. Possible barriers to school gardens are mentioned in the framework. These barriers include time, incentives, finance, teaching, and planning barriers. These barriers were described by Harder and Lindner (2008). Participants' individual characteristics included participants' age, gender, ethnicity, educational level, and participants' program size. Participants' stages of diffusion of innovation included no knowledge, knowledge, persuasion, decision, implementation, and confirmation.

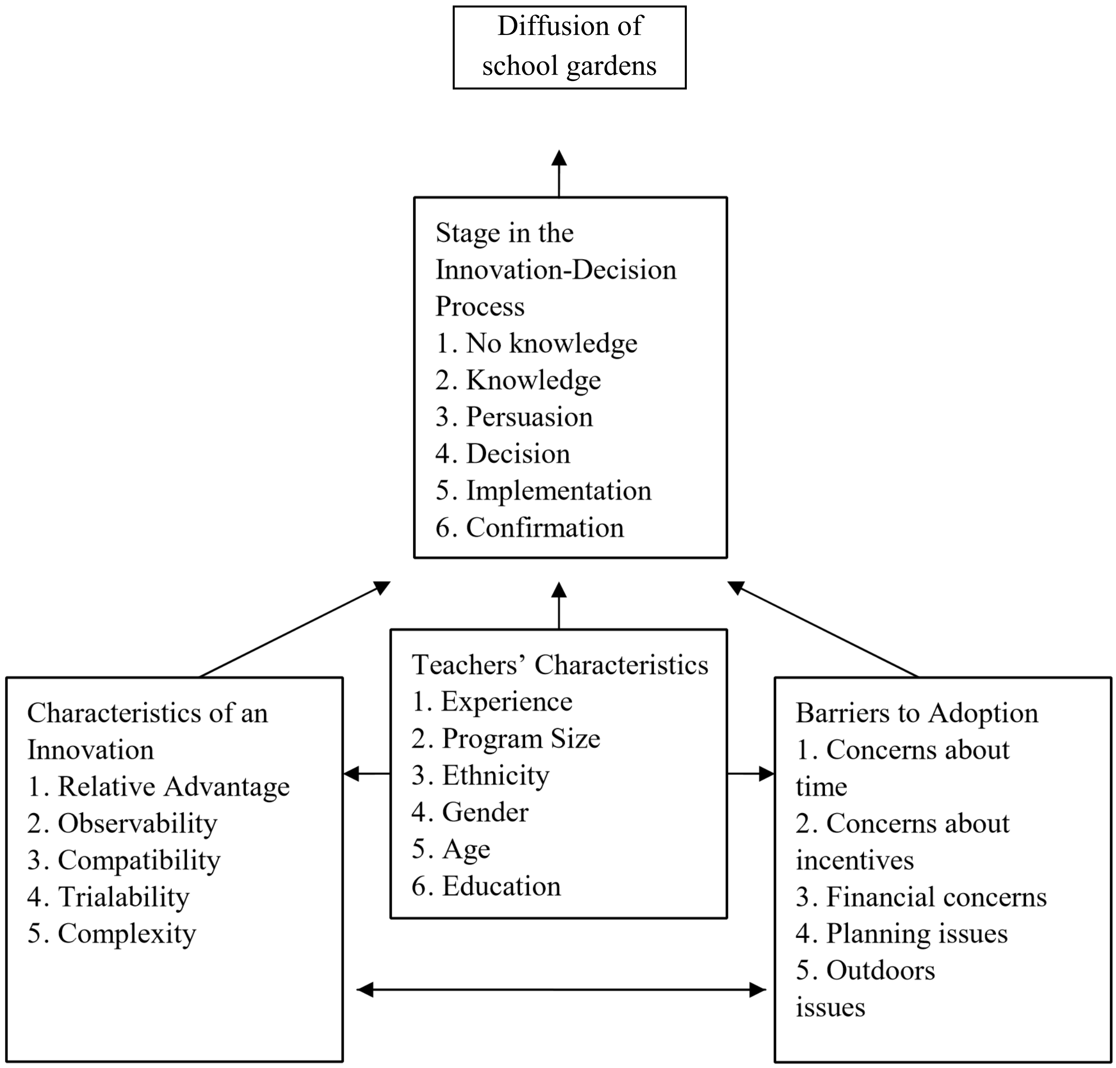

Figure 1. Theoretical framework for the diffusion of school gardens

CHAPTER II

REVIEW OF LITERATURE

Historical Perspectives on Agricultural Education

The history of Agricultural Education is rooted in the rich reformist tradition developed within modern liberal capitalistic economies. After the Civil War, parts of the United States' populace looked for increased opportunities for participation in the social, political, and the economic life of the country. Old institutions were perceived as unfit to answer the post-conflict societal questions. In the 1870s, sixty-two million people lived in the country and farmers constituted 43% of total labor force. Two-thirds of the people lived in rural areas. The percentage of urbanized people started growing steadily in the last two decades of the 1800s. Urbanization and industrialization started shaking the traditional social equilibrium. Traditional agriculture was perceived as insufficient to answer the needs of a modern industrial capitalistic economy. Agriculturists wanted to use new technology and increase land productivity to reach their goal of feeding an increasing urban population (Kohlsted, 2008).

According to Gordon (1999) the Morrill Act of 1862 initiated the plan to establish land-grant colleges for the purposes of spreading relevant agriculture knowledge in the country. In 1887, the Hatch Act established agricultural experiment stations nationwide to test new farming and ranching practices. A second Morrill Act was issued in 1890. The legislation led to the creation of the first land-grant college system. After these Acts were passed, Agricultural Education began to build its reputation and established itself as a key Government program for social and economic development of the country.

Agricultural education programs rapidly spread countrywide. The dissemination of practical skills such as crop rotation began to gain approval from farmers.

Federal Legislation Impacting Agricultural Education

Gordon (1999) affirms that the Morrill Act of 1862 pioneered U.S. vocational agricultural education. The land was an economic asset for the college and ensured continuation of these colleges. College principals had the power to sell the land in case they needed money to support academic activities, and to resolve funding shortages of public money due to Civil War activities. The provision helped establish a new national higher education system, namely the 'land-grant' college system. Higher education was extended to the masses. The Morrill Act of 1880 included African-American colleges within the new higher education system. The Hatch Act of 1887 provided funds to establish agricultural research and experiment stations at land-grant colleges. The agricultural experiment stations were charged with researching problems associated with the food and fiber industry and disseminating the results to the public.

The Smith-Lever Act of 1914 promoted the Cooperative Extension Service. In 1917, the Smith-Hughes Act created the condition for a legitimization of the relationships between the vocational education system and the State. The George-Reed Act of 1928 provided additional financial support for vocational education. Money was equally divided between agriculture and home economics. Funds were used to hire subject matter specialists in agriculture. Issued in 1946, the George-Barden Act increased funding for vocational education and indicated federal funds could be used on vocational guidance, and to support travel associated with youth associations, and the Future Farmers of America. According to Gordon (1999) the Vocational Act of 1963 broadened the definition of Vocational Agriculture and elevated the level of quality control of Agriculture Education programs. The Act changed program contents and curriculum of Agricultural education. Agribusiness became an integral part of secondary education. Horticulture became part to Vocational Agriculture. Most recently, the Carl D. Perkins Vocational Education Acts of 1984 modified previous vocational legislation. The Perkins Act recognized the importance of academic education for modern vocational education.

Historical Perspective on School Gardens

The history of School Garden Movement followed a nonlinear pathway in the United States. The idea of the school garden was borrowed from Europe. The George Putnam Grammar School, Massachusetts, was the first school to adopt a garden for education (1861). Since then, school gardens became widespread in the United States. The school garden was used for horticultural education, and nature appreciation (Hayden-Smith, 2007; Kohlsted, 2008). The agricultural use of school gardens was commonly found in many schools nationwide as early as the 1940s, and especially during World War II. Trelstad (1997) states that use of school gardens for productive purposes was occasionally proposed as an opportunity for food self-sufficiency, but its adoption has been sporadic and fluctuating between opposing perceptions. School gardening nearly vanished in the post-war period when abundance of food availability become a trademark of the national consumeristic lifestyle (Assadourian, 2003).

Agricultural education was separated from the school garden movement prior to the Smith-Hughes Act. School gardens were used for instruction, beginning around the 1900s, and for agricultural instruction, in a few selected locations. The teaching of agriculture was incorporated into the high school curriculum in urban, rural and all schools throughout the United States. Using school gardening as a part of a school educational program of study was not simple endeavor.

Hayden-Smith (2007) explores the rise and the decline of the school garden in the United States. The early history of the gardens weaves together Progressive governance, the Back to Nature Movement, and early education reform. History of garden-based education was conditioned by social changes. Garden-based education practices were shaped by grassroots movements whose ideologies were subsequently incorporated in more systematic and structured approaches. Thus, a genealogy of agricultural education may be drafted and structured around a chronological sequence of the main Movements then assimilated in church schools first, and within American academia especially.

The reformist attitude of garden-based education was advocated by John Dewey who considered the garden a powerful instrument to reform the city and the society (Smith & Motsenbocker, 2005). Back-to-the-Land Movement (1880-1914) stressed analytical observation and refuted obsolete farming practices and inefficient growing techniques. United States School Garden Army Movement (1917-1947) promoted food micro gardening at a large scale, during the two World Wars. They were used as a food security measure for people.

The Environmental Movement, which began in the 1970s, recognized the strategic value of agriculture for environmental stewardship. United States Senator Gaylord Nelson founded Earth Day in 1970 to advocate effective environmental conservation policies (Ralston, 2012). American nutritionist Alice Waters initiated the Edible Schoolyard Project in the 1980s. The edible schoolyard project focused on food production and consumption of food for middle school students according to Waters (2010). School gardens could be used as learning tools capable of enhancing student general well-being via informal education, starting from the 2010s. Thus, specific attention has been given to the role and function of school gardens for agriculture learning.

The Neo-Epicurean Movement, Food-for-Soul Movement, or Slow Food Movement had its origin in 1989 with the aim of promoting Farm-to-Table programs aimed to reduce food waste. The Movement considered food a cultural product of the land. A plan of rediscovering of regional cooking was initiated by Italian Journalist Carlo Petrini. The plan was initiated with the aim of enhancing the relationship between food producers and consumers (Tencati & Zsolnai, 2012). Moreover, the Movement's proponents promoted the centrality of farmers and role of farmers for global food security. This Movement also emphasized the centrality of the role of women in sustainable farming in developing countries.

The Farm-to-School Movement grew in conjunction with the Governmental plan establishing a Farm to School Program within the United States Department of Agriculture. The program aimed to increase consumption of fresh foods in the school cafeterias (United States Department of Agriculture, 2011a). In 2004, the Oregon Food Bank started the Seed to Supper program to enhance food security and to amplify opportunities for people to access locally produced organic food in the metropolitan Portland area. In 2010, the Oregon Food Bank established a partnership with the Oregon State University Extension Service forming a joint Seed to Supper program. Withers and Burns (2013) studied the impact of the Seed to Supper program on the program's attendees from metropolitan Portland area. Results from this study showed a positive impact of the program on the improvement of the participants' gardening skills. A positive correlation existed between; (a) the participants' increased gardening skills and the participants' food self-sufficiency; and (b) increased gardening skills and food literacy (Withers & Burns, 2013).

Federal Legislation Impacting School Gardens

The United States Department of Agriculture, which regulates school gardens, estimates about 7,000 school gardens exist nationwide (2015). Goods sold and the distribution of produce coming from school gardens is also regulated. The Department incentivizes local production, local distribution, and the consumption of goods coming from school gardens. This policy is implemented to keep school gardens active. This governmental policy is newfound. The first National School Lunch Program was launched at the very end of World War II (1946). As a result of the U.S. government regulating school gardens, local agricultural products are incorporated into school lunchrooms through the National School Lunch Program. Legislators believed that incorporating the school garden into the school lunchroom would positively affect youth's health.

The Child Nutrition Act of 1966 regulated agricultural produce provided for the consumption by school children. The Food and Agriculture Act of 1977 was created to extend sustainable agriculture and support small farming activities. The Food, Agriculture, Conservation, and Trade Act of 1990 regulated: (a) sustainable agriculture research; (b) sustainable agriculture education; and (c) training for extension service agents. The Elementary and Secondary Education Reauthorization Act of 1994 regulated the Native American colleges under the aegis of the American-Indian Higher Education Consortium. The legislature allocated new resources to fund agricultural education programs for people of Native American ethnicity. The Child Nutrition Act of 2004 regulated access to local foods in schools as well as school gardens that may be used for teaching and instruction. The Agricultural Act of 2014 was created to increase knowledge of agriculture and improve the nutritional health of children. Purposes of the provision were the intensification of the capacity for garden-based education (USDA, 2011b).

Linking School Gardens to Agricultural Education

The history of Agricultural Education addressed issues related to national food security. Agriculturalists first discussed national food security issues in the 1930s. During the two World Wars, food scarcity was due to a lack of agricultural laborers as a result of males enrolling into the military. The change from a peace economy into a war economy went hand-in-hand with the creation of food security programs for national security. Community food gardens were established in the main urban areas of New York, Chicago, Boston, and Philadelphia. Community gardens and school gardens became part of the American landscape (Ralston, 2011). The interest in food gardens began to go down between 1950 and 1960. In the 1970s, food gardens and gardening programs reached a new level of popularity. Gardens were used to fight hunger in both large metropolitan and rural areas (Lawson, 2004).

From the 1960s to the 1970s it became evident that food buying behavior of consumers across the nation was changing. Interest in food micro production and the issues associated with it became prominent starting from the mid-1970s. In 1977, the Food and Agriculture Act was passed to strengthen the link between Agricultural Education and local food production. The Food Act was incorporated into the land-grant university structure by promoting sustainable agriculture initiatives. Food security education programs spread during the 1990s. In the 2000s, ad hoc programs were created to reduce the gap between students and agriculture, as in the case of the Farm-to-School program.

The Agricultural Act of 2004 talks explicitly about the need to find new formulas to teach agriculture in relation to food security. The school garden was considered a space for potential growth of food security education. Agricultural Education is under the aegis of the United States Department of Education after a century of relative independence from the United States Department of Agriculture. This watershed moment in the history of Agriculture Education sparked controversies among agriculturalists at many levels. Agriculturalists promote self-sufficiency and food security in metropolitan areas and in areas at environmental risk, while food security education is a key component for the success of complex development programs and plans, which include health education programs, and economic development programs (USDA, 2015).

Perception of School Gardens in Education

School stakeholders show a generally positive attitude toward school gardens. Studies have shown teachers perceive school gardens having a positive impact on students. According to Eames-Sheavly, Lekies, MacDonald, and Wong (2007), the use of school gardens for agricultural education fosters an integration of complex issues and offers a unique way for students to approach gardening practices. Students learn a responsibility for the environment for the environment and also acquire a practical understanding of horticulture and sustainable food production. In addition, connecting gardens and students help teachers appreciate the use of the school garden in education (Assadourian, 2003).

The Pull of the Earth (Thorp, 2006) is a vivid description of what happens in a Midwestern elementary school when a school garden is incorporated into the traditional curriculum. Thorp (2006) investigates the vast array of possible relationships established between pupils and school garden and the education function of the school garden. Research participants were asked to identify possible solutions for the development of school garden (Thorp, 2006). Blair (2008) clarifies that, although some teachers may already consider the school garden as a suitable tool for education, the literature on the effects of school gardens has yet to be scrutinized thoroughly. Interest in gardening may fluctuate among teachers, often contingent on a lack of funding and a lack of gardening skills. Additional studies on teachers' perceptions of school gardens may be necessary to understand teachers perceptions of barriers to the establishment of school gardens (Blair, 2008).

The advantages of installing a school garden can be manifold. School gardens are gaining popularity among nutrition educators. School gardens are instrumental to increasing students' intake of fruit and vegetables. Thus, school gardens impact education on nutrition positively (Belle & Dyment, 2008; Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr, 2005; Graham & Zidenberg-Cherr, 2005; McAleese & Rankin, 2007; Parmer, Salisbury-Glennon, Struemper, & Shannon, 2009).

Sobel (2004) informed us that gardens may offer a plausible model for place-based education. By fostering connections between classroom and community, gardens create connections between local culture and agriculture, while constituting a key element in the shaping of the national food system according to Allen, Simmons, Goodman, and Warner (2003). Feenstra (1997) states that—together with food policy councils, farmer's markets, community farms, and urban farms –school gardens have brought tremendous value and supports the National Organic Food Movement.

Cheskey (1996) discusses the evidence and research that seems to indicate that the design of the typical school garden has an impact on users' behavior. Environmental features, vegetation complexity, and structural diversity may positively affect users and their behavior. The use of the garden for education may help students achieve better academic results in science, mathematics and technology subjects, by favoring interdisciplinary education.

Brunotts (1998) identified the Pittsburgh Civic Garden Center's community outreach program which brings together neighbors and local schools as a multifaceted learning tool. Esteva (1994) viewed a possibility for civic development in re-embedding food in agriculture. If on one hand, spending time in the garden benefits students (Blair 2008), on another hand, the educational impact of school gardens should be furthered analyzed (Thorp & Townsend, 2001; Wolsey & Lapp, 2014).

The school garden is generally perceived as a tool suitable for informal education. McGaughy (2013) describes the evolution of REAL School Gardens, a nonprofit organization dedicated to enhancing practical skills of children living in urban areas. To implement its goals the association has built a set of educational gardens: green infrastructures that were disseminated throughout Fort Worth area, in Texas. To ensure the long-term sustainability of the gardens, the association started collaborating with teachers, beginners, and volunteers and started a teacher training program.

Diffusion of Innovation

Research on adoption and diffusion of innovation has been relevant to the profession of Agricultural Education since Everett Rogers' Iowa Study of Hybrid Seed Corn took place in the 1950s (Lindner et al., 2016). An innovation is "an idea, practice, or project that is perceived as new by an individual or other units of adoption" (Rogers, 1995, p.36). According to Rogers (1963): "New ideas and potential adopters have identifiable characteristics which appear to affect the diffusion of innovations" (p. 69). Innovations are not adopted immediately or uniformly by individuals. Instead, each innovation has its own rate of adoption, which is "the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003, p. 221). The innovation-decision process presented by Rogers included knowledge, persuasion, decision, and implementation.

Rogers (1995) identifies five key attributes of innovation: relative advantage, compatibility, complexity, trialability, and observability. Individual's different perceptions about characteristics of an innovation would affect their adoption behavior. Based on their adoption behavior, Rogers' (1995) further identified five groups of innovation adopters: innovators, early adopters, early majority, late majority, and laggards. The greatest amount of variance for the rate of adoption is attributed to five attributes identified by Rogers (1995) as relative advantage, compatibility, complexity, observability, and trialability.

Diffusion of innovation theory (King & Rollins, 1995; Rogers, 1961) has been used largely in agricultural education research. Dooley and Murphrey (2000) suggested increasing diffusion of innovation, in an educational setting, by using incentives to increase relative advantage and increasing compatibility by tying the innovation to a prevailing set of social norms (p. 48). The essence of innovations researched in agricultural education is very wide-ranging and contains a multiplicity of practices, and invention (Doerfert, 2011; Rogers, 1958). The study of school systems, teachers, or administrators is a major diffusion research tradition (Rogers, 1995, p. 43).

According to Graham, Beall, Lussier, Mclaughlin, and Zidenberg-Cherr (2005) it is reasonable to state that the main reason for schools to adopt a school garden is that of improving academic teaching including science, environmental education, and food education (Graham et al., 2005).

Characteristics of School Gardens

The concept of relative advantage presupposes that the potential adopter is acting rationally to find the most effecting means to attain a given goal (Rogers & Shoemaker, 1971; Sargent, 2014). When adopters perceive an innovation as having a high degree of relative advantage, it is much more likely the innovation will have a rapid rate of adoption. Relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 15). An innovation may be perceived as advantageous for a number of reasons. For example, fuel-efficient cars sell better than large trucks when gas prices are high, because of the perceived cost savings. However, economic profitability is only one of the sub-dimensions of relative advantage that Rogers identified. The immediacy of reward and social prestige are other sub measurements positively affecting the relative advantage of an innovation.

Skelly and Bradley (2000) state that active learning opportunities were a recurring subject associated with the use of school gardens for the teachers of 71 elementary schools in Florida. Factors perceived to increase active learning included the ability to be persistently in contact with students, and teaching flexibility. Respondents also mentioned potential health benefits for children resulting from the consumption of food grown in the garden.

Because of the engaging nature of gardening activities can help teachers engage students in a way which is not possible in the classroom. Teachers also learn useful gardening skills which can be transferred into their own homes. Teachers have reported fewer discipline problems when science is taught in the garden (Klemmer, Waliczek & Zajiecek, 2005; Glenn & Wingenback, 2015; Deen, Hnrcirik-Scanga, White & Beraino, 2017). To determine the relative advantage in Alabama classrooms, this researcher researcher employed five measures (see Appendix B): the extent to which a school garden (a), improves the teachers' routine endeavors, (b) improves teaching efforts, (c) allows a more efficient dissemination of information, (d) if benefits compensate costs and (e) has more advantages than disadvantages.

Compatibility

According to Rogers (2003), innovations may be compatible with prior experiences or ideas. Compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). There is no guarantee that an innovation (however beneficial) can spread without finding some kind of cultural resistance. Nothing comes from nothing. As with relative advantage: a high degree of compatibility is associated with a more rapid rate of adoption (Rogers, 2003). Sargent (1984) illustrated that the tribe of Bariba in Benin, who value pain endurance, refuse numbing medical treatments because pain is considered central to Bariba identity. This is indicative of how rational responses to specific external stimuli may vary according to whether or not these responses follow a culturally determined structure. To determine the compatibility of school gardens with teachers' worldviews and beliefs, this researcher employed seven measures (see Appendix B): (a) the extent to which school gardens support the mission of the school (b) the alignment with teaching style; (c) the improvement of teaching effort; (d) the increase in efficient information dissemination; (e) the consistency with teaching methods; (f) the social benefits; and (g) the career benefits.

Observability

Observability is "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 16). Observability is another key characteristic associated with the rate of adoption of an innovation. Individuals' decisions to adopt are influenced by their observations of others who have adopted an innovation. This is true especially if the early adopter is a leader. Observability is positively associated with the rate of adoption. To determine the observability of school gardens, this researcher employed five measures (see Appendix B): (a) previous knowledge of teachers using school gardens for instruction, (b) visibility perception, (c) vicarious perception, (d) general perception, and (e) publicity.

Complexity

Complexity is "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 16). Individuals may be discouraged from adopting innovations which are perceived to be too complex. Perceptions of complexity can lead an individual to believe the costs of adoption will exceed the anticipated benefits. Complexity is the most common factor that serves as a deterrent for diffusion of innovation (Rogers, 1995). Of the five characteristics of innovation, complexity is the only one negatively associated with the rate of adoption. To determine the complexity of school gardens, five measures were employed (see Appendix B): (a) ease of operability, (b) simplicity, (c) straightforwardness, (d) manageability, and (e) comfort.

Trialability

Trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16). Previously, Rogers referred to this as divisibility (Rogers, 1963). The term deals with the potential to experiment with the practice on a smaller scale. The term also refers to an innovation that can be tested without commitment over a limited period of time, and this factor is positively related to acceptance. Trialability is an aspect that determines the success of an innovation at its early stages of adoption (Rogers, 1995). Studies have explored the influence that social systems can have on adoption. The behaviors of others can influence a person's decision to adopt (Rogers, 1995).

The term addresses the concept of allowing a potential adapter to test an innovation. Indeed, the industrial practice of testing a new product before introducing it on the market is the classic example of trial marketing by companies trying to convince potential buyers of the quality of their products. Some innovations are more testable than others. These innovations will likely be accepted faster than those that are less testable. Rogers believes that testing is more appreciated by the first adopters, rather than those who adopt later because they do not have the advantage of observing other users. Vicarious experiences can influence personal choices, in some circumstances. The experiences of near peers can work as a sort of guarantee for later adopter. Trialability can accelerate acceptance rate because small-scale testing reduces risks of unwanted effects associated with adopting an innovation. To determine the trialability of school gardens for instruction, the researcher employed four measures (see Appendix B): (a) the extent to which teachers can choose their own term of use of the garden; (b) the use of key features of school gardens, with no obligation for continued or future use; (c) the use of their own teaching material, with no obligation for developing new material; and (d) being able to initiate simple gardening tasks, without committing to tending the garden.

Relative Advantage

Agriculture teachers' beliefs about purposes of agricultural education affect their disciplinary practice. Garrett et al. (2014) investigated the set of beliefs and organizational values of a group of members from the *Association for International Agricultural and Extension Education*. Members were asked to rate a list of value statements according to their perceived organizational benefit values. This list of values is highly compatible with the goals of garden-based education. One can say that the launch of garden-based educational programs has been consistent with the Garret et al. (2014) recommendation that action should be taken to enhance the evidence of important individual benefit for Agricultural Science teachers.

There is an abundance of literature regarding the advantage of school gardens for students. However, there has been less focus on the benefits of gardens for teachers. Klemmer, Waliczek and, Zajicek (2005) provided evidence for the need to conduct more research to measure the effectiveness of school gardens for scientific education. William and Dixon (2013) stated that studies on school gardens often lack methodological rigor.

A brief review of the *Agricultural Education Magazine*, which is the official periodical of the United States National Association of Agriculture Educators, showed that experiential-based learning and adoption of innovative learning tools are highly valued by agriculture teachers affiliated with the association (Barrick, 2014; Boone, 2014). Kreutzer and Jäger (2010) studied differences between perception of organizational values by managers and volunteers. Significant differences between perceived values were identified. While "integrity" and "credibility" were considered highly valued within the organization by volunteers, the "individual gains" and "career benefits" were more evidently valued by managers. These findings show that volunteers and managers' values differ to some extent. Consequently, the presence of an identity conflict may negatively impact the organization's long-term sustainability.

Rogers' (2003) stated compatibility could be established if an innovation met the needs of potential adopters. Although school gardens are predominantly aimed towards the satisfaction of students' needs, it is also predictable that school gardens would be used for helping teachers (Dobb, Relf, & McDaniel, 1998). There is a reason to believe some teachers are receptive to the idea of garden-based education development (Skelly & Bradley, 2007). A survey of benefits and values of school gardens for teachers showed a majority of the respondents were eager to participate in garden-based educational development (Murakami, 2015). Furthermore, teachers indicated they wanted opportunities for professional development matching their actual needs and that were not too time demanding. School gardens likely satisfy these prerequisites, thus increasing the possibility that agriculture teachers will see the innovation compatible with their academic goals and instructional objectives (Klemmer, Waliczek, & Zajicek, 2005).

According to Ruiz-Gallardo, Verde and Valdes (2013) teachers consider the use of school gardens suitable for improving non-cognitive skills, self-esteem, and self-confidence of at risk secondary education students. Interviewed teachers reported school gardens were rapidly changing how and what was taught. According to the United States National Research Council (USNRC) (2009), teachers reported that new cultural challenges such as environmental degradation and food insecurity require the incorporation of non-traditional educational tools in the classroom. According to Mercier (2015), scholars continue to be favorable to the use of school gardens to enhance food security education in the United States.

While the literature is informative regarding the relative advantage and compatibility of school gardens and the theoretical advantages of using gardens to enhance agriculture education; the literature is less informative regarding such categories as observability and trialability. It is possible to say that study of these two categories has been relatively ignored by research (Harder, 2007). This is due to the larger role that both relative advantage and compatibility have had in the adoption-decision procedure, as opposed to the smaller roles of observability and trialability (Rogers, 2003). Additional research is needed on these two characteristics.

As already mentioned, complexity does not favor adoption. Earlier studies have suggested that teachers are often called upon to find greater opportunities to strengthen skills and strategies related to informal education (Mercier, 2015). In addition, teachers are generally willing to accept the idea of using the school garden to provide information on agriculture. However, a lack of gardening skills could increase the perception of the complexity of school gardens. Because of this controversy, teachers' perception of the complexity of the use of school gardens is unsure (Glenn & Wingenback, 2015; King & Rollins, 1995; Soresen, Tarpley, & Warwick, 2010). Several studies (Klemmer, Waliczek, & Zajicek, 2005; Soresen, Tarpley & Warwick, 2010) state a preponderance of perceived positive impacts of school gardens. These results show that using a school garden for education has positive impacts on academic outcomes.

Characteristics of Adopter Categories

Rogers (2003) created five categories to define adopters. Adopter categories were originally developed to indicate the speed at which an individual adopts relative to his/her peers, but Rogers found adopters within the same category tend to share common characteristics. The relationship between adoption speed and adopter characteristics is such that knowledge of an individual's adopter category is also reflective of his/her characteristics. An *innovator* is commonly defined as the individual who first applies an innovation. The innovator tends to be financially stable and have a higher tolerance for risk, compared to non-innovators.

Early adopters are well-respected opinion leaders within their local communities and may be considered the gatekeepers for an innovation. In general, earlier adopters are well-educated and well-traveled individuals (Rogers, 2003). Members of the *early majority* can be very influential but lack the charisma of early adopters. The *late majority* is almost always skeptical about novelties, which are considered as a potential threat to the status quo. They are unlikely to adopt an innovation until is absolutely necessary or until their peers convince them into doing so. *Laggards* are the last within a social structure to adopt an innovation. They tend to idealize the past, showing a nostalgic attachment to older technologies. Laggards interact most often with other laggards.

Adopters are classified based on the promptness with which they adopt the innovation. Rogers (2003) identified five stages in the innovation-decision process including knowledge, persuasion, decision, implantation, and confirmation. The *knowledge* stage occurs "when an individual (or other decision-making unit) learns of the innovation's existence and gains some understanding of how it functions" (Rogers, 2003, p. 20). The *no knowledge* stage includes potential adopters who have not yet heard of the innovation. Individuals choosing to adopt the innovation test their decision in the *implementation* stage. Li (2004) revised Rogers' stages with the addition of a no knowledge stage.

Finally, "confirmation occurs when an individual seeks reinforcement of an innovation- decision that has already been made" (Rogers, 2003, p. 20). Individuals may then progress to the *persuasion* stage and develop an opinion about the innovation. Next, "an individual engages in activities that lead to a choice to adopt or reject the innovation" in the *decision* stage (Rogers, 2003, p. 20). Gradual diffusion is due to variation of the adoption benefits over potential adopters. The extent to which the innovation is perceived positively depends upon the adopter's characteristics.

Goff, Lindner, and Dolly (2008) studied factors commonly inhibiting adults from joining agricultural education programs. The study came to the conclusion that specific sociodemographic factors such as gender, age of participants, and marriage status largely affected the participation of these adults in agricultural education programs. The study showed that amongst non-participants there were a large number of males and married individuals. Roughly two-thirds of participants and non-participants had little or no agricultural competence (p. 218). Duncan, Collins, Fuhrman, Knauft, and Berle (2016) conducted a study to determine the aspects of school gardens that had a best positive outcomes for schools in urban settings. The program's aspects typically associated with horticulture, such as planting and harvesting, were valued the highest. These findings detected the emergence of a fertile connection between school gardens and agricultural education program development. Yu (2012) conducted a study investigating the most common reasons for discontinuing school gardens. Participants in the study cited funding, maintenance difficulties and changing employment conditions as challenges to continuing the school gardens. These findings indicated a need to include the common failures of educational planners or instructions on creating a school garden associated with maintaining a garden-based education program.

Barriers to School Garden Diffusion

According to Wilcox, Shoulders, and Myers (2014) resistance to change can inhibit the adoption and diffusion of innovations. Obstacles to the adoption and diffusion of innovation can be related to "program credibility, administrative support, planning issues, technical expertise, financial concerns, concerns about time, concerns about incentives, infrastructure, conflict with traditional education, and fear of technology" (Li & Lindner, 2007, p. 47). A large quantity of research was found about barriers which may stop elementary school teachers from adopting school gardens (Battel & Krueger, 2005). DeMarco (1997) found a number of recurring barriers such as teacher's lack of time, lack of job benefits for working in the garden, lack of appropriate skills, and financial concerns. In order to make sense of the many barriers found to be a concern for teachers, DeMarco (1997) recommended of dividing the perceived barriers into four categories: logistics, conceptual, educational, and attitudinal. Logistic barriers were related to the school institution. Logistic barriers included opposition to change and lack of necessary technological support from the school. Logistic barriers were divided into administrative concerns and concerns about technical support, and technology concerns and concerns about teaching. It is essential to recognize these distinctions since the rate of diffusion of school gardens may also be impeded by personal, social and institutional barriers. Participant adoption rises when barriers are removed (Coffee & Rivkin, 1998; Downs, 1978; Mirka, 1970; Mohrmann, 1999; Ralston, 2012).

Teachers perceive working in the school garden as time-consuming. Taking care of the school garden requires constancy, and vigilant presence. They are also aware of the time investment necessary to accomplish chores to keep the school garden going. The fear of failure may dissuade teachers from engaging in school gardening. So the school garden may suffer from that fear (Downs, 1978; Marturano, 1995; Mirka, 1970; Mohrmann, 1999; Sheffield, 1992). Mirka (1970) was the first to report that time to produce new material was perceived by faculty to be a barrier to the diffusion of garden-based education. Downs (1978) produced analogous research also indicating time was a barrier, both in elementary education and other higher education fields. Mohrmann (1999) reported faculty and program leaders perceived there was a lack of time to develop garden-based education materials.

The quantity of time needed to learn how to incorporate the garden into the curriculum was also perceived to be an issue as was the quantity of time needed to develop garden-based education materials (Marturano 1995; Klemmer, Waliczek, & Zajacek, 2005; Sheffield, 1992). Coffee and Rifkin (1998) analyzed time concerns and outdoor teaching concerns. Time concerns for the school-based education course versus the traditional course raises some key questions about how school gardening will retain the value related with traditional agricultural education programs without straining teachers with additional demands on their time (Coffee & Rirkin, 1998; Downs, 1978; Mirka, 1970; Mohrmann, 1999; Ralston, 2012). DeMarco (1997) study on barriers to school gardens in elementary classes identified flaws to implementation instead of barriers. Flaws included slow action on incorporating the new relevant instructional material into the traditional classroom and teacher's loss of interest, while career, job security, and misinformation on gardening were all perceived educational and attitudinal barriers (Clardy & Copeland, 2012; DeMarco, 1997).

All of these are serious concerns which should be considered garden-based education. Teachers are not prone to reduce levels of interaction with students or even to approve an innovation they feel will impend their professional career path (Dooley & Murphey, 2000; Harder, 2007). Moreover, if garden-based education is slow to react to relevant cultural issues (e.g. food security), this does not bode well for school gardens (Cline, Cronin-Jones, Johnson, Hakverdi, & Penwell, 2002; Cronin-Jones, Klosterman, & Mesa, 2006).

Factors Affecting School Garden Sustainability

Coffee and Rivkin (1998) stated that cooperation between teachers and maintenance crews at schools is essential for educators who use school grounds to create gardens or other outdoor teaching tools. Teachers often find support among school groundskeepers, who are likely to be knowledgeable about plants. A school garden decline could have different causes and origins. Redman (2013) enumerates and categorizes the main causes that would reduce the chances of school garden long-term sustainability. School gardens are not designed professionally. In most cases, the designs proposed for the school garden are un-functional and do not fully meet the set of expectations of its potential users. A bad design would possibly affect school garden management and maintenance.

The long-term sustainability of the school garden may be affected by the culture of the school. For instance, problems may arise if different department cultures might take a confrontational attitude regarding the didactic use of the school garden. This could negatively affect the incorporation of the school garden into the traditional school curriculum. School garden sustainability may be reached with the help of an extended community. Isolating the school garden from its immediate context would possibly affect school garden sustainability and visibility. This is also the case when the school garden does not directly respond to the needs of school stakeholders.

The school garden could be perceived as something that is randomly inserted into a school property. The theme of the alienation of the school garden from the context could be the primary cause of failure of school gardens. Thus, the school garden should be rethought as a place. More research is needed in this regard. The schools should prioritize the involvement of a variety of stakeholders in school gardening. The school garden should be open to community supporters and have a strong administrative support that would help to include the school garden in the school culture. All these topics should be considered to address current challenges to the sustainability of the school garden (Sterrett & Imig, 2010).

Practicable solutions to school garden sustainability have been implemented successfully. These solutions have been successful when the school garden has deliberately been conceived to be part of a larger whole. School gardens can be used to bring grant money into schools in low-income neighborhoods. This may happen when suppliers of school garden grants perceive that the school garden has the potential to fulfill a real need (e.g. school food security). School gardens can be used for increasing wildlife habitat in metropolitan areas and increase youth's environmental awareness. Advocating for the long-term sustainability of school gardens could justify the creation of innovative natural conservation policies (Sterrett & Imig, 2010; Stirpling & Barrick, 2013).

Cronin-Jones, Klosterman, and Mesa (2006) have found significant differences in the outcome variables of student test scores such as content knowledge, behavioral intentions, and perceptions. School gardens have instrumentally been adopted for promoting environmental education among elementary students. Cline et al. (2002) state that teacher support and lack of money are not significant factors influencing the potential success of the school garden. School garden success is rather associated with the level of community participation.

McGaughy (2013) studied the work of philanthropists Richard Rainwater and Suzy Peacock who, from 1995-2003, created REAL School Gardens, a nonprofit organization devoted to hands-on education for children of urban communities. To implement their project, they have built a set of teaching gardens (e.g. Morningside Elementary School, Fort Worth, Texas). To ensure the gardens' long-term sustainability, the association has begun a collaboration with teachers, principals, and volunteers by starting a program of teacher training.

Summary

Contemporary experiences of school gardening vary, however, school gardens have not lost their appeal. This appeal has been renewed in the urban environment and deals rather with urban poverty and ‘urban education’, in the United States (Hazzard, Moreno, Beall, & Zidenberg-Cherr, 2011; Huckstein, 2008; Jaeschke, Schumacher, Reader, Cullen, & Wilson, 2012; Kincy, Furhman, Navarro, & Knauft, 2016; Passy, Morris, & Reed, 2010; Selmer, Rye, Malone, Fernandez, & Trebino, 2014; Shoulders & Myers, 2012). Several quantitative studies on school gardens have found that school gardens provide a suitable site for experiential learning to take place (Corson, 2003; Bell, Lewenstein, Shouse, & Feder, 2009; Emekauwa, 2004; Faddegon, 2005; Fisher-Maltese, 2013; Ramjattan, 2014; Rennie, 2007). Leadership is a key component for school garden success.

A teacher that does not show any kind of excitement or interest in school gardens can be a barrier to school garden development. Teachers may need some sort of incentives to establish and to maintain a garden. Teachers are overburdened and must balance a large number of responsibilities. The pervasive perception among teachers is that there is never enough time for extracurricular activities. Moreover, teachers are very sensitive to changes that may jeopardize their position within the local educational culture. Teachers are sensitive to the pressure of testing. They realize that increased pressure for assessment may result in a loss of control on contents, performance, and curriculum. If motivated, those teachers may actively contribute to the success of the school garden program (Crocco & Castigan, 2017; Hall & Hord, 2006).

CHAPTER III

METHODOLOGY

This research is a quantitative study based on a descriptive and correlational research design. Cross-sectional survey design is well-known and commonly used in Agricultural Education inquiry. This cross-sectional research showed agriscience education teachers' perceptions and factors associated with their perceptions of school gardens at a specific point in time. This research design helped to describe the population of this study with respect to a dependent variable (perception) and a set of factors related to it (stage in the innovation decision process, relative advantage, compatibility, complexity, trialability, observability, concerns about time, concerns about incentives, financial concerns, planning issues, and outdoor teaching concerns). Perception is a dependent variable of interest in this research. Age, gender, ethnicity, level of education, years of teaching experience, number of teachers in the program, were six independent variables considered in this study.

Sample

Agricultural Science teachers were selected as the population for this study. According to the Alabama Association of Agriculture Educators (AAAE) there were 302 full time Agricultural Science teachers employed in the State of Alabama. A sample of Alabama's full-time employed Agricultural Science teachers was provided by Professors James R. Lindner and Christopher A. Clemons (Auburn University Department of Agricultural Education), and by Mrs. Andy Chamness and Jacob Davis (Future Farmers of America). Cochran's (1977) formula was used to calculate sample size. Cochran's correction was used to adjust the sample size because it included more than five percent of the target population. The final sample size (*n* = 117) was based on the assumption of a 65% response rate. Random sampling was used to select participants for the study (Gall, Gall, & Borg, 2007). Agricultural Science teachers may specialize in agriculture, horticulture, natural resources, animal production, landscape design, or communication. The vision of Alabama Association of Agriculture Educators is “to implement inquiry-based learning in the classroom and career exploration through work study and supervised agricultural experience programs” (NAAE, 2018, p. 1).

Instrumentation

To measure attributes of innovation this study was based on the research instrument developed by Harder and Lindner (2008). This instrument has been used in a variety of contexts to measure the perceptions of adopting innovations in Agriculture Education (Harder, 2007; Li & Lindner, 2007). The questionnaire was pilot tested to determine face validity and to test for reliability. The instrument contains four sections (stage of adoption, characteristics impacting the diffusion, possible barriers to diffusion, and teachers’ personal characteristics). The second section asked participants to rate their agreement with 30 statements related to their perceptions of school gardens, based upon a five-point summative scale (1=*Strongly Disagree* (SD), 2=*Disagree* (D), 3=*Neither Agree nor Disagree* (NA/D), 4=*Agree* (A), 5=*Strongly Agree* (SA)). Rogers’ (2003) characteristics of an innovation were used to categorize the statements into constructs as follows: (a) relative advantage, (b) compatibility, (c) observability, (d) trialability, and (e) complexity. The third section asked participants to rate their agreement with 31 statements related to their perceptions of potential barriers to school gardens, using the same Likert-type scale as in the second section. The statements were clustered into five constructs: (a) concerns about time, (b) concerns about incentives, (c) financial concerns, (d) planning issues, and (e) outdoor teaching concerns.

The total number of items in the questionnaire with personal characteristic questions totals 69 items. The final instrument that was used in this questionnaire without personal characteristic included 63 items, namely, six items measure the degree to which the idea of using a school garden is perceived as better than the idea of not using it (relative advantage); eight items measure the degree to which the use of a school garden is perceived as consistent with existing values, and agricultural teachers' past experiences, and their needs (compatibility); six items measure the degree to which a school garden is perceived as relatively difficult to use and understand (complexity); four items measured the degree to which the results of a school garden are visible to others (visibility); six items measured the degree to which the use of a school garden may be experimented with on a limited basis (trialability); five items measure the degree to which the use of a school garden may be inhibited by teachers' perception of not having enough time to spend in the school garden; seven items measured the degree to which the use of a school garden may be inhibited by lack of time (Rogers, 2003). The reliability of the modified instrument was tested (α =.92) (Cronbach, 1951).

Statements were primarily modified from Harder's (2007) version of the instrument. Correspondingly, six demographic questions will be examined. Cronbach's (1951) alpha coefficients was calculated for each internal scale. The reliability levels for the internal scales ranged from $.81 \geq \alpha \leq .91$. These levels were considered acceptable according to the standard set by Davis (1971) and Lindner, Murphy & Briers

(2011). The reliability of the instrument that was used in this study is summarized in Table 1.

Table 1. Summary of the instruments that were used in this research (Harder & Lindner, 2008; Harder, 2007).

Measures	**Scale**	**Cronbach Alpha as described in Harder & Lindner's (2008)**	**Harder's (2007) number of items by construct (p. 134) (Items adapted for this research)**
Relative Advantage	five-point summative scale	.89	8(6)
Compatibility	five-point summative scale	.87	6(8)
Complexity	five-point summative scale	.86	6(6)
Observability	five-point summative scale	.88	3(4)
Trialability	five-point summative scale	.96	4(6)
Time concerns	5-point Likert type scale	.89	5(5)
Incentive concerns	five-point summative scale	.92	6(7)
Financial concerns	five-point summative scale	.91	5(6)
Planning concerns	five-point summative scale	.92	5(6)
Outdoor teaching concerns*	five-point summative scale	.88	9(7)

Note: Reliability levels ≥ .80 were considered acceptable. * Substituted "Technology Concerns with Outdoor Teaching Concerns" in this study.

Target Population

The target population for this study was Agricultural Science teachers employed in secondary schools in the Alabama Public School System. Full-time agricultural education teachers from Alabama were invited for this voluntarily study.

Data Collection

Prior to data collection, this study was submitted to the Auburn University's Institutional Review Board for approval. A face-to-face survey on a paper platform was designed based on the selected survey model. This researcher distributed the survey in person at the annual Alabama Association of Agriculture Educators Conference (Spring 2018). The Alabama Association of Agricultural Educators (AAAE) is Alabama's local branch of the National Association of Agricultural Educators (NAAE). The association was established to represent the interests of Agricultural Science teachers on several institutions including; (a) the Alabama Association of Career and Technical Education (AACTE) Board of Directors; and (b) the Alabama Future Farmers of America (FFA) Executive Board of Directors.

A random sample approach was utilized. Traditional paper pencil data collection technique was used. The study was limited to Agricultural Science teachers. Data collection started February 28, 2018 and ended March 13, 2018. An email was sent to Mr. Jacob Davis (AACTE) and Mr. Andy Chamness (FFA) seeking permission to attend the annual membership meetings and to recruit Agricultural Science teachers for this study.

Permission to collect data during the meetings was formalized early in February. Six meetings were attended throughout Alabama at Moulton, Albertville, Atmore, Demopolis, and Enterprise. The surveys were completed by teachers attending the 2018 Alabama Association of Agriculture Educators Conference. Participation was voluntary. No participants refused to participate or withdrew. The average time to complete the questionnaire was approximately 10 to 15 minutes.   No on-line survey was conducted to increase response rate. One hundred seventeen (*N*=117) teachers completed this survey on school gardens.

Table 2
Response Population to Questionnaire

Teachers answering the questionnaire	*f*	%
Respondents, complete	76	65
Respondents, incomplete	41	35
Non-respondents	0	0
Total	117	100

Privacy and Confidentiality

Participant privacy and confidentiality were maintained during the research procedure. Because the Alabama Association of Agriculture Educators maintains all client records, no additional agencies were needed to collect names or contact information about Agricultural Science teachers. This was an anonymous survey and it did not contain a place for the teachers to include their name or any other personal identifiers that could be the cause of disclosure. The participants were asked to place their completed questionnaires in a file box in the back of the room or at the display table. All data were entered into an Excel spreadsheet for analyses. All written surveys will be kept until December 1, 2018. Once finished, surveys will be shredded and discarded. Research findings were presented as aggregated data and contain no personal identifiers. Collected data were used for research purposes only. All information was reported as aggregated data for further statistical analysis. Respondents were allowed to withdraw from answering questions at any point during the survey without repercussion.

Data Analysis

Collected data were transferred into Statistical Package for the Social Sciences (SPSS) software version 23. The study population was described using a descriptive statistics: frequencies, means, and standard deviation. Statistical procedures including Pearson product-moment correlation were used to analyze the data (Davis, 1971).

Objective One

Frequencies and percentages were calculated to describe the selected personal characteristics (age, gender, ethnic origin or race, level of education, teaching experience, and program size) of Agriculture Science teachers. The use of frequencies and percentages is appropriate to describe categorical data (Gall, Gall, & Borg, 2007).

Objective Two

Frequencies and percentages were used to describe the participants' stages in the innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation). Innovation-decision stage was treated as a dependent variable in the study.

Objective Three

Agricultural Science teachers' perceptions of school gardens were described by cumulatively summating the scores for single items within each construct for each participant. The constructs were consistent with the characteristics of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability (Rogers, 2003). The means and standard deviations for all the items within each construct were also calculated.

Objective Four

There were five constructs which measured Agricultural Science teachers' perceptions of potential barriers to the adoption of school gardens: (a) concerns about time, (b) concerns about incentives, (c) financial concerns, (d) planning issues, and (e) outdoor teaching concerns. The perceptions of potential barriers were described by cumulatively summating the scores for individual items within each construct for each participant.

Objective Five

Relationships between potential barriers and respondents' personal characteristic were described by calculating Pearson's product-moment correlation coefficient. Pearson's r describes the strength of a relationship between two continuous variables. Davis (1971) interpretation of Pearson's *r* was used to describe the strength of the relationships (Table 3).

Objective Six

Relationships between perceptions of school gardens based on Rogers (2003) characteristics of innovation and potential barriers were described by calculating Pearson's product-moment correlation coefficient. Pearson's *r* describes the strength of a relationship between two continuous variables. Davis's (1971) interpretation of Pearson's *r* was used to describe the strength of the relationships (Table 3).

Table 3
Magnitude of Correlation Coefficient

Coefficient	Description
0.70 or higher	Very Strong Association
0.50 to 0.69	Substantial Association
0.30 to 0.49	Moderate Association
0.10 to 0.29	Low Association
0.01 to 0.09	Negligible Association

Note: Davis (1971) interpretation of Pearson's *r*

Pilot Test

A pilot study was conducted with teachers from the Alabama Association of Agriculture Educators. This group was not part of the sample population. Purposeful sample procedures were performed for the pilot study and 13 Agriculture teachers where invited to participate to the pilot study, but not in the final study. A cover letter and a pilot instrument was distributed to the participants on November 13, 2017 with 13 (100%) respondents. Teachers spend 20 minutes of their time to complete the questionnaire. Teachers accepted to file the questionnaire after being informed of their rights as respondents. An information letter was distributed together with the questionnaire.

CHAPTER IV

ANALYSIS OF DATA

Objective 1: Findings

Population Response

The Agriculture Education teachers of Alabama (*N*=302) were the target population for this study. A sample, of Agricultural Science teachers were selected among the totality of the three hundred and two instructors who belong to the Alabama National Association of Agriculture Educators. A number of one hundred and seventeen (39%) of the target population responded to the questionnaire during the Conferences held in Alabama from February 28 to March 14, 2018. Table 4 shows distribution of participating Agricultural Science teachers employed in schools with or without a school garden. Forty-two respondents signaled no presence of school gardens in their school. Seventy-five respondents signaled a presence of school gardens in their school. Table 5 shows distribution of participating Agricultural Science teachers by number of gardening tasks carried out in the school garden. Forty-four percent of participants carried out less than three tasks in the school garden. Thirty-three percent of participants carried out more three tasks in the school garden.

Table 4
Distribution of Participating Ag-Science Teachers Employed in Schools with or without a School Garden

Teachers signaling presence/absence of school gardens in their school	*f*	%
Respondents signaling a presence of school gardens in their school	75	64.1
Respondents signaling no presence of school gardens in their school	42	35.9
Total	108	100
Note: Nine people did not respond		

Table 5
Distribution of Participating Ag-Science Teachers by Number of Gardening Tasks Carried Out in the School Garden

Tasks carried out in the school gardens	*f**	%
<3	4	44.4
3	2	22.2
4-7	3	33.3
Total	9	100
Note: *f*=type of tasks (e.g. raising plants, operating machinery, etc.)*		

Gender

Table 6 indicates distribution of participating Agricultural Science teachers (*N*=117) by gender. Ninety participants (79.6%) were male and twenty-three participants (20.4%) were female. Four participants choose to not respond to this question.

Table 6
Distribution of Participating Ag-Science Teachers by Gender

Gender	*f*	%
Male	90	79.6
Female	23	20.4
Total	113	100
Note: Four people did not respond		

Age

Table 7 shows dispersal of participating Agricultural Science teachers (*N*=117) by age. The oldest teacher was 66 years old and the youngest teacher was 22 years old. The average of participants was approximately 41 years old. Nine participants chose not to respond to this question. Twenty-one participants (19.4%) were under 30 years old; seventeen (15.7%) were in 30-34 years old range; eighteen (16.6%) were in 35-39 years old range; eighteen (16.6 %) were in 40-44 years old range; twenty-four (22.2%) were in 45-54 years old range; ten (9.2%) were more than 54 years old.

Table 7
Distribution of Participating Ag-Science Teachers by Age

Age Group	*f*	%
< 30	21	19.4
30-34	17	15.7
35-39	18	16.6
40-44	18	16.6
45-54	24	22.2
>54	10	9.2
Total	108	100

Note: Nine people did not respond

Ethnic Origin or Race

Table 8 shows dispersal of participating Agricultural Science teachers (*N*=117) by ethnic origin or race. Ninety-seven (88.2%) participants were of Caucasian ethnicity or origin. Fifteen (13.6%) participants were of non-Caucasian ethnicity or origin. Eight (7.3%) participants were of African-American ethnicity or Black race. Four (3.6%) were Native Americans. One (0.9%) was of Asian or Pacific Islander origin. No participant were of Hispanic or Latino ethnicity or origin. Seven participants chose not to respond.

Table 8
Distribution of Participating Ag-Science Teachers by Ethic Origin or Race

Ethnicity	*f*	%
Caucasian	97	88.2
African-American	8	7.3
Native American	4	3.6
Asian or Pacific Islander	1	0.9
Hispanic or Latino	0	0
Other	0	0
Total	110	100
Note: Seven people did not respond		

Level of Education

Table 9 describes participating Agricultural Science teachers (*N*=117) by the highest level of education. There were four participant who had completed a doctoral degree. Forty-eight participants (43%) had a Masters' Degree; and forty-eight participants (43%) had a Bachelor's Degree. There were thirteen participant (11%) who had completed a Professional degree. Four people did not respond.

Table 9
Distribution of Participating Ag-Science Teachers by Level of Education

Degree	*f*	%
Bachelor	48	42.8
Master	48	42.8
Professional	13	11.5
Doctoral	4	3.5
Total	113	100
Note: Four people did not respond		

Teaching Experience

Table 10 describes participating Agricultural Science teachers (*n*=117) by teaching experience at Middle and Secondary school level. There were twenty-four participants (20.5%) who had less than five years' teaching experience. Twenty-eight (22%) had between 5-9 years of experience. There were sixteen participants (15%) who had between 10-14 years' teaching experiences. Seventeen participants (15.8%) had between 15-19 years of teaching experience. There were twenty-two participants (20.5%) who had more than 19 years' teaching experience. Ten people did not respond.

Table 10
Distribution of Participating Ag-Science Teachers by Teaching Experience

Teaching Experience	*f*	%
<5	24	20.5
5-9	28	26.1
10-14	16	15.0
15-19	17	15.8
>19	22	20.5
Total	107	100

Note: ten people did not respond.

Program Size

Table 11 described participating Agricultural Science teachers (*n*=117) by program size. There were eighty participants (73.4%) who were in a one person program themselves. Twenty-six (23.8%) were in a two to four person program. Three participants (2.75%) were in a more than five person program. Eight people did not respond.

Table 11
Distribution of Participating Ag-Science Teachers by Program Size

Program Size	*f*	%
1	80	73.4
2-4	26	23.8
5+	3	2.7
Total	109	100
Note: eight people did not respond.		

Objective Two: Findings

Stage in the Innovation Decision Process

The second objective was to describe teachers' stages in the innovation-decision process. The majority of Agricultural Science teachers reported they were in the "implementation" (*n*=41) or "confirmation" (*n*=41) stages. The remaining agents were in the "decision" (*n*=4), "persuasion" (*n*=6), "decision" (*n*=4), "knowledge" (*n*=5), or "no knowledge" (*n*=4) stages. The distribution of responding teachers by stage in the innovation-decision process is shown in Table 12. Six stages were used in the study to describe the innovation and decision process: no knowledge, knowledge, persuasion, decision, implementation, and confirmation.

Table 12
Distribution of Participating Ag-Science Teachers by Their Current Stage in the Innovation Decision Process

	Descriptions	*f*	%
No knowledge	I have never heard of school gardens before receiving this questionnaire	4	4
Knowledge	I understand the purpose and features of school gardens, but have not decided whether or not I like or dislike them	5	5
Persuasion	I have decided that I like or dislike school gardens	6	5.9
Decision	I have decided that I will or will not use the school gardens	4	4
Implementation	I see the benefit or having a school garden	41	40.6
Confirmation	I have used the school garden long enough to evaluate whether or not the school garden will be part of my future as a teacher of agriculture	41	40.6
Total		101	100

Objective Three: Findings

Perceived Relative Advantage

The third objective was to describe Agricultural Science teachers' perceptions of school gardens based upon Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, observability, complexity, and trialability). On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*), teachers tended to agree with the existence of relative advantage of school gardens. The perceived relative advantage of school gardens was measured by participants' responses to six statements. Frequencies and percentages were used to describe the results. As shown in Table 13, approximately 93% of participants agreed or strongly agreed that the school garden can be used to improve their teaching.

Over 70% of participants agreed or strongly agreed that using the school garden could give access to more teaching resources. About 86% of participants agreed or strongly agreed that the school garden can help to teach Agricultural Education-related subjects and about 32% of participants chose a neutral attitude toward this statement. About 64% of participants agreed or strongly agreed that using the school garden could create funding opportunity for the school. Overall, the mean and standard deviation for perceived relative advantage of the school garden were M=4.02 and SD=0.8. Alabama Agricultural Science teachers tended to agree with the existence of relative advantage of the school garden. Perceived relative advantage is positively correlated with the rate of adoption of an innovation according to Rogers (2003).

Perceived Relative Advantages of School Gardens

Table 13
Distribution of Participating Ag-Science Teachers by Their Perception about Relative Advantage of Using School Gardens for Agricultural Education

		SD		D		NA/D		A		SA	
Relative Advantage Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
School gardens can be used to improve my teaching	117	0	0	0	0	8	6.8	57	48.7	52	44.4
School gardens can help me teaching better technical agricultural contents	115	0	0	1	0.9	14	12.2	62	53.9	38	32.5
Overall school gardens can be used to improve my teaching	115	0	0	2	1.7	15	13	55	47.8	43	37.4
Incorporating school gardens into the curriculum increases my teaching effectiveness	115	0	0	1	0.9	0	0	47	40.9	44	37.6
School gardens can create more funding opportunities for school agricultural programs	115	4	3.5	5	4.3	32	27.8	41	35.7	33	28.7
School gardens enable me to accomplish tasks more quickly	116	1	0.9	22	19	47	40.5	24	20.7	22	19

Note: Overall *M*=4.02; *SD*=0.8, scale: 1=*Strongly Disagree,* 2=*Disagree*, 3=*Neither Agree nor Disagree,* 4=*Agree,* 5=*Strongly Agree*. *N*≠ 117 due to item non-response.

Perceived Compatibility

The perceived compatibility of school gardens was measured by participants' responses to eight statements. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*), teachers tended to agree with the existence of compatibility of school gardens. Frequencies and percentages are used to describe the results. As Table 14 shows, 75 (64%) of participants agreed that school gardens are compatible with the mission of the school where they teach. Approximately 88% of participants agreed that using the school garden were compatible with their teaching style.

Seventy-two percent of participants agreed that the school gardens can satisfy the learning needs of their students. About 26% of participants had a neutral attitude toward the item. Overall, the mean and standard deviation for perceived compatibility of the school garden were M=4.53 and SD=0.77. Alabama Agricultural Science teachers tended to agree with the existence of compatibility of the school garden. Compatibility is positively correlated with the rate of adoption of an innovation according to Rogers (2003).

Perceived Compatibility of School Gardens

Table 14
Distribution of Participating Ag-Science Teachers by Their Perception about Compatibility of Using School Gardens for Agricultural Education

		SD		D		NA/D		A		SA	
Compatibility Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
School gardens can be used to provide scientific-based information to the students	116	0	0	2	1.7	10	8.6	65	56	39	33.3
School gardens can be used to cultivate sustainable relationship in the classroom	116	0	0	1	0.9	15	12.9	66	56.9	34	29.3
Using a school garden for instruction is consistent with my teaching methods	116	0	0	3	2.6	20	17.2	56	48.3	37	31.9
My teaching goals can be enhanced through the use of a school garden	116	0	0	2	1.7	22	19.0	53	45.7	39	33.6
School gardens align with my teaching style	115	0	0	7	6.1	17	14.8	52	45.2	39	33.9
School gardens help me satisfy the learning needs of my students	115	0	0	3	2.6	30	26.1	45	39.1	37	32.2
School gardens can support the mission of my school	116	0	0	3	2.6	38	32.8	48	41.4	27	23.3
Using school gardens is consistent with my career goals	115	0	0	7	6.1	35	30.4	43	37.4	30	26.1

Note: Overall M=4.53; SD=0.77, scale: 1=*Strongly Disagree,* 2=*Disagree*, 3=*Neither Agree nor Disagree,* 4=*Agree,* 5=*Strongly Agree.* $N \neq 117$ due to item non-response.

Perceived Complexity

The perceived complexity of the school garden was measured by participants' responses to six statements. Frequencies and percentages are used to describe the results. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*), teachers tended to agree with the existence of complexity of school gardens. As Table 15 shows, about 74% of participants agreed or strongly agreed that the school garden is a user friendly teaching tool. About 62% of participants agreed or strongly agreed that school gardens are easy to use.

About 82% of participants agreed or strongly agreed that using a school garden for teaching is thinkable. Approximately 87% of participants agreed or strongly agreed that they would be comfortable using the school garden to teach Agricultural Science education. Overall, the mean and standard deviation for perceived complexity of the school garden were *M*=3.85 and *SD*=0.86. Agricultural Science teachers tended to agree with the existence of complexity of the school garden. Complexity is negatively correlated with the rate of adoption of an innovation according to Rogers (2003).

Perceived Complexity of School Gardens

Table 15
Distribution of Participating Ag-Science Teachers by Their Perception about Complexity of Using School Gardens for Agricultural Education

		SD		D		NA/D		A		SA	
Complexity Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
I would be comfortable using a school garden to teach	115	1	0.9	3	2.6	11	9.6	64	55.7	36	31.3
Using a school garden to enhance instruction is thinkable	113	1	0.9	4	3.5	14	12.4	70	61.9	23	20.4
It would be easy for me to incorporate a school garden in my teaching	114	1	0.9	6	5.3	22	19.3	60	52.6	25	21.9
School gardens are user-friendly teaching tools	115	1	0.9	7	6	22	19	60	52.2	25	21.7
Using a school gardens as a teaching tool is simple	115	2	1.8	17	14.8	25	21.7	48	41.7	23	20
Using the school garden for instruction is easy	110	2	1.8	11	9.4	28	25.5	49	44.5	20	18.2

Note: Overall *M*=3.85; *SD*=0.86, scale: 1=*Strongly Disagree,* 2=*Disagree*, 3=*Neither Agree nor Disagree,* 4=*Agree,* 5=*Strongly Agree*. *N*≠ 117 due to item non-response.

Perceived Trialability

The perceived trialability of the school garden was measured by participants' response to six items. Frequencies and percentages are used to describe the results. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*), teachers tended to agree with the existence of triability of the school garden. As Table 16 shows, about 86% of participants agreed or strongly agreed that it was possible for them to define the terms of their use of the school garden. Eighty percent of participants agreed or strongly agreed that it was possible for them currently to use selected teaching materials on the school garden.

About 72% of participants agreed or strongly agreed that it was possible for students to use the school garden tools (e.g., raising plants, digging beds, tilling soil, etc.). Sixty-seven percent of participants agreed or strongly agreed that it was possible for them to deliver selected portions of a course (a single lesson or unit) by using the school garden prior to developing a complete course. Overall, the mean and standard deviation for perceived trialability of the school garden were M=3.9 and SD=0.79. Agricultural Science teachers tended to agree with the existence of trialability of the school garden. Trialability is positively correlated with the rate of adoption of an innovation according to Rogers (2003).

Perceived Trialability of School Gardens

Table 16
Distribution of Participating Ag-Science Teachers by Their Perception about Trialability of Using School Gardens for Agricultural Education

		SD		D		NA/D		A		SA	
Trialability Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
I can select the features of the school garden that I want to use	115	1	0.9	0	0	15	13	65	56.5	34	29.6
I can define the term of my use of school gardens	113	1	0.9	2	1.8	20	17.7	61	54	29	25.7
It is possible for me to currently use my own teaching materials in the garden without committing to develop new material for it	113	1	0.9	7	6.3	22	19.5	64	56.9	19	16.8
It is possible for my students to perform single gardening tasks without committing to gardening	112	1	0.9	7	6.3	23	20.5	60	53.6	21	18.8
It is possible to me to deliver selected portions of a course (a single lesson) using the school garden without committing to develop new material for it	113	0	0	3	2.7	33	29.2	53	46.9	24	21.2
I can test key features of school garden with no obligation for continued or future use	112	2	1.7	4	3.6	32	28.6	50	44.6	24	21.4

Note: Overall *M*=3.9; *SD*=0.79, scale: 1=*Strongly Disagree,* 2=*Disagree*, 3=*Neither Agree nor Disagree,* 4=*Agree,* 5=*Strongly Agree*. *N*≠ 117 due to item non-response.

Perceived Observability of School Gardens

The perceived observability of the school garden was measured by participants' responses to four statements. Frequencies and percentages are used to describe the results. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*), teachers tended to agree with the existence of observability of school gardens. As Table 17 shows, about 77% of participants agreed or strongly agreed that they knew of some faculty members who are using the school garden. About 90% of participants agreed or strongly agreed that the school garden was a highly visible school feature.

About 68% of participants agreed or strongly agreed that the school garden was well publicized. About 48% of participants agreed or strongly agreed that they were aware of the limitations of the school garden for students. Overall, the mean and standard deviation for perceived observability of the school garden were M=3.85 and SD=0.88. Alabama Agricultural Science teachers tended to agree with the existence of observability of the school garden. Observability is positively correlated with the rate of adoption of an innovation according to Rogers (2003).

Perceived Observability of School Gardens

Table 17
Distribution of Participating Ag-Science Teachers by Their Perception about Observability of Using School Gardens for Agricultural Education

		SD		D		NA/D		A		SA	
Observability Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
School gardens are highly visible educational tools	113	0	1	1	0.9	11	9.7	68	60.2	33	29.2
I know teachers using school gardens for instructional purposes	113	4	3.5	5	4.4	17	15	55	48.7	32	28.3
The use of school gardens to enhance student learning is well known	113	2	1.7	9	8	25	22.1	51	45.1	26	23
The use of school gardens is well publicized	113	4	3.5	15	13.3	39	34.5	38	33.6	17	15

Note: Overall *M*=3.85; *SD*=0.88, scale: 1=*Strongly Disagree,* 2=*Disagree*, 3=*Neither Agree nor Disagree,* 4=*Agree,* 5=*Strongly Agree*. *N*≠ 117 due to item non-response.

Objective Four: Findings

The fourth objective was to describe faculty according to their perceptions about barriers to diffusion of the school garden (concerns about time, concerns about incentives, financial concerns, planning issues, and outdoor teaching concerns).

Concerns about Time

Participants' perceptions about time concerns as a barrier to diffusion of the school garden were measured by five statements. Table 18 shows the results, which are described by frequencies and percentages. As to lack of time to access the school garden, about 56% of participants thought it was a very strong or strong barrier. As to lack of time available to respond to students' request for information, 40% of participants thought it is a very strong or strong barrier and about 25% of participants thought it was a moderate barrier. As to lack of time to meet the need of the traditional Agricultural Science education classroom, almost half of participants (51%) thought it was a very strong or strong barrier. As to lack of time to learn how to incorporate the school garden into the curriculum, 22% of participants thought it was not or a weak barrier. Overall, the mean and standard deviation for concerns about time as a perceived barrier to diffusion of the school garden were M=3.25 and SD=0.99. Alabama Agricultural Science teachers tended to perceive concerns about time as a moderate barrier to diffusion of the school garden.

Concerns about Time as Perceived Barrier to Diffusion of School Gardens

Table 18
Distribution of Participating Ag-Science Teachers by Their Perception about Concerns about Time as a Barrier to Diffusion of School Gardens for Agricultural Education

		No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strongly Barrier	
Time Concern Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of time to access the school garden is a barrier	112	7	6.3	16	14.3	27	24.1	49	43.8	13	11.6
Lack of time to meet the need of traditional classroom is a barrier	112	6	5.4	22	19.6	27	24.1	49	43.8	8	7.1
Lack of time to learn incorporate the school garden into job responsibility is a barrier	112	6	5.4	19	17	31	27.7	48	42.9	8	7.1
Lack of time to search information on school garden is a barrier	112	6	5.4	21	18.9	34	30.6	42	37.8	8	7.2
Lack of time available to respond to students' request for information is a barrier	112	6	5.4	22	19.6	40	35.7	40	36.7	4	3.6

Note: Overall *M*=3.25, *SD*=0.99, scale: 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strongly Barrier. *N*≠ 117 due to item non-response.

Concerns about Incentives

Participants' perceptions about concerns about incentives as a barrier to diffusion of school gardens were measured by participants' responses to seven items. Table 19 shows the results, which are described by frequencies and percentages. As to monetary compensation for adopting the school garden, about 60% of participants thought it was a very strong or strong barrier. As to recognition for using the school garden, about 40% of participants thought it was a very strong or strong barrier and about 25% of participants thought it was no or weak barrier. As to correlation between adoption of school garden and teaching evaluation, almost half of participants (44%) thought it is a very strong or strong barrier and about 22% of participants thought it was no or weak barrier. As to correlation between students' uses of the school garden and student performance, 33% of participants thought it was a very strong or strong barrier and about 40% of participants thought it was a moderate barrier. Overall, the mean and standard deviation for concerns about incentives as a perceived barrier to diffusion of the school garden were M=3.15 and SD=0.98. Alabama Agricultural Science teachers tended to perceive concerns about incentives as a strong barrier to diffusion of the school garden.

Concerns about Incentives as Perceived Barrier to Diffusion of School Gardens

Table 19
Distribution of Participating Ag-Science Teachers by Their Perception about Concerns about Incentives as a Barrier to Diffusion of School Gardens for Agricultural Education

		No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strongly Barrier	
Incentive Concern Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of monetary compensation for developing school garden resources is a barrier	112	6	5.4	12	10.7	27	24.1	44	39.3	23	20.5
Lack for monetary incentive for using the school garden for instruction is a barrier	112	5	4.5	16	14.3	35	31.3	46	41.1	10	8.9
Lack of school recognition for using school gardens is a barrier	112	7	6.3	20	17.9	40	35.7	35	31.3	10	8.9
Lack of correlation between teachers' adoption of school gardens and teacher performance evaluation is a barrier	112	4	3.6	21	18.8	43	38.4	36	32.1	8	7.1
Lack of correlation between students' uses of school gardens and student performance is a barrier	112	6	5.4	23	20.5	46	41.4	33	29.5	4	3.6
Lack of support from local administrators is a barrier	112	11	9.8	32	28.6	35	31.3	25	22.3	9	8
Lack of support from parents is a barrier	112	9	8	30	26.8	42	37.5	24	21.4	7	6.3

Note: Overall *M*=3.15, *SD*=0.98, scale: 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strongly Barrier. *N*≠ 117 due to item non-response.

Financial Concerns

Participants' perceptions about financial concerns as a barrier to diffusion of the school garden were measured by participants' responses to six statements. Table 20 shows the results, which are described by frequencies and percentages. As to lack of money to implement school garden programs, about 41% of participants thought it was a very strong or strong barrier and about 29.5% of participants thought it was a moderate barrier. As to financial concerns for increased costs of maintenance, about 48% of participants thought it was a strong or very strong barrier and 6% of participants thought it was a no barrier. As to financial concerns for sharing revenue with multiple departments or business units, about 25% of participants thought it was a weak barrier. As to lack of money to promote the school garden locally, about 50% of participants thought it was a strong or very strong barrier and about a 6% of participants thought it was no barrier. Overall, the mean and standard deviation for financial concerns as a perceived barrier to diffusion of school gardens were *M*=3.18 and *SD*=0.99. Alabama Agricultural Science teachers tended to perceive financial concerns as moderate barrier to diffusion of the school garden.

Financial Concerns as Perceived Barrier to Diffusion of School Gardens

Table 20
Distribution of Participating Ag-Science Teachers by Their Perception about Financial Concerns as a Barrier to Diffusion of School Gardens for Agricultural Education in Alabama

		No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strongly Barrier	
Financial Concern Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Concerns about hidden costs (supplies, training, upgrades) is a barrier	111	5	4.5	22	19.8	28	25.2	39	35	17	15.3
Cost of purchasing of the necessary agricultural real estate for a school garden is a barrier	112	8	7.1	21	18.8	28	25	37	33	18	16.1
Lack of financial resources to promote the school garden locally is a barrier	111	7	6.3	20	18	29	26	38	34.2	17	15.3
The inadequate resources of my school are a barrier for the maintenance of a school garden	112	7	6.3	23	20.5	29	25.9	41	36.6	12	10.7
The inadequate resources of my school are a barrier for the establishment of a school garden	112	7	6.3	26	23.2	33	29.5	36	32.1	10	8.9
Concerns about sharing revenue from school gardens with multiple stakeholders is a barrier	112	8	7.2	28	25	46	41	22	19.6	8	7.1

Note: Overall *M*=3.18, *SD*=0.99, scale: 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strongly Barrier. *N*≠ 117 due to item non-response.

Planning Concerns

Participants' perceptions about planning issues as a barrier to diffusion of the school garden were measured by participants' responses to six statements. Table 21 shows the results, which are described by frequencies and percentages. As to lack of strategic planning for the school garden, about 35% of participants thought it was a very strong or strong barrier. As to lack of matching between school garden and school mission, 26% of participants thought it was a very strong or strong barrier. As to lack of shared vision for the role of the school garden, about 35% of participants thought it was a very strong or strong barrier. As to lack of identified need (perceived or real) for the school garden, about 53% of participants thought it was a weak or moderate barrier. Overall, the mean and standard deviation for planning issues as a perceived barrier to diffusion of the school garden were M=3.02 and SD=0.98. Alabama Agricultural Science teachers tended to perceive planning issues as a moderate barrier to diffusion of the school garden.

Planning Concerns as Perceived Barrier to Diffusion of School Gardens

Table 21
Distribution of Participating Ag-Science Teachers by Their Perception about Planning Concerns as a Barrier to Diffusion of School Gardens for Agricultural Education in Alabama

		No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strongly Barrier	
Planning Concern Items	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of identified needs (perceived or real) for a school garden is a barrier	112	7	6.3	24	21.4	36	32.1	37	33	8	7.1
Lack of planned opportunity for teachers to learn about school gardens is a barrier	112	7	6.3	23	20.5	40	35.7	34	30.4	8	7.1
Lack of shared vision for the role of school gardens with traditional agricultural education structure is a barrier	112	8	7.1	24	21.4	40	35.7	34	30.4	6	5.4
Lack of strategic planning for school gardens is a barrier	112	7	6.3	23	20.5	44	39.3	31	27.7	7	6.3
Lack of coordination between school garden stakeholders is a barrier	112	8	7.1	21	18.8	47	42	29	25.9	7	6.3
Lack of matching between school garden and school mission is a barrier	112	8	7.1	27	24.1	46	41	24	21.4	6	5.4

Note: Overall *M*=3.02, *SD*=0.98, scale: 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strongly Barrier. *N*≠ 117 due to item non-response.

Outdoor Teaching Concerns

Participants' perceptions about conflict with outdoor teaching concerns as a barrier to diffusion of the school garden were measured by participants' responses to six statements. Table 22 shows the results, which are described by frequencies and percentages. As to lack of teacher access to agricultural real property, about 48% of participants thought it was a strong or very strong barrier. As to concerns about loss of important horticultural information, about 35% of participants thought it was no or a weak barrier. As to lack of reward for student management, about 33% of participants thought it was no or a weak barrier. As to concerns for legal issues, about 32% of participants thought it was no or a weak barrier. As to concerns that the school garden will be used for replace traditional teachers jobs, about 48% of participants thought it was no or a weak barrier. Overall, the mean and standard deviation for conflict with outdoor teaching concerns as a perceived barrier to diffusion of the school garden were *M*=2.94 and *SD*=0.98. Alabama Agricultural Science teachers tended to perceive conflict with traditional education as a moderate barrier to diffusion of the school garden.

Outdoor Teaching Concerns as Perceived Barrier to Diffusion of School Gardens

Table 22
Distribution of Participating Ag-Science Teachers by Their Perception about Outdoor Teaching Concerns as a Barrier to Diffusion of School Gardens for Agricultural Education in Alabama

		No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strongly Barrier	
Statement	*N*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of teacher access to agricultural real property is a barrier	111	10	9	29	26	21	18.9	36	32.4	15	13.5
Lack of reward for student management in the garden is a barrier	112	6	5.4	32	28.6	34	30.4	31	27.7	9	8
Concern for legal issues (student liability) is a barrier	112	7	6.3	29	25.9	38	33.9	29	25.9	9	8
Concern about loss of control of important horticultural information is a barrier	112	8	7.1	32	28.6	40	35.7	23	20.5	9	8
Concern that the school garden will be used to replace traditional teacher positions is a barrier	112	19	17	35	31.3	31	27.7	22	19.9	5	4.5
Lack of training programs to learn how to operate a school garden is a barrier	112	7	6.3	29	25.9	40	35.7	27	24.1	9	8

Note: Overall *M*=2.94, *SD*=0.98, scale: 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strongly Barrier. *N*≠ 117 due to item non-response.

Summary

Table 23 summarizes the means and standard deviations of the five perceived barriers to school garden: time concern, concerns about incentives, financial concern, planning concern, and outdoor teaching concerns. Barriers that have higher mean values were: concerns about time (*M*=3.26, *SD*=0.89), financial concerns (*M*=3.22, *SD*=0.95), and concerns about incentives (*M*=3.17, *SD*=0.83). Barriers that have lower mean values include: concerns about planning (*M*=3.05, *SD*=0.90), and outdoor teaching concerns (*M*=2.97, *SD*=0.91). Alabama Agricultural Science teachers perceived all of the five constructs as moderate barriers to diffusion of school garden.

Table 23
Means and Standard Deviation of the Five Perceived Barriers

Perceived Barriers to School Gardens	*N*	*M*	*SD*
Concerns about Times	112	3.26	0.89
Concerns about Incentives	112	3.17	0.83
Financial Concerns	112	3.22	0.95
Planning Concerns	112	3.05	0.90
Outdoor Teaching Concerns	112	2.97	0.91

Note: Overall *M*=3.13, *SD*=0.89. N≠117 due to item non-response.

Table 24 summarizes the means and standard deviations of the five perceived characteristics of school garden. The characteristics that have higher mean values were: compatibility (*M*=4.03, *SD*=0.66), relative advantage (*M*=4.02, *SD*=0.63), and trialability (*M*=3.91, *SD*=0.63). The characteristics that have lower mean values include: complexity (*M*=3.85, *SD*=0.70), and observability (*M*=3.83, *SD*=0.68). Alabama Agricultural Science teachers tended to agree with the existence of all five characteristics including relative advantage, compatibility, complexity, trialability and observability.

Table 24
Means and Standard Deviation of the Five Perceived Characteristics

Perceived Characteristics of School Gardens	*N*	*M*	*SD*
Relative Advantage	117	4.02	0.63
Compatibility	117	4.03	0.66
Complexity	115	3.85	0.70
Triability	115	3.91	0.63
Observability	113	3.83	0.68

Note: Overall *M* =3.92, *SD*=0.66. N≠117 due to item non-response. Respondents tended to agree on all.

Objective Five: Findings

The fifth objective was to describe the relationships between perceptions of school gardens based on Rogers (2003) characteristics of an innovation and selected participants' personal characteristics including (a) age, (b) gender, (c) ethnic origin or race, (d) level of education, (f) teaching experience, and (g) program size. Participants' perceptions of school gardens were described according to (a) relative advantage, (b) compatibility, (c) observability, (d) complexity, and (e) trialability.

Age

The correlations between respondents' perceptions of school gardens based on Rogers (2003) characteristics of innovation and respondents' age are presented in Table 25. A significant, low positive relationship existed between age and perceptions of compatibility, r (107) = -.234, $p < .05$. No significant relationship existed between respondents' perceptions of (a) relative advantage, (b) complexity, (c) trialability and (d) observability and respondents' age. These findings can be interpreted as follow: a) the older the participants the more likely they will find the characteristics of school garden compatible to their uses. Conversely, the younger are the participants the more unlikely will be they will find the school garden compatible to their uses.

Table 25
Correlations between Perception of School Gardens and Age

	Age		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	-.180	.064	Negligible
Compatibility	-.234	.015*	Low
Complexity	-.093	.314	Negligible
Trialability	-.086	.376	Negligible
Observability	-.094	.335	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Ethnic Origin or Race

The correlations between respondents' perceptions of school gardens based on Rogers (2003) characteristics of innovation and respondents' ethnic origin or race are presented in Table 26. No significant relationships existed between perceptions of school gardens based on Rogers (2003) characteristics of innovation and respondents' ethnic origin or race.

Table 26
Correlations between Perception of School Garden and Ethnic Origin or Race

	Ethic Origin or Race		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	.013	.893	Negligible
Compatibility	-.013	.891	Negligible
Complexity	.030	.754	Negligible
Trialability	.039	.686	Negligible
Observability	-.032	.741	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Gender

The correlations between respondents' perceptions of school gardens based on Rogers (2003) characteristics of innovation and respondents' female gender are presented in Table 27. A significant, low relationship existed between participants' gender and participants' perceptions of relative advantage of school gardens, r (117) = .266, $p < .05$. A significant, moderate relationship existed between participants' gender and perceptions of compatibility of school gardens, r (115) = .381, $p < .05$.

A significant, low relationship existed between participants' gender and participants' perceptions of observability of school gardens, r (113) =.257, $p < .05$. This shows that, compared to male participants, female participants showed a more positive attitude toward (a) relative advantage (b) compatibility, and (c) observability of school garden. The means of the two groups are M=4.25 for females and M=3.85 for males.

Table 27

Correlations between Perceptions of School Gardens and Gender

	Gender		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	.266	.004*	Low
Compatibility	.381	.000*	Moderate
Complexity	.168	.076	Negligible
Trialability	.134	.160	Negligible
Observability	.257	.006*	Low

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$. Female (M=4.25, SD=.84); Male (M=3.85, SD=.79).

Education

No significant relationship existed between respondents' perceptions of school gardens based on Rogers (2003) characteristics of an innovation and respondents' level of education. Results are presented in Table 28.

Table 28
Correlations between Perceptions of Potential Barriers to School Gardens and Education

	Education		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	.069	.446	Negligible
Compatibility	.094	.316	Negligible
Complexity	.019	.844	Negligible
Trialability	.060	.528	Negligible
Observability	.108	.254	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Experience

The correlations between respondents' perceptions of school gardens based on Rogers (2003) characteristics of an innovation and respondents' teaching experience are presented in Table 29. No significant relationship existed between respondents' perceptions of school gardens based on Rogers (2003) characteristics of an innovation and respondents' years of teaching experience.

Table 29
Correlations between Perceptions of Potential Barriers to School Gardens and Teaching Experience

	Years of Teaching Experience		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	-.179	.065	Negligible
Compatibility	-.187	.053	Negligible
Complexity	-.071	.469	Negligible
Trialability	-.082	.402	Negligible
Observability	-.090	.361	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Program

The correlations between respondents' perceptions of school gardens based on Rogers (2003) characteristics of an innovation and respondents 'program size are presented in Table 30. No significant relationship existed between respondents' perceptions of school gardens based on Rogers (2003) characteristics of an innovation and respondents' program size.

Table 30
Correlations between Perceptions of Potential Barriers to School Gardens and Program Size

	Years of Teaching Experience		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	.131	.176	Negligible
Compatibility	.075	.439	Negligible
Complexity	-.076	.433	Negligible
Trialability	-.083	.393	Negligible
Observability	-.160	.098	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Summary

The significant correlation between respondents' perception of school gardens based on Rogers (2003) characteristics of innovation and respondents' individual characteristics are summarized in Table 31 and Table 32.

- A significant, low negative relationship existed between age and perceptions of compatibility, r (107) = -.234, $p < .05$.
- A significant, low relationship existed between gender and perceptions of relative advantage, r (107) = .266, $p < .05$.
- A significant, moderate relationship existed between gender and perceptions of compatibility, r (107) = .381, $p < .05$.
- A significant, low relationship existed between gender and perceptions of relative advantage, r (107) = .257, $p < .05$.

Table 31

Summary of Significant Correlations between Characteristics of Innovation and Participants' Individual Characteristics I.

	Age		
Characteristics of Innovation	*r*	*p*	Magnitude
Compatibility	.234	.015*	Low

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Table 32

Summary of Significant Correlations between Characteristics of Innovation and Participants' Individual Characteristics II.

	Gender		
Characteristics of Innovation	*r*	*p*	Magnitude
Relative Advantage	.266	.004*	Low
Compatibility	.381	.000*	Moderate
Observability	.257	.006*	Low

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong (Davis, 1971). $p^* < .05$.

Objective Six: Findings

The sixth objective was to describe the relationships between perceptions of a school garden and potential barriers (concerns about time, concerns about incentives, financial concerns, planning issues, and outdoor teaching concerns) to the diffusion of a school garden. Teachers' perceptions of school garden were described according to (a) relative advantage, (b) compatibility, (c) observability, (d) complexity, and (e) trialability.

Relative Advantage

Relative advantage is the "the degree to which the innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 15). The correlations between respondents' perceptions of relative advantage and the potential barriers to the diffusion of a school garden are presented in Table 33 A significant, low negative relationship existed between perceptions of concerns about time and perceptions of relative advantage, *r* (112) = -.20, $p<.05$.

Table 33
Correlations between Perceptions of Potential Barriers to School Gardens and Relative Advantage

	Relative Advantage		
Potential Barrier	*r*	*p*	Magnitude
Concerns about time	-.20	.04*	Low
Concerns about incentives	-.14	.14	Negligible
Financial concerns	-.16	.08	Negligible
Planning issues	-.14	.13	Negligible
Outdoor teaching concerns	-.14	.13	Negligible

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong. *$p < .05$.

Compatibility

Compatibility is “the degree to which the innovation is perceived as being socially acceptable” (Rogers, 2003, p. 15). The correlations between respondents’ perceptions of compatibility and the potential barriers to the diffusion of a school garden are presented in Table 34. A significant, low negative relationship existed between perceptions of time concerns and perceptions of compatibility, r (112) = -.21, $p < .05$.

Table 34
Correlations between Perceptions of Potential Barriers to a School Garden and Compatibility

	Compatibility		
Potential Barrier	*r*	*p*	Magnitude
Concerns about time	-.21	.02*	Low
Concerns about incentives	-.10	.27	Negligible
Financial concerns	-.16	.09	Negligible
Planning issues	-.16	.09	Negligible
Outdoor teaching concerns	-.14	.13	Negligible

Note. Magnitude: .01 ≥ r ≥ .09 = Negligible, .10 ≥ r ≥ .29 = Low, .30 ≥ r ≥ .49 = Moderate, .50 ≥ r ≥ .69 = Substantial, r ≥ .70 = Very Strong. *$p < .05$.

Complexity

Complexity is "the degree to which the innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 16). The correlations between respondents' perceptions of complexity and the potential barriers to the diffusion of school gardens are presented in Table 35. A significant, low negative relationship existed between perceptions of time concerns and perceptions of complexity, r (112) = -.26, $p < .05$.

Table 35
Correlations between Perceptions of Potential Barriers to a School Garden and Complexity

	Complexity		
Potential Barrier	*r*	*p*	Magnitude
Concerns about time	-.26	.00*	Low
Concerns about incentives	-.16	.08	Negligible
Financial concerns	-.15	.11	Negligible
Planning issues	-.15	.11	Negligible
Outdoor teaching concerns	-.17	.07	Negligible

Note. Magnitude: .01 ≥ r ≥ .09 = Negligible, .10 ≥ r ≥ .29 = Low, .30 ≥ r ≥ .49 = Moderate, .50 ≥ r ≥ .69 = Substantial, r ≥ .70 = Very Strong. *$p < .05$.

Trialability

Trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16). The correlations between respondents' perceptions of trialability and the potential barriers to the diffusion of school gardens are presented in Table 36. A significant, moderate negative relationship existed between perceptions of time concerns and perceptions of trialability, r (111) = -.35, $p < .05$. A significant, low negative relationship existed between perceptions of concerns about incentives and perceptions of trialability, r (111) = -.28, $p < .05$. A significant, moderate negative relationship existed between perceptions of financial concerns and perceptions of trialability, r (111) = -.31, $p < .05$. A significant, low negative relationship existed between perceptions of planning issues and perceptions of trialability, r (111) = -.28, $p < .05$. A significant, low negative relationship existed between perceptions of teaching issues and perceptions of trialability, r (111) = -.22, $p < .05$.

Table 36
Correlations between Perceptions of Potential Barriers to a School Gardens and Trialability

	Trialability		
Potential Barrier	*r*	*p*	Magnitude
Concerns about time	-.35	.00*	Moderate
Concerns about incentives	-.28	.00*	Low
Financial concerns	-.31	.00*	Moderate
Planning issues	-.28	.00*	Low
Outdoor teaching concerns	-.22	.02*	Low

Note. Magnitude: $.01 \geq r \geq .09$ = Negligible, $.10 \geq r \geq .29$ = Low, $.30 \geq r \geq .49$ = Moderate, $.50 \geq r \geq .69$ = Substantial, $r \geq .70$ = Very Strong. *$p < .05$.

Observability

Observability is "the degree to which the results of the innovation are visible to others" (Rogers, 2003, p. 16). The correlations between respondents' perceptions of observability and the potential barriers to the diffusion of a school garden are presented in Table 37. A significant, low negative relationship existed between perceptions of financial concerns and perceptions of observability, *r* (112) = -.20, $p < .05$. A significant, low negative relationship existed between perceptions of planning concerns and perceptions of observability, *r* (112) = -.19, $p < .05$. A significant, moderate negative relationship existed between perceptions of teaching concerns and perceptions of observability, *r* (112) = -.23, $p < .05$.

Table 37
Correlations between Perceptions of Potential Barriers to a School Garden and Observability

	Observability		
Potential Barrier	*r*	*p*	Magnitude
Concerns about time	-.18	.05	Negligible
Concerns about incentives	-.17	.07	Negligible
Financial concerns	-.20	.04*	Low
Planning issues	-.19	.04*	Low
Outdoor teaching concerns	-.23	.01*	Low

Note. Magnitude: .01 ≥ r ≥ .09 = Negligible, .10 ≥ r ≥ .29 = Low, .30 ≥ r ≥ .49 = Moderate, .50 ≥ r ≥ .69 = Substantial, r ≥ .70 = Very Strong. *$p < .05$.

Summary

Two significant, moderate negative correlations existed between barriers and school garden perception. One correlation existed between relative advantage and barriers (concerns about time). One correlation existed between compatibility and barriers (concerns about time). One correlation was found between complexity and barriers (concerns about time). Five correlations existed between trailability and barriers including, time, incentives, finance, planning and teaching. Three existed between observability and barriers including financial concerns, planning concerns, and teaching concerns.

The highest correlations existed between trialability and concerns about time $r(111) = -.35$, $p < .05$ and between trialability and financial concerns $r(111) = -.31$, $p < .05$. Nine low negative relationships existed between barriers and school garden perception. All correlations were negative correlations. Correlations were low or moderate correlations. Trialability had the largest number of moderate correlations. Two correlations were moderate and three correlation were low. Complexity and compatibility had the lowest number of correlations compared to the other characteristics. Overall, fourteen correlations existed between characteristics and barriers to school garden.

CHAPTER V

Conclusion, Implication, and Recommendation

The overall purpose of this study was to understand the influence of selected factors on the adoption of school gardens by Agricultural Science teachers of Alabama. Specifically, the study looked at how the relationships between characteristics of teachers, characteristics of the innovation, and barriers to adoption affecting the diffusion of school gardens. A random sample of (*n*=117) Agricultural Science teachers was selected for participation in the study. By learning more about Agricultural Science teachers' perception of school gardens stakeholders will be equipped to make informed programming decisions about the long-term sustainability of the school garden. Agricultural Science Education is increasingly open to the adoption of new learning technologies including the school garden.

Objective 1: Conclusion

The first objective was to describe Agricultural Science teachers using selected personal characteristics. Males outnumbered females among surveyed participants. Caucasians outnumbered largely the other ethnic groups mentioned in the survey. Males (79.6%) outnumbered females (20.4%) among surveyed participants. Participants were approximately forty years old on average. This implies that there was a lack of diversity among Agricultural Science teachers at the time of the survey (2018). More attention needs to be paid to diversity in Alabama's Agricultural Education. This researcher's belief is that young female teachers should be further encouraged in entering the Agricultural Science teaching profession in Alabama. The majority of survey participants teach in a one person program themselves. The level of education is high among Agricultural Science teachers of Alabama. The majority of survey participants held Master's degrees, but only few of them held PhDs. Presence of school gardens on high school campuses in Alabama is sizable. Three-fifths of survey respondents indicated that their school had a school garden. This implies that there is an advanced process of school garden programming in the State, but this process has not yet reached its full potential as an educational tool. This researcher suggests that the existing school gardens, when successful, should be used as a foundational resource for programming new school garden-based agricultural education initiatives.

Objective 2: Objective 1: Conclusion

The second objective was to describe Agricultural Science teachers by their current stage in the innovation-decision process related to school gardens. Six stages were used in the study to describe the innovation and decision process: no knowledge, knowledge, persuasion, decision, implementation, and confirmation. Seven-in-ten participants reported they were in the advanced stages of adoption. This implies that some participants were already actively engaging in gardening chores at the time of the survey. This researcher advises that participants with gardening skills and more advanced gardening enthusiasts should be encouraged to conduct specific gardening tasks independently. Garden enthusiast teachers should be encouraged to stay in the garden. This may have an implication on school garden long-term sustainability.

Objective 3: Conclusion

The third objective was to describe Agricultural Science teachers' perceptions of school gardens based on Roger's (2003) characteristics of innovation (relative advantage, compatibility, observability, complexity, and trialability). All participants agreed the school garden is an adoptable learning technology.

Perceived relative advantage

As to perceived relative advantage of school gardens, this researcher found that the majority of Agricultural Science teachers generally agreed with the existence of perceived relative advantage of school gardens. A majority of them agreed or strongly agreed with such relative advantages as accessing better teaching resources and improving the teaching of agricultural-related contents. More than 50% of participants agreed or strongly agreed with the following statements; (a) school gardens can be used to improve my teaching and; (b) school gardens can help me teach better technical agricultural contents. The findings indicate that advantages to adopting the school garden, which were found by U.S. Agricultural Science teachers, also exist in the group of Alabama Agricultural Science educators (DeMarco, 1997).

Perceived compatibility

As to perceived compatibility of school gardens, this researcher found that the majority of participating Agricultural Science teachers generally agreed with the existence of perceived compatibility of school gardens. A majority of them agreed or strongly agreed with such compatibilities as providing scientific resources and improving a classroom culture. More than 50% of participants agreed or strongly agreed with the following statements; (a) school gardens can be used to provide scientific-based information to the students and; (b) school gardens can be used to cultivate sustainable relationships in the classroom.

Perceived complexity

As to perceived complexity of school gardens, this researcher found that the majority of participating Agricultural Science teachers generally agreed with the existence of perceived complexity of school gardens. More than 50% of participants agreed or strongly agreed with the following statements; (a) I would be comfortable using a school garden to teach and; (b) using a school garden to enhance instruction is thinkable. These results contradict Rogers (2003) who stated that complexity is inversely related to rate of adoption. The complex part for some participants was to implement the changed teaching methodologies in the school garden.

Perceived trialability

As to perceived trialability of school gardens, this researcher found that the majority of participating Agricultural Science teachers generally agreed with the existence of perceived trialability of school gardens. More than 50% of participants agreed or strongly agreed with the following statements; (a) I can select the features of the school garden that I want to use and; (b) I can define the term of my use of school gardens. These results do not contradict Rogers (2003) who stated that trialability is directly related to rate of adoption. This implies that most of the participants have had opportunities to try the school garden before fully embracing the idea of incorporating the garden into the curriculum. This may have an implication on curriculum design for

Agricultural Science education teachers. Since the majority of teachers showed a relatively positive attitude toward testing the school garden for teaching. The research indicates that school managers should encourage teachers to partially incorporate the garden in the traditional classroom.

Perceived observability

As to perceived observability of school gardens, this researcher found that the majority of participating Agricultural Science teachers generally agreed with the existence of perceived observability of school gardens. More than 50% of participants agreed or strongly agreed with the following statements; (a) school gardens are highly visible educational tools and; (b) I know teachers using school gardens for instructional purposes. These results do not contradict Rogers (2003) who stated that observability is directly related to rate of adoption. Most survey participants have had opportunities to observe people's activities related to school gardens. Participants were generally aware of strengths and weaknesses of school gardens. This may have an implication on the general perceptions of the school. The school garden can make the entire school more visible to the community.

Perceived characteristics of school gardens

Data showed that the majority of participants generally agreed with all the twenty-nine statements related to perceived positive characteristics of the school garden. The findings did not contradict Rogers (2003) who concluded that the perceived characteristics of an innovation are positively related to rate of adoption of an innovation by a social group.

To disseminate school gardens more quickly, increased opportunities are necessary to allow more teachers to get acquainted with school gardens and, whenever possible, to use the school gardens as a teaching tool in informal situations. Additional research is necessary in areas such as: (a) identification of other advantages of the school garden as seen from Agricultural Science teachers' perspective; (b) economic assessment of the school garden, with regard to the cost/benefit analysis of investment; (c) identification of other compatibilities particularly in Alabama's in largest cities where agricultural education is needed but is unavailable.

Objective 4: Conclusion

The fourth objective was to describe teachers' perceptions of potential barriers (concerns about time, concerns about incentives, financial concerns, planning issues, and outdoor teaching concerns) to the adoption of school gardens. All teachers moderately agreed about the existence of the five barriers to the adoption of school gardens.

Perception of time as a barrier

As to perceived concerns about time as a potential barrier to diffusion of the school garden, this researcher found that the majority of Agricultural Science teachers agreed with the existence of concerns about time as potential barrier. A majority of them were concerned that using the school garden could negatively impact on the traditional classroom. More than 50% of participants agreed with the following statements; (a) lack of time to access the school garden is a barrier and; (b) lack of time to meet the need of traditional classroom is a barrier. Alabama's Agricultural Science teachers tended to perceive concerns about time as a moderate barrier to diffusion of the school garden. The findings confirm DeMarco (1997) who concluded that time concerns are barriers to the school garden. Teachers should be rewarded for spending time in the school garden.

Perception of incentives as a barrier

As to perceived concerns about incentives as a potential barrier to diffusion of the school garden, this researcher found that the majority of Agricultural Science teachers agreed moderately with the existence of concerns about incentives as potential barrier. A majority of them were concerned about lack of monetary incentives as potential barrier to the school garden. More than 50% of participants agreed with the following statements; (a) lack of monetary compensation for developing school garden resources is a barrier and; (b) lack for monetary incentive for using the school garden for instruction is a barrier. The findings also confirm DeMarco (1997) conclusion about antagonistic policies from government and school institutions in rewarding teachers as a barrier to school gardens.

Perception of financial concerns as a barrier

As to perceived financial concerns as a potential barrier to diffusion of the school garden, this researcher found that the majority of Agricultural Science teachers moderately agreed with the existence of this barrier. A majority of them were concerned about lack of financial assessment and financial accountability as potential barrier to the school garden. More than 50% of participants agreed with the following statements; (a) concerns about hidden costs (supplies, training, and upgrades) is a barrier and; (b) cost of purchasing the necessary agricultural real estate for a school garden is a barrier. The findings implicate that economic assessments are needed to study why finances are considered an issue in school garden-based education. Policy makers in schools as well as the people from the Alabama's Public School System need to be aware of the outcomes coming from such economic assessment to guarantee whether or not allocation of financial resources are commendable for school garden long-term sustainability.

Perception of planning concerns as a barrier

As to perceived planning concerns as a potential barrier to diffusion of the school garden, this researcher found that the majority of Agricultural Science teachers moderately agreed with the existence of this barrier. A majority of them were concerned about a lack of strategic planning as a potential barrier to the school garden. More than 50% of participants agreed with the following statements; (a) lack of identified needs (perceived or real) for a school garden is a barrier and; (b) lack of planned opportunity for teachers to learn about school gardens is a barrier. The findings indicate that the lack of identified need, shared vision, and strategic planning for the school garden was seen as a problem to the diffusion of school gardens in Alabama. This agrees with Rogers (2003) who recognized how felt prerequisites and innovativeness were critical conditions for an individual's innovation adoption behavior.

Perception of teaching concerns as a barrier

As to perceived outdoor teaching concerns as a potential barrier to diffusion of the school garden, this researcher found that the majority of Agricultural Science teachers moderately agreed with the existence of this barrier. A majority of them were concerned about possible complications coming from teaching outdoors as a potential barrier to utilizing the school garden. More than 50% of participants agreed with the following statements; (a) lack of teacher access to agricultural real property is a barrier and; (b) lack of reward for student management in the garden is a barrier.

Potential barriers to the school garden

All the listed five barriers were perceived as moderate barriers by Alabama's Agricultural Science teachers. The concerns about time were perceived as the largest barrier among the five barriers. The concern about finances was the second largest concern on the list. The findings indicate that the majority of participants agreed moderately with the existence of the five barriers identified by Rogers' (2003) that would impact diffusion of school gardens in Alabama. All the items were perceived as moderate barriers to the diffusion of school gardens. The findings indicate that barriers to the adaptation of the school garden, which were found by U.S. Agricultural Science teachers, also exists in Alabama.

Objective 5: Conclusion

Objective five sought to examine the relationship between Agricultural Science teachers' selected personal characteristics (age, ethnic origin, gender, education, experience, and program) and their perception about perceived attributes of school gardens. Such personal characteristics as ethnic origin, level of education, years of teaching experience, and program size had no significant influence on the perception about the five attributes of the school garden.

Age had significant impact on teachers' perceived compatibility of the school garden. Older teachers tended to agree with the existing compatibility of the school garden more than younger participants.

Gender had no significant influence on teachers' perception about two of the five attributes of the school garden (trialability and complexity). However, it had a significant impact on participants' perceptions of relative advantage, compatibility, and observability. Female participants' tended to agree with the existing relative advantage, compatibility, and observability of the school garden more than male participants.

Such personal characteristics as ethnic origin, level of education, years of teaching experience, and program size should not have to be considered when considering Alabama Agricultural Science teachers' perceptions about the five characteristics of the school garden. Age should not have to be taken into consideration when considering Agricultural Science teachers' perceived relative advantage, complexity, trialability, and observability. Nevertheless, age needs to be considered when considering teachers' perceived compatibility of the school garden. This indicates that the more experienced the teachers, the more they perceive the school garden is compatible with their value system.

Gender does not have to be taken into account when considering Agricultural Science teachers' perceived complexity and trialability. Conversely, it needs to be considered when considering teachers' perceived relative advantage, compatibility, and observability of the school garden. This implies that gender has a significant impact on relative advantage, compatibility and observability. The findings indicate that the perceived characteristics of an innovation of school gardens are positively related to rate of adoption of an innovation by a social group (Goff, Lindner, & Dolly, 2008).

Further research is recommended to determine: (a) reasons for which age would impact perceptions about compatibility; (b) why older teachers tended to agree more with the compatibility of the school garden, compared to younger teachers; (c) reasons for which gender would impact perceptions about relative advantage, compatibility and observability; and (d) reasons for which female teachers tended to agree more with the relative advantage, compatibility and observability of the school garden, compared to male teachers.

Objective 6: Conclusion

The sixth objective was to describe relationships between Agricultural Science teachers' perceptions of school gardens based upon Rogers' (2003) characteristics of an innovation and their perceptions of potential barriers to the adoption of school gardens. All five perceived attributes were correlated with at least one perceived barrier. Relative advantage has been correlated with one of the five barriers (time). Observability has been correlated with three barriers (finances, planning, and teaching). Complexity has been correlated with one barrier (time). Trialability has been correlated with all five barriers (time, incentives, finances, planning, and teaching). Compatibility has been correlated with one of the five barriers (time).

Variations in Agricultural Science teachers' perceptions about the five barriers (time, incentives, finances, planning, and teaching) would significantly influence teachers' perceptions of trialability of school gardens. If the five barriers were eliminated, participants would agree more with the existence of trialability of the school garden.

If a modification in Agricultural Science teachers' perception about one barrier were made, namely time, this change would significantly influence teachers' perceptions about such characteristics as compatibility, complexity and relative advantage. In the case in which participants perceived time as a surmountable barrier, they would tend to agree more with the existence of compatibility, complexity and relative advantage of the school garden. Wherever the time would not be a problem a problem anymore, Alabama Agricultural Science teachers would agree more with the existence of compatibility, complexity and relative advantage of the school garden.

A modification in Agricultural Science teachers' perception about finances, planning, and teaching as potential barriers to diffusion of the school garden would significantly influence Alabama Agricultural Science teachers' perceptions about observability of the school garden. If research makes the assumption that teachers perceived the lack of finances, lack of planning, and teaching concerns as less serious treats to the school garden; teachers would agree to a greater extent of observability of the school garden. Whenever finances, planning, and teaching were not considered barriers to the school garden, teachers would agree further with observability of the school garden.

To increase Agricultural Science teachers' perceived trialability of the school garden, actions are recommended to decrease concerns about finances, planning concerns, financial concerns and teaching concerns. To increase teachers' perceived relative advantage of the school garden, actions are recommended to decrease concerns about time. A similar recommendation is made for increasing the perception of compatibility, and complexity. To increase teachers' perceived observability of the school garden, actions are recommended to decrease financial, planning and teaching concerns.

Additional Recommendations

Stakeholders who have an interest in the diffusion of school gardens in Alabama may use this study's findings to modify the way in which the school garden program is implemented in Alabama. This research can be; (a) used to better understand-school gardens in Alabama; (b) used to provide guidelines for the establishment of school gardens in Alabama; (c) used to enrich the diffusion of innovation theory (this is the first study which has applied Rogers (2003) Diffusion of Innovation Theory to school gardens); and (d) used to provide a research model for other researchers about the diffusion of the school garden as an effective instructional technology.

Recommendations for future studies include: (a) analyzing the role of female Agricultural Science teachers in making innovation related decisions; (b) measuring Agricultural Science teachers perceptions about factors contributing to school gardens' long term sustainability; (c) determining if there are any other attributes of the school garden as well as other unmentioned barriers to school gardens perceived by Agricultural Science teachers; (d) analyzing the costs and benefits of establishing a school garden.

Moreover, recommendations for future studies include: (a) measuring the effectiveness of the school garden for agricultural education to determine whether there is a difference between traditional education and school garden-based education; (b) measuring Agricultural Science perceptions about motivations for adopting the school garden; (c) how to design school gardens for curriculum areas related to agricultural science education; (d) measuring Agricultural Science teachers' perceptions about attributes and barriers impacting diffusion of the school garden in other States of the

United States; (e) measuring students/parents' perceptions about attributes and barriers impacting diffusion of school gardens in Alabama.

REFERENCES

Allen, P., Simmons, M., Goodman, M., & Warner, K. (2003). Shifting plates in the agri-food landscape: The tectonics of alternative agri-food initiatives in California. *Journal of Rural Studies*, *19*(1), 61-75. doi: 10.1016/S07430167(02)00047-5\

Assadourian, E. (2003). The growing value of gardens. *World Watch Magazine*, *16*(1), 28-35. Retrieved from http://www.worldwatch.org/

Bachert, R. (1976). *History and analysis of the school garden movement in America, 1890-1910* (Unpublished master's thesis). Indiana University, Bloomington, IN.

Barrick, R. K. (2014). Experiential learning in school-based agricultural education: Still vital after all these years. *The Agricultural Education Magazine*, *86*(6), 2. Retrieved from https://www.naae.org/

Battel, R. D., & Krueger, D. E. (2005). Barriers to change: Farmers' willingness to adopt sustainable manure management practices. *Journal of Extension, 43*(4). Retrieved from https://joe.org/joe/2005august/a7.php

Bell, A. C., & Dyment, J. E. (2008). Grounds for health: the intersection of green school grounds and health promoting schools. *Environmental Education Research*, *14*(1), 77-90. doi: 10.1080/13504620701843426

Bell, P., Lewenstein, B., Shouse, A. W., & Feder, M. A. (Eds.). (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, D.C.: National Academies Press.

Blair, D. (2008). The child in the garden: An evaluative review of the benefits of school gardening. *The Journal of Environmental Education*, *40*(2), 15-38. doi: 10.3200/ JOEE.40.2.15-38

Boone, H. N. (2014). A major fork in the road. *The Agricultural Education Magazine*, *86*(5), 2. Retrieved from https://www.naae.org/

Brunotts, C. M. (1998). *School gardening: A multifaceted learning tool. An evaluation of the Pittsburgh civic garden center's neighbors and schools gardening together* (Unpublished master's thesis). Duquesne University, Pittsburgh, PA.

Cheskey, E. (1996). How schoolyards influence behavior. *Green Teacher*, *47*(1), 11-14. Retrieved from https://eric.ed.gov/?id=EJ539987

Clardy, A. E., & Copeland, B. (2012). Sustainable school gardens and green education: Familiar lessons through a new lens. *The Agricultural Education Magazine*, *84*(5), 20-21. Retrieved from https://www.naae.org

Cline, S., Cronin-Jones, L., Johnson, C., Hakverdi, M., & Penwell, R. (2002). *The Impact of community involvement on the success of schoolyard ecosystem restoration/education programs: A case study approach*. Paper presented at the American Educational Research Association Conference, New Orleans, LA. Retrieved from http://files.eric.ed.gov/

Cochran, W. G. (1977). *Sampling techniques* (3rd Ed.). New York: John Wiley & Sons.

Coffee, S. R., & Rivkin, M. S. (1998). Better schools and gardens. *Science Teacher*, *65*(4), 24–27. Retrieved from https://learningcenter.nsta.org/

Corson, C. (2003). *Grounds for learning: Hope for Americas derelict schoolyards.* Retrieved from http://www.cherylcorson.com/

Crocco, M. S., & Costigan, A. T. (2007). The narrowing of curriculum and pedagogy in the age of accountability urban educators speak out. *Urban Education*, *42*(6), 512-535. doi: 10.1177/0042085907304964

Cronbach, L. J. (1951). Coefficient alpha in the internal structure of tests. *Psychometrika, 16,* 297-334. Retrieved from http://psych.colorado.edu/

Cronin-Jones, L., Klosterman, M., & Mesa, J. (2006). Are outdoor schoolyard learning activities really effective?: A standards-based evaluation, presented at the North American Association for Environmental Education Conference*,* Minneapolis, MN. Retrieved from http://www.peecworks.org/

Davis J.A. (1971) *Elementary Survey Analysis*. Englewood, NJ: Prentice-Hall

Deen, Hrncirik-Scanga, Wright & Berahino (2017). Empowering youth and communities through 4-H school gardening programs: Results of focus groups in Burundi, Africa. *Journal of International Agricultural and Extension Education*, 24(2), 34-47. doi: 10.5191/jiaee.2017.24209

DeMarco, L. W. (1997). *The factors affecting elementary school teachers' integration of school gardening into the curriculum.* (Unpublished doctoral dissertation). Virginia Polytechnic Institute and State University, Blacksburg, VA.

Desmond, D., Grieshop, J., & Subramaniam, A. (2004). *Revisiting garden-based learning in basic education*. Rome, Italy: FAO. Retrieved from https://hort.cals.cornell.edu/

Dobbs, K., Relf, D., & McDaniel, A. (1998). Survey on the needs of elementary education teachers to enhance the use of horticulture or gardening in the classroom. *HortTechnology*, *8*(3), 370-372. Retrieved from http://horttech.ashspublications.org/

Doerfert, D. L. (Ed.) (2011). *National research agenda: American Association for Agricultural Education's research priority areas for 2011-2015*. Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications. Retrieved from http://aaaeonline.org/

Dooley, K. E., & Murphrey, T. P. (2000). How the perspectives of administrators, faculty, and support units impact the rate of distance education adoption. *Online Journal of Distance Learning Administration*, *3*(4). Retrieved from http://www.westga.edu/

Downs, G. W. (1978). Complexity and innovation research. In M. Radnor, I. Feller, and E. M. Rogers (Eds.), *The diffusion innovation: An assessment*, 1-21. Evanston IL: Northwestern University Press.

Duncan, D. W., Collins, A., Fuhrman, N. E., Knauft, D. A., & Berle, D. C. (2016). The impacts of a school garden program on urban middle school youth. *Journal of Agricultural Education*, *57*(4), 174-185. doi: https://doi.org/10.5032/jae.2016.04174

Eames-Sheavly, M., Lekies, K. S., MacDonald, L., & Wong, K. J. (2007). Greener voices: an exploration of adult perceptions of participation of children and youth in gardening planning, design, and implementation. *HortTechnology*, *17*(2), 247-253. Retrieved from http://horttech.ashspublications.org/

Emekauwa, E. (2004). *They remember what they touch: The impact of place-based learning in east feliciana parish*. Arlington, VA: Rural School and Community Trust. Retrieved from http://files.eric.ed.gov/fulltext/ED497983.pdf

Esteva, G. (1994). Re-embedding food in agriculture. *Culture, Agriculture, Food and Environment*, *13*(48), 1-12. doi: 10.1525/cuag.1994.13.48.1

Faddegon, P. A. (2005). *The kids growing food school gardening program: Agricultural literacy and other educational outcomes* (Unpublished doctoral dissertation). Cornell University, Ithaca, NY.

Feenstra, G. W. (1997). Local food systems and sustainable communities. *American Journal of Alternative Agriculture*, *12*(1), 28-36. doi: https://doi.org/10.1017/S0889189300007165

Fisher-Maltese, C. B. (2013). Fostering science literacy, environmental stewardship, and collaboration: Assessing a garden-based approach to teaching life science (Unpublished doctoral dissertation). Rutgers, The State University of New Jersey-New Brunswick. Retrieved from https://search.proquest.com/

Food and Agriculture Organization of the United Nations. (2005). *Setting up and running a school garden: A manual for teachers, parents and communities*. Rome, Italy: FAO. Retrieved from ftp://ftp.fao.org/docrep/fao/012/a0218e/a0218e.pdf

Food and Agriculture Organization of the United Nations. (2006). *Food Security.* Rome, Italy: FAO. Retrieved from http://www.fao.org/

Food and Agriculture Organization of the United Nations. (2010). *A new deal for school gardens*. Rome, Italy: FAO. Retrieved from http://www.fao.org/

Food and Agriculture Organization of the United Nations (2017). *School gardens: Helping to build a world without hunger*. Rome, Italy: FAO. Retrieved from http://www.fao.org/

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Education research: An introduction* (8th Ed.). Boston: Pearson Education.

Garrett, R., Balinas, M., Wingenbach, G., Rutherford, T., Fath, K., Alvis, S., & Pratt, O. (2014). Members' perceived benefits and values of the Association for International Agricultural and Extension Education. *Journal of International Agricultural and Extension Education*, *21*(2), 6-16. doi: 10.5191/jiaee.2014.21201

Glenn, A., & Wingenbach, G. (2015). Effects of the junior master gardener's (JMG) curriculum on Guatemalan students' knowledge gain and attitude toward science. *Journal of International Agricultural and Extension Education*, *21*(2), 62-73. doi:10.5191/jiaee.2015.22205

Goff, S., Lindner, J. R., & Dolly, D. (2008). Factors in participation and nonparticipation in farmer field schools in Trinidad and Tobago. *Proceedings of the 24th Annual Meeting E.A.R.T.H. University*, Costa Rica. Retrieved from https://www.aiaee.org/

Gordon, H. R. (1999). *The history and growth of career and technical education in America*. Long Grovee, IL: Waveland Press.

Graham, H., Beall, D., Lussier, M., McLaughlin, P., & Zidenberg-Cherr, S. (2005). Use of school gardens in academic instruction. *Journal of Nutrition Education & Behavior*, 37(3), 147-151. Retrieved from http://www.kohalacenter.org/

Graham, H., & Zidenberg-Cherr, S. (2005). California teachers perceive school gardens as an effective nutritional tool to promote healthful eating habits. *Journal of the American Dietetic Association*, 105(11), 1797-1800. doi: 10.1016/j.jada.2005.08.034.

Hall, G. E., & Hord, S. M. (2006). *Implementing change: Patterns, principles and potholes*. New York, NY: Pearson Education. Retrieved from http://archive.wastatelaser.org/

Harder, A. (2007). *Characteristics and barriers impacting the diffusion of eXtension among Texas cooperative extension county extension agents* (Unpublished doctoral dissertation). Texas A&M University, College Station, TX. Retrieved from http://oaktrust.library.tamu.edu/

Harder, A., & Lindner, J. R. (2008). An assessment of county extension agents' adoption of extension. *Journal of Extension*, *46*(3). Retrieved from https://www.joe.org/

Hayden-Smith, R. (2007). "Soldiers of the soil": The work of the United States school garden army during World War I. *Applied Environmental Education & Communication*, *6*(1), 19–29. doi:10.1080/15330150701319453

Hazzard, E. L., Moreno, E., Beall, D. L., & Zidenberg-Cherr, S. (2011). Best practice models for implementing, sustaining, and using instructional school gardens in California. *Journal of Nutrition Education and Behavior*, *43*(5), 409-413. Retrieved from http://dx.doi.org.lib-ezproxy.tamu.edu:2048/

Huckestein, S. L. (2008). *Experiential learning in school gardens and other outdoor environments: A survey of needs for supplemental programs* (Unpublished Master's Thesis). Virginia Polytechnic Institute and State University, Blacksburg, VA. Retrieved from https://theses.lib.vt.edu/

Jaeschke, E. M, Schumacher, J. Raeder, Cullen, R. W, & Wilson, M. A. (2012). Perceptions of principals, teachers, and school food, health, and nutrition professionals regarding the sustainability and utilization of school food gardens. *The Journal of Child Nutrition & Management, 36*(2), 7-13. Retrieved from https://pubag.nal.usda.gov/catalog/4777887

Kincy, N., Fuhrman, N. E., Navarro, M., & Knauft, D. (2016). Predicting teacher likelihood to use school gardens: A case study. *Applied Environmental Education & Communication*, *15*(2), 138-149. doi: http://dx.doi.org/10.1080/1533015X.2016.1164096

King, R. N., & Rollins, T. (1995). Factors influencing the adoption decision: An analysis of adopters and non-adopters. *Journal of Agricultural Education*, *36*(4), 39-48. doi: 10.5032/jae.1995.04039

Klemmer, C. D., Waliczek, T. M., & Zajicek, J. M. (2005). Growing minds: The effect of a school gardening program on the science achievement of elementary students. *HortTechnology*, *15*(3), 448-452. Retrieved from http://aggie-horticulture.tamu.edu/

Kohlstedt, S. G. (2008). "A better crop of boys and girls": The school gardening movement, 1890–1920. *History of Education Quarterly*, *48*(1), 58-93. doi: 10.1111/j.1748-5959.2008.00126.x

Kreutzer, K., & Jäger, U. (2010). Volunteering versus managerialism: Conflict over organizational identity in voluntary associations. *Nonprofit and Voluntary Sector Quarterly*, *20*(10), 1-28. doi; 10.1177/0899764010369386

Lawson, L. (2004). The planner in the garden: A historical view into the relationship between planning and community gardens. *Journal of Planning History*, *3*(2), 151-176. doi:10.1177/1538513204264752

Li, Y. (2004). Faculty perceptions about attributes and barriers impacting diffusion of web-based distance education (WBDE) at the China Agricultural University. *Dissertation Abstracts International, 65*(7), 2460A. (UMI No. 3141422). Retrieved from https://oaktrust.library.tamu.edu/

Li, Y., & Lindner, J. R. (2007). Barriers to diffusion of web-based distance education at China Agricultural University. *Journal of International Agricultural and Extension Education*, *14*(1), 45-57. doi: 10.5191/jiaee.2007.14104

Lindner, J. R., Murphy, T. H., & Briers, G. H. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, 42(4), 43–53. doi: 10.5032/jae.2001.04043

Lindner, J. R., Rodriguez, M. T., Strong, R., Jones, D., & Layfield, D. (2016). New technologies, practices, and products adoption decisions. In Roberts, T. G., Harder, A., & Brashears, M. T. (Eds), *American Association for Agricultural Education national research agenda: 2016-2020* (pp. 19-24). Gainesville, FL: Department of Agricultural Education and Communication.

Marturano, A. (1995). Horticulture and human culture. *Science and Children*, *32*(5), 26-50. Retrieved from http://www.jstor.org/stable/43165384

McAleese, J. D., & Rankin, L. L. (2007). Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *Journal of the American Dietetic Association*, *107*(4), 662-665. doi: 10.1016/j.jada.2007.01.015

McGaughy, T. D. (2013). *The REAL school garden experience: Building sustainable school gardens through sustainable communities* (Unpublished doctoral dissertation). Texas Tech University, Lubbock, TX. Retrieved from https://oaktrust.library.tamu.edu/

Mercier, S. (2015). *Food and agriculture education in the United States*. Washington, DC: AGree. Retrieved from http://www.foodandagpolicy.org/

Mirka, G. D. (1970). *Factors which influence elementary teachers' use of the out-of-doors* (Unpublished master's thesis). Ohio State University, Columbus, OH.

Mohrmann, P. (1999). Planting the seeds of science: The school garden: A perfect laboratory for teaching science. *Science Instructor*, *108*(16), 25-29. Retrieved from http://www.nsta.org/highschool/msguidelines-tst.aspx

Murakami, T. (2015). *Educators' perspectives associated with school garden programs in Clark County, Nevada: Practices, resources, benefits and barriers* (Unpublished master's thesis). University of Nevada, Las Vegas, NV. Retrieved from https://digitalscholarship.unlv.edu/

National Association of Agriculture Educators. (2017). *Agricultural education in Alabama*. Retrieved from https://www.naae.org/

Passy, R., Morris, M., & Reed, F. (2010). *Impact of school gardening on learning: Final report submitted to the Royal Horticultural Society*. Berkshire, U.K.: National Foundation for Educational Research in England and Wales. Retrieved from https://www.food4families.org.uk/

Parmer, S. M., Salisbury-Glennon, J., Shannon, D., & Struempler, B. (2009). School gardens: An experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *Journal of Nutrition Education and Behavior*, *41*(3), 212-217. doi: 10.1016/j.jneb.2008.06.002.

Ralston, S. J. (2011). It takes a garden project: Dewey and Pudup on the politics of school gardening. *Ethics & the Environment*, *16*(2), 1-24. doi:10.2979/ethicsenviro.16.2.1

Ralston, S. J. (2012). Educating future generations of community gardeners: A Deweyan challenge. *Critical Education*, *3*(3). Retrieved from http://ojs.library.ubc.ca/index.php/criticaled/article/view/182349

Ramjattan, V. (2014). *Garden based learning–moving the classroom outdoors: An investigation into the concerns of three teachers regarding the use of GBL as a strategy for teaching and learning in green thumb primary in north east Trinidad* (Unpublished doctoral dissertation). University of West Indies, Saint Augustine, Trinidad & Tobago. uri: http://hdl.handle.net/2139/21587

Redman, M. A. (2013). *Keeping green schoolyards green: A study of challenges and success strategies for the long-term sustainability of schoolyard habitats* (Unpublished master's thesis). George Mason University, Arlington, VA. doi: http://hdl.handle.net/1920/8328

Rennie, L.J. (2007). Learning science outside of school. In S.K. Abell & N.G. Lederman (Eds.), *Handbook of research on science education*, 125-167. Mahwah, NJ: Lawrence Erlbaum Assoc., Inc.

Roberts, T. G., Harder, A., & Brashears, M. T. (2016). *American association for agricultural education national research agenda: 2016-2020*. Gainesville, FL: Department of Agricultural Education and Communication. Retrieved from http://aaaeonline.org/

Rogers, C. R. (1958). The characteristics of a helping relationship. *Journal of Counseling & Development*, *37*(1), 6-16. doi: 10.1002/j.2164-4918.1958.tb01147x

Rogers, E. M. (1961). Characteristics of agricultural innovators and other adopter categories. In E. Katz, E. A. Wilkening, E. M. Rogers, R. Mason, R. L. Dahling, T. W. Harrell, W. Schramm (Eds.), *Studies of innovation and of communication to the public. Study in the utilization of behavioral science, Vol. II,* 61-98. California Institute for Communication Research. New York, NY: Ford Foundation Press. Retrieved from http://files.eric.ed.gov/fulltext/ED040600.pdf

Rogers, E. M. (1963). The adoption process. *The Journal of Cooperative Extension*, *1*(1), 16-22. Retrieved from https://www.joe.org/joe/

Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations: A cross cultural approach*. New York, NY: Free Press.

Rogers, E. M. (1995). Lessons for guidelines from the diffusion of innovations. *The Joint Commission journal on Quality Improvement*, *21*(7), 324-328. doi: 10.1016/S1070-3242(16)30155-9

Rogers, E. M. (2003). *Diffusion of innovations* (5th Ed.). New York, NY: Free Press.

Ruiz-Gallardo, J. R., Verde, A., & Valdés, A. (2013). Garden-based learning: An experience with "at risk" secondary education students. *The Journal of Environmental Education*, *44*(4), 252-270. uri: http://dx.doi.org/10.1080/00958964.2013.786669

Sargent, C. (1984). Between death and shame: Dimensions of pain in bariba culture. *Social Science & Medicine*, *19*(12), 1299-1304. doi: 10.1016/02779536(84)90016-9

Sargent, T. C. (2014). Professional learning communities and the diffusion of pedagogical innovation in the Chinese education system. *Comparative Education Review*, *59*(1), 102-132. Retrieved from https://www.journals.uchicago.edu/doi/pdfplus/10.1086/678358

Selmer, S. J., Rye, J. A., Malone, E., Fernandez, D., & Trebino, K.(2014). What should we grow in our school garden to sell at the farmers' market? Initiating statistical literacy through science and mathematics integration. *Science Activities: Classroom Projects and Curriculum Ideas*, *51*(1), 17–32. doi:10.1080/00368121.2013.860418

Sheffield, B. K. (1992). *The affective and cognitive effects of an interdisciplinary garden-based curriculum on underachieving elementary students* (Unpublished doctoral dissertation). University of South Carolina, Columbia, SC.

Shoulders, C. W., & Myers, B. E. (2012). Teachers' use of agricultural laboratories in secondary agricultural education. *Journal of Agricultural Education*, *53*(2), 124-138. doi: 10.5032/jae.2012.02124

Smith, L. L., & Motsenbocker, C. E. (2005). Impact of hands-on-science through school gardening in Louisiana public elementary schools. *HortTechnology*, *15*(3), 439- 433. Retrieved from http://horttech.ashspublications.org/

Skelly, S. M., & Bradley, J. C. (2000). The importance of school gardens as perceived by Florida elementary school teachers. *HortTechnology*, *10*(1), 229–231. Retrieved from http://horttech.ashspublications.org/

Skelly, S. M., & Bradley, J. C. (2007). The growing phenomenon of school gardens: Measuring their variation and their effect on students' sense of responsibility and attitudes toward science and the environment. *Applied Environmental Education & Communication*, *6*(1), 97–104. doi:10.1080/15330150701319438

Sterrett, W., & Imig, S. (2010). Learning green: Perspectives from US department of education green ribbon schools educators. *Journal of Sustainability Education*, *10*(1). Retrieved from http://hdl.handle.net/1959.13/1328896

Stripling, C. T., & Barrick, R. K. (2013). Examining the professional, technical, and general knowledge competencies needed by beginning school-based agricultural education teachers. *Journal of Agricultural Education*, *54*(3), 67-83. doi: 10.5032/jae.2013.03067

Sobel, D. (2004). Place-based education: Connecting classroom and community. *Nature Literary Series 4*(1), 1-7. Retrieved from http://www.kohalacenter.org/

Soresen, T. J., Tarpley, R. S., & Warnick, B. K. (2010). Inservice needs of Utah agriculture teachers. *Journal of Agricultural Education*, *51*(3), 1-11. doi: 10. 5032/jae.2010.03001

Tencati, A., & Zsolnai, L. (2012). Collaborative enterprise and sustainability: The case of slow food. *Journal of Business Ethics, 110*(3), 345–354. doi:10.1007/s10551–011–1178–1d

Thorp, L. (2006). *The pull of the earth: Participatory ethnography in the school garden*. Washington D.C.: Rowman & Littlefield/Altamira Press.

Thorp, L., & Townsend, C. (2001). *Agricultural education in an elementary school: An ethnographic study of a school garden*. Paper presented at the 28th Annual National Agricultural Research Conference, New Orleans, LA. Retrieved from http://www.aaaeonline.org/

Trelstad, B. (1997). Little machines in their gardens: A history of school gardens in America, 1891 to 1920. *Landscape Journal, 16*(2), 161–173. doi: 10.3368/lj.16.2.161

United States Department of Agriculture (2011a). *Nutrition standards in the national school lunch and school breakfast programs. Final rule*. Washington, D.C.: Office of the Federal Register, National Archives and Records Administration. Retrieved from https://www.govinfo.gov/content/pkg/FR-2012-0126/pdf/2012-1010.pdf

United States Department of Agriculture. (2011b). *History of agriculture: School gardening in the early 1990s*. Washington, D.C.: Office of the Federal Register, National Archives and Records Administration. Retrieved from http://riley.nal.usda.gov/

United States Department of Agriculture. (2015). *Farm to school census*. Washington, D.C.: Office of the Federal Register, National Archives and Records Administration. Retrieved from https://farmtoschoolcensus.fns.usda.gov/

United States National Research Council. (2009). *Learning science in informal environments: People, places and pursuits*. Washington, DC: The National Academic Press. Retrieved from http://makepuppet.org/

Valente, T. W. (1996). Social network thresholds in the diffusion of innovations. *Social Networks*, *18*(1), 69-89. doi:10.1016/0378-8733(95)00256-1

Waters, A. (2010). *The edible schoolyard*. Retrieved from http://www.edibleschoolyard.org/about-us

Wilcox, A. K., Shoulders, C. W., & Myers, B. E. (2014). Encouraging teacher change within the realities of school-based agricultural education: Lessons from teachers' initial use of socio-scientific issues-based Instruction. *Journal of Agricultural Education*, *55*(5), 16-29. doi: 10.5032/jae.2014.05016

Williams, D. R., & Dixon, P. S. (2013). Impact of garden-based learning on academic outcomes in schools: Synthesis of research between 1990 and 2010. *Review of Educational Research*, *83*(2), 211-235. doi: 10.3102/0034654313475824

Withers, D., & Burns, H. (2013). Enhancing food security through experiential sustainability leadership practices: A study of the seed-to-supper program, *Journal of Sustainability Education, 5*(1). Retrieved from http://www.jsedimensions.org/

Wolsey, T. D., & Lapp, D. (2014). School gardens: situating students within a global context. *Journal of Education*, *194*(3), 53-58. Retrieved from http://eds.a.ebscohost.com/

Yu, F. (2012). *School garden sustainability: Major challenges to the long-term maintenance and success of school garden programs* (Unpublished master's thesis). University of Delaware, Newark, DE. Retrieved from http://udspace.udel.edu/handle/19716/12045

APPENDIX A

AUBURN UNIVERSITY

COLLEGE OF EDUCATION
CURRICULUM AND TEACHING

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

INFORMATION LETTER
for a Research Study entitled
Perceptions of Adoption and Diffusion of School Gardens

You are invited to participate in a research study on adoption and use of school gardens. The study is being conducted by Marco Giliberti, Graduate Student, under the direction of Professor James Lindner in the Auburn University Department of Curriculum and Teaching's Agriscience Education Program. You are invited to participate because you are an agriscience education teacher and are age 19 years or older.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to complete a questionnaire. Your total time commitment will be approximately ten minutes.

Are there any risks or discomforts? The risks associated with participating in this study are minimal and no more than encountered in everyday life. To minimize these risks, data will be collected anonymously and presented only in aggregate form. No direct links to your responses will be collected.

Are there any benefits to yourself or others? There are no direct benefits to your participation in this study. Benefits to others may include a better understanding of how school gardens can be used for instruction and teaching.

Will you receive compensation for participating? You will not receive any compensation for your participation.

Are there any costs? Other than your time there are no costs associated with your participation.

If you change your mind about participating, you can withdraw at any time by not returning the distributed questionnaire by closing your browser window or simply not returning it. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you have submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the College of Education, Curriculum and Teaching, and the Agriscience Education program.

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Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by maintaining your anonymous responses and insuring there are no connections between your responses and you. At the conclusion of this study all data collected will be destroyed after Information collected through your participation may be used presentation at academic conferences, journals, population publications, and student research outlets (dissertation, thesis).

If you have questions about this study, please contact Marco Giliberti at mzg0014@auburn.edu or Professor James Lindner at jrl0039@auburn.edu, 334.844.6797.

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.

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Investigator's signature Date
Marco Gilibert

____

Faculty Advisor signature Date
James Lindner, Ph.D.

APPENDIX B

AGRISCIENCE TEACHERS' PERCEPTION OF SCHOOL GARDENS STUDY, AUBURN UNIVERSITY

Purpose: The purpose of this study is to determine characteristics and barriers on the adoption of school gardens among Agriscience Teachers in Alabama. There are four sections in this questionnaire. Please, read the direction for each section carefully.

SECTION I: STAGE OF ADOPTION

School gardens are considered important learning tools. Those gardens are used as settings for experiential learning and agricultural education throughout the U.S. School gardens will fully launch in Alabama in the near future, although some school gardens have been established and are currently available for instruction. Indicate your answers for the statements described below by clicking the radio button on the left side of your answer.

Q.1 Please indicate if there is any school garden in your school

- ☐ Yes
- ☐ No

Q.2 If yes indicate what is your role in school gardening

- ☐ Digging beds
- ☐ Pruning
- ☐ Controlling pests
- ☐ Using machinery
- ☐ Maintaining equipment
- ☐ Basic building tasks
- ☐ Raising plants

Q.3 Please indicate your level of involvement with school gardens

- ☐ I have never heard of school gardens before receiving this questionnaire
- ☐ I understand the purpose and features of school gardens, but have not decided whether or not I like or dislike them
- ☐ I have decided that I like or dislike school gardens
- ☐ I have decided that I will or will not use the school gardens
- ☐ I see the benefits of having a school gardens
- ☐ I have used the school garden long enough to evaluate whether or not the school garden will be part of my future as a teacher of agriculture

SECTION II: CHARACTERISTICS IMPACTING DIFFUSION OF SCHOOL GARDENS

Below there is a list of characteristics that may impact the diffusion of school gardens in Alabama. Please, read each item carefully before indicating your answer by checking the appropriate square.

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Relative advantage						
Q.4	School gardens can be used to improve my teaching	☐	☐	☐	☐	☐
Q.5	Incorporating a school garden into my curriculum increases my teaching effectiveness	☐	☐	☐	☐	☐
Q.6	School garden can help me better teach technical agricultural contents	☐	☐	☐	☐	☐
Q.7	School gardens can create more funding opportunities for school agricultural programs	☐	☐	☐	☐	☐
Q.8	School gardens enable me to accomplish tasks more quickly	☐	☐	☐	☐	☐
Q.9	School gardens can be used to improve my teaching	☐	☐	☐	☐	☐
Compatibility						
Q.10	School gardens support the mission of my school	☐	☐	☐	☐	☐
Q.11	School gardens align with my teaching style	☐	☐	☐	☐	☐
Q.12	School gardens help me to satisfy the learning needs of my students	☐	☐	☐	☐	☐
Q.13	School gardens can be used to provide scientific-based information to the students	☐	☐	☐	☐	☐
Q.14	Using a school garden for instruction is consistent with my teaching methods	☐	☐	☐	☐	☐
Q.15	My teaching goals can be enhanced through the use of a school garden	☐	☐	☐	☐	☐
Q.16	School gardens can be used to cultivate sustainable relationships in the classroom	☐	☐	☐	☐	☐
Q.17	Using school gardens is consistent with my career goals	☐	☐	☐	☐	☐

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Complexity						
Q.18	School gardens are user-friendly teaching tools	☐	☐	☐	☐	☐
Q.19	Using a school garden as a teaching tool is simple	☐	☐	☐	☐	☐
Q.20	Using the school garden for instruction is easy	☐	☐	☐	☐	☐
Q.21	Using a school garden to enhance instruction is feasable	☐	☐	☐	☐	☐
Q.22	It would be easy for me to incorporate a school garden in my program	☐	☐	☐	☐	☐
Q.23	I would be comfortable using a school garden to teach	☐	☐	☐	☐	☐
Trialability						
Q.24	I can select the features of the school garden that I want to use	☐	☐	☐	☐	☐
Q.25	I can define the term of my use of school gardens	☐	☐	☐	☐	☐
Q.26	I can test key features of school gardens with no obligation for continued or future use	☐	☐	☐	☐	☐
Q.27	It is possible to me to deliver selected portions of a course (a single lesson or a module) using the school garden without committing to develop new material for it	☐	☐	☐	☐	☐
Q.28	It is possible for my students to perform single gardening tasks without committing to gardening	☐	☐	☐	☐	☐
Q.29	It is possible for me to currently use my own teaching materials in the garden without committing to develop new material for it	☐	☐	☐	☐	☐
Observability						
Q.30	I know teachers using school gardens for instructional purposes	☐	☐	☐	☐	☐
Q.31	School gardens are highly visible educational tools	☐	☐	☐	☐	☐
Q.32	The use of school gardens to enhance student learning is well known	☐	☐	☐	☐	☐
Q.33	The use of school gardens in well publicized	☐	☐	☐	☐	☐

SECTION III: POSSIBLE BARRIERS TO THE DIFFUSION OF SCHOOL GARDENS
Below there is a list of characteristics that may impact the diffusion of school gardens in Alabama. Please read each item carefully before indicating your answer by checking the appropriate square.

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Concerns about time						
Q.34	Lack of time to access the school garden is a barrier	☐	☐	☐	☐	☐
Q.35	Lack of time available to respond to students' request for information is a barrier	☐	☐	☐	☐	☐
Q.36	Lack of time to meet the needs of traditional classroom is a barrier	☐	☐	☐	☐	☐
Q.37	Lack of time to learn incorporate the school garden into job responsibilities is a barrier	☐	☐	☐	☐	☐
Q.38	Lack of time available to search for information on school gardens is a barrier	☐	☐	☐	☐	☐
Concerns about incentives						
Q.39	Lack of monetary compensation for developing school garden resources is a barrier	☐	☐	☐	☐	☐
Q.40	Lack of school recognition for using school gardens is a barrier	☐	☐	☐	☐	☐
Q.41	Lack of correlation between teachers' adoption of school gardens and teacher performance evaluation is a barrier	☐	☐	☐	☐	☐
Q.42	Lack of correlation between students' uses of school gardens and student performance is a barrier	☐	☐	☐	☐	☐
Q.43	Lack for monetary incentive for using the school garden for instruction is a barrier	☐	☐	☐	☐	☐
Q.44	Lack of support from local administrators is a barrier	☐	☐	☐	☐	☐
Q.45	Lack of support from parents is a barrier	☐	☐	☐	☐	☐

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Financial concerns						
Q.46	The inadequate resources of my school are a barrier for the establishment of a school garden	☐	☐	☐	☐	☐
Q.47	The inadequate resources of my school are a barrier for the manteinance of a school garden	☐	☐	☐	☐	☐
Q.48	Concerns about sharing revenue from school gardens with multiple stakeholders is a barrier	☐	☐	☐	☐	☐
Q.49	Lack of financial resources to promote the school garden locally is a barrier	☐	☐	☐	☐	☐
Q.50	Cost of purchaising/leasing of the necessary agricultural real estate for a school garden is a barrier	☐	☐	☐	☐	☐
Q.51	Concerns about hidden costs (e.g. supplies) is a barrier	☐	☐	☐	☐	☐
Planning concerns						
Q.52	Lack of identified needs (perceived or real) for a school garden is a barrier	☐	☐	☐	☐	☐
Q.53	Lack of shared vision for the role of school gardens with traditional agricultural education structure is a barrier	☐	☐	☐	☐	☐
Q.54	Lack of strategic planning for school gardens is a barrier	☐	☐	☐	☐	☐
Q.55	Lack of matching between school garden and school mission is a barrier	☐	☐	☐	☐	☐
Q.56	Lack of coordination by school garden partners is a barrier	☐	☐	☐	☐	☐
Q.57	Lack of planned opportunity for teachers to learn about school gardens is a barrier	☐	☐	☐	☐	☐
Outdoor teaching concerns						
Q.58	Lack of teacher access to agricultural property is a barrier	☐	☐	☐	☐	☐
Q.59	Concern about loss of control of important horticultural information is a barrier	☐	☐	☐	☐	☐
Q.60	Lack of reward for student mgt in the garden is a barrier	☐	☐	☐	☐	☐
Q.61	Concern for legal issues (student liability) is a barrier	☐	☐	☐	☐	☐
Q.62	Concern that the school garden will be used to replace traditional teacher positions is a barrier	☐	☐	☐	☐	☐
Q.63	Lack of training programs to learn how to operate a school garden is a barrier	☐	☐	☐	☐	☐

SECTION IV: PERSONAL CHARACTERISTICS

Please, indicate your responses to the following questions by checking the appropriate square.

Q.64 **In what year were you born?**

Year ☐☐☐☐

Q.65 **What is your ethnic origin or race?**

- ☐ White
- ☐ Hispanic or Latino
- ☐ Black or African American
- ☐ Native American
- ☐ Asian/Pacific Islander
- ☐ Other
- ☐ Choose not to respond

Q.66 **What is your gender?**

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Prefer not to say

Q.67 **What is the highest degree or level of school you have completed?**

- ☐ Undergraduate Degree
- ☐ Master's Degree
- ☐ Professional Degree
- ☐ Doctorate Degree

Q.68 **Not including this year (2017-2018), how many years have you been teaching agriculture education at the middle/secondary level?**

Years Teaching ☐☐

Q.69 **How many teachers comprise the agricultural education program at your school?**

Total number of teachers including you ☐☐