

**An Evaluation of Supplemental Activities Before and After a Field Trip to a Public Garden:
Effects on Student Knowledge and Behavior**

by

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Abstract

The purpose of the study was to evaluate if students exhibit better knowledge comprehension and retention when exposed to activities before and after attending a garden field trip. Students' behavior was evaluated on the field trip to see if exposure to activities before attending the field trip affected their ability to focus on the instruction while at the field trip site. Students participated in pre- and post-testing which evaluated their knowledge prior to and after the field trip. The experimental group of students participated in pre- and post-field trip activities along with the pre- and post-testing. The control group of students were pre- and post-tested, but experienced no pre-or post-activities. Teachers were surveyed following the field trip and Huntsville Botanical Garden field trip guides were interviewed in a semiformal setting after the field trip. The survey and interview questions concerned the students' behavior during the field trip. Results of the study indicated the activities did not affect the experimental or control group scores, but the field trip to Huntsville Botanical Garden did.

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CHAPTER I

INTRODUCTION

Science and engineering have fueled the United States economy for over half a century creating jobs, high standards of living, and international economic leadership. Industries focused on science, technology, engineering, and mathematics are collectively known as the STEM disciplines. Currently, the United States does not produce enough STEM workers domestically in key fields (Atkinson, 2012). The number of bachelors' of science degrees in STEM fields over the past 15 years have increased 22% overall and masters' degrees have increased at about half the rate of non-STEM masters' degrees. Almost half of all doctoral STEM degrees awarded in the United States are awarded to foreign nationals (Atkinson, 2012).

How can the United States reverse the STEM workforce shortage? To encourage children to pursue STEM work fields, children should be exposed to student-centered learning and learning experiences outside the classroom (Shoults and Shoults, 2012). Students spend about two-thirds of their waking lives outside formal schooling yet educators tend to ignore the crucial influential experiences outside of school which shape a students' knowledge, understanding, beliefs, attitudes, and motivation to learn (Braund and Reiss, 2006). In recent years, some field trips have been discontinued due to time and fiscal restraints (Coughlin, 2010); however, field trips are a valuable teaching tool. This teaching tool is strengthened by careful, purposeful planning and evaluation by teachers and site educators. Field trips can be enjoyable, but they must also be educational, integrative, and worthwhile (Coughlin, 2010). Out of 11 alternative strategies for learning science, field trips, ranked at the top as the most enjoyable by students (Braund and Reiss, 2006).

The purpose of a field trip is to enrich the curriculum, allow students to make tangible connections with what they are learning in the classroom, and expand learning beyond the classroom subjects (Kisiel, 2007). Schools often support field trips to institutions such as zoos, planetariums, aquariums, museums, and botanical gardens. They are ideal for increasing students' experiences and perceptions of organisms and their habitats.

Field trips provide students with opportunities to apply content learned in the classroom to context outside of the school environment. The hope is that students will enhance their understanding and retention of knowledge (Nadelson and Jordan, 2012). Field trips expand the opportunities for students to transfer, apply, or anchor knowledge which provides the justification for using field trips for learning (Nadelson and Jordan, 2012).

Hands-on learning experiences greatly contribute to deeper understanding and perceptions of relationships between animals, plants, and their habitat. Active learning during a field trip supports a constructivist approach to learning which asserts that students who are actively engaged in the process of seeking knowledge are more likely to understand and grasp the idea at hand (Orion and Hofstein, 1997). Hands-on experiences encourage visitors to interact with artifacts and exhibits. The objectives of educational institutions are to connect the curriculum of formal education to the present and past (Peacock and Pratt, 2011).

Field trips have shown to be an effective way to increase students' views of biology as a school subject and their awareness toward environmental protection (Prokop et al., 2007). Field trips to nature centers and botanical gardens encourage an environmentally responsible culture. The purpose of institutions such as nature centers and botanical gardens are to educate the public about the environment. The goal of environmental education is to develop environmentally

literate adults. An obstacle which prevents the development of environmentally responsible adults is a lack of awareness (Hines et al., 1987). Educating adults begins with their early experiences in the outdoors. One function of a botanical garden is to develop public understanding of biodiversity and conservation biology whose foundations are in identifying species (Tunncliffe, 2001). Viewing plants enables visitors to botanical gardens and helps them understand biodiversity and conservation biology.

Objectives

The first objective of this study was to examine differences with respect to knowledge and retention between students who participate in pre- and post-activities versus students who do not participate in activities before and after attending a field trip to a public garden. The second objective of this study was to examine the behavioral differences between students who participate in pre- and post-activities versus students who do not participate in activities while attending a field trip to a public garden.

Assumptions

This research was conducted with elementary school students in the second grade using butterfly biology and ecology as a subject matter model. It was assumed that none of the students had participated in formal butterfly education before participating in the study.

It was assumed that the assessment tool was presented and administered to the participating students impartially.

It was assumed that all students participated in the pre- and post-testing.

It was assumed that the assessment tool was administered fairly and that each student answered the test independently.

It was assumed that the pre-tests were administered before the treatment began and that the post-tests were administered after the treatment ended.

It was assumed that all participating students answered the assessment tool truthfully and to the best of their ability.

It was assumed that all participating students attended the field trip to Huntsville Botanical Garden.

Limitations

This study was limited to the schools and students who voluntarily agreed to participate in the study and therefore, lacked randomization. The study was also limited to the second grade level based on the type of field trip available at Huntsville Botanical Garden. For this reason, the study did not include all the students at the participating schools. Because of the voluntary nature of participation, the students tested may have varied in their responses due to different backgrounds, histories, and experiences.

Delimitations

The population of this study was delimited to those schools and students who voluntarily agreed to participate in the study during fall of 2015 and the 2016 academic school year in the Huntsville/Madison, Alabama area.

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CHAPTER II

REVIEW OF LITERATURE

The literature reviewed in this chapter is based on the following topics: a general history of school gardening, school gardening research, followed by the subject areas of this study- learning on field trips, correlation of environmental education and environmentally responsible adults, and field trips studies to gardens and arboreta.

School Gardening History

School gardening is a long standing practice which can trace its formal roots to the Sixteenth Century. Johann A. Comenius (1592-1620), a Moravian monk, philosopher, and educator, believed education should be universal, practical, and innovative (Subramaniam, 2002). He argued education should not only be about the subjects, but also the socialization of children. He believed gardens should be connected with the school, where children can have the chance to leisurely enjoy and learn to appreciate trees, flowers, and herbs.

One hundred years after Comenius, Jean-Jacques Rousseau (1712-1778) emphasized the importance of nature as a child's greatest teacher and that his or her knowledge of the natural world serves as a foundation for later learning (Subramaniam, 2002). He recommended gardens for educational purposes in Central Europe. Later, Johann Pestalozzi (1746-1827) expanded Comenius and Rousseau's position by starting a school using gardening, farming, and home skills as practical education. As an admirer of Pestalozzi's principles, Friedrich Frobel (1782-1852) took Pestalozzi's teachings one step further and incorporated "doing" as well as observing which was not only mechanical, but creative. In 1811, Prussia was the first country to

include school gardening in a curriculum and in 1869 school gardens became mandated by William I and the law was enforced by Erasmus Schwab.

Maria Montessori (1870-1952) was one of the first educators to recognize that children are experiential learners (Montessori, 1912). She created learning environments called child-centered classrooms, meaning the child created their own knowledge. Montessori worked with children in the poor neighborhoods of Rome, Italy, with the purpose of preventing vandalism among the children in their neighborhoods. Montessori came to believe that teaching children to work in a garden would lead them to contemplate nature intelligently and improve their moral education. She later wrote about her experiences and came to the conclusion, “A child’s participation in gardens fosters the first notions of household life” (Montessori, 1912). Most people would agree that participation in a classroom garden is a “good thing” for children. The benefits of classroom gardening are numerous. Documented academic benefits include: math, science, English, and art skills. Nonacademic benefits include: improved nutritional status, stimulating creativity, encouraging leadership and volunteerism, and promoting beautification. Self-esteem is enhanced through caring for plants and doing tasks that promote an appreciation of living things (Mullen et al., 2012).

Great Britain took steps to teach children the importance of gardening and their natural environment. The origins of the conservation movement in Great Britain began in the late Nineteenth Century, when organizations for the preservation of commons, open spaces, and footpaths, the Royal Society for the Protection of Birds, and the National Trust were established (Marsden, 1998).

An influx of immigrants from Eastern Europe and Ireland in the late Nineteenth Century caused cities, such as London, to swell in population. Some citizens argued for a 'back to the land' solution to remove deprived people from the overcrowded cities and towns (Marsden, 1998). There were rifts between the social class system which in turn affected the education system in Great Britain. There was controversy over what the education system should provide. Some believed the role of education was to provide purpose-built schools suitable for segregating officer classes, "men of broad mind," "from the lower class," and "from the commoner" (Marsden, 1998). Others, such as Alfred Davies supported aesthetic education. He believed in beautification of school playgrounds and classrooms. He stated in his book, *The Cult of the Beautification in the School*, (Davies, 1912) "Surely, a rustic pergola, especially if made by the children themselves, and the sight of rambler roses in full bloom upon it, would do more to arouse a love of the beautiful in the young than any amount of cold types in your Country Readers or Nature-study books." Davies also supported the idea that students should celebrate St. David's day planting shade trees and evergreens (Marsden, 1998).

The School of Nature Study Union was formed in 1903 in London. The purpose was to place students in firsthand relationships with living organisms and the natural environment. Nature study was approved for its contribution to citizenship and health education. Branches of the school had social, moral, industrial, and aesthetic values. School gardening contributed to nature study as well. It is said that school gardening awakened interests and desires that helped in the formation of good habits, health, and profitable employment for the future (Marsden, 1998).

In Great Britain, after the outbreak of World War I, school gardening became even more embedded in the school curriculum. The League of Young Patriots was formed to fulfill the

desire of children to work for their country. Children were shown as able to help in the war effort by assisting in harvests and tending domestic gardens to replace the labor which had gone to serve their country in continental Europe (Marsden, 1998). Other themes and organizations spawned from The League of Young Patriots included: The Garden as a Munition Factory, A Corner for France in Every School Garden, and The Infant School Garden as an Aid to Food Production (Marsden, 1998). The Boards of Education and Agriculture combined their resources to train teachers and provide educational material for students to effectively produce crops and practice good conservation habits (Marsden, 1998). After World War I ended, schools aligned gardening practices with more biology teachings and health instruction (Marsden, 1998).

In 1903, Australia joined the school gardening movement. The Australian school gardening movement was greatly influenced by the Australian Natives Association. The Association promoted school gardening as a concern for the stewardship of nature, connections between nature, hard work, and moral development (Subramaniam, 2002). In India, Mahatma Gandhi (1869-1948) believed that natural and rural environments were important for the education of children. He believed that education should be expanded beyond the four walls of the classroom. Gandhi developed self-sufficient schools in low-income communities which did not have the financial backing of government. He believed that simple agricultural practices could be used in an educational context (Subramaniam, 2002).

In 1890, the Massachusetts Horticulture Society sent Henry Lincoln Clapp to study the School Gardens of Europe. When Clapp returned he began a wildflower garden which adjoined his school, the George Puttnam School of Roxbury. The wildflower garden was first used for

student observation, but to engage students in more activity, Clapp acquired a vacant lot where he taught students to create pathways, beds, plant, and maintain the garden (Kohlstedt, 2008).

Another American educator at the turn of the Twentieth Century, John Dewey (1859-1952), proposed ideas about integrating school and society. He worked to integrate classroom learning and students' natural environment. Dewey encouraged teachers to connect ideas to practical elements within the curriculum (Kohlstedt, 2008). Dewey referred to the school gardening movement as a movement towards freedom in the child's school with an environmental outlook (Subramaniam, 2002). He believed the purpose of school gardens was not to create more gardeners, but as an avenue to teach students broader subjects such as chemistry, physics, biology, math, and history (Subramaniam, 2002).

Due to mass immigration of foreigners and citizens from rural communities to cities, in the United States. Cities became dirty, over crowded, rampant with disease, and nature-deprived (Marsden, 1998). The School Gardening Movement and conservation efforts became heightened as part of social reform movements to combat the problems in the cities. An advocate for the School Gardening Movement was Wilber Jackman of the Cook County Normal School in Chicago, Illinois. School gardening gained public attention and credibility when the Committee of Ten of the National Education Association in 1893 endorsed it as the appropriate preparation for high school sciences (Kohlstedt, 2008).

Francis Parker also at Cook County Normal School, spread school gardening to the Midwestern United States and beyond. His initial idea was to have students grow their own plants, however the popularity of the project was enormous. Parents were encouraged to establish similar spaces at their homes to encourage "local pride" (Kohlstedt, 2008). The

American Civic Association (ACA), promoted the “City Beautification” initiative. The ACA believed the quality of environment reflected the behavior of the people who lived in a community. The beauty or ugliness of the surroundings affected a community’s moral standing according to the ACA (Marsden, 1998).

By 1918 school gardens were established in every state. During World War I over one million students contributed to the production of food. After World War I there was a slight decline in school gardens, however a reemergence of school gardens came during World War II as Victory Gardens. Following World War II, there was a 20-year gap from 1944 to 1964. Athletic fields began to replace school gardening plots. As an offshoot of education reform and the environmental movement in the 1960s and 1970s, school gardening reemerged again as a progressive, interactive educational link between humanity and the environment (Subramaniam, 2002). School gardening has gained public support since the 1970s. In 1993, the American Horticultural Society hosted its first symposium based on child and school gardening which was entitled “Children, Plants, and Gardens: Educational Opportunities.” The goal of the symposium was to recognize school gardening and the educational effects school gardening has on curricula (Subramaniam, 2002). In the past 25 years’ school gardening has increased in the United States. States such as Texas and California have actively encouraged school gardening by providing curriculum and evaluated research (Blair, 2009). In California, 57 percent of school principals said their schools had some type of instructional garden or plantings. Southeastern states such as Florida, Louisiana, and South Carolina have programs which promote school gardening (Blair, 2009). In the northeastern United States, Vermont leads the school gardening movement by

partnering with the National Gardening Association (Blair, 2009). Current use of school gardens is for intellectual, emotional, aesthetic, spiritual, and social purposes (Subramaniam, 2002).

School Gardening Research

School gardening research has been conducted across the United States. Purposes for the research varies from cognitive to behavioral differences. The following narratives offer an overview of some of the school gardening studies.

In the academic year of 1993-1994 a study, in San Antonio, Texas, was conducted to evaluate the benefits of participation in the Classroom Garden Project, report findings, and make suggestions for future evaluative research in this area (Alexander et al., 1995). Out of the 10,000 participants in the Classroom Garden Project, data was collected from 52 second and third grade students from the San Antonio Independent School District. The study conducted qualitative interviews with children, parents, teachers, a Master Gardener, and a school principal on positive effects and drawbacks to the Classroom Garden Project.

In total, 5 classrooms were used for data collection. Three of the classes were involved in the Classroom Gardening Project while the two other classes were not involved. Seventy percent of the participants were Hispanic, many from single parent homes. The interview questions were open-ended and included two questions specifically for adults and two questions asked to both children and adults. Questions were: “What are the effects of gardening on the children?”, “What are the changes you’ve noticed in the children?”, “What are the good things about the gardens?”, and “What are the bad things about the gardens?”. The interviews were videotaped, transcribed, and evaluated for emerging themes.

From the interviews, six themes emerged which included: moral development, academic learning, parent/child/community interaction, pleasant experiences, the influence of the Master Gardener, and perceived problems. The data indicated that the garden project positively affected the school children (Alexander et al., 1995). Perceived problems of the Classroom Garden Project mostly revolved around garden vandalism, limited time during the regular school day, and limited number of participants in the study. Vandalism was a concern due to a lack of security of the garden property, but it was nothing that could not be fixed or replanted. The children learned a valuable lesson due to the vandalism. The value of living things and the frustration when things of value are ruined out of neglect or meanness.

A study conducted by Klemmer et al., 2005 examined the differences between third, fourth, and fifth grade students who participated in school gardening activities. The experimental groups participated in activities throughout the school year and control groups were taught science through traditional classroom-based methods. There were 647 students who participated in the Texas based study. The experimental group had 453 participants and the control group had 194 participants. The experimental group used hands-on garden activities to learn science concepts instead of traditional curriculum methods. Teachers were encouraged to use gardening to the fullest extent in their classroom curriculum. To evaluate the students, grade appropriate tests were given to each participant. The experimental group had a mean score of 53.1 out of a possible 100 points and the control group mean score was 47.4 points out of 100. The experimental group scored 5.6 points higher on the science achievement test compared to the control group. Students who participated in hands-on gardening activities had higher science achievement score than those who did not. This suggests that hands-on learning serves as living

laboratories in which students can view what they are learning and apply that knowledge to everyday life.

Understanding attitude and behavior toward plants are essential when comparing people and plant relationships. A study was conducted in Slovakia which focused on the initial psychometric assessment of plant attitude. Participants ranged in age from 10 to 15 years old. This particular age range was chosen because of the importance in development of children's cognitive abilities and their ecological awareness of the roles of animals and plants. To conduct the study, each participant was given a questionnaire which included demographic characteristics such as age and gender. Participants were also asked about their present and past experiences with plants. For example, students were asked, "Do you have a garden at home?" Students completed the Plant Attitude Scale (PAS). The PAS used a Likert-Scale ranging from 1 (strongly agree) to 5 (strongly disagree). Results of the study concluded that Slovakian children attitudes towards plants were neutral. The importance of plants was relatively positive, interest in plants showed the lowest mean score. Overall, children who live with families that have gardens have an increased positive attitude towards plants. It was suggested that children who encounter nature early have a more positive attitude toward plants (Fancovicova and Prokop, 2010).

In 1996, a study was conducted to determine the factors that promote the successful use of gardening with in an elementary school curriculum (DeMarco et al., 1999). The study was conducted across the United States through the National Gardening Association. Survey questions asked participants to list which factors were the most essential to the success of gardening curricula. Of the 315 surveys sent across the United States to educators, 236 were usable. The top three factors include: student and faculty ownership or commitment to integrate

gardening into the curriculum, availability of physical resources, and faculty knowledge and skill in using gardening as a method to enhance the curriculum. The results of this study indicate teachers must be willing to make the commitment of time and energy to school gardening. He or she must recognize and believe that gardening is a valuable tool to enhance the curricula. To achieve this goal, the horticulture community needs to provide opportunities to promote school gardening. For example, training opportunities for educators at botanical gardens or arboreta would likely increase the integration of gardening into the classroom curricula. Using gardening as a teaching tool is critical to the future of the horticulture industry. Exposing children to school gardening at a young age creates an avenue for cultivating future gardeners, horticulturalist, and conservationists by orienting their attention at an early age.

Learning Styles and Gender

In a study done in 2009 by Dr. Sarah Carrier of North Carolina State University, the impact of environmental education lessons in the schoolyard versus those within the traditional classroom were examined (Carrier, 2009). Participants were fourth and fifth grade students from the southeastern United States. Students were placed into either a treatment or control group. The control groups were placed in a traditional classroom setting and the experimental group was placed in the schoolyard setting. Each group had at least one fourth and one fifth grade class. The study analyzed four variable outcomes of participants' knowledge, attitudes, behaviors, and comfort levels using a multivariate analysis. Boys tested higher in the outdoor treatment group than in the traditional classroom curriculum for all four variable outcomes (Carrier, 2009).

Research on gender differences in students' learning styles indicated that girls traditionally performed better in a classroom environment (Carrier, 2009). Girls were described

as verbal-emotive, able to sit still, and able to multitask. Boys' learning style was impulsive, special-kinesthetic learning, and physically more aggressive. Early research has indicated that boys need more action-oriented activities to keep them engaged in the subject matter. The intent of the research was to explore the potential for outdoor strategies to meet the special needs of boys in environmental science.

The results of the study indicated that boys scored higher on attitudes and behavior than girls in the treatment group (Carrier, 2009). The treatment group participated in activities in the schoolyard. Both boys and girls increased their knowledge scores more in the treatment than the traditional classroom group. Boys increased their environmental attitude in the schoolyard setting treatment over the control, traditional classroom setting, however girls' attitudes were not significantly different. Overall, the groups increased their behavior scores, but boys improved significantly more in the treatment group when compared to girls in the treatment group. Boys increased their comfort zone scores in the treatment group versus the traditional group, however girls were not statistically significant.

A study conducted in the academic year of 2000-2001 in Temple, Texas by professors Klemmer, Waliczek, and Zajicek acknowledged both male and female scores were significantly higher in the experimental group than the control group (Klemmer et al., 2005). The participants included third, fourth, and fifth grade classes. Teachers were trained and received copies of the school gardening curriculum handbook provided by Texas Extension. The control groups received the curriculum towards the end of the academic year and the experimental group received the curriculum at the beginning of the academic year. The experimental groups were asked to incorporate the curriculum throughout the academic year. The purpose of the study was

to assess possible differences between students who were taught an entire academic year using school gardening curriculum versus students who were taught only part of the academic year using the school gardening curriculum. The average mean score for females in both the experimental and control groups were higher than the males. The research indicates that hands-on gardening activities did not differ between male and female, but rather it showed that both groups benefitted from the hands-on activities. Similar to Carrier's research, males were shown to have benefitted the most from the hands-on gardening activities, whereas, females were more inclined to benefit from a traditional-classroom setting.

Research suggests that females prefer to study plants and botany over males (Prokop et al., 2007). However, in the study performed by Fancovicova and Prokop in 2010, there were no differences in student attitudes towards plants. A possible reason for the lack of gender differences could be because students are mainly attracted by noticeable features of the plants such as fruit or flower or that the sample groups were too homogenous (Fancovicova and Prokop, 2010). The homogenous groups, meant for example, participants all came from a similar urban or rural background which affected their attitudes towards plants.

Correlation between Environmental Education and an Environmentally Responsible

Future

The goal of environmental education is to develop environmentally literate adults. According to research by Hines and others in 1987, an obstacle which prevents the development of environmentally responsible adults is a lack of awareness (Hines et al., 1987). The study attempted to address concerns for environmentally responsible future. The goals of the study were to analyze and synthesize environmental behavior research, identify variables which

research indicated was most strongly associated with responsible behavior, determine strength of the relationship between variables, and form a model of environmental behavior representative of the findings.

One hundred twenty-eight studies were analyzed and comprised as data for the research. Analysis of the studies resulted in five variable categories such as: cognitive, psycho-social, demographic, behavioral intervention approaches, and classroom strategies aimed at encouraging responsible environmental behavior (Hines et al., 1987). Multiple factors indicated whether a child would be environmentally responsible. The factors include: personality, knowledge of environmental issue, knowledge of action strategies, action skills, and intention to act play a role in whether a person will exhibit responsible environmental behavior.

Why use Field Trips for Learning

Science educators in many countries have expressed concerns that current curricula in schools, especially with students between the ages of 14 and 16 have lost interest in science (Braund and Reiss, 2006). Their claim is the current curriculum is too boring, irrelevant, outdated, and designed to educate a minority of future scientists rather than equipping the majority with scientific understanding, reasoning, and literacy. There is a constant struggle for the attention of the student during the school day as well as after school. There are now so many extracurricular activities for students, that often times science clubs and organizations do not meet the required student enrollment (Caccavale, 2016).

Students spend about two-thirds of their waking lives outside of the formal school environment yet educators tend to ignore, or at least down play the crucial influential experiences outside of school which shape a students' knowledge, understanding, beliefs,

attitudes, and motivation to learn (Braund and Reiss, 2006). Out of 11 alternative strategies for learning science, field trips are ranked at the top as the most enjoyable by students (Braund and Reiss, 2006).

Traditionally, places such as museums, botanical gardens, and zoos have acted as storehouses for specimens and artifacts (Braund and Reiss, 2006). These collections provide opportunities for students to view, and in some cases touch the specimens and artifacts. However, drawbacks to field trips are that they are potentially expensive, time-consuming to organize, typically require administrative involvement, and can be perceived as encumbering unnecessary liability (Coughlin, 2010).

To illustrate how learning can be achieved outside of the traditional classroom setting Braund and Reiss, conducted a study in 2006 in the United Kingdom using three different field trip laboratory locations (Braund and Reiss, 2006). The laboratories included: museums, botanical gardens, and chemistry trails. Results of the study concluded students were able to better connect with the subjects such as earth science, chemistry, and physics by attending the field trip to the “outside laboratory” than in the traditional classroom-setting.

In a study conducted in 2010 by Patricia Coughlin, students, teachers, and chaperones participated in a field trip to a local historical schoolhouse in Pennsylvania (Coughlin, 2010). Two hundred third graders participated in the study. Three components made up the research project: pre-visit lessons, field trip, and a post-visit lesson. Two pre-visit lessons were used to build background knowledge and provide visiting classes with a focus for their learning before the field trip. In the first lesson students listened to a story entitled, “A Country Schoolhouse,” which tells the story of a child and his grandfather’s country schoolhouse. The second lesson was

an artifact activity. Teachers had students put school artifacts in the appropriate chronological order from oldest to present day.

The second component of the research project was the field trip itself to the Franklin-Lutz schoolhouse. The third component of the research project is a post-visit lesson. Teachers had their students either do a report on their visit to the Franklin-Lutz Schoolhouse or interview someone who lived during the time of the Franklin-Lutz Schoolhouse. Results of the study concluded that the field trip was relevant to student learning and the quality and number of activities and lessons were appropriate for their students. Field trips are a valuable teaching tool. This teaching tool is strengthened by careful, purposeful planning and evaluation by teachers and site educators. Field trips can be enjoyable, but they must also be educational, integrative, and worthwhile.

Learning on Field Trips

In 2011, Alan Peacock and Nick Pratt evaluated how young people respond to learning spaces outside school. The research focused on educational institutions such as museums, botanical gardens, and science centers. Research was drawn to illustrate how design, culture, educational strategies, and setting affect the way students respond to field trips (Peacock and Pratt, 2011). Education at institutions are mostly hands-on, in the sense that they encourage visitors to interact with artifacts and exhibits. The objective of educational institutions is to link the curriculum of formal education particularly students between the ages of 5 and 16 years old (Peacock and Pratt, 2011).

Layout and setting can play a positive or negative role in students' learning (Peacock and Pratt, 2011). A negative perception of setting and layout would be a large building. For example,

the Eden Project in Cornwall, UK has two domes built into a cliff which houses tropical and Mediterranean plants. The buildings are so large and eye-catching that they can make the plants inside them seem unimportant. When children were asked for their most significant memory from that particular field trip, it was the tram which took them to the buildings. A positive perception of layout would be structured trails and pre-determined routes. By limiting travel confusion, students, teachers, and other visitors can move through an institution's exhibits with ease. When students took a field trip to the Carymoor Environment Center located in Castle Cary, United Kingdom, students were able to move efficiently through the exhibits. The Carymoor Environment Center teaches about recycling and waste.

Cultural differences influence students' learning (Peacock and Pratt, 2011). People conceive ideas such as "nature" differently from culture to culture. For example, environments which aim to communicate about plants, landscape, fossils, or physical process must have a clear idea about their "message." The potential for different interpretations exists among visitors from a range of sociocultural backgrounds. A culture operates within a set of practices that have norms. An education institution can be seen as places in which different cultural practices and norms come into contact. Educational institutions also strive to create cultural experiences to maximize learning.

Educational strategies at educational institutions often vary between each institution (Peacock and Pratt, 2011). Some institutions are task-oriented while others are learner-oriented. An example of a task-oriented field trip would be the Eden Project. Within five minutes of students arriving, they were given a worksheet to complete. The task-oriented strategy can often distract students from the "Wow!" experience because they are focused on finishing their

worksheet. On the other hand, learner-oriented strategies offer students a more holistic and informal structure. Research done at the Eden Project in 2011, revealed that students outside of a classroom setting learned best through their own observation. Effective learning in these contexts happens when a child is enabled to identify things that are both do-able and worth doing, which can lead to positive action.

Benefits of Field Trips

Field trips are ideal for increasing students' experiences and perceptions of organisms and their habitats. In a study done in Slovakia, researchers conducted a one-day field trip for both improving students' knowledge in ecology and for examining short-term effects of field trips (Prokop et al., 2007). Sixth grade students from one urban school and two rural schools participated in the study. The control groups learned field trip information in a traditional classroom setting, whereas, the experimental groups took a field trip to three different ecosystems: freshwater, meadow, and wood. Two months before the field trip the students were surveyed about their favorite subject, interest in animals and plants, and experience on field trips. The results of the survey concluded that there was no difference among the control and experimental groups at the beginning of the project. However, in the post-testing it was found that the attitudes of students in the experimental groups who participated in the field trip significantly increased whereas students in the control group remained unaffected. Field trips should focus on interactions between the students and the environment. Hands-on experiences in various ecosystems greatly contribute to deeper understanding and perceptions of relationships between animals, plants, and their habitat. Field trips are an effective way to increase students' views of biology as school subject and their awareness toward environmental protection.

Field trips provide students with opportunities to apply content learned in the classroom to context outside of the school environment. The hope is that students will enhance their understanding and retention knowledge. Field trips expand the opportunities for students to transfer, apply, or anchor knowledge which provides the justification for using field trips for learning. However, the benefits of field trips may be influenced by the nature of the experience and less by the exposure to content. In a study done by Nadelson and Jordan in 2012, 111 sixth grade students recalled the activities and attitudes of a day long environmental awareness field trip event. The event was called “Outside Day” and some of the activities during the event were observation and other activities were hands-on. The objective for “Outside Day” was to provide the sixth grade students with a positive experience and greater appreciation of nature through interactive outdoor games, learning activities, demonstrations, presentations, and being outside. “Outside Day” took place at a local park that was primarily chosen for its proximity to the schools from which the participating students’ in the study were drawn (Nadelson and Jordan, 2012).

Instead of a survey, researchers went to each classroom of participating students’ after the experience (Nadelson and Jordan, 2012). The students were asked to recall what took place at the “Outside Day” event. The results of the study found that participants’ had an overall positive attitude toward the “Outside Day” event due to the content and less by the social aspect (Nadelson and Jordan, 2012). The recollection rates of “Outside Day” ranged from 0% to 41% recollection. The lowest recollection rates were activities that occurred as a display, demonstration, or presentation. The highest recollection rates were activities which featured hands-on interactive experiences.

Science teaching is predominantly conducted in three types of learning environments: classroom, laboratory, and outdoors. The outdoor environment is one of the least used areas for teaching (Orion and Hofstein, 1996). A field trip in an outdoor environment can be an integral part of a curriculum. When used as part of the curriculum it is important to prepare the students before attending the field trip and it is also important to have the field trip in place early in the learning sequence to provide a concrete basis for understanding abstract ideas. Field trips not only promote student academic success; they also have the opportunity to strengthen the social relationships among students.

The purpose of the study done by Orion and Hofstein (1996) was to describe the development and validation of the Science Outdoor Learning Environment Inventory (SOLEI) instrument used to assess learning environments of science studied in the outdoors. A total of 643 high school students from Israel participated in the research project. The students participated in three different types of field trips and three disciplines of science were used to assess the SOLEI instrument. The three science disciplines incorporated in the instrument were earth science, biology, and chemistry.

Differences among the field trips were active versus passive learning. Students who participated in the biology and earth science field trips were engaged in active learning (Orion and Hofstein, 1996). Students who attended the chemistry field trip were engaged in passive learning. Students who were actively involved in the earth science and biology outdoor events experience a more positive learning environment versus the students who were a part of the indoor chemistry lecture event. Active learning during a field trip supports a constructivist learning approach which states, students who are actively engaged in the process of knowledge

are more likely to understand and grasp the concept at hand. Constructivist learning was developed by Dr. Jean Piaget (1896-1980), a Swiss physiologist whose primary research was in the development of knowledge. His work with genetic epistemology (the origins of thinking) earned him numerous awards and accolades. Piaget was the first physiologist to make a systematic study of cognitive development. He contributed to the theory of child cognitive development which showed that children think differently from adults (Smith, 2000). Piaget believed children are born with a very basic mental structure on which all subsequent learning and knowledge is based (McLeod, 2011).

In a 2005 study by James Kisiel, the motivations of teachers to take their students on field trips were explained. Eight motivations were identified which included: connecting with classroom curriculum, providing general learning experiences, encouraging lifelong learning, enhancing interest and motivation, providing exposure to new experiences, and meeting school expectations. The participating teachers believed the hands-on experiences of specific exhibits of the museum itself enhanced student understanding of the curriculum (Kisiel, 2005). According to the National Science Education Standards set by the National Research Council, museums and science centers can contribute greatly to the understanding of science and encourage students to further their interests outside of school. This view corresponds with the identified benefits of field trips as part of the educational experience of a child. Field trips have a long-lasting affect both cognitive and sociocultural student memories (Kisiel, 2005).

Field Trips to Gardens and Arboretums

Children learn about animals and plants from an early age (Keil, 1979). Plants are a part of the scenery both inside and outside. Children have an understanding of plants which

contributes to their understanding of nature; however, they gradually adopt the adult attitude that vegetation is either worthless or utilitarian (Schneckloth, 1989). Typically, children first learn about plants from their family members and school is not typically the source of a child's knowledge of plants (Tunnicliffe and Reiss, 2000). Students admit learning little from books or media, most children noticed plants from everyday observations (Tunnicliffe and Reiss, 2000).

One function of a botanical garden is to develop the public understanding of biodiversity and conservation biology whose foundations are in identifying species (Tunnicliffe, 2001). Viewing plants enables visitors to botanical gardens better understand biodiversity and conservation biology. Listening to the conversations of visitors and analyzing their conversations is one way to tell if visitors are gaining information from their visit to a botanical garden.

A study conducted in 2001 at the Royal Botanical Gardens, Kew in London, England to determine if school groups named the plants, talked about their structures and physiology, or talked about aesthetic or utilitarian value in their conversations (Tunnicliffe, 2001). The conversations of participants, education directors and programmers pinpointed teaching opportunities to tailor education programs to fit the needs of elementary-age children. Results of the study concluded that 67% named the plant in some fashion, 50% of the groups talked about specific features of the plants, and 7% of the conversations did not mention the plants. In the findings, the research has noted that elementary-age children focus on particular parts of plants including: leaves, prickly stems, colorful flowers, fruit, and patterns of the leaves. Functions of the plants are hardly mentioned, but some conversations did mention seed production and

acquiring food. For botanical garden staff and educators, the results of the study meant more emphasis is needed on plant function.

A study at Arnold Arboretum in Boston, Massachusetts was conducted with 121 preschoolers that participated in three guided field trips to the arboretum (Hoisington et al., 2010). The main objectives of the project were to promote exploration, discussion, and science education. Researchers focused their attention on supporting children's use of three specific skills: exploring, representing, and engaging in science talks. Many of the participants had limited experience in the outdoors, but researchers were surprised by the children's willingness to make close observations, discuss their observations, and generate ideas about what they had observed. In the context of multiple visits, knowledge of plants and wildlife increased with each visit to the arboretum. Researchers compared drawings by participants from the first field trip to the third field trip and revealed a gradual increase in their abilities to represent what they observed. For example, during the first field trip many of the drawings did not include roots or root structure, but by third field trip drawings indicated root structure. Comments from teachers reported children had learned plant names, proper use of a magnifying glass, and an increased ability to explain discoveries made at the arboretum.

At the University of Wisconsin-Madison Arboretum, Fox Prairie Elementary School's fourth grade class participated in a study on trees and wood-inhabiting insects during the 2004-2005 academic year (Biggs et al., 2006). The study included three educator-led group discussions, five hands-on periods, and students collected and recorded insect data in the classroom. Students integrated knowledge and information from a range of disciplines: strengthened cooperative skills by taking turns recording data, sharing equipment, and agreeing

on names for the species that they found. The project revealed a pairing of science teaching with in-class research enhanced the learning of the students.

In 2003, a three-day program offered at Slayton Arboretum entitled “Art in the Garden” was offered to children between the ages of 8 and 12 (Betz, 2004). The program helped children explore the arboretum from naturalist and artist perspectives. The main objective of the program was for children to spend time in the outdoors, understand the importance of connecting with nature, and appreciate the natural communities in which they live and play on a daily basis. The program used three main themes: Use of senses, observation and appreciation of differences in the world, and use of imagination. At the end of the three-day program children and instructors were given a chance to give their opinion. The program is still a part of the annual events at Slayton Arboretum.

Successful field trip programing and marketing is often measured by qualitative research. Using non-participatory observation in field collecting, analyzing program documents and records, and interviewing alumni, as well as current and former staff members at Brooklyn Botanical Garden, researchers were able to measure the success of the Project Green Reach Program (PGR) at Brooklyn Botanical Garden (Morgan et al., 2009). Project Green Reach is an outreach program for kindergarten through eighth grade teachers and their classes from Brooklyn's Title I schools. The goal of the study was to determine if there are long-term effects of hands-on gardening activities from youth to adulthood and the extent of the role the public garden plays in educating young people about plants. Researchers found PGR was a positive experience for participants, through hands-on activities, especially for those who came from a

low socioeconomic background. Participants learned more about plants, sustainability, and how to grow food as the result of attending the program.

In 2002, another study was conducted in the New York metropolitan area by Stephanie Pace and Dr. Roger Tesi (2004) through William Paterson University with four men and four women between the ages of 25 and 31. The purpose of the study was to capture the lasting effects of field trip experiences on the participants' education and life. Data were collected using interviews which lasted approximately 35 minutes (Pace and Tesi, 2004). At the conclusion of the interviews, 12 reoccurring topics were analyzed. One of the 12 topics that emerged was hands-on activities. Seven out of the eight participants said hands-on activities were a part of their experience on the memorable field trip. The study concluded a lack of hands-on activities and involvement on the field trip made experiences less valuable from an educational standpoint. The article maintained that field trips with real-life experiences, with which students can connect, will resonate more with the participants.

Field Trips to Other Types of Museums

Education, conservation, and outreach are shared missions among museums, zoos, aquariums, and public gardens. The impact of zoos and aquariums on education, understanding, and attitude toward conservation with adults was studied by the Association of Zoos and Aquariums (AZA) (Falk et al., 2007). The study was conducted over a three-year period with 12 AZA accredited institutions, and over 5,500 visitors participating in the study. Researchers stated two objectives for the project. The first objective focused on the visitors' motivation for visiting an institution, and the second objective focused on short and long-term conservation attitudes and knowledge of visitors. Results of the study concluded visitors arrive at zoos and aquariums

with specific motivations, and the motivations directly relate to the experience. Ten percent of visitors showed significant changes in their conservation knowledge. Sixty-one percent believed zoos and aquariums reinforced their value and attitudes towards conservation. Forty-two percent of visitors believed zoos and aquariums are important to conservation education and animal care and 57% of visitors expressed that the experience strengthened their connection to nature.

In another study, elementary school students participated in activities while on a field trip to the zoo to keep them engaged in learning (Scott and Matthews, 2010). By using the hands-on activities students explored their ideas about wildlife and built on these ideas both before and after the field trip to the zoo. Teachers used books and websites for student research before attending the field trip. During the field trip chaperones encouraged students to find information on the zoo exhibit signs. Results of the studies showed that hands-on activities boosted student learning comprehension. The zoo was not only a place for exploration and creating curiosity, but also a good setting for meaningful science instruction. Teachers take students on field trips to enhance the curriculum, make connections to what students are learning in school, and provide students with meaningful learning experiences (Kisiel, 2007).

Summary

From the time of Johann Comenius to today, gardening has been used for science education, environmental education, nutritional education, art education, curiosity, and imagination (Betz, 2004; Kohlstedt, 2000; Marsden, 1998; Mullen et al., 2012; Subramaniam, 2002). Using a hands-on approach with activities allows students to engage and learn more proficiently than through traditional methods (Biggs et al., 2006; Kisiel, 2007; Nadelson and Jordan, 2012; Orion and Hofstein, 1996; Pace and Tesi, 2004; Scott and Matthews, 2010). Field

trips benefit students both socially and academically (Kisiel, 2007; Prokop et al., 2007).

Botanical garden field trips cultivate environmentally responsible adults (Hoisington et al., 2010; Morgan et al., 2009).

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CHAPTER III

METHODOLOGY

Objectives

Objective I:

The first purpose of this study was to examine the knowledge and retention differences between students who participated in pre- and post-activities versus students who did not participate in activities before and after attending a field trip to a public garden.

Objective II:

The second purpose of this study was to examine the behavioral differences between students who participated in the pre- and post-activities versus students who did not participate in the activities.

Samples

Objective I:

In the fall of 2015, second graders from Huntsville and Madison, Alabama schools participated in the study. Participating schools included Rainbow Elementary School, Endeavor Elementary School, Legacy Elementary School, and Montessori School of Huntsville.

Demographic information was gathered from each of the schools. Ethnicity, gender, and socioeconomic status are reported for each school. Socioeconomic status is represented by participation in the Free and Reduced School Breakfast and Lunch Programs. To qualify for this program in the state of Alabama, the parent or guardian of the child must be a resident of Alabama. The household must also have a combined annual income of \$37,167 or below for a family of four to qualify for the Alabama School Breakfast and Lunch Program.

Rainbow Elementary School had a total of 844 students attending grades kindergarten through sixth grade. Rainbow Elementary School was 49% male and 51% female. There were seven different ethnicities indicated by students: 60% Caucasian, 19% African American, 9% Asian, 7% Hispanic, 4% Multi-Racial, 0.71% Native American, and 0.24% Pacific Islander. Out of the total student population 4.5% of students received a reduced lunch cost and 6.3% of the students received a free lunch.

Endeavor Elementary School had 747 students attending grades kindergarten through sixth grade. The student population was 50% male and 50% female. The ethnicities of the students were as follows: 66% Caucasian, 22% African American, 4% Native American, 3% Hispanic, 3% Asian, 3% Multi-Racial, and 0.13% Pacific Islander. Out of the total population of students 5.5% of students received a reduced lunch cost and 5.7% of the student population received a free lunch.

Legacy Elementary School had a total of 686 students attending grades kindergarten through sixth grade. Legacy Elementary School was 50% female and 50% male. The ethnicity breakdown of the student population was as follows: 61% Caucasian, 24% African American, 7% Hispanic, 4% Asian, 3% Native American, 0.58% Multi-Racial, and 0.58% Pacific Islander. Out of the total student population 4.7% receive a reduced lunch cost and 5.7% receive a free lunch.

The Montessori School of Huntsville (MSH) educates 119 children from 101 families from as young as eighteen months old through sixth grade year round. The school was 51% male and 49% female. The ethnicity breakdown of the student population is as follows: 72% Caucasian, 9% African American, 8% Multi-Racial, 6% Hispanic, and 5% Asian. Currently,

MSH's families originate from five of the seven continents with nearly 20% of students living in households that speak more than one language. The current tuition rate for an elementary student annually to attend MSH is \$9,052 per year. They do not participate in the School Lunch Program.

Objective II:

The second grade teachers from each of the participating schools were asked to fill out a survey on their class' behavior while on the field trip. Field trip volunteers and members of the Huntsville Botanical Garden (HSVBG) education team were asked to participate in the study by interviewing with the researcher about the students' behavior immediately after the field trip. Field trip volunteers were in charge of at least one class during the field trip. There were 14 teachers and volunteers surveyed. Some volunteers were interviewed multiple times because they led multiple field trips throughout the study.

Instrumentations

Objective I:

Students were evaluated using a demographics survey and knowledge exam. The demographic section included 10 questions pertaining to the participants' gender, ethnicity, if the participant had visited HSVBG, if the participant had studied butterflies and if the participant had been to a butterfly house.

The knowledge exam consisted of 22 questions related to butterfly life cycle and anatomy. The questions used in the exam were from the Indiana State Standards and the Core Knowledge Foundation under the Life Cycles Section (Kepchar and Skillman, 2011). This instrument was used because it was already validated and grade level appropriate, and no

comparable exercise was found in the State of Alabama Science Curriculum. However, the questions satisfy and are similar to the second grade science curriculum which can be found in the Science Curriculum Guide to the State of Alabama (Alabama Course of Study, 2015). In the Life Science section of the Alabama Curriculum Guide students are expected to be able to identify characteristics of animals, including behavior, size, and body covering. Students should be taught to identify animal behaviors and characteristics that help them survive as well as be able to describe physical traits of animals, including color, shape, and size. Additional content to be taught includes the migration and hibernation patterns of animals as survival strategies.

Objective II:

At the beginning of the field trips each teacher was given an open-ended survey to be completed and returned to the researcher at the end of the field trip. The survey included the following questions: 1. “Were your students attentive and engaged during the field trip?”, 2. “Did they seem interested in the butterfly lesson provided by HSVBG?”, 3. “Were the students able to answer the questions of the field trip guide?”, 4. “How was the behavior of your students?”, 5. “What is typical field trip behavior for a class?”, 6. “Was the behavior on this field trip any different from other field trips in the past?”, and 7. “Overall, what was your impression of the class on the field trip?”.

Huntsville Botanical Garden staff and volunteer interviews were conducted onsite by the researcher after the field trip. The following questions were asked to the staff members and volunteers by the researcher: 1. “Were the students engaged and attentive during their field trip?”, 2. “Did the student exhibit typical field trip behavior?”, 3. “What was the behavior of the students

during the field trip?”, 4. “Were the students able to answer your questions?”, and 5. “What was your overall impression of the behavior of the students?”.

Treatments

Objective I:

This study was conducted at each of the elementary schools and Huntsville Botanical Garden (HSVBG), in Huntsville, Alabama during the fall semester of the 2015 academic year. The study consisted of two groups, a control and an experimental group. Both groups participated in the pre-and post-testing and field trips to HSVBG. The experimental groups participated in the pre- and post-activities butterfly field trips and testing, whereas, the control groups only participated in butterfly field trips and testing. This study is a pre-test-post-test control group design. The participants selected were already established into groups making it a quasi-experiment.

Objective II:

The second grade teachers were aware of which classes had participated in the pre-activities. To compare the differences in behavior, field trip volunteers were kept unaware of which classes had participated in the pre-activities.

Activities

The pre-activity focused on the participants’ ability to identify the parts of a butterfly and the stages of metamorphosis of butterflies. All the activities were led by the researcher and completed at the schools during normal school hours. The children’s book, *Are You a Butterfly?* written by Judy Allen, was used to guide the participants through the life cycle stages of butterflies. Participants listened to the story, *Are You a Butterfly?* as it was read aloud. After the

story, the participants and the researcher talked about the life cycle. Participants then made an art project with the butterfly life cycle using pasta noodles, a paper plate, glue, and strip of paper to label the life cycle.

The post-activity focused primarily on butterfly host plants and the anatomical parts of butterflies. First, the participants recalled what they saw, smelled, and felt on their field trip to HSVBG. Second, host plants such as tropical milkweed, parsley, fennel, and butterfly bush were brought into the classroom. The participants were given pieces of the plant to pass around, smell, and touch. Participants learned about plants that butterflies use for nectar, plants preferred for egg laying, and plants for caterpillar feeding. As a group, the participants talked about the different anatomical parts of a butterfly using a drawing similar to the drawing on the tests. Finally, students constructed a butterfly out of coffee filters and clothes pins to take home to promote or further generate discussion.

Field Trips

The Huntsville Botanical Garden currently offers a school field trip for kindergarten through fourth grade students called “Butterflies.” Students satisfy Alabama Course of Study Science Standards in the category labeled “Life Science.” A typical field trip begins with students and teachers gathered in the amphitheater of the garden. In the amphitheater, a member of the education team at HSVBG welcomes and introduces the rules of the garden. In the introduction students are asked questions about butterflies and the butterfly lifecycle. Classes are then split into groups. Each group experience stops at three stations during the field trip. At the first station, the nature center classroom, classes watch a video on Monarch butterflies and their lifecycle. The second station is located at the Nature Center Butterfly House where students

explore and complete a “Search and Find” worksheet. The worksheet consists of pictures that students are required to circle and find in the butterfly house. At the third station, students are led by a volunteer through the perennial and water gardens. Students view carnivorous plants in the perennial garden and feed the fish at the water garden.

Data Collection

Once the participating schools agreed to the terms of the research project, the researcher met with lead teachers from each school in July or August, 2015. Consent forms were sent home with the participants to their parent or guardian in August and September. Pre-testing was done a week before the pre-activities. Pre-activities took place a week before the butterfly field trips and post-activities were done within a week after the field trip. Post-testing was done within a week of the post-activities. The pre- and post-tests were distributed to the participants by the teachers. To ensure confidentiality, the participants’ surveys and tests were coded to match each other. Students who did not return a consent form were dropped from the study, but were not excluded from the field trip.

Data Analyses

The results of the pre- and post-tests and demographic information were entered into Microsoft Excel and SPSS for scoring and analyses. All data were then entered into the Statistical Package for the Social Sciences (SPSS®) for Windows™ Release 23.0 (SPSS, 2015) for evaluation. All missing scores were coded as missing values. The SPSS® procedure “Reliability Analysis” was used to determine the stability of test scores and the internal consistency of the instrument. The SPSS® procedure “Frequencies” was conducted to ascertain descriptive statistics, including central tendencies and percentages. Independent sample t-tests

were calculated to compare the knowledge scores of the experimental groups to those of the control groups. A paired sample t-test was used to compare the experimental groups pre- and post-tests as well as the control groups pre- and post-tests. Additionally, paired and independent samples t-tests with “select cases” and used to determine if there were any connections between the knowledge scores and certain demographics. The alpha level was set a priori at 0.10. In the results section, all differences reported are significant $P=0.10$.

LITERATURE CITATION

Alabama Course of Study-Science. 2015. Alabama State Department of Education. Montgomery, AL.

Kepchar, A. and Skillman. 2011. Butterfly Life Cycle Life Cycle: Indiana State Standards: Science 2.3.1. Indiana State Department of Education. Indianapolis, IN.

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CHAPTER IV

FINDINGS AND DISCUSSION

This chapter contains data regarding the pre-and post-field trip activities of elementary school students who participated in field trips to Huntsville Botanical Garden. This study's first objective was to determine if participants in the pre- and post-field trip activities increased their knowledge. After looking at main effects, interactions of independent variables the activities were assessed. The second objective of this study was to examine the behavioral differences during the field trip between students who participated in supplemental activities versus students who did not participate in supplemental activities.

Objective I: Supplemental Activities Influence on Student Knowledge

Sample Description

Participants in the first part of the study were second graders attending the Madison and Huntsville, Alabama school. There were 17 participating classrooms, 9 of which were experimental and the other 8 were control. A total of 245 students participated in the study with 138 participants in the experimental group and 107 in the control group. The SPSS procedure of "Frequency" was conducted to determine distribution of gender, ethnicity, and schools. Slightly more of the participants were male than female. In the experimental group, males represented 51%, females represented 48%, and 1% were unaccounted for. In the control group, males represented 52%, females represented 45%, and 3% were unaccounted for.

The ethnicity of the participants was examined and is shown in Table 2. In the experimental group there were, 64% Caucasian, 18% African American, 10% Multi-Racial, 3%

Asian, 3% Hispanic, and 2% Unaccounted. In the control group there were, 50% Caucasian, 31% African American, 9% Multi-Racial, 5% Asian, 1% Hispanic, and 4% Unaccounted.

The school distribution of the participants was also examined and is shown in Table 3. In the experimental group the schools were represented by, 21% Endeavor, 14% Legacy, 13% Rainbow, and 8% Montessori. In the control group the schools were represented by, 21% Endeavor, 17% Legacy, and 6% Rainbow. Montessori was only part of the experimental group.

With the pre- and post-tests, the researcher attached a survey which asked the participants if they had been to Huntsville Botanical Garden (HSVVG) (Table 4), if they had studied butterflies (Table 5), and if they had ever been to a butterfly house (Table 6). The questions were asked to determine the experiences of the students. The questions were not statistically examined regarding gender, ethnicity, or school.

Discussion

From the participants' answers to the survey the researcher determined a majority of participants had been to HSVVG, studied butterflies, and been to a butterfly house prior to the study. A participant's prior experience with the subject can influence their knowledge and behavior. In 2010, a study done at Arnold Arboretum found that plant and wildlife knowledge increased after visiting the arboretum three different times (Hoisington et al., 2010). In 1987, a study found knowledge of the environment will influence behavior of a child, therefore predicting the likelihood of an environmentally responsible person (Hines et al., 1987).

The post-test answers to "Have you studied butterflies?" 44% of the students said they had not studied butterflies. The students did not realize they were studying by attending the field trip and participating in the supplemental activities. Similar to previous studies, students do not

believe they are studying when they are not in a traditional classroom setting (Betz, 2004; Biggs et al., 2006; Hoisington et al., 2010; Nadelson and Jordan, 2012).

Main Effects

A paired samples T-test analysis was used to compare the pre -and post-test scores of the experimental group (Table 7). The pre-test mean score was 15.04 and the post-test mean score was 17.31. There were significant differences between the pre-and post-test scores at $p=0.10$, $t(135) = -7.103$, and standard deviations of 4.376 and 3.809.

A paired samples T-test analysis was used to compare the pre-and post-test scores of the control group (Table 8). The pre-test mean score was 15.15 and the post-test mean score was 17.05 of the experimental group. There was a significant difference between the pre-and post-test scores at $p=0.10$, $t(108) = -5.871$, and a standard deviation of 3.908 and 3.470. The mean difference between the test scores was 1.90.

A T-test for independent samples were used determine the differences between the pre-test scores of experimental participants and control participants (Table 9). There were no significant differences between the pre-test scores of the experimental group and control group. The mean scores were not significant at $p=0.10$, $t(243) = -.191$, $t(243) = -.194$, $p=.848$.

T-tests for independent samples were used determine the differences between the post-test scores of the experimental participants and control participants (Table 10). There were no differences between the post-test scores of the experimental group and control group. The mean scores were $p=0.10$, $t(243) = .558$, $t(243) = .564$, $p=.577$, and $p=.573$.

Discussion

Comparisons were made between the experimental and control groups' pre-and post-test scores using both independent and paired samples t-tests. Both the experimental and control groups started at the same knowledge level. The experimental group post-test scores increased after the field trip and supplemental activities. The control group post-test scores increased after the field trip, but without the supplemental activities. One reason that may explain the increase in scores, regardless if the participant was in the experimental or control group, were the hand-on activities performed on the field trips. For example, in the butterfly house the participants completed a search and find worksheet which had them find different types of host plants, butterflies, and other wildlife. It has been reported that the more interactive a field trip is the more likely students will learn from the field trip experience (Biggs et al., 2006; Orion and Hofstein, 1996; Kisiel, 2007; Nadelson and Jordan, 2012; Pace and Tesi 2004; Scott and Matthews, 2010). The supplemental activities did not improve knowledge acquisition and retention compared to the control group. The field trip itself is enough to increase knowledge acquisition and retention regardless of group.

Interaction Effects: Gender

A paired samples t-test was used to determine the differences between the pre-and post-test scores of male and female experimental group participants (Table 11). There were differences between the scores with $p=0.10$, $t(69)=-5.575$, and $t(65)=-4.300$. Both males and females had significant improvement from pre-test to post-test. The males and females in the experimental group had a mean difference of 2.70 and 1.80, respectively.

A paired samples t-test was used to determine the differences between the pre-and post-test scores of the male and female participants in the control group (Table 12). There were

significant differences between the pre- and post-test scores with $p=0.10$, $t(55) = -4.445$, and $t(47) = -3.864$. Both males and females had significant improvement from pre-test to post-test. mean differences between the males and females are 2.036 and 1.875, respectively.

An independent samples T-test analyses compared the pre-test scores of the male and female participants (Table 13). Pre-test scores did not differ between gender in the experimental or control groups. An independent samples t-test analyses compared the post-test scores of the male and female participants (Table 14). Post-test scores did not differ between gender in the experimental or control groups.

Discussion

Comparisons were made between male and female experimental and control groups' pre- and post-test scores. Post-test scores increased for each group, but the male experimental group had the largest numerical increase of 2.70 points. One reason for this larger score increase is males are physical or kinesthetic learners who prefer to be actively doing something. Control group females did score 0.75 points higher than the males. Experimental group females did score 0.02 points higher than the males. Females are more solitary or intrapersonal learners who tend to prefer quiet traditional classroom setting (Carrier, 2009; Klemmer et al., 2005). Young females are developing at a faster rate than young males, therefore their ability to recall information is greater (Carrier, 2009; Klemmer et al., 2005).

Interaction Effects: Ethnicity

A paired samples t-test was performed to analyze the pre-and post-test scores of experimental participants within their ethnicities (Table 15). There were significant increases between pre- and post-tests among all ethnicities except for Asians. However, with an N of 4,

both the Hispanic and Asian results are inconclusive. A paired samples t-test analyzed the differences between the pre-and post-tests of the control group ethnicities (Table 16). There were significant increases between pre- and post-tests among all ethnicities. In the Hispanic control group, N equals 1, therefore results are inconclusive.

An independent samples t-test analysis was used to compare the pre-test mean scores of the participants' ethnicities (Table 17). There were no significant differences between experimental and control groups within the ethnicities. An independent samples t-test analysis was used to compare the post-test mean scores of the participants' ethnicities (Table 18). There were no significant differences within the ethnicities.

Discussion

Comparisons were made among the ethnicities of participants using independent and paired samples t-tests. All of the ethnicities' scores increased from the pre- to the post-tests. There were no significant differences within the ethnicities. Similar results were found in a 2004 study done by Lundberg and Schreiner. Lundberg and Schreiner concluded teacher-student relationships have more of an affect on learning than differences among ethnicity. The ability for the teacher to establish and maintain a relationship with their student is crucial for learning (Lundberg and Schreiner, 2004).

Interaction Effects: School

A paired samples t-test was used to compare the pre- and post-test scores from each schools' experimental group (Table 19). There were significant differences among Rainbow, Legacy, Endeavor Elementary Schools, and Montessori. All groups increased their scores from the pre- to the post-test scores. A paired samples t-test was used to analyze the pre- and post-test

scores of each schools' control group (Table 20). There were significant increases within all schools.

An independent t-test was performed to compare the schools' pre-test mean scores of the treatment groups (Table 21). There were no significant differences between the schools pre-test scores of the experimental and control groups. Montessori only had an experimental group, therefore no comparison could be made. An independent samples t-test was used to compare the schools' post-test scores of the treatment groups (Table 22). Only Endeavor Elementary had significant differences between the schools' post-test scores of the experimental and control groups with $p=0.10$, $t(105)=1.861$. The experimental Endeavor post-test score was 18.52, while the control group scored 17.47.

Discussion

Comparison were made between the pre-and post-test scores of schools. Post-test mean scores significantly increased for each school regardless of being in the experimental or control group. The activities had no effect beyond that of the garden experience. The actual experience of visiting the garden is more important than pre or follow-up. Endeavor Elementary was the only school to show differences between the experimental and control groups' post-test scores. The researcher noted that the Endeavor experimental group teachers were the most engaged teachers. In a 2014 study, researchers found that teacher instruction, behavior, and attitude is a predictor for student behavior and engagement (Scott et al., 2014). The observation made in the Scott, Hirn, and Alter study correlates with the observation of the researcher.

Objective II: Supplemental Activities Influence on Student Behavior

Sample Description

Participants in the second objective of the study were teachers from the participating schools and the staff and volunteers from Huntsville Botanical Garden. Part 1 included, 6 teachers from Legacy Elementary, 4 teachers from Rainbow Elementary, 3 teachers from Endeavor Elementary, and 1 teacher from the Montessori School who were asked to take surveys regarding their students' behavior and experience on the butterfly field trip at Huntsville Botanical Garden. Part 2 included 3 members of the HSVBG education staff and 14 HSVBG field trip volunteers all of whom were interviewed by the researcher. Part 3 of objective II is a comparison and contrast of the responses of teachers, HSVBG staff and volunteers, and researcher.

Teacher surveys were conducted following the field trips and collected after the post-activity. The interviews were conducted in an office or classroom at HSVBG. The teacher survey was 7 questions. The researcher asked 5 to 7 questions during the interviews. During most of the interviews the researcher asked follow-up questions to explain an answer in more detail. Each interview lasted between 5 to 15 minutes and was electronically transcribed during the interview. During the interview the researcher made notes and recorded the information given to them verbatim. The staff and volunteers were unaware which classes were the control and experimental groups, however the teachers did know. Also included in objective II are the observation made by the researcher.

Note: All data quoted directly from interviews are presented verbatim in the italic form. Quotes were corrected for grammatical errors. Names within quotes have been altered or eliminated.

Part 1: Teachers

Analysis and Results

There were 14 teachers who were asked to take a survey regarding their students' behavior during the field trip (Table 23). Seven teachers were from the experimental group and 7 were from the control group. The experimental and control group teachers all believed their students were engaged and attentive during the field trip. The teachers also believed their students were interested in the lesson at the garden. Twelve of the teachers said their students could or mostly answer the questions, but two teachers said their students could not answer the questions. One of the experimental teachers said, "*Many wanted to answer questions and even raised their hands. Unfortunately, they were guessing answers. They didn't know information or vocabulary words.*"

The teachers were asked about the behavior of their students, differences also emerged between the experimental and control groups. The experimental teachers said all their students behaved well, but in the control group 2 of the 7 teachers said their students did not behave well. A control group teacher from Endeavor summarized her students' behavior as "*Very active in the garden, but did settle down to listen.*"

All the teachers believed their students exhibited typical field trip behavior which most described as excited. The teacher from Montessori described typical field trip behavior as, "*Typical field trip behavior depends on the activity. If we were at a play or touring a museum, I would expect a more subdued energy. They wouldn't be allowed to be as active as they are at the Gardens. They are always expected to be respectful of the field trip leaders, the chaperones, teachers, classmates, and the trip location.*"

Lastly, the teachers were asked about their overall impression of their students on the field trip. Both control and experimental group teachers said their students enjoyed the field trip

and thought it was educational and informative. A control group teacher from Endeavor states, *“They loved every minute, so did the parent chaperones. I received comments about how fun and educational this trip was for the children.”* An experimental teacher from Rainbow summarized her impression of her students’ as *“I was impressed with my class. They paid attention, raised their hands to participate and were actually engaged. They said it was great! Loved the scavenger hunt in the butterfly house. Some even said it was the best day ever! Great staff and volunteers at the Botanical Gardens!”*

However, some of the teachers felt their students were not as prepared for the field trip as they normally are. One teacher from Legacy’s control group states, *“My students were very attentive, but they haven’t studied butterflies and insects yet. Their background knowledge is limited.”* Overall, the teachers from both the experimental and control groups had positive remarks about their students’ behavior during the field trip.

Discussion

The experimental and control group teachers gave positive reviews of their students behavior during the field trip. There were only two teachers who said their class just behaved “okay” during the field trip, both teachers were from the control group. From the responses of the teachers it can be assumed the activities did not have an affect on the students’ behavior.

Both the experimental and control group teachers felt their students were not as prepared as they normally are in the spring. Two factors stand out: first, the timing of the field trip was at the beginning of the school year (September and October) and teachers are still trying to establish behavior expectations for their class. Second, the schools spend close to a month in the

spring learning about butterflies and preparing for the field trip that usually takes place in April or May.

Part 2: HSVBG staff and volunteers

Analysis and Results

Below are the responses of the HSVBG staff and volunteers as well as the field trip observations of the researcher. The responses the staff and volunteers were taken following the field trips. The responses and observations are split between the experimental and control groups for easy comparison and contrasting. Volunteers 1-8 were experimental group leaders and volunteers 9-14 were control group leaders. The staff and volunteers were given group numbers of 1 and 2, but they did not know which group was experimental or control. The researcher assigned Group 1 as experimental and Group 2 as control.

Experimental Group

HSVBG Staff Observations

Three members of the HSVBG education staff were asked questions about the experimental groups of each school. Not all the staff members were available for interviewing every time. The staff members were asked 5 questions during the interview. The staff members led the introduction and made observation during the field trips. They did not lead individual classes through the garden. Below is a summary of the interviews.

HSVBG staff member 1:

1. Were the students attentive and engaged?

- *The second group (control) was not as engaged in the discussion as the first group (experimental). I think that because there were more kids in the first group (experimental) may have been a factor.*
- *They were attentive.*
- *Yes, they were engaged and attentive in the butterfly house.*

2. Did the students exhibit typical field trip behavior?

- *They were rambunctious and energetic.*

- *Possibly because of the timing.*
 - *Teachers are still getting a handle on their students*
3. Were the students able to answer your questions during the field trip?
 - *Yes, they asked questions about butterflies.*
 - *The class was very familiar with the material. Both classes were fascinated with the fish at the aquatic garden. Both classes were very excited well behaved.*
 4. What was the behavior of the students on the field trip?
 - *Slightly below average behavior. Their behavior is often dependent on volunteer and teacher.*
 5. Overall, what was your impression of the class?
 - *I thought the groups were extreme for example, some of the students knew the information, but some knew very little.*
 - *They were less well behaved than in the spring when the school group typically comes to the garden.*

HSVVG staff member 2:

1. Were the students attentive and engaged?
 - *The first group was more engaged than the second group.*
 - *The teachers and students were engaged and actively listening.*
 - *Most were engaged, but some wondering eyes.*
2. Did the students exhibit typical field trip behavior?
 - *mid-level discipline.*
3. Were the students able to answer your questions?
 - *Only a select few knew the answers to the questions.*
4. What was the behavior of the students on the field trip?
 - *We had more behavior problems in the second group (Control) than in the first (Experimental).*
 - *They were well behaved.*
 - *They were little more difficult than other groups and had mid-level discipline.*
5. Overall, what was your impression of the classes?
 - *We had more interest overall in the first group (Experimental).*
 - *Overall, students were well behaved and attentive.*
 - *The students made observations without adult guidance. They were the most engaged and attentive of the group.*

HSVVG staff member 3:

1. Were the students attentive and engaged?
 - *They were well engaged. The first group (Experimental) of teachers and students were more engaged and the second group (Control) the teachers were not as engaged; therefore, the students were not as engaged. The teachers are the role models for their students.*
2. Did the student exhibit typical field trip behavior?
 - *The students were well behaved*

3. Were the students able to answer your questions?
 - *The students were able to answer questions well.*
4. What was the behavior of the students?
 - *They were well behaved, both groups were well informed.*
5. Overall, what was your impression of the students?
 - *It is the responsibility of the teacher effects their garden experience and I thought the second group presentation was better presented, but the students in the first group processed the information better.*

Discussion

The HSVBG staff gave positive reviews of the experimental group's behavior. A majority of the classes were attentive and engaged during the field trip and their behavior was above average on most field trips. It was noted that Group 1 (Experimental) did behave better than Group 2 (Control). It is possible that previous interaction with HSVBG staff on pre-field trip activities helped the students feel more connected to the staff and therefore better behaved.

Volunteer Observations

HSVBG volunteers were asked questions about the experimental groups of each school. The volunteers were asked 5 questions during the interview. There were 8 interviews conducted regarding the experimental group. The HSVBG volunteers led one class at a time around the garden unless noted. Below is a summary of the interviews.

HSVBG Volunteer 1:

1. Were the students attentive and engaged during the field trip?
 - *They listened and added to discussion*
2. Did the students exhibit typical field trip behavior?
 - *Above average behavior compared to other field trip groups*
3. Were the students able to answer your questions during the field trip?
 - *They knew about butterflies and were able to answer questions asked to them.*
4. What was the behavior of the students during the field trip?
 - *They were very well behaved and followed instructions well.*
5. Overall, what was your impression of the class?
 - *The girls were a little more observant than the boys.*
 - *The parents and teacher didn't help discipline the students.*

HSVVG Volunteer 2:

1. Were the students attentive and engaged during the field trip?
 - *75% of the time they were not attentive and 25% of the time they were attentive.*
2. Did the students exhibit typical field trip behavior?
 - *Average*
3. Were the students able to answer your questions?
 - *They were able to answer some questions about butterflies and added to the discussion some.*
4. What was the behavior of the students during the field trip?
 - *They had average behavior.*
5. Overall what was your impression of the class?
 - *The parents and teacher didn't help with discipline. I felt like because of a lack of disciplinary support from parents and teachers it affected the overall field trip experience for the students. Students were most engaged in the butterfly house, but lost their focus when walking through the garden.*

HSVVG Volunteer 3: The volunteer was specifically stationed in the Butterfly House.

1. Were the students attentive and engaged?
 - *Yes, the students were engaged and attentive.*
2. Did the students exhibit typical field trip behavior?
 - *Better than average*
3. Were the students able to answer your questions?
 - *Yes, the students were able to answer questions and add to the discussion. Students asked questions specifically about host plants.*
4. What was the behavior of the students?
 - *We had no disciplinary problems and good support from the teachers and parents keeping the students on task.*
5. Overall, what was your impression of the class?
 - *Very good.*

HSVVG Volunteer 4:

1. Were the students attentive and engaged during the field trip?
 - *They payed attention during the video and listened to instructions*
2. Did the students exhibit typical field trip behavior?
 - *Typical to better behavior on a field trip*
3. Were the students able to answer your questions?
 - *Yes, and they asked questions specifically about birds on the garden walk. In the Butterfly House they asked lots of questions about caterpillars.*
4. What was the behavior of you students?
 - *Excited and listened to instructions. I had good parent and teacher help during the field trip.*

5. Overall, what was your impression of the students during the field trip?

- *Well behaved.*

HSVVG Volunteer 5:

1. Were the students attentive and engaged during the field trip?

- *They were attentive and engaged.*

2. Did the students exhibit typical field trip behavior?

- *Above average*

3. Were the students able to answer your questions during the field trip?

- *They listened, told stories, and answered questions.*

4. What was the behavior of the students?

- *They had above average behavior on the field trip and the helpful parents and teachers kept the students on task during the field trip.*

5. Overall, what was your impression of the students?

- *The students had a basic knowledge of butterflies and my impression of the class was that they were knowledgeable of trees, butterflies, and life cycles.*

HSVVG Volunteer 6:

1. Were the students attentive and engaged during the field trip?

- *At the beginning of the field trip the students were very attentive, but towards the end their attentiveness began to waiver.*

2. Was this typical field trip behavior?

- *Yes, this was typical behavior of students on a field trip (excited, curious, and engaged).*

3. Were the students able to answer your questions?

- *The students asked questions about trees while on their garden walk specifically why some trees grow together. The students were able to answer some of the questions presented by their field trip guide. The boys asked and answered a majority of the questions.*

4. What was the behavior of the students on the field trip?

- *I had good teacher and parent support during the field trip and no disciplinary problems.*

5. Overall, what was your impression of the class?

- *Overall, a great class! Feeding the coy fish at the aquatic garden was a favorite among the students. They also loved seeing the scarecrows.*

HSVVG Volunteer 7:

1. Were the students attentive and engaged during the field trip?

- *They were slightly more attentive in the past.*

2. Was the behavior of the students typical of a field trip?

- *They were better behaved than most.*

3. Were the students able to answer your questions during the field trip?

- *They were on the low-end of the second grade level.*

4. What was the behavior of the students on the field trip?
 - *Mid-level discipline.*
5. Overall, what was your impression of the students on the field trip?
 - *They took slightly longer route than typical, but were easy to move the group through the garden. They were not distracted by parents.*

HSVBG Volunteer 8:

1. Were the students engaged and attentive during the field trip?
 - *Yes, students were the most engaged in the butterfly house.*
2. Did the students exhibit typical field trip behavior?
 - *Typical*
3. Were the students able to answer your questions during the field trip?
 - *Not as educated as other groups*
4. What was the behavior of your students on the field trip?
 - *Mediocre discipline.*
5. Overall, what was your impression the student on the field trip?
 - *The students loved the carnivorous plants, but were all over the place. I found that the parents were distracting.*

Discussion

The HSVBG volunteers gave mixed reviews of the students' behavior within the experimental group. Their behavior was good especially with helpful teachers and parents. However, towards the end of the field trips the students' engagement and attention began to fall behind according to the HSVBG volunteers. None of the volunteers have an education background. The backgrounds of the volunteers included retired military members, businesspersons, and engineers. Many of the volunteers are parents and grandparents.

Researcher Observations

The following behavioral observations were done by the researcher throughout the four phases of the field trip (introduction, butterfly house, garden walk, and video observations). The observations were split by experimental and control observations and by the different schools' field trip. The researcher was able to differentiate between experimental and control group in two

ways. First, by seating arrangement during the introduction. Experimental teachers were asked to seat their students on one side of the amphitheater and control classes on the other side. Second, classes would wear the same colored T-shirt. Therefore, classes could be identified by the color T-shirt the students were wearing.

Introduction observations:

- *Students made observations and realizations. Students were engaged and attentive. Had good engagement from the teachers.*
- *In the amphitheater the students guessed answers to some questions and knew answer to others.*
- *The students were attentive and engaged.*

Butterfly House observation:

- *Student made observations about eggs and caterpillars.*
- *Students made their own observations in the Butterfly House.*
- *They were engaged and attentive to the volunteer.*
- *They were pointing out butterflies.*
- *They talked about host plants.*
- *They worked in groups in the butterfly house scavenger hunt.*

Garden Walk observations:

- *The students made observations as they walked through the fern glade.*
- *They were very interested in the carnivorous plants.*
- *Overall, the students were rambunctious, especially towards the end of the garden walk*
- *Students were singing and not paying attention to field trip guide possibly due to soft spoken guide.*
- *Small group at the front near the guide was most engaged and attentive.*
- *Overall, very excited, but not as attentive as other groups.*
- *Towards the end of the field trip they didn't listen to instructions as well.*

Video observations:

- *Students were very attentive during the film.*
- *The students made connections.*
- *They were attentive in the beginning, but not towards the end.*

Discussion

The researcher made observations regarding the experimental groups' behavior and engagement during the field trips. The students were attentive in the beginning of the field trip,

but tended to not pay attention towards the end. Behavior was good in the beginning of the field trip, but not towards the end of the field trip. The researcher had a similar opinion to the staff and volunteers at HSVBG. There was a mix of behaviors during the field trips, however the experimental group tended to behave better.

Control Group

Staff Observations

Three members of the HSVBG education staff were asked questions about the control groups of each school. Not all the staff members were available for interviewing every time.

Below is a summary of the interviews.

HSVBG staff member 1:

1. Were the students attentive and engaged during the program?
 - *I thought the first group (Experimental) processed the information given to them better than the second group (Control) and had a better understanding of the concepts.*
 - *They were attentive.*
2. Did the students exhibit typical field trip behavior?
 - *The students exhibited typical behavior.*
 - *Slightly Below average*
3. Were the students able to answer your questions?
 - *The first group (Experimental) answered questions better than the second group (Control).*
4. What was the behavior of students during a field trip program?
 - *The students exhibited typical behavior.*
5. Overall, what was your impression of the students during the field trip?
 - *Typical*
 - *Rambunctious and energetic possibly because of the timing. Teachers are still getting a handle on their students less well behaved than in the spring when the school group typically comes to the garden.*

HSVBG staff member 2:

1. Were the students attentive and engaged during the program?
 - *The first group (Experimental) was more engaged than the second group (Control).*
 - *It was difficult to pay attention for example the parents were a distraction during the film. The teachers were not as engaged and tended to sit back during the film.*
2. Did the students exhibit typical field trip behavior?

- *Below average*
 - *Slightly Below average behavior*
3. Were the students able to answer your questions?
 - *Only a select few knew the answers to the questions in the second group (Control).*
 - *No*
 - *Some*
 4. What was the behavior of the students during the program?
 - *We had more behavior problems in the second group (Control) than in the first group (Experimental).*
 - *They were slightly below average behavior. Their behavior is often dependent on volunteer and teacher.*
 - *The second group (Control) was not as well behaved as the first group (Experimental). They were the second group (Control) to see the film and least engaged and attentive of the groups.*
 5. Overall what was your impression of the classes?
 - *There was more interest overall in the first group (Experimental).*
 - *Overall, good participation and curiosity*

HSVBG staff member 3:

1. Were the students engaged and attentive during butterfly program?
 - *The students were not as engaged or attentive. In the first group (Experimental) teachers and students more engaged than the second group (Control). Teachers were not engaged, therefore students not as engaged. Teachers are the role models for their students.*
2. Were the students able to answer your questions during the program?
 - *Students were able to answer questions well.*
3. Were the students exhibiting typical field trip behavior?
 - *Average*
4. What was the behavior of the students on the field trip?
 - *Not as good as the first group (Experimental)*
5. Overall, what was your impression of the classes?
 - *They were well informed and well behaved. It is the responsibility of the teacher which effects their garden experience. Overall, I thought the second presentation was better presented.*

Discussion

Overall, the HSVBG staff gave more negative answers to the questions regarding the control group. For example, staff member 3 states, “*The teachers are the role models for their students.*” The students will model their attitude and behavior after the teacher, therefore if the

teachers are not engaged then the students will not be engaged. In a 2014 study, researchers found that teacher instruction, behavior, and attitude is a predictor for student behavior and engagement (Scott et al., 2014). The results of the 2014 study correlate with the observations made by the HSVBG staff.

Volunteer Observations

HSVBG volunteers were asked questions about the control groups of each school.

Volunteers 9-14 were asked 5 questions about the control group during the interview. There were 6 interviews conducted. The HSVBG volunteers led one class at a time through the parts of the field trip unless noted. Teachers and parent chaperones were with the classes as well. Below is a summary of the interviews.

HSVBG Volunteer 9:

1. Were the students attentive and engaged during the field trip?
 - *No, they were not attentive and tended to be very talkative.*
2. Did the student exhibit typical field trip behavior?
 - *No, they were below average.*
3. Were the students able to answer your questions during the field trip?
 - *The students were not able to answer questions.*
4. What was the behavior of the students during the field trip?
 - *They had below average behavior. Very little disciplinary help from teachers or parents.*
5. Overall, what was your impression of the class on the field trip?
 - *There was a lot of pushing and shoving while on their walk through the garden. Overall, they were not very well behaved. The students were given instructions, but didn't follow them well. For example, being quiet or talking softly, staying behind adult leader, staying in line, lots of pushing and shoving to be at the front of the line. They were a very talkative class.*

HSVBG Volunteer 10:

1. Were the students engaged and attentive during the field trip?
 - *Yes*
2. Did the students exhibit typical field trip behavior?
 - *Above average behavior*
3. Were the students able to answer your questions during the field trip?

- *The students were very polite and raised their hands when they had a question or a comment.*
4. What was the behavior of the students during the field trip?
 - *They were well behaved, able to answer questions, and add to discussion. The teacher and parents were helpful keeping the students engaged and disciplined while on the field trip. The teacher and parents influenced their garden field trip experience.*
 5. Overall, what was your impression of the class on the field trip?
 - *The Butterfly house and Aquatic Garden were the favorite spots of the students. The students had above average behavior. Their teacher had good control over her class. I set ground rules early during the field trip. For example, stay with the group, ask questions politely, and no running. At the end of the field trip students wanted to see more of the garden.*

HSVVG Volunteer 11:

1. Were the students attentive and engaged during the field trip?
 - *Not attentive, about 25% were engaged and attentive and 75% not engaged/attentive. I did not have as much help from parents and teachers.*
2. Did the students exhibit typical field trip behavior?
 - *Not typical field trip behavior*
3. Were the students able to answer your questions during the field trip?
 - *Not as much enthusiasm or questioning. There was a lack of curiosity from the students*
4. What was the behavior of the students during the field trip?
 - *Mid-level behavior for a field trip.*
5. Overall, what was your impression of the students during the field trip?
 - *They were more interest in playing than field trip or learning.*

HSVVG Volunteer 12:

1. Were the students attentive and engaged during the field trip?
 - *The students were attentive during all parts of the field trip.*
2. Was this typical field trip behavior?
 - *Better than a typical group on a field trip.*
3. Were the students able to answer your questions during the field trip?
 - *Yes, and they asked questions and were able to answer questions asked by me.*
4. What was the behavior of the students during the field trip?
 - *I did not have discipline problems and I had help from parents and teachers to keep the students on task.*
5. Overall, what was your impression of the class on the field trip?
 - *The students liked the scarecrows and feeding the fish best. Boys spoke out more and tended to answer questions. Students liked the carnivorous plants during their garden walk.*

HSVVG Volunteer 13: Note the volunteer led two classes on the field trip.

1. Were the students attentive and engaged during the field trip?

- *They were attentive and engaged.*
2. Did the students exhibit typical field trip behavior?
 - *Yes, above average behavior*
 3. Were the students able to answer your questions during the field trip?
 - *They listened, told stories, and answered my questions.*
 4. What was the behavior of the student during the field trip?
 - *They had an above average behavior. The parents and teacher were helpful keeping the students on task during the field trip.*
 5. Overall, what was your impression of the class?
 - *They had a basic knowledge of butterflies and were knowledgeable of trees, butterflies, and life cycles.*

HSVVG Volunteer 14: Note the volunteer was stationed only in the Butterfly House

1. Were the students engaged and attentive during the field trip?
 - *The students were engaged and attentive during the field trip.*
2. Did the students exhibit typical field trip behavior?
 - *Yes*
3. Were the students able to answer your questions during the field trip?
 - *The students were able to answer questions and add to the discussion. The students also asked questions specifically about host plants.*
4. What was the behavior of the students during the field trip?
 - *I had no disciplinary problems and good support from the teachers and parents keeping the students on task.*
5. Overall, what was your impression of the classes?
 - *Very good.*

Discussion

There were 6 volunteer interviews conducted regarding the control groups. Four of the volunteers gave positive answers to the questions and 2 of the volunteers gave negative answers to the questions. A common trend among the responses of the volunteers were the students who behaved the best, generally had the most engaged teachers and parent chaperones. Volunteer 13 said, “ *They had above average behavior. The parents and teachers were helpful keeping the students on task during the field trip.*” Volunteer 12 said, “ *I did not have discipline problems and I had help from parents and teachers to keep the students on task.*” Volunteer 10 said, “*They were well behaved, able to answer questions and add to discussion. The teacher and parents*

were helpful keeping the students engaged and disciplined while on the field trip. The teacher and parents influenced their garden field trip experience.” However, bad behavior was often because of a lack of engagement from the teachers and parent chaperones according to the volunteers. For example, Volunteer 9 said, “ *They had below average behavior. Very little disciplinary help from teachers or parents. The students were given instructions, but didn’t follow them well. For example, being quiet or talking softly, staying behind adult leader, staying in line, lots of pushing and shoving to be at the front of the line. They were a very talkative class.*”

Similar to HSVBG staff member observations, students will model their attitude and behavior after their teachers. The responses of the volunteers correlate with the results of the 2014 study done by Scott, Hirn, and Alter who found that teacher instruction, behavior, and attitude affect the students’ behavior and engagement.

Researcher’s Observations

The following observations of the control group were done by the researcher throughout the four parts of the field trip (introduction, butterfly house, garden walk, and video observations). The observations were split by experimental and control observations and by the different schools’ field trip. The researcher was able to differentiate between experimental and control group in two ways. First, by seating arrangement during the introduction. Experimental teachers were asked to seat their students on one side of the amphitheater and control classes on the other side. Second, classes would wear the same colored T-shirt. Therefore, classes could be identified by the color T-shirt the students were wearing.

Introduction observations:

- *Teachers weren’t as helpful during the program keeping students engaged in the discussion.*
- *Students were very excited, but unable to answer questions.*

- *Students were guessing answers to questions*
- *Students knew lifecycle question.*

Butterfly House observations:

- *Students were engaged and attentive*
- *Scavenger hunt kept students engaged by having them make observations in the Butterfly House*
- *Students were rambunctious*
- *Made good observations in the Butterfly House with help from parents/teachers/and guide.*
- *Paid attention and listened to the guide giving instructions*

Video observations:

- *Talkative during the film*

Garden Walk observations:

- *Made connections between moth and butterfly.*

Discussion

The researcher made similar observations as the HSVBG staff and volunteers regarding the control group. There were a mix of behaviors for the control group. The volunteers stated the students' behavior is dependent on the teacher and parent chaperones. The researcher believes the volunteer has an influence on the students' behavior as well. The researcher noted that the students made observations mostly in the butterfly house whereas the volunteers state students made observations on the garden walk.

Part 3: Compare and Contrast

Discussion

There were a total of 18 interviews analyzed for the control group and 21 interviews analyzed for the experimental group. Five of 7 teachers said their students were well behaved during the field trip. However, comments from both experimental and control group teachers felt that their students were as not prepared from an educational standpoint. The HSVBG staff,

HSVVG volunteers, and researcher gave mixed reviews of the behavior of the control group of students. The staff at HSVVG believed overall that the students' behavior was dependent on the teacher, field trip volunteer, and parent chaperones. The HSVVG field trip volunteers believed overall the students' behavior were dependent on the teachers and parent chaperones' ability to assist in controlling the students' behavior. A future study would be needed to determine the success of field trips and teacher engagement. Generally, the experimental groups were able to answer questions and their behavior was better than the control groups.

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TABLES

Table 1. Gender demographic analysis of students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Gender	N	Percentages
Experimental	Male	70	51%
	Female	66	48%
	Unaccounted	2	1%
Subtotal		138	100%
Control	Male	56	52%
	Female	48	45%
	Unaccounted	3	3%
Subtotal		107	100%

Table 2. Ethnicity demographic analysis of students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Ethnicity	N	Percentage
Experimental	Caucasian	88	64%
	African American	25	18%
	Multi-Racial	14	10%
	Asian	4	3%
	Hispanic	4	3%
	Unaccounted	3	2%
Subtotal		138	100%
Control	Caucasian	53	50%
	African American	33	31%
	Multi-Racial	10	9%
	Asian	6	5%
	Hispanic	1	1%
	Unaccounted	4	4%
Subtotal		107	100%

Table 3. School demographic of students who participated in supplemental field trip activities (Experimental) and students who did not participate in field trip activities (Control).

Group	School	N	Percentage
Experimental	Endeavor	52	21%
Control		53	21%
Experimental	Legacy	34	14%
Control		42	17%
Experimental	Rainbow	31	13%
Control		14	6%
Experimental	Montessori	19	8%
Total		245	100%

Table 4. Students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control) demographic answers to “Have you been to Huntsville Botanical Garden?”

Group	Question	Answers	N	Percentages
Experimental	Have you been to Huntsville Botanical Garden?	Yes	89	36%
		No	47	20%
Yes		72	29%	
No		37	15%	
Total			245	100%

Table 5. Students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control) demographic answers to “Have you ever studied butterflies?”

Group	Question	Pre-Test Answers	N	Percentages	Post-Test Answers	N	Percentages
Experimental	Have you ever studied butterflies?	Yes	75	30%	Yes	115	47%
		No	61	25%	No	83	34%
Control		Yes	56	23%	Yes	21	9%
		No	53	22%	No	26	10%
Total			245	100%		245	100%

Table 6. Students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control) demographic answers to “Have you been to a butterfly house?”

Groups	Question	Answers	N	Percentages
Experimental	Have you been to a butterfly house?	Yes	84	34%
		No	52	21%
Control		Yes	60	25%
		No	49	20%
Total			245	100%

Table 7. Paired samples T-test analysis comparing the pre-and post-test scores of students who participated in supplemental field trip activities (Experimental).

Test	N	Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test	138	15.04	4.376	-2.27	135	-7.013	*0.000
Post-test		17.31	3.809				

* Indicates a significant change at the a priori 0.10 level.

Table 8. Paired samples T-test analysis comparing the pre-and post-test scores of students who did not participate in supplemental field trip activities (Control).

Test	N	Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test	107	15.15	3.908	-1.90	108	-5.871	*0.000
Post-test		17.05	3.470				

* Indicates a significant change at the a priori 0.10 level.

Table 9. Independent samples T-test analysis comparing the pre-test scores of students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	N	Pre-test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental	138	15.04	4.376	0.103	243	-0.191	0.848
Control	107	15.15	3.908			-0.194	

Table 10. Independent samples T-test analysis comparing the post-test scores of students who participated in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	N	Post-test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental	138	17.31	3.809	0.263	243	0.558	0.577
Control	107	17.05	3.470			0.564	

Table 11. Paired samples T-test analysis comparing the genders and pre- and post-test scores of students who participated in supplemental field trip activities (Experimental).

Test	Gender	N	Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Male	70	14.60 17.30	4.362 3.447	-2.700	69	-5.575	*0.000
Pre-test Post-test	Female	66	15.52 17.32	4.376 4.117	-1.803	65	-4.300	

* Indicates a significant change at the a priori 0.10 level.

Table 12. Paired samples T-test analysis comparing the genders and pre- and post-test scores of students who did not participated in supplemental field trip activities (Control).

Test	Gender	N	Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Male	56	14.73 16.77	4.029 3.668	-2.036	55	-4.445	*0.000
Pre-test Post-test	Female	48	15.65 17.52	3.761 3.101	-1.875	47	-3.864	

* Indicates a significant change at the a priori 0.10 level.

Table 13. Independent samples T-test analysis comparing the genders and pre-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Gender	N	Pre-Test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental	Male	70	14.60	4.362	-0.132	124	-0.175	0.862
	Female	66	15.52	4.376	-0.131		-0.167	0.868
Control	Male	56	14.73	4.029	-0.132	112	0.836	0.405
	Female	48	15.65	3.761	-0.131		-0.284	0.777

Table 14. Independent samples T-test analysis comparing the genders and post-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Gender	N	Post-Test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental	Male	70	17.30	3.457	0.532	124	-0.175	0.862
	Female	56	17.32	4.177	-0.203		-0.167	0.868
Control	Male	56	16.77	3.667	0.532	112	0.836	0.405
	Female	48	17.52	3.101	-0.203		-0.284	0.777

Table 15. Paired Samples T-test analysis comparing the ethnicities and pre- and post-test scores of students who did participate in supplemental field trip activities (Experimental).

Test	Ethnicity	N	Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Caucasian	88	15.47 17.58	4.213 3.814	-2.114	87	-5.433	*0.000
Pre-test Post-test	African American	25	13.40 16.16	4.311 3.636	-2.760	24	-3.560	*0.002
Pre-test Post-test	Multi-Racial	14	15.07 18.14	4.376 3.183	-3.071	13	-2.328	*0.037
Pre-test Post-test	Asian	4	16.00 15.75	8.756 6.652	0.250	3	0.212	0.846
Pre-test Post-test	Hispanic	4	15.75 18.75	2.500 1.258	-3.000	3	-4.243	*0.024

* Indicates a significant change at the a priori 0.10 level.

Table 16. Paired Samples T-test analysis comparing the ethnicities and pre- and post-test scores of students who did not participate in supplemental field trip activities (Control)

Test	Ethnicity	N	Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Caucasian	53	16.17 17.89	3.593 2.554	-1.717	52	-3.539	*0.001
Pre-test Post-test	African American	33	14.52 16.18	3.852 3.828	-1.667	32	-2.958	*0.006
Pre-test Post-test	Multi-Racial	10	13.00 16.10	4.738 5.466	-3.100	9	-2.394	*0.040
Pre-test Post-test	Asian	6	14.00 17.33	4.000 2.066	-3.333	5	-2.774	*0.039
Pre-test Post-test	Hispanic	1	10.00 10.00	n/a	n/a	n/a	n/a	n/a

* Indicates a significant change at the a priori 0.10 level.

Table 17. Independent samples T-test analysis comparing the ethnicities and pre-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Ethnicity	N	Pre-Test Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental Control	Caucasian	88	15.47	4.213	-0.704	139	-1.014	0.312
		53	16.17	3.593				
Experimental Control	African American	25	13.40	4.311	-1.115	56	-1.041	0.302
		33	14.52	3.828				
Experimental Control	Multi-Racial	14	15.07	4.376	2.071	22	1.105	0.281
		10	13.00	4.738				
Experimental Control	Asian	4	16.00	8.756	2.000	8	0.498	0.632
		6	14.00	4.000				
Experimental Control	Hispanic	4	15.75	2.500	5.750	3	2.057	0.132
		1	10.00					

Table 18. Independent samples T-test analysis comparing the ethnicities and post-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	Ethnicity	N	Post-Test Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Experimental Control	Caucasian	88 53	17.58 17.89	3.814 2.554	-0.307	139	-0.520	0.604
Experimental Control	African American	25 33	16.16 16.18	3.636 3.828	-0.022	56	-0.022	0.983
Experimental Control	Multi-Racial	14 10	18.14 16.10	3.183 5.466	2.043	22	1.156	0.260
Experimental Control	Asian	4 6	15.75 17.33	6.652 2.066	-1.583	8	-0.559	0.592
Experimental Control	Hispanic	4 1	18.75 10.00	1.258	8.750	3	6.220	*0.008

* Indicates a significant change at the a priori 0.10 level.

Table 19. Paired samples T-test analysis comparing the schools and pre-and post-test scores of students who participated in supplemental field trip activities (Experimental).

Test	School	N	Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Endeavor	52	16.63 18.52	2.794 2.638	-1.885	51	-4.442	*0.000
Pre-test Post-test	Legacy	34	15.47 17.29	4.129 3.100	-1.824	33	-3.163	*0.003
Pre-test Post-test	Rainbow	31	12.90 16.13	5.369 4.056	-3.226	30	-4.144	*0.000
Pre-test Post-test	Montessori	19	13.42 15.95	4.891 5.958	-2.526	18	-2.186	*0.042

* Indicates a significant change at the a priori 0.10 level.

Table 20. Paired samples T-test analysis comparing the schools and pre-and post-test scores of students who did not participate in supplemental field trip (Control).

Test	School	N	Mean Scores	Standard Deviation	Mean Difference	Df	T	2-Tailed Sig.
Pre-test Post-test	Endeavor	53	15.87 17.47	3.082 3.105	-1.604	52	-3.390	*0.001
Pre-test Post-test	Legacy	42	14.86 16.98	4.106 3.324	-2.119	41	-3.818	*0.000
Pre-test Post-test	Rainbow	14	13.29 15.64	5.441 4.877	-2.357	13	-3.667	*0.003

* Indicates a significant change at the a priori 0.10 level.

Table 21. Independent samples T-test analysis comparing the schools and pre-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	School	N	Pre-test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tail Sig.
Experimental Control	Endeavor	52 53	16.63 15.87	2.794 3.082	0.767	103	1.335	0.185
Experimental Control	Legacy	34 42	15.47 14.86	4.129 4.106	0.613	74	0.646	0.520
Experimental Control	Rainbow	31 14	12.90 13.29	5.369 5.441	-0.382	43	-0.220	0.827

Table 22. Independent samples T-test analysis comparing the schools and post-test scores of students who did participate in supplemental field trip activities (Experimental) and students who did not participate in supplemental field trip activities (Control).

Group	School	N	Post-test Mean Score	Standard Deviation	Mean Difference	Df	T	2-Tail Sig.
Experimental Control	Endeavor	52	18.52	2.638	1.048	103	1.861	*0.066
		53	17.47	3.105				
Experimental Control	Legacy	34	17.29	3.100	0.318	74	0.427	0.670
		42	16.98	3.240				
Experimental Control	Rainbow	31	16.13	4.056	0.486	43	0.349	0.728
		14	15.64	4.877				

* Indicates a significant change at the a priori 0.10 level.

Table 23. The behavioral responses of teachers who's students participated in supplemental field trip activities (Experimental) and teachers who's students did not participate in supplemental field trip activities (Control).

Question	Experimental Responses	Control Responses
Were your students attentive and engaged during the field trip?	All the interviewed teachers believed their students were attentive and engaged during the field trip.	All the interviewed teachers believed their students were attentive and engaged during the field trip.
Did your students seem interested in the lesson provided by the garden?	All the interviewed teachers believed their students were interested in the lesson provided by the garden.	All the interviewed teachers believed their students were interested in the lesson provided by the garden.
Were you students able to answer the questions asked by the garden staff and/or volunteers?	Two teachers said their students could answer questions, 4 teachers said their students could answer some of the questions, and 1 teacher said her students could not answer the questions.	Six of seven teachers believed their students could answer some of questions. One teacher said that her students could not answer questions.
How was the behavior of your students?	All the teachers said their students were well behaved during the field trip.	Five teachers believed their students' behavior was good during the field trip. Two of the teachers believed their students' behavior was okay during the field trip.
Were your students exhibiting typical behavior during the field trip?	All the teachers said their students' exhibited typical behavior (excited) during the field trip.	All the teachers said their students' exhibited typical behavior (excited) during the field trip.
Overall, what was your impression of your class during the field trip?	The teachers said their students liked visiting the garden and thought their students learned from the experience, but said their students were not as prepared as they normally are.	The teachers said their students liked visiting the garden and thought their students learned from the experience, but said their students were not as prepared as they normally are.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Purpose of the Study

The goal of this study was to examine the effects of supplemental field trip activities to a field trip on student knowledge and behavior. The first purpose of this study was to examine the knowledge differences between students who participated in pre- and post-activities versus students who did not participate in activities before and after attending a field trip to a public garden. The second purpose of this study was to examine the behavioral difference between students who participated in the pre- and post-activities versus students who did not participate in the activities.

Summary of the Literature Review

From the time of Johann Comenius to today, gardening has been used for science education, environmental education, nutritional education, art education, curiosity, and imagination (Betz, 2004; Kohlstedt, 2000; Marsden, 1998; Mullen et al., 2012; Subramaniam, 2002). Schools often support field trips to institutions such as zoos, planetariums, aquariums, museums, and botanical gardens. They are ideal for increasing students' experiences and perceptions of organisms and their habitats. Field trips provide students with opportunities to apply content learned in the classroom to context outside of the school environment. The hope is that students will enhance their understanding and retention of knowledge (Nadelson and Jordan, 2012). Field trips expand the opportunities for students to transfer, apply, or anchor knowledge which provides the justification for using field trips for learning (Nadelson and Jordan, 2012). The purpose of a field trip is to enrich the curriculum, allow students to make tangible

connections with what they are learning in the classroom, and expand learning beyond the classroom subjects (Kisiel, 2007). Field trips benefit students both socially and academically (Kisiel, 2007; Prokop et al., 2007). Using a hands-on approach with activities allows students to engage and learn more proficiently than through traditional methods (Biggs et al., 2006; Orion and Hofstein, 1996; Pace and Tesi, 2004; Scott and Matthews, 2010). Botanical garden field trips cultivate environmentally responsible adults (Hoisington et al., 2010, Morgan et al., 2009).

Methodology

This study was conducted at each of the 4 participating elementary schools and Huntsville Botanical Garden (HSVBG), in Huntsville, Alabama during the fall semester of the 2015 academic year. The study consisted of two groups, control and experimental. The experimental group participated in the pre- and post-activities, butterfly field trips and testing, whereas, the control group only participated in butterfly field trips and testing. This study is a pretest-posttest control group design. The participants selected were already established into groups making it a quasi-experiment. The second grade teachers were aware of which classes had participated in the pre-activities. To compare the differences in behavior, field trip volunteers and HSVBG staff were kept unaware of which classes had participated in the pre-activities.

Sample Group

This study was conducted at four different schools in Huntsville and Madison, AL. Participants were second graders from seventeen participating classrooms, eight were control and nine were experimental. A total of 138 students were in the experimental group and 107 were in the control group.

Instrumentation

Objective I:

Students were evaluated using a demographics survey and knowledge exam. The demographic section included 10 questions pertaining to the participants' gender, ethnicity, if the participant had visited HSVBG, if the participant had studied butterflies, and if the participant had been to a butterfly house. The knowledge exam consisted of 22 questions related to butterfly lifecycle and anatomy. The questions were found in the Indiana State Standards and the Core Knowledge Foundation under the Life Cycles Section (Kepchar and Skillman, 2011). This instrument was used because it was already validated and grade level appropriate, and no comparable exercise was found in the State of Alabama Science Curriculum. However, the questions satisfy and are similar to the second grade science curriculum which can be found in the Science Curriculum Guide to the State of Alabama (Alabama Course of Study, 2015).

Objective II:

Teachers and HSVBG staff were interviewed or took surveys regarding the behavior of the students. Each interview or survey consisted of five to seven questions. Questions considered the students' attentiveness during the field trip, the interest of the students during the field trip, students' abilities to answer questions during the field trip, the general behavior of the class, recall if the students showed typical field trip behavior, and the overall impression of the class on the field trip.

Conclusions

The following conclusions are based upon the research and results presented in previous chapters. The pre- and post-test mean scores, gender, ethnicity, school, and behavior differences between treatment groups are discussed.

Objective I

Part 1: Main effects

Independent and paired samples t-test were used to compare the pre-and post-test scores of the experimental and control treatment groups. According to the independent samples t-test there were no significant differences between the pre- and post-test scores of the experimental and control groups. However, the paired samples t-test revealed there were differences between the experimental pre- and post-scores and the control pre-and post-test scores. One reason that may explain the significant differences were the hand-on activities performed on the field trips. The field trip allowed students to directly interact with butterflies and plants. It has been reported that the more interactive a field trip is the more likely students will learn from the field trip experience (Biggs et al., 2006; Orion and Hofstein, 1996; Kisiel, 2007; Nadelson and Jordan, 2012; Pace and Tesi, 2004; Scott and Matthews, 2010). The activities had no effect beyond that of the garden experience. The actual experience of visiting the garden is more important than pre or follow-up activity.

Part 2: Interaction effects: Gender

Independent and paired samples t-tests were used to determine the difference between gender pre- and post-test scores. The independent samples t-test revealed there were no significant differences between the male and female pre-test scores and the male and female post-test scores. The paired samples t-test revealed significant improvement in both the male pre- to post-test scores and female pre-to post-test scores. Male scores numerically increased more between the pre- and post-tests. One potential reason for this larger score increase is males are physical or kinesthetic learners who prefer to be actively doing something. The combination

of supplemental activities and field trip activities allowed boys to apply the kinesthetic learning that they tend to prefer. Control group females did score 0.75 points higher than the males. Experimental group females did score 0.02 points higher than the males. The activities and field trip were geared more toward kinesthetic learners. However, females numerically did better overall. Whereas, females are more solitary or intrapersonal learners who prefer quiet traditional classroom setting (Carrier, 2009; Klemmer et al., 2005). Young females are developing at a faster rate than young males, therefore their ability to recall information is greater (Carrier, 2009; Klemmer et al., 2005).

Part 3: Interaction effects: Ethnicity

Independent and paired samples t-tests were used to determine the difference between ethnicity pre- and post-test scores. There were no significant differences between the pre- and post-test scores of the experimental and control group ethnicities based on independent samples t-test. There were significant increases among all the ethnicities except for Asian. However, with an N of 4 both the Hispanic and Asian results are inconclusive. Similar results were found in a 2004 study done by Lundberg and Schreiner. Lundberg and Schreiner concluded teacher-student relationships have more of an affect on learning than differences among ethnicity. The ability for the teacher to establish and maintain a relationship with their student is crucial for learning (Lundberg and Schreiner, 2004).

Part 4: Interaction effects: Schools

Independent and paired samples-tests were used to determine the differences between the pre- and post-test scores between the participating schools. The independent samples t-test determined there were only significant differences between the control and experimental groups

at Endeavor Elementary. Endeavor Elementary was the only school to show differences between the experimental and control groups' post test scores. The researcher noted that the Endeavor experimental group teachers were the most engaged teachers. It has been proven in previous studies that teachers who are the most engaged will have students who perform better academically (Scott et al., 2014). Post-test mean scores significantly increased for each school regardless of being in the experimental or control group.

Objective II

Part 1: Teacher

The survey answers from the experimental and control group teacher were analyzed. All the teachers had positive things to say about their class' behavior. The few teachers who did have negative statements said it was mainly due do to their students' not being as prepared as they normally are for the field trip. Two factors standout: first, the timing of the field trip was at the beginning of the school year (September and October) and teachers are still trying to establish behavior expectations for their class. Second, the schools spend close to a month in the spring learning about butterflies and preparing for the field trip that usually takes place in April or May.

Part 2: HSVBG staff and volunteers

The HSVBG staff and volunteers interview responses were analyzed. The experimental group noted better behavior than the control groups according to the answers from the HSVBG staff and volunteers. When either the staff member or volunteer did have a negative comment on the behavior they often cited the teacher and chaperones, stating it is the responsibility of the teacher and chaperones to help make sure the students behaved well.

The researcher had a similar opinion as the HSVBG staff and volunteers regarding the behavior of the students. The researcher agreed that it is the responsibility of the teacher and chaperones to help enforce good behavior on a field trip, but it is also the responsibility of the field trip volunteer. The students feed off of the personality and energy of their leader. For example, if a volunteer is energetic and loud then the students will be louder and more energetic. If a volunteer has a more reserved personality the students are likely to be more rambunctious and possibly distracted.

Part 3: Compare and Contrast

The survey answers of the teachers, interview responses from the HSVBG staff members and volunteers, and researcher observations were compared and contrasted. There were differences between the teacher answers and staff and volunteer responses. The teachers are naturally more biased toward their class, whereas the staff members, volunteers, and researcher are unbiased. The classes who had the better behavior tended to be with the teachers who were the most interested in the lesson during the field trip regardless of experimental or control grouping.

Programmatic Implications

The following recommendations for actions are based on the findings and conclusions of this study.

1. Interaction with HSVBG staff before the field trip improves engagement and behavior.

Therefore, it is suggested that staff members visit the classrooms as possible prior to the children coming to the garden.

2. It is also suggested to continue the pre-activities to improve engagement and behavior of students. This is another chance for especially the boys to have a kinesthetic learning experience and improve their learning and behavior on the field trip.
3. Teachers and parent chaperones should be reminded of the importance of keeping the students engaged and attentive during the field trip. Children model their behavior. If the children are kept on task and teachers and chaperones seem interested in the material, the students are more likely to behave and learn as well. This could be accomplished by the garden developing a paragraph to be included in the permission forms for the field trip as well as reminding participants at the beginning of the field trip itself.

Recommendations for Additional Research

The following recommendations were made based on the findings of this research:

1. It is recommended that more students be tested from different socioeconomic backgrounds to ensure diversity.
2. It is recommended that different grade levels should be tested.
3. It is recommended that a follow-up study be conducted with multiple pre- and post-activities prior to and after the field trip.
4. It is recommended that a follow-up study be conducted with the teachers to determine if there are differences between an outsider leading the activities and a teacher leading the activities.
5. It is recommended that teacher engagement affects on student success and behavior on field trips be studied.

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APPENDICES

APPENDIX A



Auburn University Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn, AL 36849

Please note that Ms. Jayne Funderburk, Auburn University Graduate Student, has the permission of **Huntsville Botanical Garden** to conduct research at the garden for her study, "An evaluation of pre and post field trip activities on student behavior, knowledge acquisition and retention at a public garden."

Ms. Funderburk will conduct interviews with the garden leaders of elementary field trip groups. After the field trip Ms. Funderburk will ask the garden field trip leaders questions about the behavior of the student groups, their ability to pay attention and answer questions. Her plan is to meet with the field trip leaders immediately after a group has finished their tour of the garden. The education department of the garden will help Ms. Funderburk conduct the interviews. Ms. Funderburk's on-site research activities will be finished by December 1, 2015.

Ms. Funderburk has also agreed to provide to my office a copy of the Auburn University IRB-approved, stamped consent document before she conducts interviews and will provide a copy of any aggregate results. If there are any questions contact my office.

Signed,

A handwritten signature in cursive script, reading "Paula Steigerwald".

Paula Steigerwald, President and CEO
Huntsville Botanical Garden

4747 Bob Wallace Avenue • Huntsville, AL 35805
Phone (256) 830-4447 • FAX (256) 830-5314
www.hsvbg.org



Rainbow Elementary

50 Nance Road
Madison, AL 35758

Phone: 256-824-8106
Fax: 256-824-8110
Email: dcwhite@madisoncity.k12.al.us

June 30, 2015
Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn University, AL 36849

Dear IRB members,

After reviewing the proposed study, "An Evaluation of the Effects of Pre and Post Field Trip Activities on Elementary Student Behavior, Knowledge Acquisition and Retention," presented by Ms. Jayne Funderburk, a graduate student at Auburn University, I have granted permission for the study to be conducted at Rainbow Elementary School.

The purpose of the study is to determine if behavior, knowledge acquisition and retention improves if students are exposed to activities before visiting Huntsville Botanical Garden. The primary activity will be participating in pre and post activities with the assistance of Ms. Funderburk and taking part in pre and post tests on their knowledge of butterfly anatomy, habitat, and life cycle. Only students in the second grade will participate to align with Huntsville Botanical Garden's second grade butterfly field trips.

I understand that pre and post activities and testing will occur for 4 weeks during normal classroom instruction and during students' regularly scheduled science instruction. This will be a once a week event lasting from forty-five minutes to an hour. I expect that this project will end no later than December 1, 2015. Ms. Funderburk has also agreed to provide to us a copy of the aggregate results from her study.

If the IRB has any concerns about the permission being granted by this letter, please contact me.

Sincerely,

Dorinda C. White, Principal



Endeavor Elementary School

1997 Old Railroad Bed Road
Harvest, AL 35749
Phone: (256) 851-4620
Fax: (256) 851-4621

Karen Mardis
Principal

Jenny McAlister
Assistant Principal

July 1, 2015
Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn University, AL 36849

Dear IRB members,

After reviewing the proposed study, "An Evaluation of the Effects of Pre and Post Field Trip Activities on Elementary Student Behavior, Knowledge Acquisition and Retention," presented by Ms. Jayne Funderburk, a graduate student at Auburn University, I have granted permission for the study to be conducted at **Endeavor Elementary School**.

The purpose of the study is to determine if behavior, knowledge acquisition and retention improves if students are exposed to activities before visiting Huntsville Botanical Garden. The primary activity will be participating in pre and post activities with the assistance of Ms. Funderburk and taking part in pre and post tests on their knowledge of butterfly anatomy, habitat, and life cycle. Only students in the second grade will participate to align with Huntsville Botanical Garden's second grade butterfly field trips.

I understand that pre and post activities and testing will occur for 4 weeks during normal classroom instruction and during students' regularly scheduled science instruction. This will be a once a week event lasting from forty-five minutes to an hour. I expect that this project will end no later than December 1, 2015. Ms. Funderburk has also agreed to provide to us a copy of the aggregate results from her study.

If the IRB has any concerns about the permission being granted by this letter, please contact me.

Sincerely,

Karen Mardis



Legacy Elementary School

165 Pine Grove Road
Madison, Alabama 35757
Phone: (256) 851-4630
Fax: (256) 851-4631

Mr. Keith Trawick
Principal

Ms. Wynnetta Ford
Assistant Principal

July 10, 2015

Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn University, AL 36849

Dear IRB members,

After reviewing the proposed study, "An Evaluation of the Effects of Pre and Post Field Trip Activities on Elementary Student Behavior, Knowledge Acquisition and Retention," presented by Ms. Jayne Funderburk, a graduate student at Auburn University, I have granted permission for the study to be conducted at Legacy Elementary School.

The purpose of the study is to determine if behavior, knowledge acquisition and retention improves if students are exposed to activities before visiting Huntsville Botanical Garden. The primary activity will be participating in pre and post activities with the assistance of Ms. Funderburk and taking part in pre and post tests on their knowledge of butterfly anatomy, habitat, and life cycle. Only students in the second grade will participate to align with Huntsville Botanical Garden's second grade butterfly field trips.

I understand that pre and post activities and testing will occur for 4 weeks during normal classroom instruction and during students' regularly scheduled science instruction. This will be a once a week event lasting from forty-five minutes to an hour. I expect that this project will end no later than December 1, 2015. Ms. Funderburk has also agreed to provide to us a copy of the aggregate results from her study.

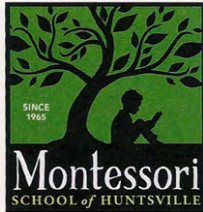
If the IRB has any concerns about the permission being granted by this letter, please contact me.

Sincerely,

Keith Trawick, Principal
Legacy Elementary School

Learning with Pride... Leading the Pack... Leaving a Legacy





The Montessori School of Huntsville

"Growing in knowledge, respect, and creativity"

15975 Chaney Thompson Rd

Huntsville, AL 35803

Phone 256-881-3790 Fax 256-881-3188

www.montessorihuntsville.org

office@montessorihuntsville.org

July 22, 2015

Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn University, AL 36849

Dear IRB members,

After reviewing the proposed study, "An Evaluation of the Effects of Pre and Post Field Trip Activities on Elementary Student Behavior, Knowledge Acquisition and Retention," presented by Ms. Jayne Funderburk, a graduate student at Auburn University, I have granted permission for the study to be conducted at the Montessori School of Huntsville.

The purpose of the study is to determine if behavior, knowledge acquisition and retention improves if students are exposed to activities before visiting Huntsville Botanical Garden. The primary activity will be participating in pre and post activities with the assistance of Ms. Funderburk and taking part in pre and post tests on their knowledge of butterfly anatomy, habitat, and life cycle. Only students in the second grade will participate to align with Huntsville Botanical Garden's second grade butterfly field trips.

I understand that pre and post activities and testing will occur for 4 weeks during normal classroom instruction and during students' regularly scheduled science instruction. This will be a once a week event lasting from forty-five minutes to an hour. I expect that this project will end no later than December 1, 2015. Ms. Funderburk has also agreed to provide to us a copy of the aggregate results from her study.

If the IRB has any concerns about the permission being granted by this letter, please contact me.

Sincerely,

Allison MacKenzie
Head of School

APPENDIX B

DEPARTMENT OF
HORTICULTURE



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

CONSENT LETTER TO SECOND GRADE TEACHERS

for a Research Study entitled

**“An Evaluation of the Effects of Pre and Post Field Trip Activities on Elementary Student
Behavior, Knowledge Acquisition, and Retention.”**

You are invited to participate in a study to evaluate student behavior and knowledge of the Huntsville Botanical Garden. The study is being conducted by Ms. Jayne Funderburk, graduate student, under the direction of Dr. Carolyn Robinson, Professor of Horticulture in the Auburn University Department of Horticulture. You are invited to participate because you are leading the students on their field trip of the garden and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to administer and collect pre and post tests, assist with pre and post activities, attend a field trip to Huntsville Botanical Garden, and interview with Ms. Funderburk. Your total time commitment will be approximately five hours.

Are there any risks or discomforts? To my knowledge there will be no physical risks associated with this research study.

Are there any benefits to yourself or others? By participating in this study your students and you will be given a free field trip to Huntsville Botanical Garden.

Will you receive compensation for participating? To my knowledge I will not be offering any compensation other than the free field trip provided by Huntsville Botanical Garden.

Are there any costs? If you decide to participate, you will not be charged monetarily, however the only cost will be your time for the interview.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Horticulture or Huntsville Botanical Garden.

Consent Letter

Participant's Initials _____

Page 1/2

101 Funchess Hall, Auburn, AL 36849-5408; Telephone: 334-844-4862; Fax: 334-844-3131

w w w . a u b u r n . e d u

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by anonymously naming you as an interviewed second grade teacher of the participating schools. Information collected through your participation will allow me to complete my graduate degree and will be published in my thesis and a journal article; however, no names will be used.

If you have questions about this study, please ask them now or contact Ms. Jayne Funderburk at mjf0007@auburn.edu or Dr. Carolyn Robinson at cwr0001@auburn.edu. A copy of this document will be given to you to keep.

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 email at IRBadmin@auburn.edu or IRBChair@auburn.edu.

Participant's signature Date

Investigator obtaining consent Date

Printed Name

Printed Name

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

**INFORMATION LETTER TO HBG TOUR STAFF
for a Research Study entitled
“An Evaluation of the Effects of Pre and Post Field Trip Activities on
Elementary Student Behavior, Knowledge Acquisition, and
Retention.”**

You are invited to participate in a study to evaluate student behavior and knowledge of the Huntsville Botanical Garden. The study is being conducted by Ms. Jayne Funderburk, graduate student, under the direction of Dr. Carolyn Robinson, Professor of Horticulture in the Auburn University Department of Horticulture. You are invited to participate because you are leading the students on their field trip of the garden and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to interview with Ms. Funderburk after the students' field trip to Huntsville Botanical Garden. Your total time commitment will be approximately one hour for the interview at most.

Are there any risks or discomforts? To my knowledge there will be no physical risks associated with this research study.

Are there any benefits to yourself or others? If you participate in this study, you can expect to spend at least an hour with Ms. Funderburk being asked a series of questions regarding each groups behavior. I cannot promise you that you will receive any benefits described.

Will you receive compensation for participating? To my knowledge I will not be offering any compensation.



each groups behavior. I cannot promise you that you will receive any benefits described.

Will you receive compensation for participating? To my knowledge I will not be offering any compensation.

Are there any costs? If you decide to participate, you will not be charged monetarily, however the only cost will be your time for the interview.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Horticulture or Huntsville Botanical Garden.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by anonymously naming you as an interviewed volunteer of Huntsville Botanical Garden. Information collected through your participation will allow me to complete my graduate degree and will be published in my thesis and a journal article; however, no names will be used.

If you have questions about this study, please ask them now or contact Ms. Jayne Funderburk at mjf0007@auburn.edu or Dr. Carolyn Robinson at cwr0001@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of

DEPARTMENT
OF
HORTICULTURE



AUBURN UNIVERSITY

COLLEGE OF AGRICULTURE

Research Compliance or the Institutional Review Board by phone
(334)-844-5966 or email 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.

Investigator's signature

Date

Print Name

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

PARENTAL PERMISSION/CHILD ASSENT
for a Research Study entitled
“An Evaluation of the Effects of Pre and Post Field Trip Activities on
Elementary School Student Behavior, Knowledge Acquisition and
Retention”

Your son or daughter is invited to participate in a research study to determine what affect pre and post field trip activities will have on their knowledge acquisition and retention. This study is being conducted by Ms. Jayne Funderburk, Auburn University Graduate Student, under the direction of Dr. Carolyn Robinson, Associate Professor in the Auburn University Department of Horticulture. Your son or daughter is invited to participate because he or she is participating in a field trip this year to Huntsville Botanical Garden. Since he/she is under the age of 18 or younger we must have your permission to include him/her in the study.

What will be involved if your son/daughter participates? If you decide to allow him/her to participate in this research study, he/she will be asked to take part in Huntsville Botanical Garden's pre and post activities and will also be surveyed on their knowledge of plants and flowers associated with the field trip. Your son's/daughter's total time commitment in class will be approximately 2 hours.

Are there any risks or discomforts? There should be no physical risks to your son or daughter and their participation in the research project will not affect their grades.

Will there be compensation for participating? There will not be any compensation for your son or daughter's participation in this research study.

However, Huntsville Botanical Garden has agreed to waive their school participation fees based on participation in the study.

If you (or your son/daughter) change your mind about his/her participation, he or she can be withdrawn from the study at any time. His/her participation is completely/voluntary. If you choose to withdraw your son/daughter, his/her data can be withdrawn as long as it is identifiable. Your decision about whether or not to allow your son/daughter to participate or to stop participating will not jeopardize your or his/her future relations with Auburn University, the Department of Horticulture or Huntsville Botanical Garden. No class credit will be given or removed based on participation or not.

Your son's/daughter's privacy will be protected. Any information obtained in connection with this study will remain confidential. The data collected will be protected by coding and removing all names once the pre and post surveys have been matched. Information obtained through his/her participation will allow me to complete my graduate degree and will be published in my thesis and a journal article; however no names of children will be used.

If you (or your son/daughter) have questions about this study, please contact Ms. Jayne Funderburk at mjf0007@auburn.edu or Dr. Carolyn Robinson at cwr0001@auburn.edu. A copy of this document will be given to you to keep.

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

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT WISH FOR YOUR SON OR DAUGHTER TO PARTICIPATE IN THIS RESEARCH STUDY YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO ALLOW HIM OR HER TO PARTICIPATE. YOUR

**SON'S/DAUGHTER'S SIGNATURE INDICATES HIS/HER
WILLINGNESS TO PARTICIPATE.**

Parent/Guardian Initials _____
Participant Initials _____

Participant's Signature Date

Investigator Obtaining Consent Date

Printed Name

Printed Name

Parent/Guardian Signature Date

Printed Name

APPENDIX C

Multiple Choice:

1. In which stage of the butterfly life cycle does it NOT eat?

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

2. During this stage, the _____ hatches from the egg and begins to eat lots of plants to help it grow.

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

3. In this stage, _____ are placed on or near the plants.

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

4. In the last stage of the life cycle, the _____ finds a mate to produce more eggs.

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

5. A butterfly is a(n)

- A. Insect
- B. Animal
- C. Reptile
- D. None of the Above

6. Butterflies lay their eggs on _____.

- A. Trees
- B. In the water
- C. Houses
- D. Plants

7. In which stage of the life cycle do a butterfly wings develop?

- A. Egg

- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

8. In which stage does the glue-like substance hold them onto plants?

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

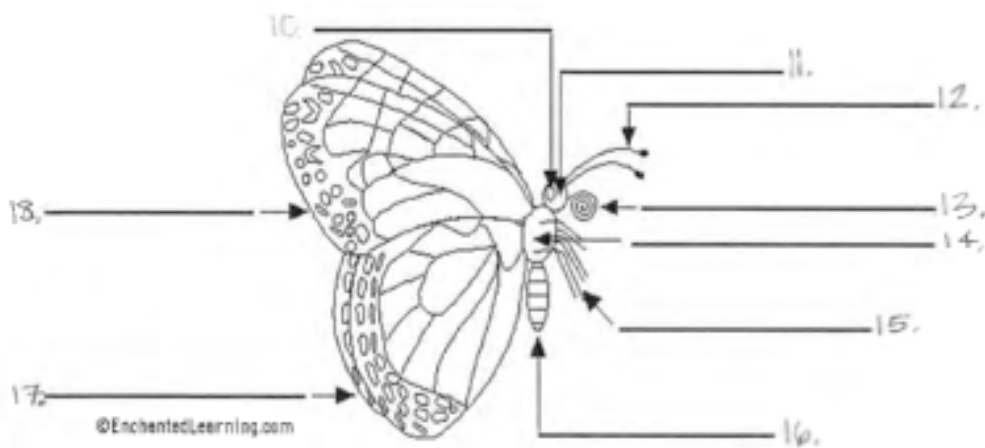
9. In which stage does the butterfly only eat liquid?

- A. Egg
- B. Caterpillar (Larva)
- C. Pupa (Chrysalis)
- D. Adult Butterfly

Matching:

Word Bank

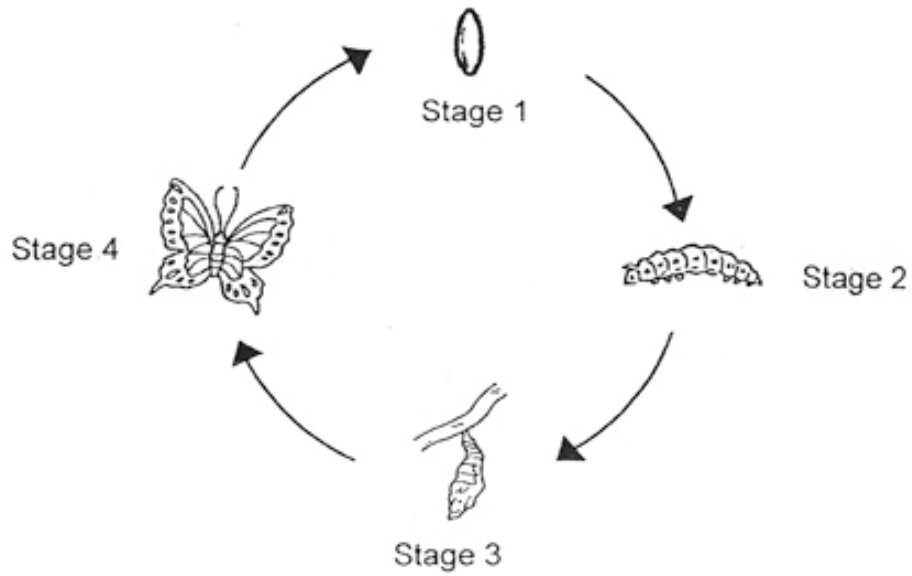
- | | |
|-----------------|--------------|
| A. Abdomen | F. Fore wing |
| B. Antenna | G. Head |
| C. Compound Eye | H. Hind wing |
| D. Leg (Tongue) | I. Proboscis |
| E. Thorax | |



Word Bank

- A. Egg
- B. Pupa (Chrysalis)
- C. Caterpillar (Larva)
- D. Adult Butterfly

19.



22. _____

21. _____

20. _____

1. Ethnicity: Circle one please.

A. Caucasian/White

B. African American/Black

C. Hispanic/Latino

D. Asian

E. Other

2. Gender: Circle one please.

A. Male

B. Female

3. Have you ever visited Huntsville Botanical Garden? Check ____ Yes or ____ No

4. Did you go to Huntsville Botanical Garden with your school? ____ Yes or ____ No

5. Did you go to Huntsville Botanical Garden with your family? ____ Yes or ____ No

6. Did you go to Huntsville Botanical Garden with someone else? If so who? _____.

7. Have you ever studied butterflies before? ____ Yes or ____ No

8. Have you ever grown butterflies before? ____ Yes or ____ No

9. Have you ever been to a butterfly house? ____ Yes or ____ No

10. Do you think this test was:

A. Easy

B. Medium/Ok

C. Hard

APPENDIX D

Interview Questions with Huntsville Botanical Garden Staff and Volunteers:

1. Were the students engaged and attentive during the field trip?
2. Did the students exhibit typical field trip behavior?
3. Were the students able to answer your questions during the field trip?
4. What was the behavior of the students on the field trip?
5. Overall, what was your impression of the students during the field trip?

Survey Questions for Teacher:

1. Were your students engaged and attentive during the field trip?
2. Did they seem interested in the butterfly lesson provided by HSVBG?
3. Were the students able to answer the questions of the field trip guide?
4. How was the behavior of your students?
5. What is typical field trip behavior for a class?
6. Overall, what was your impression of the class on the field trip?