

Program Evaluation of Elementary School Field Trips to a Botanical Garden

by

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Abstract

The purpose of this study was to evaluate Fernwood Botanical Garden and Nature Preserve's 4th grade environmental science pond studies field trip programs. Student knowledge gain and attitude towards subject matter was evaluated through pre- and post-test questionnaires. Teachers were surveyed following the field trip, and observations were made by the researcher during the field trip to assess if students were actively involved. A case study comparing field trip program preparation, pedagogy, activities and outcomes was also conducted at Fernwood Botanical Garden and Nature Preserve, Chicago Botanic Garden, and The Morton Arboretum. Results of the study indicated that students gained knowledge of subject matter and retained it in the short and long term (1 and 6 weeks), and that the field trip had a significant impact on their attitudes. Results also indicate that teachers who attended field trips at Fernwood Botanical Garden and Nature Preserve were satisfied with the preparation aspect of the field trip, but they thought improvements should be made in pedagogy and activity. The case study also indicated that Fernwood Botanical Garden and Nature Preserve's field trip preparation was satisfactory, but the activity portion of the field trip could make improvements when compared to The Chicago Botanic and The Morton Arboretum. Chicago Botanic Garden could make improvements to their field trip evaluations, and The Morton Arboretum could improve the activity portion of their field trip.

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more ways than he will ever understand, and only making fun of my weird hybrid East Texas-Alabama-Tennessee-Midwest accent a little bit.

To Heath, Anna-Marie, Mandy, and Evan—Thank you for being a hearty laugh at the end of a long day! Wouldn't have made it through without yall. And last but certainly not least, to my fiancé Matthew Burrows for being my supporter, partner, and best friend. I know you hate sappy praise so I won't ramble, but just know that I couldn't imagine a more perfect reason that fate led me to Auburn than to meet and fall in love with you. I can't wait to see where life takes us.

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Style manual or journal used

American Society for Horticultural Science

Computer software used

Microsoft Word 2017, SPSS versions 23.1

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CHAPTER I

INTRODUCTION

The Field Trip

Despite an overwhelming amount of research that supports field trips as a beneficial learning tool for teachers and students, field trips have been on the decline (Dillon et al., 2006). That trend continued through the recession years (2009 to 2014) and in the 2015-2016 school year just twelve percent of administrators surveyed by the American Association of School Administrators said they had brought field trips back to pre-recession levels (Reeves and Rodrigue, 2016). For informal science education centers like nature centers and public gardens this generally means a decrease in income. To correct this issue, field trip administrators must identify how their program can be beneficial to teachers and students and an asset to school curriculums. To help informal learning facilities like parks and gardens achieve this goal, it is important to evaluate field trip programs to get feedback. This helps field trip administrators understand what teachers and students thought about their experience and how to improve it in the future to encourage return visits.

Need for the Study

Not only are learning field trips on the decline, but there is limited research on the curriculums public gardens use to develop their programs in the natural environment and how they implement them. While it is generally understood that field trip curriculums should incorporate state wide learning curriculum standards for each grade level, there is little research on how public gardens effectively utilize those standards. This is important

for public gardens to know and implement because if schools can show that field trips are valuable learning experiences and assets to curriculum they may be more willing to allocate funds to them.

This research is important to students, because most of life and learning takes place outside of the classroom, and field trips in the natural environment provide students hands on learning opportunities (Alon and Tal, 2015). This research considers how one public garden, Fernwood Botanical Garden and Nature Preserve, organizes and administers a 4th grade field trip in the natural environment titled “Pond Studies and Animal Classification.” This research evaluates the program using student and teacher surveys and pre/post tests to determine how the field trip impacted student knowledge and attitude. Another field trip at Fernwood Botanical Garden and Nature Preserve was compared to similar programs at two gardens within 130 miles: Chicago Botanic Garden and The Morton Arboretum. The goals of this research were to ensure that Fernwood Botanical Garden and Nature Preserve is current and effective in its teaching to characterize field trips in the natural environment, and discover how they are implemented at 3 different public gardens.

Informal Science Learning

Informal science learning can come from a variety of experiences, such as reading, watching T.V. shows, online activities and science field trips whereas formal science learning is generally through classroom instruction. Every year, millions of elementary and middle school students take field trips during the traditional school year (Knapp and Barrie, 2001). Of those, one of the most common learning field trip configurations involves visits to outdoor or field locations where environmental and

ecological learning can take place (Nadelson and Jordan, 2012). When the World Wildlife Fund surveyed primary and secondary educators, they found that approximately half of the teachers polled had taken their students on an informal science field trip (Knapp, 2000). Much of the research conducted on the benefits of field trips shows that they are not only important because of high volume participation, but also their contributions to learning both in and out of the classroom. However, among these studies, field trips in the natural environment have been studied significantly less often (Alon and Tal, 2015). There are many reasons field trips in the natural environment should be studied, including attitude and behavioral effects on students, the trend toward fewer students who pursue science careers, and benefits on child development.

Children in Nature

Educators and child development professionals have long promoted safe, outdoor playtime opportunities for children, toddlers, and infants. Communication, physical, emotional, social, and personal skills are areas that can be enhanced with outdoor play (Robinson, 2016). It is also widely accepted that nature and plants contribute to human well-being (Relf and Dorn, 1995). Nature encourages creativity, social interaction (Browne, 1992 in Relf, 1992) and the building of relationships with other people (Lewis, 1996). Peoples' attitude towards nature and the environment may be affected by many things, but perhaps the strongest factor is environmental knowledge (Cammack et al., 2002). As environmental knowledge increases, environmental attitude improves and environmentally friendly behavior tends to follow (Cammack et al., 2002). By spending time in public gardens people, especially children, can learn that nature is essential for many of our physical and aesthetic needs. That knowledge can promote enjoyment of

working with or in nature, valuing resourcefulness, and seeing the benefits that technological improvements can provide, not just for people, but also for the environment. Environmental literacy benefits not only the present generation, but future generations as well (Green, 1994). One of the best-known educators of the 20th century, Maria Montessori, was a great advocate for incorporating nature into school curriculum. She stated that “nature can be a great basis for an introduction to the pleasures and later a necessity for nurturing living things” (Montessori, 1964).

From spending time in nature, children can also learn that their actions have consequences. For example, a plant that is not watered will die, and a flower that has been picked cannot be put back on the plant. If we want children to show concern and respect for one another and the environment, they must be exposed to the environment and the beauties it holds (Fleener, 2008). Many studies have demonstrated that environmental education programs that involve activity based learning have been very successful in improving children’s respect for nature and environmental attitudes (Cammack et al., 2002; Alon and Tal, 2015). Students’ attitudes improve as they understand how they impact the environment and how they can positively affect that impact.

People typically remember their first exposure to seeds or plants and planting. As years pass, it is usually easy for people to remember the hands-on learning they did in elementary school as opposed to text they read in books. Also, in the United States today’s parents are very concerned about their children’s physical and mental health, personality development, and academic performance (Robinson, 2016). This increase in protectiveness of children combined with an increase in women entering the workforce,

has resulted in development of more structured activity and care options for children (Mintz, 2004). Historically, children got outdoor playtime with friends and neighbors, but today people do not necessarily know their neighbors as they once did (Dunkelman, 2014). Children's afternoons are filled with scheduled activities and afterschool programs, and their weekends tend to be tightly scheduled. Such activity tends to omit experiences in nature. Activities like slowing down and taking a walk, watching colors change on leaves, or watching a spider spin its web are too slow, and not productive enough for most people (Robinson, 2016). Activities and time need to be reassessed, and children and parents alike need time to connect with nature or it could lead to negative impacts on mental health and the environment (Grogan, 2011).

Attitude and Behavior Effects

Two very important outcomes of modern outdoor education are attitude and behavior effects. Ninety-five percent of the average American's life is spent outside of the classroom, which means the majority of their learning takes place outside of the classroom as well. Therefore it is especially important to incorporate non-traditional settings for learning (Sacco et al., 2014). When people look back at their elementary and middle school years, they may not remember specific subject content, but they often remember significant events, such as field trips that they experienced (Knapp, 2007). Not only can they recall the experience, but it usually had a positive impact on their attitudes in regard to that subject. For example, students who participated in a marine ecology field trip showed a more positive attitude toward the subject matter following the field experience (Knapp, 2000). When exposed to field trips in the natural environment, students can have direct experience with natural phenomena. Students can see and hear

bubbles of methane gas being released from the ground in an area that was once swamp (Alon and Tal, 2015). They could witness a live demonstration of transpiration by placing a plastic bag around a tree branch and watching the water droplets form (Nadelson and Jordan, 2012). The opportunities seem limitless. The ability to see these things in action as opposed to simply hearing them from a teacher in a classroom setting has a significant effect on student attitudes. In one study, researchers found that 14 of their 15 students discussed environmental tangibles in a post-field trip interview and expressed an increase in pro-environmental attitudes (Farmer et al., 2007).

Scientific Influence

The most recent push for the use of informal science field trips in teaching curriculum is the science, technology, engineering, art and math movement, or STEAM movement. The aim of STEAM learning is to change traditional views of science education as “dry and boring” by administering learning in a wide variety of social dynamics and settings. These experiences could take place during a walk in a park, summer camp activities that impart lessons about biology, or a short interactive video at a museum (Sacco et al., 2014). Research has demonstrated that field trips have a positive effect on short term knowledge retention of subject matter, as well as a positive effect on long term attitude and behavior towards the subject being taught, or the location of the lesson (Knapp, 2000). That means that students who are exposed to STEAM subjects at a younger age are more likely to become involved in those fields of study later in life.

Social Impact

Not only do field trips allow conceptual and affective growth, but social development as well. Although this may seem less pressing than knowledge or attitude,

there is a general decline in face to face interactions among individuals that field trips can help offset (Fleener, 2008). Social competence is defined as the social, emotional, and cognitive skills that children need for successful social adaptation. Children with good social skills can assess a situation and use many different social behaviors and use them in the appropriate context. They are also able to understand other people's emotions, perceive social cues, and exhibit understanding of others motivations and goals. Social competence can help children create and establish positive relationships, while avoiding negative treatment or victimization (Welsh and Bierman, 2008). Not only is the social impact of field trips important as an administrator or educator for the growth of your children, but it is also important to the children themselves. In a study done on situational interest of secondary students in a field trip to a zoo, researchers discovered that student interest was triggered by variables such as active involvement (hands-on activities), novelty, surprise, knowledge acquisition (activities and provided information), and social involvement (opportunities for socialization) (Dohn, 2013).

Curriculum

The curriculum used in this study was the Fernwood Botanical Garden and Nature Preserve Environmental Science Program (ESP) field trip curriculum, which was established by lead naturalist Wendy Jones. The fourth grade field trip program topic is Animal Classification and Pond Studies. The program consists of an indoor classroom portion (classification) and an outdoor portion (pond studies). It was developed for fourth grade but can be altered to fit any grade level.

Objectives

The aim of this study was to evaluate the current 4th grade environmental science field trip program in place at Fernwood Botanical Garden and Nature Preserve in Niles, MI. The objectives were to determine if 1) the field trips provided students with an enjoyable experience that affected their attitude towards subject matter presented, 2) the field trip curriculum increased student knowledge on subject matter presented in the short and long term (1 and 6 weeks), 3) teachers were satisfied with the program, and 4) Fernwood Botanical Garden and Nature Preserve is current in its teaching when compared to state standards and other notable public garden field trip programs.

Definition of Terms

For the purposes of this study, the following terms have been operationally defined:

1. Attitude: manner, disposition, feeling, position, etc. with regard to a person or thing; tendency or orientation, especially of the mind (Lexico Publishing Group, 2017)
2. Behavior: manner of behaving or acting; the action or reaction under any given circumstance (Lexico Publishing Group, 2017).
3. Knowledge: acquaintance or familiarity gained by sight, experience, or report; familiarity or conversance, as with a particular subject or branch of learning (Lexico Publishing Group, 2017).
4. Public Garden: an institution that maintains collections of plants for the purpose of public education and enjoyment, in addition to research, conservation, and higher learning. (American Public Garden Association, 2015).

5. Botanical Garden: A place where a wide variety of plants are cultivated for scientific, educational, and ornamental purposes, often including a library, a herbarium, and greenhouses (Lexico Publishing Group, 2017).
6. Arboretum: A place where trees and plants are grown in order to be studied or seen by the public. (Lexico Publishing Group, 2017).
7. Pedagogy: the function or work of a teacher; the art and science of teaching, education, and instructional methods. (Lexico Publishing Group, 2017).

Basic Assumptions

It was assumed that all respondents answered the surveys honestly and to the best of their abilities. It was also assumed that instructors presented and administered each round of surveys to students without bias. It was assumed that all students who completed a survey were present on the day of the field trip and the days of survey administration. Also, it was assumed that two post-tests administered to participants at one and six weeks after a field trip were long enough to gauge short and long term impact. Finally, it was assumed that one field trip in a semester is enough to affect student attitude, behavior, and knowledge.

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 fourth grade level based on the field trip available at Fernwood Botanical Garden and Nature Preserve. Because of the voluntary nature of participation, the students tested may have varied in their responses due to backgrounds, history, and experiences. There was also

participant loss over time from pre to post tests because some teachers forgot to administer surveys.

Delimitations

This study investigated the effects of an environmental science field trip program on student attitude, behavior, and knowledge of 4th graders from Niles community schools in Niles, MI, who voluntarily participated in the research study during the fall of 2016.

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CHAPTER II

REVIEW OF LITERATURE

Children in Nature

Child development professionals have long promoted safe, outdoor playtime opportunities for children, toddlers, and infants. Communication, physical, emotional, social, and personal skills are areas that can be enhanced with outdoor play (Robinson, 2016). It is also widely accepted that nature and plants contribute to human well-being (Relf and Dorn, 1995). Nature encourages creativity, social interaction (Browne, 1992 in Relf, 1992) and the building of relationships with other people (Lewis, 1996). By spending time in public gardens people, especially children, can learn that nature is essential for many of our physical and aesthetic needs. That knowledge can then promote working with or in nature, valuing resourcefulness, and seeing the benefits that technological improvements can provide, not just for people, but also for the environment (Green, 1994). One of the best-known educators of the 20th century, Maria Montessori, was a great advocate for incorporating nature into school curriculum. She stated that “nature can be a great basis for an introduction to the pleasures and later a necessity for nurturing living things” (Montessori, 1964).

From spending time in nature, children can also learn that their actions have consequences. For example, a plant that is not watered will die, and a flower that has been picked cannot be put back on the plant. If we want children to show concern and respect for one another and the environment, they must be exposed to the environment

and the beauties it holds (Fleener, 2013). Many studies have demonstrated that environmental education programs that involve activity based learning have been very successful in improving children's respect for nature and environmental attitudes (Cammack et al., 2002; Alon and Tal, 2015). The students' attitudes improve as they understand how they impact the environment and how they can have a positive affect on that impact.

People usually remember their first exposure to seeds or plants and planting. As years pass, it is very easy for people to remember the hands-on learning they did in elementary school as opposed to text they read in books. Also, today's parents are very concerned about their children's physical and mental health, personality development, and academic performance (Robinson, 2016). This trend of increased protection of children combined with more women entering the workforce, led more structured activity and care for children (Mintz, 2004). Historically, children got outdoor playtime with friends and neighbors, but today people do not necessarily know their neighbors as they once did (Dunkelman, 2014). Children's afternoons and weekends are filled with scheduled activities and afterschool programs. Activities like slowing down and taking a walk, watching colors change on leaves, or watching a spider spin its web are too slow, and not productive enough for most people (Robinson, 2016). Activities and time need to be reassessed, and children and parents alike need time to connect with nature or it could have negative impacts on the environment as well as people's state of mind (Grogan, 2011).

Environmental Science

The aim of environmental educators is to change individual behavior toward the environment by producing environmentally literate and responsible citizens (Knapp, 2000). Environmental education is a sequential process that attempts to increase understanding of the environment and promote pro-environmental values, with the goal of motivating citizens to act individually and collectively in an environmentally conscious manner that balances the social, economic, and ecological needs of today without compromising those of the future (Hungerford et al, 1980; United Nations Educational, Scientific, and Cultural Organization–United Nations Environmental Programme (UNESCO–UNEP, 1978; USEPA, 2006). Peoples’ attitude towards nature and the environment may be affected by many things, but perhaps the strongest factor is environmental knowledge (Cammack et al., 2002). As environmental knowledge increases, environmental attitude improves and environmentally friendly behavior tends to follow (Cammack et al., 2002)

Field Trips

Millions of elementary and middle school students take field trips during the traditional school year (Knapp and Barrie, 2001). Field trips are usually arranged by schools, have educational purposes and take place in engaging and interactive settings (Morag and Tal, 2014). Despite an overwhelming amount of research that supports field trips as a beneficial learning tool for teachers and students, field trips have been on the decline (Dillon et al., 2006). That trend continued through the recession years (2009 to 2014) and in the 2015-2016 school year just twelve percent of administrators surveyed by the American Association of School Administrators said they had brought field trips back to pre-recession levels (Reeves and Rodrigue, 2016). Field trips allow students to develop

their social skills, motoric skills, and enhance their motivation to learn and develop individually (Ballentyne and Packer, 1996). Much of the research conducted on the benefits of field trips shows that they are not only important because of high volume participation, but also their contributions to learning both in and out of the classroom (Alon and Tal, 2015). Field trips also trigger student interest through variables such as active involvement, novelty, surprise, knowledge, acquisition, and social involvement (Dohn, 2011).

Attitude and Behavior Effects

Two very important outcomes of modern outdoor education are attitude and behavior effects. Ninety-five percent of the average American's life is spent outside of the classroom, which means the majority of their learning takes place outside of the classroom as well. Therefore it is especially important to incorporate non-traditional settings for learning (Sacco et al., 2014). When people look back at their elementary and middle school years, they may not remember specific subject content, but they often remember significant events, such as field trips that they experienced (Knapp, 2007). Not only can they recall the experience, but it usually had a positive impact on their attitudes in regard to that subject. For example, students who participated in a marine ecology field trip showed a more positive attitude toward the subject matter following the field experience (Knapp, 2000). When exposed to field trips in the natural environment, students can have direct experience with natural phenomena. Students can see and hear bubbles of methane gas being released from the ground in an area that was once swamp (Alon and Tal, 2015). They could witness a live demonstration of transpiration by placing a plastic bag around a tree branch and watching the water droplets form (Nadelson and

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Scientific Influence

The most recent push for the use of informal science field trips in teaching curriculum is the science, technology, engineering, art and math movement, or STEAM movement. One aim of STEAM learning is to change traditional views of science education as “dry and boring” by administering learning in a wide variety of social dynamics and settings. These experiences could take place during a walk in a park, summer camp activities that impart lessons about biology, or a short interactive video at a museum (Sacco et al, 2014). Research has demonstrated that field trips have a positive effect on short term knowledge retention of subject matter, as well as a positive effect on long term attitude and behavior towards the subject being taught, or the location of the lesson (Knapp, 2000). That means that students who are exposed to STEAM subjects at a younger age are more likely to become involved in those fields of study later in life.

Social Impact

Not only do field trips allow conceptual and affective growth, but social development as well. Although this may seem less pressing than knowledge or attitude, there is a general decline in face to face interactions among individuals that field trips can help offset (Fleener, 2008). Social competence is defined as the social, emotional, and cognitive skills that children need for successful social adaptation. Children with good

social skills can assess a situation and use many different social behaviors and use them in the appropriate context. They are also able to understand other people's emotions, perceive social cues, and exhibit understanding of others motivations and goals. Social competence can help children create and establish positive relationships, while avoiding negative treatment or victimization (Welsh and Bierman, 2008). Not only is the social impact of field trips important as an administrator or educator for the growth of your children, but it is also important to the children themselves. In a study done on situational interest of secondary students in a field trip to a zoo, researchers discovered that student interest was triggered by variables such as active involvement (hands-on activities), novelty, surprise, knowledge acquisition (activities and provided information), and social involvement (opportunities for socialization) (Dohn, 2011).

One skill set that field trips can help develop that has a strong impact on social competency is a child's communication skills. Communication skills are the ability to effectively communicate with others, including both listening and speaking (Robinson, 2001). Social connectedness and compliance later in life are strongly associated with language skills at the ages of three and eight (Herbert-Myers, et al., 2006). Additionally, social acceptance as a child is related to competent communication, while poor communication has been linked to social rejection (Odom et al., 2006) The decline of egocentrism during middle childhood can improve communication skills, (Cole and Cole, 1993) which are some of the most important skills needed to succeed (Yost and Tucker, 2000). To effectively communicate, people involved in a conversation must be able to see the other's point of view (Fish 2000, in Robinson, 2001).

Development of Life Skills

Studying the impact of field trips on children's development of life skills such as self-understanding, leadership skills, and decision making skills is also important. Self-understanding is a person's awareness of his or her own abilities and weaknesses, while self-esteem is a person's value of him or herself. As school age children have more positive self-experiences, they begin to develop more positive self-regard. During this period positive regard from others, such as parents, teachers, and peers, becomes much more important (Blume and Zembar, 2007). The school-age years which start around seven or eight, are said to be a "sensitive period" in terms of a student's self-understanding of their competence. The extent to which a child's self-understanding becomes internalized depends, at least in part, on the support and feedback of others (Blume and Zembar, 2007). As children grow into adolescence (sixth to eighth grade), the approval of others may come to supercede their self-worth. Therefore, a good foundation for self-understanding must therefore be established at an early age, both in the home and at school (Fleener, 2008). Additionally, high self-esteem during childhood has been connected to satisfaction and happiness later in life, while low self-esteem has been connected to depression and maladjustment in school and life (Beane and Lipka, 1987). Schools must provide children with the opportunity to take on responsibilities, accomplish tasks, and be successful to build their self-esteem.

A person with leadership skills can motivate others to achieve a common goal, whether through organization, persuasion, or example. To be an effective leader, good academic skills, problem solving skills, and relationship skills are needed (Ordovery, 1997, in Ackerman, 1997). As children grow into adults, the leadership skills they attain during their school years will be applicable in many areas of their life including socially

and professionally. As young people grow into their adolescence, they are formulating ideas of how society works and are negotiating their relationship with society. A child who feels connected to society will have a sense of usefulness and therefore interest in participation in that society (Berman, 1997).

Decision making skills include the ability to look at different choices and determine the best one based on previous experience or the experience of others. Logical decisions generally follow this pattern: 1) identify options, 2) determine consequences of those options, 3) consider consequences, 4) evaluate likelihood of the consequences, and 5) make a decision based on the previous steps (Haynie et al., 1997). The social-emotional and cognitive skills needed to make clear decisions are like any other complex and integrated skill area, such as reading, driving a car, or riding a bicycle (Elias and Arnold, 2006). The skill can be learned, however to be obtained it must be “overlearned” or internalized to the extent that it becomes automatic (Elias and Butler, 1999). Social-emotional skills that will be used throughout life must be practiced enough that they are internalized. Once they are internalized, children will be able to apply the skills they’ve acquired to any situation.

Program Evaluation

To gain a better understanding of what a program evaluation does, it is necessary to define what a program truly is. There are infinite numbers and varieties of programs, however all of them are usually developed from an organization’s mission. The organization identifies several overall goals, and the goals often turn into programs. It is important to evaluate programs so that an organization can determine if the program is indeed useful to its constituents.

Program evaluations are a type of case study and can be defined as carefully collecting information about a program, or some aspect of the program, to make necessary decisions about the program. Program evaluations specifically examine a programs efficiency and effectiveness. They are often conducted with one or more of the following goals in mind: to assess the need for the program, to assess the program's design and logic, to examine the success of the implementation of the program, to assess the outcome, and to assess the programs cost and efficiency (Rossi et al., 2004). A program evaluation may come in many forms, encompassing both quantitative and qualitative research methods, and often incorporates both research types in a mixed method study (USEPA, 2012).

There are three types of program evaluation based on the timing of the evaluation. The first type is developmental evaluation and involves the evaluation of a proposed program before it is implemented. In this type of study, the evaluator provides informal feedback to the design team to help improve the program before it is implemented or pilot tested. The second type, formative evaluation, is conducted during a program for the purpose of improvement. Finally, the third and last type of program evaluation is implemented with the purpose of evaluating a program to provide a final evaluative judgement. It is most often conducted at the conclusion of a program (Rossi et al., 2004).

Program evaluations may be found across many disciplines, including education, sociology, psychology, social work, and agriculture. Within the field of horticulture, these studies can cover a wide range of subject matter. One program evaluation in horticulture was conducted at an assisted living home. Participants cared for indoor plants over a four-week period and took part in four two hour horticulture classes. A mixed

method approach was used, with surveys, interviews, and observations. Participants increased feelings of mastery (control over ones' circumstances), self-rated health, and self-rated happiness (Collins and O'Callaghan, 2008). In another study in 2006, teenage 4-H youth were engaged as "children's garden consultants" to provide feedback for children's garden designs. Seven teenagers were given time to research children's garden designs and educational programming and were then allowed to present their findings and recommendations to children's garden experts. Surveys, interviews, and observations with both the youth and the adults were conducted. The 4-H participants reported their experience as both fun and educational, while the adult participants reported the experience as successful and felt the youth had many great ideas to offer (Lekies et al., 2006).

A case study in 2009 examined the evaluation of education programs for public gardens (Steil and Lyons, 2009). An evaluation approach, or recommended model for evaluation was developed and 11 public garden employees were interviewed about their approach to program evaluation and their opinion of the created model. Several themes emerged from the interviews, including the importance of evaluation for education programs, the difficulty of conducting evaluations, and the characteristics that make for a good evaluation. The interviews also provided feedback for improving the evaluation model developed for the study (Steil and Lyons, 2009).

A 2005 program evaluation of the Junior Master Gardener (JMG) Program in 3rd grade classroom had students complete surveys with both open and close-ended questions and teachers were interviewed at the conclusion of the program for feedback. Students had gains in agricultural knowledge and in positive attitudes towards agriculture. They

also reported enjoyment of the program and a desire to participate in future JMG activities. Teachers also reported satisfaction with the program and provided feedback for its further improvement (Dirks and Orvis, 2005). Another study evaluated the efficacy of pre-visit activities in increasing learning on field trips. Observations and close-ended and open ended questions were utilized in evaluating the program. Although there was no significant difference in the knowledge and content portion of the surveys between students who participated in the pre-field trip activity and those who did not, students who participated in the pre-test activity exhibited less off task behavior during the garden visit (Funderburk, 2016).

In socio-horticultural research, several data collection methods are often utilized: surveys, tests, personal interviews, focus groups, and observations. Personal interviews are ideal when an in depth understanding of the interviewee's thoughts on the research topic are desired. Focus groups are interviews conducted with a special type of group, which is defined by either its purpose, size, procedures, or composition. Focus groups provide the advantage of interviewing several people at once, while providing interaction between participants that may produce data that may not have been produced in a personal interview. For both personal interviews and focus groups, sessions are usually audio recorded and transcribed for analysis. Observations may either be direct observations from field research or observations from another participant's observations, such as a teacher's observation of her students. Observations may be employed in conjunction with other data collection types like surveys and interviews, or may stand alone when combined with extensive field time (Shoemaker et al., 2000).

The FiNE Framework

In a recent study done by Morag and Tal, the goal was to provide a framework for evaluating field trips in the natural environment. This framework, called the FiNE framework, is the first solid, detailed attempt to outline the components of an outdoor field trip (Morag and Tal, 2012). The basic outline of the FiNE model for a field trip experience is composed of four concentric rings. The outermost ring is preparation, followed by pedagogy, then activity, and the innermost ring represents outcomes. In their study, Morag and Tal used a mixed method approach, utilizing both quantitative and qualitative data. The FiNE framework provides good information and guidelines for what to look for when evaluating field trips (Table 2.1).

Preparation. The outer ring addresses the coordination, planning and preparation phase of the field trip. This ring has three elements, as follows: classroom preparation (by a teacher or a facilitator), communication and collaboration between the organization/facilitator and the teacher, and connection of the field trip topic/content to the school curriculum (Morag and Tal, 2012). Information regarding preparation for the field trip comes from the teacher and field trip facilitator and by observing the field trip. Additional information is obtained from the students. The teachers describe any preparation for the field trip that took place in school and any connection to the curriculum. The teachers and facilitators provide information about the coordination of the field trip, including whether their discussions covered details of the program or merely essential technical information, such as the length of the trip, physical challenges, meeting points and so forth (Morag and Tal, 2012).

Pedagogy. The second ring deals with the pedagogy employed in the field trip, as interpreted by the researcher—the external observer. The pedagogy ring includes the

following components: clarifying/discussing the fieldtrip goals to ensure that students are familiar with them, using the immediate environment as a source for learning (referring to observed phenomena), making connections to everyday life, enhancing learning through social interactions, and facilitator's overall performance (interpersonal, didactic and logistic skills) (Morag and Tal, 2012). Not only does a good field trip contain hands on, action based learning, but a structure that compliments the school curriculum that students are currently learning in the classroom. Studies have shown that the preparation done by the classroom teacher can have an extremely significant impact on the quality of the field trip (Morag and Tal, 2012). For this reason, researchers are studying what components of field trips contribute to its success the most, and how those components can be measured and tested. Although they can vary greatly, program evaluations are the most widely accepted method of measuring the success of field trip programs. The majority of research on this topic is done quantitatively, where the focus is on knowledge gain and retention using a pre and post-test to measure any changes in student knowledge or effect. There are some studies, however, that measure these effects qualitatively through open ended interviews, which focus more on attitude and behavioral changes (Knapp and Poff, 2001).

Activity. This ring includes both learning activities and physical activity. While learning activities could be considered under pedagogy, Morag and Tal (2012) give these items a separate ring in the framework, based on their experience and the importance the research literature attributes to students' active learning in general and to physical activity and hands-on experiences in authentic out-of-school learning environments in particular (Grabinger and Dunlap, 1995; Higgins and Nicol, 2002; Kahn, 2002).

Outcomes. In Morag and Tal's 2012 study the field trip outcomes, represented by the inner circle, were reported by students through in-depth interviews. Through interviews the researcher is able to better understand student's knowledge gain and retention, as well as any changes in their attitudes or beliefs that could not be identified through observations. In the analysis of the interview transcripts, statements that addressed both the cognitive and affective domains are identified as follows: cognitive domain- learning and understanding of phenomena and ideas, and affective domain- attitudes, values, beliefs and feelings.

State Education Standards

One tool that public gardens and other similar institutions have at their disposal to create and administer field trips that ensure student learning is the state curriculum requirements. Ensuring that state guidelines are met helps justify school expenditure on learning field trips. The state of Michigan publishes their science requirements by grade level, and breaks them down into four separate disciplines: Science Processes (S), Physical Science (P), Life Science (L), and Earth Science (E). These disciplines are then broken down into more specific standards. Using Life Science as an example, the standards include Organization of Living Things (OL), Evolution (EV), and Ecosystems (EC). Disciplines and standards are the same across grade levels K-7, but each grade level has specific requirements that fall under those. In Michigan, the main concept of life sciences is "the role of different organisms and the flow of energy within an ecosystem." Fourth grade requirements are listed in Appendix D.

Fernwood Botanical Garden and Nature Preserve

Fernwood Botanical Garden and Nature Preserve is in southwest Michigan in the town of Niles. It began as the country home of Kay and Walter Boydston, who purchased the first 12.5 acres in 1941. Additional land purchases increased the property size to 105 acres, allowing the garden to expand not only the size of its gardens, but the variety of plants and planting they could hold. Today Fernwood Botanical Garden and Nature Preserve contains many small gardens, an arboretum, nature center, prairie, conservatory, and a nature preserve. The garden's mission is "To enrich people's lives by awakening and deepening their appreciation of nature and the possibilities of harmony between people, plants, gardens, and wildlife," and with the wide range of natural environments it offers, the staff at Fernwood Botanical Garden and Nature Preserve have the capacity to help its visitors achieve that goal.

Fernwood's nature preserve is a diverse site. A 125-foot drop in elevation has given rise to several natural communities, including dry and wet forests, young second-growth woods, streams and ponds, and a reconstructed tallgrass prairie. Species of endangered or threatened Michigan plants and animals are protected in the preserve. Rocky cliffs occupy the center of this 1,000-square-foot conservatory, with a waterfall cascading down to a small pond at one end. More than 100 kinds of tropical ferns grow in the rocks and nearby beds. Fernwood Botanical Garden and Nature Preserve also houses a 5-acre prairie. The nature center and exhibits showcase the many ecosystems of the garden, the animals that live in the region, and items of seasonal interest. Finally, the arboretum occupies 45-acres and was established in 1967. The design consultant was Clarence Godshalk, Director Emeritus of Morton Arboretum.

Fernwood Botanical Garden and Nature Preserve also offers amenities to visitors, from seminars and workshops to hosting meetings and holiday events. One of the aspects of Fernwood Botanical Garden and Nature Preserve that is utilized most often is its education programs. The garden offers adult, youth, and family education programs, as well as symposiums, bus tours, culinary programs, summer camps, and school programs. Recently, Fernwood Botanical Garden and Nature Preserve began planning a new education building, equipped with solar panels, a water conservation program, rain garden, and 16 foot interactive touch screen wall. With this new state of the art building, Carol Line, Executive Director of Fernwood, hopes to update the gardens natural science education programs as well. The new building will bring new life into the classes and field trip programs, while still maintaining the integrity of the garden's focus on natural science education.

The education programs that were the focus of this research came from the environmental science field trip programs. Fernwood Botanical Garden and Nature Preserve offers a traveling bus that can visit local schools to give presentations, as well as on site field trip presentations for grade levels K-6. For each grade level, there are multiple field trip options for teachers to choose from to allow them to integrate the trip into their grade level curriculum. The field trips are set up to enhance student learning. The goal of this research was to evaluate the garden's programs to ensure that they are current and effective in their teaching practices.

Teachers

Over the years, educational researchers have investigated many factors considered to affect student learning. At the heart of this line of inquiry is the core belief that

teachers make a difference (Sanders et al, 1997). There are continuing debates about how much the teacher effectiveness literature can be trusted to identify characteristics of effective teaching, and additional debates as well about how such research findings should frame the subsequent development of teacher evaluation systems. However, one assumption often made about teacher-student relationships is that the behavior patterns of teachers affect the behavior patterns of students (Sanders et al, 1997). Presumably, then, the more that students perceive their teacher cares about them or the material they are teaching, the more the students will care about the class, and the more likely they will be to pay attention in class and consequently learn more course material (Teven and Mckrosky, 1997).

Sanders et al. (1997) demonstrated that despite ongoing debates about teacher impact on student achievement, when compared to class size and homogeneity, teacher influence had the highest impact on student achievement. In addition, student academic level was found to be significantly related to academic progress, although not nearly to the degree found for the teacher. Therefore, it is of utmost importance that when evaluating field trip programs the educator's opinions and feedback should be taken into consideration. If a teacher is not excited both verbally and nonverbally about a field trip experience, his or her students are less likely to pay attention and enjoy the experience.

Summary of Literature

Learning in and outside of the classroom has a major impact on the growth and development of students. For this reason it is important to provide students the opportunity to express themselves, feel successful, and take on responsibility. Field trips in the natural environment offer well suited venues for this to take place. It is equally

important to ensure that field trips are effective and current in their subject matter content and pedagogy . The best way to do this is through program evaluation. Teachers also play an important role in student attitude and knowledge gained during a field trip so their involvement is important. The FiNE Framework (Morag and Tal, 2012) provides an outline for assessing field trips in the natural environment including preparation, pedagogy, activity, and outcomes.

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Table 2.1. Components of the FiNE Framework.

Preparation	<ol style="list-style-type: none"> 1. Classroom Prep 2. Collaboration 3. Connection to Curriculum 	Data collected from observation, and teachers/facilitators
Pedagogy	<ol style="list-style-type: none"> 1. Clarifying the Goals 2. Using the Environment 3. Connections to Everyday Life 4. Social Interaction 5. Facilitators Performance 	Data collected from observation, and teachers/facilitators
Activity	<ol style="list-style-type: none"> 1. Physical Activity-Observer 2. Active Learning-Observer 3. Physical Activity-Student 4. Active Learning-Student 	1 and 2 Data collected from observation, and teachers/facilitators 3 and 4 Data collected from students
Outcome	<ol style="list-style-type: none"> 1. Feelings, Attitude, and Belief 2. Knowledge and Understanding 	Data collected from students

Morag and Tal, 2012.

CHAPTER III
STUDENT EVALUATION OF FIELD TRIP AT FERNWOOD BOTANICAL
GARDEN AND NATURE PRESERVE

Summary

It is widely accepted that nature and plants contribute to human well-being (Relf and Dorn, 1995). Nature encourages creativity, social interaction (Browne, 1992 in Relf, 1992) and the building of relationships with other people (Lewis 1996; Stine, 1997). Attitudes towards nature and the environment may be affected by many things, but perhaps the strongest factor is environmental knowledge (Cammack et al., 2002). As environmental knowledge increases, environmental attitude improves and environmentally friendly behavior tends to follow (Cammack et al., 2002). For students to become more environmentally aware and act on that awareness, their knowledge of the environment must increase. Research has demonstrated that field trips have a positive effect on short term knowledge retention of subject matter, as well as a positive effect on long term attitude and behavior towards the subject being taught, or the location of the lesson (Knapp, 2000).

This study examined knowledge and attitude impacts of attending an environmental science field trip program at Fernwood Botanical Garden and Nature Preserve in Niles, MI on 4th grade students. Students came from two local Niles schools: Ballard Elementary School, and Howard-Ellis Elementary School. Participating students were given a pre-test survey, along with two post-test surveys to analyze any changes in

student knowledge, attitude, or behavior towards the subject matter presented on the field trip. There were 205 participants.

Questions for the survey were developed from the FiNE Framework for field trips in the natural environment, which was developed to outline the components of a field trip experience that takes place in the outdoors (Morag and Tal, 2012). The basic outline of the FiNE model is that field trip components are broken down and divided into four concentric rings. The outermost ring is preparation, followed by pedagogy, activity, and the innermost ring is outcomes. Morag and Tal (2012) used a mixed method approach, utilizing both quantitative and qualitative data. The FiNE framework provides information and guidelines for evaluating field trips.

Introduction

Impact of Field Trips. The most recent push for the use of informal science field trips in teaching curriculum is the science, technology, engineering, art and math movement, or STEAM movement. The aim of STEAM learning is to change traditional views of science education as “dry and boring” by administering learning in a wide variety of social dynamics and settings. These experiences could take place during a walk in a park, summer camp activities that impart lessons about biology, or a short interactive video at a museum (Sacco et al., 2014). Research has demonstrated that field trips have a positive effect on short term knowledge retention of subject matter, as well as a positive effect on long term attitude and behavior towards the subject being taught, or the location of the lesson (Knapp, 2000).

Not only can field trips encourage conceptual and affective growth, but they can also promote social development as well. Although this may seem less pressing than

knowledge or attitude, there is a general decline in face to face interactions among individuals that field trips can help offset (Fleener, 2008). Social competence is defined as the social, emotional, and cognitive skills that children need for successful social adaptation. Children with good social skills can assess a situation and use many different social behaviors and use them in the appropriate context. They are also able to understand other people's emotions, perceive social cues, and exhibit understanding of others motivations and goals. Social competence can help children create and establish positive relationships, while avoiding negative treatment or victimization (Welsh and Bierman, 2008). In a study done on situational interest of secondary students in a field trip to a zoo, researchers discovered that student interest was triggered by variables such as active involvement (hands-on activities), novelty (not previously experienced), surprise (experienced unexpectedly), knowledge acquisition (activities and provided information), and social involvement (opportunities for socialization) (Dohn, 2011).

As school aged children have more positive personal experiences, they begin to develop more positive self-regard. During this time positive regard from others, such as parents, teachers, and peers, becomes much more important (Blume and Zembar, 2007). The school-age years which start around seven or eight, are said to be a "sensitive period" in terms of a student's self-understanding of their competence (Ruble, 1987 in Blume and Zembar, 2007). The extent to which a child's self-understanding becomes internalized depends, at least in part, on the support and feedback of others (Blume and Zembar, 2007). As children grow into adolescence (sixth to eighth grade), the approval of others may come to supercede their self-worth. Therefore, a good foundation for self-understanding must therefore be established at an early age, both in the home and at

school (Fleener, 2008). Additionally, high self-esteem during childhood has been connected to satisfaction and happiness later in life, while low self-esteem has been connected to depression and maladjustment in school and life (Beane and Lipka, 1987). Schools must provide children with the opportunity to take on responsibilities, accomplish tasks, and be successful to build their self-esteem.

Environmental Science. The aim of environmental educators is to change individual behavior toward the environment by producing environmentally literate and responsible citizens (Knapp, 2000). Environmental education is a sequential process that attempts to increase understanding of the environment and promote pro-environmental values, with the goal of motivating citizens to act individually and collectively in an environmentally conscious manner that balances the social, economic, and ecological needs of today without compromising those of the future (Hungerford et al, 1980; United Nations Educational, Scientific, and Cultural Organization–United Nations Environmental Programme (UNESCO–UNEP), 1978; United States Environmental Protection Agency, 2006). Attitudes towards nature and the environment may be affected by many things, but perhaps the strongest factor is environmental knowledge (Cammack et al., 2002). As environmental knowledge increases, environmental attitude improves and environmentally friendly behavior tends to follow (Cammack et al., 2002).

Program Evaluation. To gain a better understanding of what a program evaluation does, it is necessary to define a program. There are seemingly infinite numbers and varieties of programs, however they are usually developed from an organizations mission. The organization identifies several overall goals, and the goals often turn into programs. It is important to evaluate programs so that an organization can determine if the program is

indeed useful to its constituents. This assessment can come from a wide variety of evaluation topics such as cost/benefit analysis, effectiveness, efficiency, goal-based, processes, and outcome. The specific program that served as the subject of this research was chosen because completion of Fernwood's new education building has provided a time of transition, making it imperative to assess their field trip programs.

Program evaluations are a type of case study and can be defined as carefully collecting information about a program, or some aspect of the program, in order to make necessary decisions about the program. Program evaluations specifically examine a programs efficiency and effectiveness. They are often conducted with one or more of the following goals in mind: assess the need for the program, assess the programs design and logic, examine the success of the implementation of the program, assess the outcome, and assess the programs cost and efficiency (Rossi et al., 2004). A program evaluation may come in many forms, encompassing both quantitative and qualitative research methods, and often incorporates both research types in a mixed method study (USEPA, 2012).

The FiNE Framework. In a recent study done by Morag and Tal, the goal was to provide a framework for evaluating field trips in the natural environment. This framework, called the FiNE framework, is the first solid, detailed attempt at outlining the components of a field trip that takes place in the outdoors (Morag and Tal, 2012). The basic outline of the FiNE model is that field trip components are broken down and divided into four rings. The outermost ring is preparation, followed by pedagogy, then activity, and finally outcomes. The FiNE framework provides good information and guidelines for what to look for when evaluating field trips. All of the components the framework consists of are demonstrated in Table 3.1.

Materials and Methods

This study evaluated the educational effectiveness of Fernwood Botanical Garden and Nature Preserve's 4th grade natural science field trip programs. This study was a mixed method study that incorporated both quantitative and qualitative data collection in a program evaluation with emphasis on applying components Morag and Tal identified in 2012: preparation, pedagogy, activity, and outcomes. Auburn University Institutional Review Board approval was granted before the project began in fall of 2016. Copies of the parental consent and student assent forms are included in Appendix A.

Objectives. The objectives of this study were to determine if 1) field trip experiences affected student attitude towards nature, 2) field trip curriculum utilized increased student knowledge on subject matter in the short and long term (1 and 6 weeks), and 3) students were actively engaged in the field trip experience.

Sample. Data for this research was collected in September and October of 2016. The surveys were developed during spring and summer 2016. The program for this research was chosen because Fernwood's new education building provides a time of transition, making it imperative to assess their field trip programs. The 4th grade program is consistently used by local schools, and provides high attendance numbers. Two local school districts adjacent to Fernwood Botanical Garden and Nature Preserve are Buchanan Independent School District and Niles Independent School District. Buchanan and Niles ISDs participate in the garden's programs. Due to the limited time period available to collect data, this study focused on Niles ISD. Niles is currently the strongest partner with Fernwood Botanical Garden and Nature Preserve. Niles Community Schools include grades K-12 with approximately 4,000 students, and a total

of 300 teachers. This study collected data on 4th grade classes from two different elementary schools in Niles ISD: Ballard Elementary School and Howard-Ellis Elementary. Demographic information about the students was self-reported at the end of the survey (Appendix A). Socioeconomic status was based on free and reduced cost lunch information from the school district. At Ballard Elementary 76.6% of students use free or reduced cost lunch. At Howard Elementary 67.3% of the student body uses free or reduced cost lunch.

Instrumentation. The state science curriculum standards for Michigan were compared to the field trip objectives to determine the relevancy of subject matter of the field trip to what is taught in the classroom. The survey instrument used for the quantitative portion of this study was created in a dichotomous question and short answer format. The pre-test survey contained six questions covering the knowledge portion of the field trip (Appendix A). One short answer question was “Name a plant that lives in a pond.” An example of a yes/no question was “Do wetlands provide flood control?”. There was also a question about whether the student had visited Fernwood Botanical Garden and Nature Preserve before and a demographics portion at the end asking the students’ gender, age, and ethnicity. Students were provided a cover sheet, where they identified their name, grade level, and teacher name. This cover sheet was used to provide comparisons between pre and post surveys for an individual and was destroyed after data was entered. The post-test surveys at one and six weeks after their field trip were both identical, containing the same content and garden questions from the pre-test surveys but added questions about student attitudes towards nature. The post-test surveys consisted of 14

questions and included dichotomous, short answer, and a single Likert Scale question (Appendix B).

Data Collection Procedures. Principals of the participating schools were contacted to obtain site authorization. Fourth grade teachers were then contacted to request participation. Teachers were given the basic research outline. They were ensured that the research would involve minimal class time, and that they would be provided copies of all the surveys and consent forms to create as little inconvenience for them as possible. Four classes participated from Ballard Elementary, and four classes from Howard-Ellis for a total of 8 fourth grade classes and approximately 200 students.

The next step in the research process was to deliver pre-test surveys (Appendix A) to the participating schools. A pre-test packet was created for each teacher containing consent forms, and a thank you letter that outlined the research process. Teachers were informed not to administer the surveys until consent forms had been returned. In this study, all students would complete the pre-and post-test surveys, to avoid peer pressure, but only students who returned signed consent forms had their data used in the study.

Qualitative data was collected during the field trips. Fernwood Botanical Garden and Nature Preserve teaches two classes at one time (approximately 60 students). Fernwood's educators taught field trip classes, while the researcher observed and took notes on student behavior and interaction. Notes included descriptive statements, not inferential ones. For example, "Bobby looks bored," is not a statement that can be used to analyze data because it includes the researcher's bias. However, statements like "Bobby is turned around talking to a friend" or "Bobby is picking flowers" would be more objective statements to record.

Field trips began on September 21st, 2016 and ended October 7th, 2016. The typical length of the Pond Studies and Animal Classification field trip is two and a half hours. At the start of the program, students were led through the garden visitor center by their teachers, parent volunteers, and the lead naturalist at Fernwood. From there students were divided into two groups of approximately 15 to 20 students each. One group went inside for the food chains portion of the trip, and the other group stayed outside for an introduction to wetlands. After the wetland introduction, that group was further divided into two smaller groups, and each was sent to a different pond in the garden for the pond scooping activity. After each activity was completed, the groups switched locations and completed the other half of the field trip.

Post-test surveys were broken into two tiers. The first tier of surveys was administered within 7 days of the field trip. The second tier of surveys was administered 6 weeks after the field trip.

Data Analysis Procedures. Quantitative data were recorded in Microsoft Excel and analyzed in SPSS including frequencies, descriptives, paired sample t-tests, and independent sample t-tests were run through SPSS. The qualitative portion of this study is phenomenological, with the shared student experience of attending a field trip in the natural environment. Colaizzi's phenomenological method (1978) was employed in analyzing short answer responses. In this method, all written responses are read several times to obtain an overall feeling for them. From each response, significant statements are identified. Meanings are then formulated from the significant statements and phrases. The formulated meanings are clustered into themes, allowing for the emergence of

themes common to all the participant's responses. The results are then integrated into an in-depth description of the phenomenon (field trip) (Colaizzi, 1978).

Results and Discussion

Demographics. Frequencies were run to determine demographic information and poll questions from the surveys. The race breakdown of participating students were 72.5% Caucasian, 14.6% Hispanic, and 12.8% African American. The group was comprised of 50.7% female students and 49.2% male. Following the demographics questions, students were asked poll questions related to Fernwood Botanical Garden and Nature Preserve. Almost all students had been to visit the garden before (90.5%) When asked to specify who they had been with, most of them indicated that they had visited with their school (73.5%). Another 18.4% said they had been with family, and 8.2% said with friends. On the post-tests, students were asked if they were told what they would be learning before their field trip started and 91.7% indicated that they were. Ninety-five percent responded that they learned something new on their field trip, and 94.8% said they understood what they were learning. 69.8% said that the field trip changed their feelings towards what they were taught, and 85.4% said they would tell other people about the experience.

Pre and Post Test Content Scores. Paired samples t-tests were run to compare student scores between the pre-test and post-test 1, pre-test and post-test 2, and post-test 1 and post-test 2. Zero is the lowest score, meaning there were no correct answers, and 9 was the highest possible score meaning that all Yes/No questions were correct, and the student had specific examples for the short answer responses. For example, when asked to name an animal that lives in a pond, the response "Bug" received a score of 1 and the

response “Dragonfly Nymph” received a score of 2. There was a significant difference between pre-test and post-test 1 content scores (Table 3.2). The average score on the pre-test was 5.2 out of 9 and increased to 6.6 for post-test 1. There were also significant differences between the pre-test and post-test 2 (Table 3.3) with average scores increasing from 5.2 to 5.9. Between post-test 1 and 2 there was a significant drop in scores (Table 3.4) from 6.6 to 5.9.

Independent samples t-tests were conducted to compare scores between student gender and age. Neither gender (Table 3.5) or age (Table 3.6) yielded significant differences.

Short Answer Responses. When asked to name a plant that lives in a pond, the most common responses in the pretest data were lily pads, cattails, and seaweed. Lily pads and cattails were still the top two answers in the post test, but pond weed, moss, and algae were also mentioned multiple times. When asked to name two animals that lived in a pond on the pre-test most students answered with three animals: Frog (83.3%), Fish (76.3%) and Turtle (13.4%). Other common responses included ducks and tadpoles. In the post-test those numbers decreased: Frog (33.3%), Fish (29.1%), and Turtle (4.8%). Other responses included specific answers like water strider, red worms, baby flies, dragonfly nymphs, snails, etc. Students favorite part of the field trip was overwhelmingly the pond study portion because they enjoyed getting dirty, learned new things, learned about animals, got to touch bugs, etc. One student responded, “My favorite part of our field trip was being at the pond because we found a lot of wild life”. Another said their favorite part was, “When I learned baby dragon flies live in ponds because I love dragon flies.” A few students also enjoyed learning about animals in the classroom and getting to

touch animals skulls and pelts. One said their favorite part was, “learning that dogs and wolves are in the same class.”

When examining all participants, students scored significantly higher on post-test 1 and post-test 2 than on the pre-test. There was also a significant drop in scores between post-test 1 and post-test 2 which is not surprising considering that students were learning completely different things in class at the time of the surveys. Short answer responses increased in specificity, and students favorite part of the field trip was overwhelmingly the hands-on activity of pond scooping. Although scores dropped between post-tests, students were still able to recall their favorite activity during the field trip. Connections have been found between student involvement and novelty, hands on involvement, and surprise in field trip programs (Dohn 2011), and this research supports those findings. Almost 70% of students also reported that the field trip changed their feelings about what they learned. Both the existing literature and the findings from this study indicate that field trips have a positive impact on student short term knowledge gain, and long term attitude toward subject matter. Students also overwhelmingly responded that they had visited Fernwood Botanical Garden and Nature Preserve before, but 95% of them still indicated that they learned something new. This again affirms the importance of novelty, involvement, and surprise in field trip programs.

Overall the garden’s staff effectively administers the field trip program, and creates a positive and interactive experience for students. When compared to the preparation components of the FiNE Framework Fernwood Botanical Garden and Nature Preserve’s field trip preparation satisfies nearly all components. The increase on content scores and decrease in generic short answer responses supports that Fernwood Botanical

Garden and Nature Preserve is effective in their teaching. Further research should be done on the attitude and behavioral effects of participation in field trips in the natural environment, especially in the long term.

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Table 3.1 Components of the FiNE Framework Used to Develop Pre and Post-Test Survey Questions.

Preparation	4. Classroom Prep 5. Collaboration 6. Connection to Curriculum	Data collected from observation, and teachers/facilitators
Pedagogy	6. Clarifying the Goals 7. Using the Environment 8. Connections to Everyday Life 9. Social Interaction 10. Facilitators Performance	Data collected from observation, and teachers/facilitators
Activity	5. Physical Activity-Observer 6. Active Learning-Observer 7. Physical Activity-Student 8. Active Learning-Student	1 and 2 Data collected from observation, and teachers/facilitators 3 and 4 Data collected from students
Outcome	3. Feelings, Attitude, and Belief 4. Knowledge and Understanding	Data collected from students

Morag and Tal, 2012.

Table 3.2 Paired samples T-test comparing the pre-test and post-test 1 content question scores of 4th grade students from two schools (Ballard Elementary and Howard Elementary)^z after attending a Pond Studies field trip in the natural environment.

Treatment	N	Mean Score	SD	Mean Difference	df	t ^y	P
Pre	94	5.20	1.22				
Post 1	94	6.62	1.24	1.42	93	8.26	0.001 ^x

^zBoth schools are located in Niles, MI.

^yT-scores are standard scores which use standard deviation units to express an individual's performance across two data sets.

^xP less than or equal to 0.05

Table 3.3 Paired samples T-test comparing the pre-test and post-test 2 content question scores of 4th grade students from two schools (Ballard Elementary and Howard Elementary)^z after attending a Pond Studies field trip in the natural environment.

Treatment	N	Mean Score	SD	Mean Difference	df	t ^y	P
Pre	39	5.05	1.37	0.79	38	2.72	0.01 ^x
Post 2	39	5.85	1.46				

^zBoth schools are located in Niles, MI.

^yT-scores are standard scores which use standard deviation units to express an individual's performance across two data sets.

^xP less than or equal to 0.05

Table 3.4 Paired samples T-test comparing the post-test 1 and post-test 2 content question scores of 4th grade students from Ballard Elementary^z after attending a Pond Studies field trip in the natural environment.

Treatment	N	Mean Score	SD	Mean Difference	df	t ^y	P
Post 1	19	6.79	1.36				
Post 2	19	5.32	1.29	1.47	18	3.99	0.001 ^x

^zLocated in Niles, MI.

^yT-scores are standard scores which use standard deviation units to express an individual's performance across two data sets.

^xP less than or equal to 0.05

Table 3.5 Independent samples T-test comparing the pre-test, post-test 1, and post-test 2 content question scores of 4th grade students from two schools (Howard Elementary and Ballard Elementary)^z by gender after attending a Pond Studies field trip in the natural environment.

Treatment	Gender	N	Mean Score	SD	Mean Difference	df	t ^y	P
Pre	Male	101	5.19	1.32	-0.17	203	-0.97	0.33 ^x
	Female	104	5.37	1.14				
Post 1	Male	45	6.49	1.36	-0.25	92	-0.96	0.34 ^x
	Female	49	6.73	1.11				
Post 2	Male	18	5.67	1.68	-0.39	35	-0.80	0.43 ^x
	Female	19	6.05	1.22				

^zLocated in Niles, MI.

^yT-scores are standard scores which use standard deviation units to express an individual's performance across two data sets.

^xP greater than or equal to 0.05

Table 3.6 Independent samples T-test comparing the pre-test, post-test 1, and post-test 2 content question scores of 4th grade students from two schools (Howard Elementary and Ballard Elementary)^z by age after attending a Pond Studies field trip in the natural environment.

Treatment	Age ^y	N	Mean Score	SD	Mean Difference	df	t ^x	P
Pre	9	132	5.29	1.28	0.06	187	0.30	0.76 ^w
	10	57	5.23	1.20				
Post 1	9	59	6.66	1.18	0.16	83	0.55	0.59 ^w
	10	26	6.50	1.40				
Post 2	9	21	5.76	1.38	-0.17	33	-0.34	0.74 ^w
	10	14	5.93	1.54				

^zLocated in Niles, MI.

^yYears

^xT-scores are standard scores which use standard deviation units to express an individual's performance across two data sets.

^wP greater than or equal to 0.05

CHAPTER IV
TEACHER EVALUATION OF 4th GRADE FIELD TRIP TO FERNWOOD
BOTANICAL GARDEN AND NATURE PRESERVE

Summary

Every year, millions of elementary and middle school students take field trips during the traditional school year (Knapp and Barrie, 2001). When the World Wildlife Fund surveyed primary and secondary educators, they found that approximately half of the teachers polled had taken their students on an informal science field trip to a zoo, garden, or similar experience (Knapp, 2000). Of those, one of the most common learning field trip configurations involves visits to outdoor or field locations where environmental and ecological learning can take place (Nadelson and Jordan, 2012). Much of the research conducted on the benefits of field trips shows that they are not only important because of high volume participation, but also their contributions to learning both in and out of the classroom. Because studies of field trips in the natural environment are studied significantly less often (Alon and Tal, 2015) this research focuses on field trips in the natural environment and why educators may or may not choose to participate.

The purpose of this research was to determine how teachers evaluated a field trip to Fernwood Botanical Garden and Nature Preserve (FBGNP) and see how they believed the program could improve. Each teacher brought their students to FBGNP for a day of learning in the natural environment, and then completed a survey about preparation for the field trip, activity during the field trip, and how they think the garden could improve

upon its current programming. FBGNP needed teacher feedback because they had not performed formal evaluations on their education programming in the last decade. They had also seen a decline in field trip attendance, specifically from teachers who had been bringing their students to Fernwood for field trips for many years.

Program analysis indicates that adequate field trip preparation is made by FBGNP. They were in contact with almost every teacher prior to the field trip, which helped avoid confusion upon arrival, and ensured that educators knew what to expect from the field trip. Pedagogically, the garden meets state requirements for science curriculums, and is therefore current in its teaching. However, some teachers felt field trip content did not align with what some of the students were learning in class. FBGNP should inform teachers of the exact state standards addressed in each field trip. This would allow teachers to make more informed selection on which field trip to attend. All teachers agreed that the classroom portion of the lesson was too long without break or activity. All teachers agreed that they noticed a change in student attitude and behavior toward the subject matter after the field trip.

Introduction

Program Evaluation. To effectively evaluate a program, it is necessary to understand what a program is. There are seemingly infinite numbers and varieties of programs, however they are usually developed from an organization's mission. The organization identifies several goals and then the goals often turn into programs. It is important to evaluate programs so that an organization can determine if the program is useful to its constituents (Rossi et al., 2004). This program was chosen because Fernwood Botanical Garden and Nature Preserve's new education building creates transition. The 4th grade

program is consistently used by local schools, and typically provides high attendance numbers.

Program evaluations are a type of case study and can be defined as carefully collecting information about a program, or some aspect of the program, to make necessary decisions about the program. Program evaluations examine a program's efficiency and effectiveness. They are often conducted with one or more of the following goals in mind: assess the need for the program, assess the programs design and logic, examine the success of the implementation of the program, assess the outcome, and assess the programs cost and efficiency (Rossi et al, 2004). A program evaluation may come in many forms, encompassing both quantitative and qualitative research methods, and often incorporates both research types in a mixed method study (USEPA, 2012).

There are three types of program evaluation based on the timing of the evaluation. The first type is developmental evaluation and involves the evaluation of a proposed program before it is implemented. In this type of study, the evaluator provides informal feedback to the design team to help improve the program before it is implemented or pilot tested. The second type, formative evaluation, is conducted during a program for improvement. Finally, the third and last type of program evaluation is implemented with the purpose of evaluating a program to provide a final evaluative judgement. It is most often conducted after a program is completed (Rossi et al., 2004).

Importance of Teacher Influence. Over the years, educational researchers have investigated many factors considered to affect student learning. At the heart of this line of inquiry is the core belief that teachers make a difference. There are continuing debates about how much the teacher effectiveness literature can be trusted to identify

characteristics of effective teaching and additional debates as well about how such research findings should frame the subsequent development of teacher evaluation systems. These debates aside, one assumption often made about teacher-student relationships is that the behavior patterns of teachers affect the behavior patterns of students (Sanders et al., 1997). Presumably, then, the more that students perceive their teacher cares about them or the material they are teaching, the more the students will care about the class and the more likely they will be to pay attention in class and consequently learn more course material (Teven and McCrosky, 1997).

In a 1997 study Sanders et al. demonstrated that despite ongoing debates about teacher impact on student achievement, when compared to class size and homogeneity, teacher influence had the highest impact on student achievement. In addition, student academic level was found to be significantly related to academic progress, although not nearly to the degree found for the teacher. Therefore, it is of utmost importance that when evaluating field trip programs the educator's opinions and feedback be taken into consideration. If a teacher is not excited both verbally and nonverbally about a field trip experience, his or her students are less likely to pay attention and enjoy the experience (Sanders et al, 1997).

Materials and Methods

Objective. The objectives of this study were to 1) assure that Fernwood Botanical Garden and Nature Preserve's programs were current, effective, and coordinated with state curriculums, and 2) obtain feedback from educators about their perceptions of and experiences with Fernwood Botanical Garden and Nature Preserve's environmental science field trips.

Sample. Data for this study was collected in October of 2016. Teachers were recruited from two local schools, Howard Ellis Elementary and Ballard Elementary, both of which attended the 4th grade Pond Studies and Animal Classification field trip at Fernwood Botanical Garden and Nature Preserve. Eight teachers were approached and five consented to participate for a response rate of 63%.

Instrumentation. To address objective two of this study a questionnaire (Appendix C) was developed using the FiNE Framework (Morag and Tal, 2012) including questions regarding preparation, pedagogy, activity, and outcomes. The questionnaire contained a short demographics section, 8 dichotomous questions, 1 Likert response scale, and 4 open ended questions.

Data Collection Procedures. To address objective one of this research Fernwood's field trip curriculum was compared to the Michigan State Education Standards. For objective two, questionnaires were administered to teachers at the same time as the first round of student post-test surveys: within seven days of the field trip to Fernwood. Teachers were informed that data collected would be anonymous to Fernwood staff and employees to attempt to eliminate biased answers. Teachers returned their questionnaires with student surveys after completion.

Data Analysis Procedures. Frequencies and descriptives of the demographics and dichotomous questions were run through SPSS. Michigan State Education Standards were compared to Fernwood's field trip curriculum to determine if programs were current for a 4th grade level. This study was phenomenological, with the shared student experience of bringing students to and attending a field trip in the natural environment. Colaizzi's phenomenological method (1978) was employed in analyzing short answer

responses. In this method, all written responses are read several times to obtain an overall feeling for them. From each response, significant statements are identified. Meanings are then formulated from the significant statements and phrases. The formulated meanings are clustered into themes, allowing for the emergence of themes common to all the participant's responses. The results are then integrated into an in-depth description of the phenomenon (Colaizzi, 1978).

Results and Discussion

Demographics. All teachers (n= 5) were female, between the ages of 34 and 45 (M= 41.5), and had between 11 and 22 years of teaching experience (M= 18.5).

The dichotomous questions related to preparation and the field trip experience. The results of all questions are listed in Table 4.1. In preparation, the teachers indicated that Fernwood Botanical Garden and Nature Preserve does an adequate job because most teachers had been in contact with a garden staff member about the field trip and that the goals of the field trip had been clarified. Pedagogically, all teachers believed that the program was beneficial but less than half said that it related to what they were learning in school. There were no dichotomous questions related to the field trip activity. The average guide score on a Likert scale was a 4.8 out of 5, with one meaning the guide did a poor job and five meaning a great job. In field trip outcomes all teachers indicated that their students' attitudes or feelings about nature were changed by the field trip and that they intended to bring students in the future.

State Education Standards. After comparing Fernwood Botanical Garden and Nature Preserve's curriculum to the State Education Standards for Michigan, the garden does

cover several 4th grade standards in the Pond Studies field trip, specifically the standards that fall under the category of evolution.

K-7 Standard L.EV: Develop an understanding that plants and animals have observable parts and characteristics that help them survive and flourish in their environments. Understand that fossils provide evidence that life forms have changed over time and were influenced by changes in environmental conditions. Understand that life forms either change (evolve) over time or risk extinction due to environmental changes and describe how scientists identify the relatedness of various organisms based on similarities in anatomical features.

Students learned a variety of evolutionary characteristics of plants and animals that live in ponds and how they help them survive.

Preparation. From the frequencies it can be concluded that the preparation portion of the FiNE framework is being met by Fernwood Botanical Garden and Nature Preserve's field trip program. Eighty percent of the teachers had a staff member visit the classroom before the field trip and communicate about the field trip. One hundred percent of the teachers said goals of the field trip had been discussed and clarified; a vital component of ensuring a successful field trip experience.

Pedagogy. Less than half of the teachers (40%) responded that the curriculum on the field trip applied to what they were teaching in the classroom. This could be because teachers do not use the subject of pond animals to teach the same state standards that Fernwood Botanical Garden and Nature Preserve covers, or because they are learning something different in class at the time of the field trip. The short answer question asked teachers if they believe that the field trip they attended was beneficial to their students, as well as an asset to their curriculum in class. The question was two parts. The first was a filter question to determine if teachers felt the field trip was beneficial to students. If they responded yes, teachers were then asked how/why they believed that. Out of 4

responses (n= 5) all believed the field trip to be beneficial and valuable. In the short answer follow-up question one response from a teacher from Ballard Elementary stated, “Supports our curriculum in area of science.” One teacher from Howard elementary responded, “Not specific state standard for grade level, but beneficial.” And finally, another teacher from Howard wrote, “Beneficial, but not valuable asset to curriculum.”

Activity. For the activity portion of the questionnaire, teachers were given a Likert scale and asked to rank their guide’s performance during the field trip with 1 being poor and 5 being great. All teachers (n= 5) indicated that guides did a very good job with an average score of 4.8. One short answer question also asked if any changes could be made to the field trip and some teachers provided constructive criticism regarding the classroom learning portion about animal classification. One teacher responded, “Less sitting in classroom, more hands-on experience,” and another, “The classroom info was a lot. They started to lose focus. They needed to be moving more and more hands on.”

Outcome. The final dichotomous question in the survey asked if teachers noticed a difference in students’ attitude or behavior toward the subject matter changed. All 5 teachers (100%) responded yes. Teachers were asked if they planned to bring students on Fernwood Botanical Garden and Nature Preserve field trips in the future, and if not, why. All teachers responded yes, so there were no short answer elaborations. The final short answer question was, “If any changes could be made to the Fernwood programs to improve the experience for you or your students, what would it be? For Example: Meeting different state standards, different activities, integration of technology, length of field trip, etc.” The examples provided came from previous discussions with Ms. Carol Line, the executive director of Fernwood, about things she often wondered if the ESP

program could improve. All 5 teachers provided feedback to this question. One response stated,

“I think the program is great. The classroom instruction focused on adaptation was deepened with the visit to the pond. We can also refer back to/extend the concepts in the classroom. I don't feel technology is needed. This is a hands-on, participate in nature (discovery) type of learning experience. We did not spend much time on wetland instruction.”

The other responses provided constructive criticism and contained very similar themes. The themes included in-classroom learning about animal classification was too long for students to sit still, and the classroom time needed more hands-on activity/movement, and technology is not necessary. One teacher commented, “Technology isn't needed, kids need and enjoy being outdoors, exploring, and learning.” One teacher asked how Fernwood could adjust the field trip to meet their state requirements.

Conclusion

When examining all participants in this study, the overall preparation for their field trip experience was well done. Garden staff was in contact and communication with almost every teacher prior to the field trip, which assures that teachers understand what to expect when they arrived. Some teachers responded that the field trip did not meet state requirements, while other stated it did. Based on the comparison of Michigan state science standards and the pond studies curriculum, it was found that several objectives are met, including but not limited to those that fall under the category of evolution. Inquisition could determine what standards teachers would like to have covered specifically. One suggestion would be for Fernwood Botanical Garden and Nature Preserve to list the state standards with each field trip. This would inform teachers of the

exact standards addressed. For the activity assessment, it is clear from teacher responses that they believed the classroom session was too long for students to pay attention. “Students began to get wiggly,” as one teacher responded and needed activity to break up the lesson. Responses to the outcome questions for educators were all positive, with teachers noting changes in their students’ attitude or behavior toward the subject matter being taught. Research should be done on how educators view fieldtrips, and in what ways gardens and public spaces like gardens can accommodate the needs of a classroom. For programs like the ESP program at Fernwood Botanical Garden and Nature Preserve to not only succeed, but thrive, it is vital that field trips are beneficial to students and their teachers. Teachers are an invaluable resource for improving field trips, and can be strong advocates for learning field trips.

Overall, educators seemed to have a positive experience during their field trip at Fernwood Botanical Garden and Nature Preserve. All five teachers said they planned to bring students in the future, which is a strong indicator that they perceive the field trip program as a valuable one. However, there were some constructive statements about adjusting half of the field trip to accommodate the attention spans of fourth graders. Since teacher attitude and behavior may be one of the strongest influences over student attitude and behavior toward a subject, it is important for public gardens like Fernwood Botanical Garden and Nature Preserve to ensure they are meeting the needs and requirements of their participating educators. The best way to do this is through evaluation surveys, which should be administered as soon as possible following a field trip.

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Table 4.1 Teacher responses for the dichotomous questions of the FBGNP Field Trip Effectiveness questionnaire.

Question	Response
Preparation	
2. Has anyone from Fernwood been to visit your classroom?	80% Y, 20% N
3. Was there communication between you and the facilitator prior to the field trip?	80% Y, 0% N
4. Were field trip goals discussed or clarified?	100% Y
Pedagogy	
1. Did your field trip relate to what you are learning in school?	40% Y, 60% N
7. Did you think that the supplemental learning provided by Fernwood was beneficial to your students, and an asset to your curriculum?	100% Y
Outcome	
6. Did you notice a difference in your students' feelings toward the subject matter after the field trip?	100% Y
8. Do you intend to continue to bring your students to Fernwood for natural science field trips?	100% Y

CHAPTER V
PRAIRIE PROGRAM EVALUATIONS

Summary

Much of the research conducted on the benefits of field trips shows that they are important because of high volume participation, and their contributions to learning both in and out of the classroom. Every year, millions of elementary and middle school students take field trips during the traditional school year (Knapp and Barrie, 2001). Of those, one of the most common learning field trip configurations involves visits to outdoor or field locations where environmental and ecological learning can take place (Nadelson and Jordan, 2012). However field trips in the natural environment are studied significantly less often than those in formal science centers like museums (Alon and Tal, 2015). Therefore, it is beneficial for public gardens and other institutions who host field trips in the natural environment to investigate why educators may or may not choose to participate in their programs.

This study focuses on comparing fifth grade field trips to three different botanical gardens that all have a tall grass prairie as part of their field trip program. The three gardens observed were Fernwood Botanical Garden and Nature Preserve (FBGNP), Chicago Botanic Garden (CBG), and The Morton Arboretum (TMA). Although they differ in size and budget, each garden offers different advantages for their students. One day was spent at each garden, and one class was observed during each 5th grade prairie field trip. Notes were taken by the researcher, and then organized in Microsoft Word.

Observations about both administrative aspects and learning and activities were made at each location.

Introduction

Field Trips and Public Gardens. Much of the research conducted on the benefits of field trips shows that they are not only important because of high volume participation, but also their contributions to learning both in and out of the classroom (Alon and Tal, 2015). In a 2014 study of field trips Mintz and Tal offered extensive literature reviewing learning outcomes including gaining knowledge, developing thinking skills, changing attitudes, motivation in some areas, and emotional effects. Field trips also trigger student interest through variables such as active involvement, novelty, surprise, knowledge, acquisition, and social involvement (Dohn, 2011). Despite this knowledge, learning field trips have been on the decline (Dillon et al., 2006). There is also limited research on the curriculums used to develop programs in the natural environment, and how informal science centers like public gardens implement them. While it is generally understood that field trip curriculums should incorporate state wide learning curriculum standards for each grade level, there is little research on how public gardens effectively utilize those standards. This is important for public gardens to know and implement because if schools can show that field trips are a valuable learning experience and an asset to curriculum they may be more willing to allocate funds to them.

Program Evaluation. Another way public gardens can ensure that their programming is current and effective is through program evaluation. Program evaluations are a type of case study and can be defined as carefully collecting information about a program, or some aspect of the program, to make necessary decisions about the program. They are

often conducted with one or more of the following goals in mind: to assess the need for the program, to assess the programs design and logic, to examine the success of the implementation of the program, to assess the outcome, and to assess the programs cost and efficiency (Rossi et al., 2004).

Gardens in this Study. The three gardens observed in this study were Fernwood Botanical Garden and Nature Preserve (FBGNP), Chicago Botanic Garden (CBG) and The Morton Arboretum (TMA). FBGNP is in Niles, Michigan and began as the country home of Kay and Walter Boydston, who purchased the first 12.5 acres in 1941. Additional land purchases increased the property size to 105 acres, allowing FBGNP to expand not only the size of its gardens, but the variety of plants and planting they could hold. The population of Niles and the closest town, Buchannan, combined is 16,000 people. CBG is located north of Chicago in Glencoe, Illinois and was opened in 1972 by the Chicago Horticultural society and today stands as an example of public-private ownership. The garden is owned by the Forest Preserve District of Cook County, and is run by the Chicago Horticultural Society. TMA was started by Joy Morton of Morton Salt in 1922 and is in Lisle, Illinois. Glencoe and Lisle, Illinois are both suburbs of Chicago and are 25 miles from downtown. The population of Chicago is over 2.7 million.

Materials and Methods

Objectives. The objectives of this study were to 1) compare and contrast three gardens and 2) develop best management practices for field trip administration, implementation, and evaluation.

Sample. Three gardens were observed: Fernwood Botanical Garden and Nature Preserve, Chicago Botanic Garden, and The Morton Arboretum. FBGNP is 105 acres, CBG is 385,

and TMA is 1,700. FBGNP hosts over 40,000 guests per year and CBG and TMA had over 1 million. Membership households offer similar trends with FBGNP at 2,600, CBG at 50,000 and TMA at 43,700. FBGNP has approximately 12 employees, CBG has 240, and TMA has 380. FBGNP's operating budget is approximately \$900,000 compared to about \$30 million at both CBG and TMA.

Data Collection Procedures. Observations of field trip activities and guides were made and notes recorded at the time of each field trip. Interviews with volunteers and staff both prior to and following the field trips were also implemented and transcribed. Colaizzi's phenomenological method (1978) was employed in analyzing data.

Results

Site Information and Field Trip Length. FBGNP can accommodate 60 students for their prairie field trip program, however since the prairie is only half of the program, there are no more than 30 students at the prairie at one time. The entire field trip lasts 2.5 hrs, but the portion spent in the prairie is 1 hr long.

CBG can accommodate a maximum of 4 classes or 120 students. A typical prairie field trip program at CBG is 1.5 hrs long. Prior to signing up for a field trip teachers must ensure that the proper adult to student ratio will be met. For CBG this is 1:5 for elementary school, 1:7 for junior high, and 1:10 for high school

TMA can accommodate a maximum of 180 students per program. There are usually 15 students per guide with at least 2 parent chaperones in each group, which creates a ratio of 1 adult to five students. They are limited by indoor space, not outdoor. At the Morton Arboretum, the program supposed to run for 1.75 hrs.

Preparation. At FBGNP field trip volunteer educators are required to attend one training session with FBGNP staff, and encouraged to shadow a staff member at least once before leading a group of their own. Teachers are informed to bring enough chaperones for a ratio of 1 adult to 5 students, but there is no formal contract or online form requiring this.

At CBG 2016 was the first year to use the prairie in field trip programs. CBG, like many other public gardens, utilizes volunteers as educators on fieldtrips. Volunteer trainings are seasonal as field trip topics change, and an office hour style training is available to individuals. Guides are given packets with tools and activities in them to distribute to students before the start of the field trip.

At TMA teachers are all given a form to fill out ahead of time that contains the main guide contact info, teacher contact, the requested program, and student needs or specifications. This information is then given to TMA volunteers for that program so that they can be prepared for the needs of each class. Guides are each provided with supporting materials like animal pelts, photos, and items for activity. When a guide is hired their first month is spent shadowing a mentor guide. They are given lesson plans to study and then lead a couple tours with their mentor for feedback.

Pedagogy. After observing field trips at all three sites, pedagogical topics were identified as common or key themes at each garden. These themes included the focus of the education programs at that garden, the scientific method, history of the garden or space, discovery and discussion, and finally state standards. Fernwood Botanical Garden and Nature Preserve places strong emphasis on the prairie ecosystem and plant adaptations. Fernwood spends time talking about the history of the space, as well as history of tall

grass prairies in the United States. They utilize the discovery method of teaching, and use state standards to develop their curriculum.

At CBG the focus is plant science and entomology. They offer no mammal or wildlife classes at CBG, possibly to separate themselves from other informal science learning centers in the area. The focus of the prairie field trip is on the plants and their adaptations. CBG also places importance on the scientific method and student discovery and discussion. They do not talk about this history of the garden or the creation of the prairie very much if at all. CBG uses state education standards to develop their field trip curriculum.

TMA has a strong focus on ecosystems, plant adaptations, and wildlife. There is also less emphasis on the history of the space and learning through discovery and discussion. TMA uses state education standards to develop their field trip curriculum.

Activity. Based on observation of field trip activities at each garden, the activities were classified within four categories: Props, Tools and Measurement, Group Work, and Hands on Learning. FBGNP did not utilize all four categories. At the beginning of the field trip students were combined into one group and a guide presented a 20 to 25 minute review of plant anatomy, photosynthesis, and respiration. Since the focus of FBGNP's field trip was on plant adaptations, the guide made sure to talk about functions of various plant parts and why they might adapt to certain environments. This portion of the field trip involved some props, including posters and drawings of plant anatomy, and diagrams of the formula for photosynthesis. Then students were divided into two groups. One guide immediately walked their students to the prairie, while the other stayed back and talked about the history of prairies, as well as invasive species they could expect to see

along the walk to the prairie. Once they reached the prairie, guides accompanied students on a path the guide selected and stopped to talk about certain plants that exhibited interesting adaptations along the way. Guides also explained to students that plants have families just like people do, and pointed out specific plants that are in the same genus as one another. Next, students were walked into the prairie in a single file line along 2 to 3-foot-wide mowed paths. Students were completely immersed in the prairie before being led to a platform in the center where they took a seat for a short lesson. While students were seated, the guide talked about burn marks that could be seen on the platform and discussed why burning the prairie is beneficial. They also talked about imagining what it would have been like to be a settler riding through the prairie on horseback. If time allowed the guide also delved into the history of the prairie at FBGNP and the history of tall grass prairies in the U.S. in general. From there students were walked back out of the prairie to regroup with their teachers and load onto busses.

Chicago Botanic Garden staff said that the prairie program is one of the most difficult programs they offer because buses must drive students out to the prairie instead of dropping them off at the education center. This necessitates two-way radio communication for immediate contact among staff members. CBG utilized all four categories of activity. Their guides were given several packets with work material and students were divided into groups of 4 or 5. The field trip began with students seated near the prairie. Students were all given a booklet from the guide with worksheet information including places to draw, describe, and answer short questions. The Prairie was within eyesight for students so the guide asked them to make observations about the difference between the prairie and the lawn on which they were sitting and write it down in their

booklet. Then the guide explained their activity for the day would involve analyzing a quadrat. They explained that a quadrat is simply a small square ruler one foot by one foot that students place on the ground to analyze what is inside it. The guide showed students the tools they would be using and the purpose for which they would be used. Each group packet included a thermometer, a quadrat ruler, and measuring tape to measure the height of the tallest plant within the quadrat. The student booklet contained boxes in which plants could be drawn for comparison. One student in each group was given bag containing the tools they would use for the activity, and were told to pick a section of lawn to complete the activity. After they finished the activity the guide reconvened the students and displayed a grass sample with the roots attached. She showed the group how short the roots were and asked for a volunteer to measure the length of the roots of the grass sample. From there, the group was escorted to the prairie. Once at the prairie, students proceeded on a 5-foot-wide gravel path. When everyone reached the prairie, the guide asked a student volunteer to read aloud to the group their observations. There was discussion about how many different plants they found in their lawn quadrat. Then, the guide asked students to guess how long they thought prairie plant roots would be, then using a paint roller with string on it, the guide rolled out a line to demonstrate how deep they grow, and followed up with the question, "Why do you think prairie plant roots are so long?". The guide told them to think about that while they were given time to fill in the rest of their activity booklet. Students were divided into groups and filled out their booklet with info on a prairie quadrat. Students then regrouped and the guide talked briefly about the history of tall grass prairies and settlers. Normally students would pick a prairie plant and write about it in their booklet but this group did not have time to

complete the activity because they had arrived late. Before the end of the trip, the guide pulled up a sample of mountain mint, showed it to the students, and talked about its impact as an invasive species. Before students walked back to their bus the guide also explained the practice of burning tall grass prairies and its effects.

The Morton Arboretum also incorporated all four categories of activity. Teachers were asked to pre-assign students into groups of no larger than 15 before unloading the bus at the prairie. The first part of the field trip involved an introduction to the garden in which the guide answered three questions: Where are we? Who is Mr. Morton? What is an Arboretum? The guide also explained rules of the garden to the students. Next, students walked into the prairie following their guide. At TMA, there are 6-foot-wide pathways that are mowed for easy access into the prairie. At a designated stopping point the guide asked students what they saw and most responded, “tall grasses”. This launched a discussion about ecosystems in which the guide prompted students to define what they think an ecosystem is and describe a few different ecosystems. The guide then taught students about biotic and abiotic factors in an ecosystem. The guide asked students, “What is another name for Illinois?”, which is The Prairie State, and showed a map of what at one time was the state covered in prairie. She also touched briefly on prairie habitat loss due to development and farming. The first activity engaged students in using rope to make a “wagon”. Students pretended to be items in the wagon that settlers might have needed while the guide discussed history and walked the student volunteers through a small loop in the prairie on a narrower path. Students could then experience what it might have been like to be a settler navigating through the prairie grass. Next the group stopped at a sign that provided information about the prairie and how seeds were spread

to create a larger prairie that they see today. As the group continued along the path walking deeper into the prairie, they stopped at a dead tree and the guide identified and explained “a snag”. After she pointed out the black marks on it, a student guessed it had been in a fire which led to a discussion about burning the prairie. The guide used photos to show students what a burned prairie looked like. Next, the guide walked students into a small circle laid out in the prairie to discuss plant biomass. The guide defined the term and reviewed plant parts with a visual aid. The guide asked students to hold a rope at their waist and pretend that line was the soil line. She explained that would mean half of them was above ground and half of them was below ground. The guide asked the students move the rope to a level they thought might represent prairie plants growing in the soil. She shared the correct answer and pulled out a life size poster of big blue stem, placed it flat on the ground and asked a couple students to lay on it with their feet at the soil line to show how tall the whole plant was, including roots. Next the guide passed around small pages with photos of common prairie plants and their roots, while also asking students what they thought soil was like in a prairie. She pulled a soil sample, measured the air and soil temperature for comparison, and measured light intensity. The guide also pulled out Queen Anne’s Lace and discussed types and functions of roots before having students pair up to go on a prairie scavenger hunt. One student came across animal scat and the guide pulled out a sheet that identified types of animal droppings and talked about how scientists can learn about animals from their droppings. This concluded the learning activity and students walked back to the bus.

Outcome. Notes were taken on how each garden ensures that they are current and effective in their teachings. At FBGNP, there have been no formal evaluations in the last

decade, but previously they were sent out annually to all teachers who participated in a field trip that year. At CBG every teacher that brings students on a field trip to the garden is given a map of the garden, a catalogue of the garden, and an evaluation form for them to fill out about their experience. Staff members indicated that this feedback is used to update program activities, ensure that teachers have an enjoyable experience, and provide feedback for guides. At TMA evaluations are sent out to teachers weekly. At the end of every field trip program they lead, guides also fill out an evaluation to provide their input.

Conclusion and Recommendations

The three gardens observed in this study were each very different, but FBGNP was most unlike the others, not because of the content of the field trip but because of garden size, facility space, and budget. CBG had the most scientific approach to their 5th grade prairie program with a strong emphasis on data collection and analysis. Although this approach is narrower in scope than most natural education programs that include all aspects of an ecosystem and seemed more clinical than the other two gardens, it may be more convincing to administration that the field trip is not just beneficial to students but is also a vital asset to curriculum. With cuts in funding for learning field trips, more research should be done to assess factors that alter value of a field trip for school administrations, and the lab-like setting CBG created could be one of those factors.

TMA had the most traditional natural education trip, incorporating all aspects of the prairie including wildlife. They also had expert guides that adjusted the lesson based on student interest in each trip, which is not surprising since they have the most extensive volunteer training program among the three gardens. Guides did incorporate some scientific measurement techniques and tools, but not to the extent of CBG. Finally,

FBGNP offered a similar although more simplified experience to that of TMA. Shorter time frames and lack of tools and props changed the dynamic of the field trip by making it less learner focused. Simple changes could be made to make the trip more interactive, like giving students a task or job instead of simply teaching them about the adaptations. Also, it is clear from program evaluation literature and garden visits that FBGNP should be formally evaluating their programs, preferably more than once a year to ensure current and specific feedback. One feature FBGNP offered that the other gardens did not was a truly immersive experience in the prairie. Students could walk into the prairie and get a grasp on just how overwhelming 12-foot-tall grasses can be. TMA had a small section of the trip dedicated to walking along narrow paths, but CBG only had gravel walkways through the prairie.

Although FBGNP is the smallest of the three gardens both in size and staff and operates on a much smaller annual budget, it is more representative of the average public garden in America. Approximately 90% of the public gardens in the U.S. operate on an annual budget of less than \$1 million. That means CBG and TMA among the 10% that operate with a budget of over \$1 million. Therefore, it is hard to compare FBGNP to the two gardens and determine which is most effective in field trip administration and implementation, but it seems appropriate to learn from other gardens and emulate their activities and programs in a manner that fits a small garden. CBG and TMA have both been awarded by the American Public Gardens Association, including The Program Excellence Award to CBG and the Champion of Trees Award to TMA so they certainly serve as models of excellence. Overall, FBGNP has some improvements that can be made to their field trip curriculums with relative ease, while maintaining their core values

of natural education. CBG could provide more extensive training programs for their volunteers like TMA. They could also implement reports for guides to provide comments and feedback. TMA does a satisfactory job of providing teamwork work for students, but should have more activities in which every student can participate rather than a selected few.

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CHAPTER VI

SUMMARY AND CONCLUSIONS

Purpose of the Study

While it is generally understood that field trips are beneficial to students, there is little research on how public gardens effectively develop field trip programs that ensure student success. This is important for public gardens to know and implement because if schools can show that field trips are a valuable learning experience and an asset to curriculum they may be more willing to allocate time and funds to them.

This research is important to students, because most of life and learning takes place outside of the classroom, and field trips in the natural environment provide students hands on learning opportunities. This study assesses, in particular, how one public garden, Fernwood Botanical Garden and Nature Preserve (FBGNP), organizes and administers a 4th grade field trip in the natural environment titled “Pond Studies and Animal Classification.” This study also evaluated the program using student and teacher surveys, and pre/post tests to determine how the field trip impacted student knowledge and attitude and how a field trip at FBGNP compared to two other gardens, Chicago Botanic Garden (CBG) and The Morton Arboretum (TMA). The goals of this research were to ensure that FBGNP is current and effective in their teachings, to provide more literature on field trips in the natural environment, and compare how those field trips are implemented at 3 different public gardens.

Summary of Literature

Learning in and outside of the classroom has a major impact on the growth and development of students (Alon and Tal, 2015). For this reason it is important to provide students the opportunity to express themselves, feel successful, and take on responsibility. Field trips in the natural environment offer a great opportunity for this to take place (Browne, 1992 in Relf, 1992; Lewis, 1996). It is equally important to ensure that field trip are effective and current in their teachings, and that they do in fact provide students with those opportunities. The best way to do this is through program evaluation (Rossi et al., 2004). Teachers also play an important role in student attitude and knowledge gains during a field trip so their involvement is important (Sanders et al., 1997). The FiNE Framework was developed in 2012 by Morag and Tal to provide an outline for assessing field trips in the natural environment and consists of four rings: Preparation, Pedagogy, Activity, and Outcomes.

Methodology

Sample Group. Data for this research was collected from two local school districts adjacent to FBGNP: Buchannan Independent School District, and Niles Independent School District. Buchannan and Niles ISDs frequently participate in FBGNP programs. Due to the limited time period available to collect data, this study focused on Niles ISD. Niles is currently the strongest partner with FBGNP. Niles Community Schools include grades K-12 with approximately 4,000 students, and a total of 300 teachers.

Part 1. This study collected data on 4th grade students from two different elementary schools in Niles ISD: Ballard Elementary School and Howard-Ellis Elementary.

Demographic information about the students was self-reported at the end of the survey. 208 students returned consent forms and agreed to participate.

Part 2. Data for this study was collected in October of 2016. Teachers were recruited from two local schools, Howard Ellis Elementary and Ballard Elementary, both of which were represented by classes attending the 4th grade Pond Studies and Animal Classification field trip at FBGNP. Eight teachers were asked and five consented to participate in this study, yielding a response rate of 63%.

Part 3. One class of students was observed at FBGNP, CBG, and TMA. All students were in 5th grade, and were led through the field trip by one volunteer garden staff member.

Instrumentation.

Part 1. The state science curriculum standards for Michigan was compared to the field trip objectives to determine the relevancy of subject matter of the field trip to what is taught in the classroom. The survey instrument used for the quantitative portion of this study was created in a yes/no and short answer format. The pre-test survey contained seven questions covering the knowledge portion of the field trip (Appendix A). One short answer question was “Name a plant that lives in a pond.” An example of a yes/no question was “Do wetlands provide flood control?”. There was also a question about whether the student had visited FBGNP before and a demographics portions at the end asking the students’ gender, age, and ethnicity. Students were provided a cover sheet, where they identified their name, grade level, and teacher name. This cover sheet was used to provide comparisons between pre and post surveys for each individual and was destroyed to assure confidentiality after data was entered. The post-test surveys at one

and six weeks after their field trip were both identical, containing the same content and garden questions from the pre-test surveys but added questions about student attitudes towards nature (Appendix B). The post-test surveys had 14 questions and included dichotomous, short answer, and a single Likert Scale question.

Part 2. To address objective one of this research FBGNP's field trip curriculum was compared to the Michigan State Education Standards. To address objective two of this study a questionnaire (Appendix C) was developed using the FiNE Framework (Morag and Tal, 2012) including questions regarding preparation, pedagogy, activity, and outcomes. The questionnaire contained a short demographics section, eight dichotomous questions, one Likert response scale, and four open ended questions.

Part 3. Observations were made and notes recorded at the time of each field trip. Short interviews with volunteers and staff both prior to and following the field trips were also implemented and transcribed.

Conclusions

Part 1. Students scored significantly higher on post-test 1 and post-test 2 than on the pre-test. There was also a significant drop in scores between post-test 1 and post-test 2 which is not surprising considering that students were learning completely different things in class at the time of the surveys. Short answer responses increased in specificity, and students favorite part of the field trip was overwhelmingly the hands-on activity of pond scooping. Although scores dropped between post-tests, students were still able to recall their favorite activity during the field trip. Connections have been found between student involvement and novelty, hands on involvement, and surprise in field trip programs (Dohn 2011), and this research supports those findings. Almost 70% of students also

reported that the field trip changed their feelings about what they learned. Both the existing literature and the findings from this study indicate that field trips have a positive impact on student short term knowledge gain, and long term attitude toward subject matter. Students also overwhelmingly responded that they had visited Fernwood before, but 95% of them still indicated that they learned something new. This again affirms the importance of novelty, involvement, and surprise in field trip programs.

Overall FBGNP staff effectively administers the field trip program, and creates a positive and interactive experience for students. The increase in content scores and decrease in generic short answer responses supports that the garden is effective in its teaching.

Part 2. Overall preparation for the field trip was satisfactory. FBGNP staff was in contact and communication with almost every teacher prior to the field trip, which assures that teachers understand what to expect when they arrived. Some teachers responded that the field trip did not meet state requirements, while other stated it did. Based on the comparison of Michigan state science standards and the pond studies curriculum, it was found that several objectives are met, including but not limited to those that fall under the category of evolution. Inquisition could determine what standards they specifically would like to cover that may be difficult in a traditional classroom setting. For the activity assessment, it is clear from teacher responses that they believe the classroom session was too long for students to pay attention. “Students began to get wiggly,” as one teacher responded and needed activity to break up the lesson. Responses to the outcome questions for educators were all positive, with teachers noting changes in their students’ attitude or behavior toward the subject matter being taught. Research should be done on

how educators view field trips, and what ways gardens and public spaces like gardens can accommodate the needs of a classroom. For programs like the ESP program at FBGNP to be successful it is vital that field trips are beneficial to both the students and their teachers. Teachers are an invaluable resource for improving field trips, and can be a strong advocate for learning field trips.

Part 3. The three gardens observed in this study were each very different, but FBGNP was most unlike the others because of size and budget. CBG had the most scientific approach to their 5th grade prairie program, with a strong emphasis on data collection and analysis. Although this approach is not a traditional natural education approach and seemed more clinical than the other two gardens, it may be more helpful to convince administration that the field trip is not just beneficial to students, but a vital asset to curriculum. With reduced funding for learning field trips, more research should be done to see what it takes for a field trip to be considered “worth it” to school administrations. The lab-like setting CBG created could be a model. TMA had the most traditional natural education trip, incorporating all aspects of the prairie, including wildlife. They also had expert guides that adjusted the lesson based on student interest in each trip, which is not surprising since they have the most extensive volunteer training program. They did incorporate some scientific measurement activities and tools, but not to the extent of CBG. Finally, FBGNP offered a very similar experience to that of TMA, although more simplified. Shorter time frames and lack of tools and props can change the dynamic of the field trip. Simple changes could be made to make the trip more interactive, like giving students a task to reinforce instruction instead of simply talking to them about the adaptations. One element FBGNP offered that differed from the other gardens was a truly

immersive experience in the prairie. Students could walk into the prairie and get a grasp on just how overwhelming 12-foot-tall grasses can seem. TMA had a small section of the trip dedicated to walking along narrow paths, but CBG only had gravel walkways through the prairie.

As previously mentioned FBGNP is the smallest garden of the group, both in size and staff, and operates on a much smaller annual budget. FBGNP is more representative of the average public garden in America. Approximately 90% of the public gardens in the U.S. operate on an annual budget of less than 1 million dollars. That means CBG and TMA are part of the 10% who operate with a budget of over 1 million dollars. Therefore, it is hard to compare FBGNP to the two gardens and determine definitive field trip best practices, but it is appropriate to learn from other gardens and emulate their activities and programs in a manner that fits small gardens.

Programmatic Implications

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

1. Interaction between Fernwood Botanical Garden and Nature Preserve staff and local school teachers before the field trip assures that teachers know what to expect and have a satisfactory experience for their students. FBGNP should stay in contact with teachers, and clearly describe field trip content, including state education standards that will be met, before students come to the garden.
2. FBGNP should align their teachings with what students are learning in school for maximum engagement from students during the field trip.

3. FBGNP should adjust their programming so that students are provided activity breaks from long lectures periods during the classroom portion of the field trip.
4. FBGNP must implement formal program evaluations that are administered to teachers immediately following their field trip and pertaining to preparation, pedagogy, activity, and outcomes.
5. Chicago Botanic Garden should expand their volunteer training program, and The Morton Arboretum needs to include more activities in which all students may participate.

Recommendations for Additional Research

1. More students should be tested across other grade levels and school districts to ensure diversity in age and location.
2. More teachers should be surveyed across other grade levels to ensure diversity in teaching experience and location.
3. A follow-up study should be conducted with student interviews about their experience for more detailed findings about long term attitude changes towards subject matter.
4. School lesson plan effects on student success and behavior during field trips should be studied.
5. This study should be repeated at other public gardens to ensure diversity of location and amenities and gather beneficial data for the industry.

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APPENDICES

APPENDIX A

4th Grade Pre-test Survey Questions

Please circle your answer.

- 1. Does a wetland support the life of plants and animals?
Yes No
- 2. Do wetlands provide flood control?
Yes No
- 3. Do wetlands filter groundwater?
Yes No
- 4. Have you visited Fernwood before?
Yes No

If you answered yes to the previous questions, who did you visit Fernwood with? (ex: school, family, friends)

- 5. Would you like to visit Fernwood, either for the first time or again?
Yes No

Short Answer.

- 6. Name a plant that lives in a pond:

- 7. Name two animals that live in a pond:

_____ and _____

Demographics.

Gender: (Circle one)

Female

Male

Age: _____

Ethnicity: _____

APPENDIX B

4th Grade Post Test 1 and 2 Survey Questions

Please circle your answer.

1. Did your guide tell you what you would learn on your field trip before you began the field trip?

Yes No

2. On a scale of 1 to 5 (1 being very bad and 5 being very good), how would you rank your guides performance?

1 2 3 4 5

3. Does a wetland support the life of plants and animals?

Yes No

4. Do wetlands provide flood control?

Yes No

5. Do wetlands filter groundwater?

Yes No

6. Did you learn anything new during your field trip?

Yes No

7. Did you understand what you were being taught during your field trip?

Yes No

8. Did this field trip change your feelings in anyway about ponds or the plants and animals that live in them? (ex: you used to think frogs were gross, but now you think they are cool)

Yes No

9. Would you tell other people about your field trip to Fernwood?

Yes No

10. Have you visited Fernwood before?

Yes No

11. If you answered yes to the previous questions, who did you visit Fernwood with? (ex: school, family, friends)

12. Would you like to visit Fernwood again?

Yes No

Short Answer.

13. Name a plant that lives in a pond:

14. Name two animals that live in a pond:

_____ and _____

15. What was your favorite part of your field trip today? Why?

Demographics.

Gender: (Circle one)

Female Male

Age: _____

Ethnicity: _____

APPENDIX C

Teacher Questionnaire about Fernwood Pond Studies Field Trip

Please circle your answer.

Did your field trip relate to what you are learning in school?

Yes No

Has anyone from Fernwood been to visit your classroom?

Yes No

Was there communication between you and the facilitator prior to the field trip?

Yes No

Were field trip goals discussed or clarified?

Yes No

How would you rank your facilitators overall performance, 1 being very poor and 5 being very good.

1 2 3 4 5

Did you notice a difference in your students' feelings toward the subject matter after the field trip?

Yes No

Did you think that the supplemental learning provided by Fernwood was beneficial to your students, and a valuable asset to your curriculum?

Yes No

How/Why?

Do you intend to continue to bring your students to Fernwood for natural science field trips?

Yes No

If not, why?

Short Answer.

If any changes could be made to the Fernwood programs to improve your or your students experience, what would it be?

Ex: Meeting different state standards, different activities, integration of technology, length of field trip, etc.

Demographics. (Optional)

Age: _____

Gender: _____

Years Teaching: _____

APPENDIX D

Organization of Living Things

K-7 Standard L.OL: Develop an understanding that plants and animals (including humans) have basic requirements for maintaining life which include the need for air, water, and a source of energy. Understand that all life forms can be classified as producers, consumers, or decomposers as they are all part of a global food chain where food/energy is supplied by plants which need light to produce food/energy. Develop an understanding that plants and animals can be classified by observable traits and physical characteristics. Understand that all living organisms are composed of cells and they exhibit cell growth and division. Understand that all plants and animals have a definite life cycle, body parts, and systems to perform specific life functions.

L.OL.E.1 Life Requirements- Organisms have basic needs. Animals and plants need air, water, and food. Plants also require light. Plants and animals use food as a source of energy and as a source of building material for growth and repair.

L.OL.04.15 Determine that plants require air, water, light, and a source of energy and building material for growth and repair.

L.OL.04.16 Determine that animals require air, water, and a source of energy and building material for growth and repair.

Evolution

K-7 Standard L.EV: Develop an understanding that plants and animals have observable parts and characteristics that help them survive and flourish in their environments. Understand that fossils provide evidence that life forms have changed over time and were influenced by changes in environmental conditions. Understand that life forms either change (evolve) over time or risk extinction due to environmental changes and describe how scientists identify the relatedness of various organisms based on similarities in anatomical features.

L.EV.E.2 Survival- Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.

L.EV.04.21 Identify individual differences (color, leg length, size, wing size, leaf shape) in organisms of the same kind.

L.EV.04.22 Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction.

Ecosystems

K-7 Standard L.EC: Develop an understanding of the interdependence of the variety of populations, communities and ecosystems, including those in the Great

Lakes region. Develop an understanding of different types of interdependence and that biotic (living) and abiotic (non-living) factors affect the balance of an ecosystem. Understand that all organisms cause changes, some detrimental and others beneficial, in the environment where they live.

L.EC.E.1 Interactions- Organisms interact in various ways including providing food and shelter to one another. Some interactions are helpful; others are harmful to the organism and other organisms.

L.EC.04.11 Identify organisms as part of a food chain or food web.

L.EC.E.2 Changed Environment Effects- When the environment changes, some plants and animals survive to reproduce; others die or move to new locations.

L.EC.04.21 Explain how environmental changes can produce a change in the food web.

APPENDIX E



19 July 2016

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

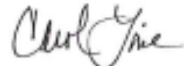
Please note that Ms. Lizzie Lewis, AU Graduate Student, has the permission of the Fernwood Botanical Garden and Nature Preserve to conduct research at our facility for her study, "Program Evaluation of 4th, 5th, and 6th Grade Environmental Science Field Trips to a Botanical Garden".

Ms. Lewis will contact employees by approaching them to ask for their participation as field trip guides and educators. Her plan is to have all data collected, and all field trips completed by the end of November 2016. Ms. Lewis' on-site research activities will be finished by December 4th, 2016.

Ms. Lewis has agreed that her research will create minimal interference in normal activity at Fernwood. Observations will take place during normal field trip times. Ms. Lewis has also agreed to provide to my office a copy of the Auburn University IRB-approved, stamped consent document before she recruits participants, and will also provide a copy of any aggregate results.

If there are any questions, please contact my office.

Sincerely,



Carol Line
Executive Director

269.695.6491 ext. 210
cline@fernwoodbotanical.org

13988 Range Line Road, Niles, MI 49120-9042 www.fernwoodbotanical.org 269.695.6491
FERNWOOD BOTANICAL GARDEN AND NATURE PRESERVE

Niles Community Schools
Ballard Elementary School



September 14, 2016

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

Dear IRB Members,

After reviewing the proposed study, "Program Evaluation of 4th Grade Environmental Science Field Trips to a Botanical Garden", presented by Ms. Lewis, a graduate student at Auburn University, I have granted permission for the study to be conducted at Ballard Elementary School.

The purpose of the study is to determine if Fernwood Botanical Garden and Nature Preserve is both current and effective in their teachings, as well as provide a framework for evaluation of field trip programs in nature centers and public gardens. The primary activity will be environmental science field trips to Fernwood Botanical Garden. Only students in the 4th grade are eligible to participate.

I understand that the field trips will occur during one class day, for 2 and a half hours. I also understand that after the field trips, interviews will take place during one class period, lasting approximately 30 minutes. I expect that this project will end no later than December 9th, 2016. Ms. Lewis will contact our teachers and students and will collect data at Ballard Elementary School.

I understand that Ms. Lewis will receive parental/guardian consent for all participants, and have confirmed that she has the cooperation of the classroom teachers. Ms. Lewis has agreed to provide to my office a copy of all Auburn University IRB-approved, stamped consent documents before she recruits participants on campus. Any data collected by Ms. Lewis will be kept confidential. Ms. Lewis has also agreed to provide to us a copy of the aggregate results from his study.

If the IRB has any concerns about the permission being granted by this letter, please contact me at the phone number listed below.

Sincerely,

A handwritten signature in cursive script that reads "David Eichenberg".

David Eichenberg
Principal
(269) 683-5900
david.eichenberg@nilesschools.org

Dynamic Learners Diverse Opportunities Driven to Succeed

1601 Chicago Road • Niles, Michigan 49120 • Phone (269) 683-5900 • Fax (269) 684-9527

Niles Community Schools
Howard Elementary



September 15, 2016

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

Dear IRB Members,

After reviewing the proposed study, "Program Evaluation of 4th Grade Environmental Science Field Trips to a Botanical Garden", presented by Ms. Lewis, a graduate student at Auburn University, I have granted permission for the study to be conducted at Howard Elementary School.

The purpose of the study is to determine if Fernwood Botanical Garden and Nature Preserve is both current and effective in their teachings, as well as provide a framework for evaluation of field trip programs in nature centers and public gardens. The primary activity will be environmental science field trips to Fernwood Botanical Garden. Only students in the 4th grade are eligible to participate.

I understand that the field trips will occur during one class day, for 2 and a half hours. I also understand that after the field trips, interviews will take place during one class period, lasting approximately 30 minutes. I expect that this project will end no later than December 9th, 2016. Ms. Lewis will contact our teachers and students and will collect data at Howard Elementary School.

I understand that Ms. Lewis will receive parental/guardian consent for all participants, and have confirmed that she has the cooperation of the classroom teachers. Ms. Lewis has agreed to provide to my office a copy of all Auburn University IRB-approved, stamped consent documents before she recruits participants on campus. Any data collected by Ms. Lewis will be kept confidential. Ms. Lewis has also agreed to provide to us a copy of the aggregate results from his study.

If the IRB has any concerns about the permission being granted by this letter, please contact me at the phone number listed below.

Sincerely,

Michelle Asmus
Principal
Howard-Elis Elementary School

APPENDIX F

DEPARTMENT OF
HORTICULTURE



AUBURN UNIVERSITY
COLLEGE OF AGRICULTURE

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

PARENTAL PERMISSION/CHILD ASSENT

for a Research Study entitled

"Program Evaluation of 4th, 5th, and 6th Grade Environmental Science Field Trips to a Botanical"

Your son or daughter is invited to participate in a research study to determine the effectiveness of Fernwood Botanical Gardens Environmental Science Field Trip Programs. The study is being conducted by Elizabeth Lewis, Master's Student, under the direction of Dr. Carolyn Robinson, professor in the Auburn University Department of Horticulture. Your son or daughter is invited to participate because he or she is in one of the participating classes. Since he/she is age 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 complete surveys about their field trip, both before and after the field trip. All students in the class can attend the field trip, but only students who return this form will be administered the pre and post surveys. Some students will be randomly selected to participate in interviews about their field trip, which will include audio recording the interview. A separate audio release form for transcription is attached. Your son's/daughter's total time commitment outside of the field trip will be approximately 45 minutes.

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.

Are there any benefits to your son/daughter or others? If he/she participates in this study, he/she will not be charged an admission fee to Fernwood Botanical Garden for their field trips.

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

Parent/Guardian Initials _____

Participant Initials _____

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Protocol # 16-160 EP 1609



Are there any costs? There will be no monetary costs to your children, only their time to participate.

If you (or your son/daughter) change your mind about his/her participation, he/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 Fernwood Botanical Garden.

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 remaining in a locked drawer that only I have access to, until it is destroyed. Information obtained through his/her participation may be used to 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 (or your son/daughter) have questions about this study, please ask them now or contact Ms. Lizzie Lewis at ezl0022@auburn.edu or Dr. Carolyn Robinson at cwr0001@auburn.edu.

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

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU 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.

Participant's signature _____ Date _____ Investigator obtaining consent _____ Date _____

Printed Name _____ Printed Name _____

Parent/Guardian Signature _____ Date _____

Printed Name _____

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Protocol # 16-180 EP 1809



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Protocol # 16-160 EP 1609

INFORMED CONSENT

for a Research Study entitled

“Program Evaluation of 4th, 5th, and 6th Grade Field Trips to a Botanical Garden.”

You are invited to participate in a research study to determine the effectiveness of Fernwood Botanical Gardens Environmental Science Field Trip Programs. The study is being conducted by Elizabeth Lewis, Master’s Student, under the direction of Dr. Carolyn Robinson, professor in the Auburn University Department of Horticulture. You were selected as a possible participant because you are a teacher who send students to participate in these field trips 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 complete a survey about your experience with the Fernwood field trip programs, and their effectiveness. Your total time commitment will be approximately 20 minutes.

Are there any risks or discomforts? There should be no physical risks to you should you participate in the study.

Are there any benefits to yourself or others? If you participate in this study, you can help improve the field trip programs at Fernwood, and therefore provide an even more rewarding experience for your students.

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

Are there any costs? If you decide to participate, the only cost to you will be the time pf participation.

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 Fernwood Botanical Garden.

Participant’s initials _____

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101 Fanchess Hall, Auburn, AL 36849-5408; Telephone: 334-844-4862; Fax: 334-844-5131

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HORTICULTURE



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Your privacy will be protected. Any information obtained in connection with this study will remain anonymous. Information obtained through your participation may be published in my thesis or an educational journal.

If you have questions about this study, *please ask them now* or contact Elizabeth Lewis at exl022@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 e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

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

Participant's signature Date Investigator obtaining consent Date

Printed Name Printed Name

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