LEARNING WITH NATURE: EXPLORING THREE TYPES OF LANDSCAPES THAT FACILITATE OUTDOOR LEARNING FOR MIDDLE SCHOOLS

by

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(Under the Direction of Daniel Nadenicek)

ABSTRACT

Children's direct experience of natural environments is an essential, critical and irreplaceable dimension of healthy maturation and development. A lack of nature exposure leads to obesity, environmental generational amnesia and nature-deficit disorder. This thesis identifies, thoroughly investigates, analyzes and discusses three common landscape types in outdoor learning environments—natural habitats, emblematic landscapes and edible gardens—and accesses the learning intentions and potential linked to each type. This thesis further explores how the activities settings in each of these three landscape types contribute to the outdoor learning process. Additionally, it considers how design principles might optimize outdoor learning as we consider the pros and cons of the three common type landscapes to guide public schools in their decision-making. Finally, the study suggests various educational opportunities with regard to Georgia Performance Standards for middle school children learning in each landscape type.

INDEX WORDS: Outdoor Learning Environment Design, Schoolyard, Natural Habitat, Edible Garden, Emblematic landscape

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BLA, Beijing Forestry University, China, 2013

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF LANDSCAPE ARCHITECTURE

ATHENS, GEORGIA

2017

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DEDICATION

I want to dedicate this to my parents, Bo Sun and Li Dai. Thank you for your love and support. This is also for my grandparents, who spent time with me in gardens when I was a child.

ACKNOWLEDGEMENTS

First, I would like to thank Daniel Nadenicek for encouraging me to approach this interesting topic and for guiding me to complete this thesis. Thank you also to Maureen O'Brien and Alfie Vick for providing me with useful resources and feedback throughout this process. Thank you, too, to Umit Yilmaz and Marianne Cramer for providing valuable advice and inspiring books.

I am indebted to Anne Shenk for agreeing to give me the opportunity to conduct observations at the State Botanical Garden of Georgia and to Andrea Bisceglia for her kindness, help and patience during my on-site research. Thank you to Philip Prichard at the UGArden for introducing me to the best vegetable garden in the district. I owe Dr. Mitchell great thanks for allowing me to observe her wonderful classes and for giving me an in-depth interview.

Thank you to Yabiao Gao and Dora He for their friendship and encouragement in my daily life. And finally, this thesis would not have been possible without the patient guidance of Georgia Harrison Hall and Donna Gabriel, who helped me throughout graduate school. Finally, I thank my parents for their unconditional love and support.

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CHAPTER 1

INTRODUTION

Nature does not steal time; it amplifies it.

—Richard Louv, *Last Child in the Woods*

Outdoor experience has proven beneficial for children's holistic development (Wilson 2012); children thus have been frequently encouraged to increase the amount of time spent playing and learning in natural places. However, according to a nationwide poll from the Nature Conservancy, only 10 percent of children say they spend time outdoors every day, while most instead engage in indoor activities such as playing video games, surfing on the Internet, and watching TV (Fairbank et al. 2011). A lack of exposure to nature may cause "nature-deficit disorder," a concept first proposed by Richard Louv in his famous book *Last Child in the Woods*. Louv (2008, 36) describes this disorder as "the human costs of alienation from nature, among them: diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses."

Causes of Nature-Deficit Disorder

Many factors can cause nature-deficit disorder, and a lack of natural areas and green infrastructure in one's surrounding landscape and community is a leading cause. The Nature Conservancy poll revealed that 61 percent of children say there are no green spaces near their homes (Fairbank et al. 2011).

However, even for children who live in a green community, where they can encounter and explore natural areas during their commute to and from school, factors such as design, planning, and even lifestyle choices may still drive them away from the outdoors.

Inadequate design and poor maintenance, which result in green spaces that are unsafe and not easily accessible, are also significant causes of nature-deficit disorder. Parents who are aware of safety risks in the natural environment may hold negative attitudes toward activities in natural spaces (Louv 2008, 118). For example, parents are highly reluctant to allow their children to visit places with plantings that are too dense for children to access or places providing hiding places that could cause harm, reducing the amount of time children's are exposed to nature.

On a broader scale, poor planning can also contribute to nature-deficit disorder. According to the same Nature Conservancy poll, 62 percent of children could not reach a natural habitat by public transportation (Fairbank et al. 2011). Since the Transit-Oriented Development approach has been prevalent in planning practice, there remains hope that this situation will be gradually rectified. However, this will not occur without direct intent.

Modern lifestyles exacerbate the disorder as well. Media and indoor entertainment such as TV, the Internet, and electronic games distract children's attention, resulting in obesity and disengagement. Meanwhile, reliance on the automobile also deprives children

of the chance to explore nature on their way to school. Riding on a school bus or in a car replaces cycling and walking and consumes more energy.[1]

Situation in Schools

When analyzing the causes of nature-deficit disorder, the role of schools should not be neglected. Children's awake time during weekdays can be divided into three categories: being at home or in one's neighborhood, commuting between school and home or other places, and being at school. Time spent in school is of great significance since it represents nearly 40 percent of the total 120 hours in the work week. One can imagine that if a child does not have time or permission to play in his backyard; if the community park is beyond his or her proximity or is dark and unsafe; or if the child lives in a low-density neighborhood, may have to take a school bus to commute, or lives in a community without a planned green network accessible to children on their way to school, then school is the only place for that child to have meaningful daily experiences in nature.

However, the circumstances in schools are not optimal. The typical daily schedule of middle schools illustrates this fact straightforwardly. Most schools today have eliminated the traditional recess between classes. In the mornings, children usually have four classes with only a five-minute break to switch between classrooms, and after lunch the same routine repeats until school dismissal. Some children may have a PE class every

[1] Richard Louv (2008) identifies many other factors keeping children inside such as an over exaggerated fear of child abductions.

day; however, other schools may retain a long daily recess after the second class in the morning and correspondingly decrease the PE classes.

One may argue that the outdoor time in school is already sufficient because PE class will ensure outdoor exercise. However, large portions of the activities in PE classes are conducted in indoor gymnasiums. Moreover, the organized sports in PE classes often constitute more of a "task" than "play," and they do not require children to explore nature using all of their senses. What has increased along with the popularity of team sports is the obesity rate, which indicates that organized sports cannot replace nature experience (Louv 2008). According to the Centers for Disease Control and Prevention (CDC), obesity in American children has more than doubled over the past 30 years:

> …the prevalence of obesity in 2011-2014 was 17.0% and extreme obesity was 5.8%. Between 1988-1994 and 2013-2014, the prevalence of obesity increased until 2003-2004 and then decreased in children aged 2 to 5 years, increased until 2007-2008 and then leveled off in children aged 6 to 11 years, and increased among adolescents aged 12 to 19 years (Ogden et al. 2016).

In addition to the schools' daily schedule, poor or inadequate use of space is also a cause of nature deficit problems. Public schools, especially those located in rural areas, usually do not use fences or walls to mark their property lines, meaning that strangers can easily access school grounds. Thus, in order to maintain students' security, school buildings are often designed to include everything. Buildings with diverse functions are linked together, comprising a mega structure for safety considerations. Children eat, study, and exercise all in the same building. This spatial structure almost exclusively restricts children's everyday routines to the indoors and prevents them from passing through outdoor environments. Moreover, these mega school buildings are usually

connected by huge parking lots, which link outside roads with entrances and discourage walking. Fields are often empty and dull, and reserved green spaces often act only as enclosures.

Although the shrinking amount of recess time in elementary and middle schools makes it difficult for students to have exposure to nature, school grounds still offer a great potential for outdoors experiences. Children could spend time outdoors during formal class time; that is to say, school grounds have the potential to become an outdoor classroom characterized by natural features. While one may question whether school grounds are the best places for outdoor learning, noting that other places such as parks, botanical gardens, and even nearby natural areas could play the same role, it is not possible for schools to organize excursions to such places every day. School grounds are essential because they can and should be used daily.

Place-Based Learning

One may also challenge the assertion that school grounds should be used for nature experiences by questioning the existence of related education theories and teachers' desire to go outside. However, the theory and practice of "place-based learning" answers these questions.

First introduced by Sobel (2004), place-based learning is defined as having environmental education within a local setting. It is a counterpoint to the general kind of environmental education that introduces complex concepts of ecosystem to children without real-world experience. Place-based education connects children directly to settings in their communities and encourages children to become self-motivated learners. Place-based learning theory has been applied to real-world teaching processes, including

programs such as 4-H, which provide experiences in which young people participate in hands-on projects in their community. Moreover, research has shown that place-based learning can increase children's grades in different subjects. The application of this learning theory has recently been emerging across the country, both inside and outside schools.

Problem

Since nature experience has been shown to be beneficial for children's cognitive, affective and evaluative learning, according to Kellert (2002), and since the theory of place-based learning has been readily accepted by educators, landscape architects who help to implement outdoor learning are now encouraged to develop the capacity to design outdoor learning environments. However, most information on this subject currently exists only in the form of experiences collected and discussed through project case studies. There is few systematic typology and design theory in this field. Furthermore, since learning and play have significant overlap, the design theory of learning environments has not been differentiated from the design theory of playscapes, nor has there been differentiation with regard to the evaluation criteria for the design of learning environments for children. Therefore, research that investigates the relationship between school environments and environmental learning processes is essential, which leads to the central research question: How might landscape design facilitate children's outdoor learning?

Research Question

In order to gain a thorough understanding of school outdoor learning environments, a classification of different types of learning landscapes should be considered. Based on the literature review in Chapter Two and the typology in Chapter Three, three types of landscapes could cover most outdoor learning-related activity settings. These three types are natural habitats such as river corridors, edible gardens with unique features such as outdoor kitchens, and emblematic landscapes with settings representing cultural connotations that are acquired in outdoor education processes. Thus, the research question can be focused: How might three different types of landscapes (natural habitat, emblematic landscape, and edible garden) facilitate outdoor learning for middle schools?

Motive

Compared to other theories such as playground design, theories about outdoor learning environment design are few. This author would like to explore the topic and attempt to contribute some knowledge to the field. To do so, even more in-depth questions need to be investigated: What types of learning can children achieve in certain types of learning landscapes? What learning action is involved in a particular learning environment? What activity patterns are common for outdoor learning? What are the types of settings in each three learning landscapes? What are the relationships between outdoor settings and outdoor learning intentions? What are the relationships between the outdoor settings and the activity patterns of outdoor learning? How might landscape design facilitate and optimize effective learning processes?

The purpose of this thesis is to investigate, analyze and discuss outdoor learning processes' learning intentions, activity patterns and related outdoor settings in the three common landscape types (natural habitats, general emblematic gardens, and edible gardens) by conducting field observations and an in-depth interview. And to deduce the possible learning intentions on the basis of Georgia Performance of Standards to explore how the outdoor learning settings in these three landscape types might contribute to the potential outdoor learning process. Design principle(s) that would facilitate and even optimize the outdoor learning process are synthesized, and important qualities for school outdoor learning environment are summarized.

Significance

The typology and field observation in this thesis will fill the gap between outdoor learning activities and outdoor learning environment design to some extent. As place-based learning for children's holistic development on school grounds gradually develops, this thesis's analysis of the factors and principles that influence the quality of outdoor learning environments will provide credible guidance for future designers. The data gathered and analysis of outdoor learning activities and features of outdoor learning intentions in this thesis will also provide references for educators to explore the potential teaching methods for children's holistic development.

Overview of Chapters

Chapter Two reviews the relevant literature in order to create a big picture view of the field of study, and in Chapter Three, the thesis demonstrates the applied methods and explains the classification of learning landscape types.

Chapter Four introduces the selected sites and education programs for observation. It then illustrates each observation by describing the learning process; recording the learning purpose, settings, and locations. It further presents the method followed in conducting an in-depth interview with teacher. A summary of the interview is provided to conclude the chapter.

Chapter Five analyzes the learning purposes, individual learning modes, the organization of learning activities, and learning settings and their associated information. The relationship between learning purposes and the settings' information and the relationship between learning activity patterns and settings are also discussed.

Chapter Six generates a system of design principles and strategies to facilitate and optimize outdoor learning. Common types of learning settings and space configurations are synthesized regarding to the three types of outdoor learning landscapes. Finally, the thesis concludes with important qualities of the thesis subject and also suggests various limitations.

CHAPTER 2

LITERATURE REVIEW

Heaven, Earth, and I were produced together, and all things and I are one.

—Zhuang Zhou, *The Adjustment of Controversies*

Children, nature, and learning are three core areas of this thesis. In this chapter, related facts and theories from the three areas are introduced, organized from general to specific. The author first articulates the notions of children's development stages, natural places within school grounds, and the relationship between children and nature. Nature here refers to wilderness with living organisms and habitats that are mostly independent of human mastery and manipulation. Second, the author affirms the definition of learning, introduces "place-based education", and synthesizes outdoor education purposes from different literature. Further, the author moves to the physical learning place of school and introduces the brief history, basic concepts, and design strategies of school outdoor learning environments. The "emblem and expression dichotomy" presented in this chapter is borrowed from a broader field to provide some guidelines for the design of landscapes with cognitive purpose. Finally, a documentation of activity settings for learning environments (outdoor learning settings) is provided in preparation for exploring the typology of learning landscapes and conducting further on-site research and observations.

Children's Development Stages

As humans grow, their personalities and characteristics emerge and mature. Children's behaviors and habits at different development stages respond accordingly. In general children's development can be divided into four stages: early childhood, from age 0 to 7; middle childhood, from age 8 to 11; preadolescence or early adolescence, from 12-14; and adolescence, from 15 to 18 (Moore and Cooper 2014, 35-39). This thesis is focused on middle childhood and early adolescence because children at those development stages have been shown to be more inclined to interact with nature (Kellert 2002).

In middle childhood, children, especially males, have a larger territorial range due to their physical maturation. Children tend to have same-gender friendships at this stage, and they begin to need a sense of group belonging. They like attractive, accessible, and changeable places that stimulate their imaginations and creativity. And they enjoy autonomy and are inclined to find places for themselves where they gain self-confidence from doing so. (Moore and Cooper 2014, 38)

Early adolescence is the stage with the most physical, social, and psychological changes. Children start to self-review and think about the meaning of life. Nature at this stage is a Medium and a source of self-expression in poetry and other art forms. They can bond to a certain place with hands-on projects or research that requires frequent visits (Moore and Cooper 2014, 39).

Children and Nature

Three Ways of Experiencing Nature

When discussing the children and nature relationship, Stephen Kellert (2002, 118) has classified the experience into three categories: direct, indirect, and "vicarious" or "symbolic" ways. Direct experience with nature includes direct encounters with natural systems, natural setting, and non human species that are apart from "continuous human input and control" (Kellert 2002, 119). Indirect experience of nature depicts more restricted, programmed and organized activities in a human controlled, manipulated nature environment. For instance, a community garden requires consistent maintenance in order to operate. Thus, the experience in a community garden is an indirect experience of nature. The vicarious or symbolic way indicates accessing pictures, symbols, and other form of nature through both traditional and electronic media (Kellert 2002, 120). Although symbolic and indirect nature experiences are increasing, and direct experience is decreasing, each way is critical for children's development.

Green Schoolyard

According to Kellert's three ways to experience nature, children's learning in traditional schoolyard should fall under indirect experience because school grounds are parts of built environments and are not nature. However, because the location, size, and accessibility of schools are so different from each other, different types of nature experiences may exist in school. Through good planning and design, a traditional schoolyard could include ecological lessons and achieve a direct experience of nature. Danks (2010, 27-46) states that schools could introduce small "wild garden[s]" or

wildlife sanctuaries as a microcosm to attract nearby wildlife populations. For schools with large property, habitat restoration projects that mimic nature also provide food and shelter for supporting possible wildlife and thus form its ecosystem. Another possible situation is that schools adjacent to natural conservation lands could link to that larger landscape, providing easy access to the natural area. Therefore, schoolyard experiences in this thesis are not limited to indirect contact.

How Does Nature Affect Children?

Biophilia

Researchers have noticed the important role of nature for human's development. Several hypotheses have been put forward to explain this relationship. Edward O. Wilson's (1994) hypothesis defines "biophilia" as "the urge to affiliate with other forms of life." He believes humans have an innate affinity for the natural world, a biologically based need integral to our development as individuals (Wilson 1984).

Multisensory and early childhood development

Robin Moore (1997) finds that natural settings stimulate all senses, and multisensory experience and helps to build the cognitive constructs that are necessary for sustained intellectual development. Natural spaces and materials also stimulate children's limitless imaginations and serve as the medium of inventiveness and creativity (Moore and Wong 1997).

Environmental stewardship and children's resilience

L. Chawla (1999), on the other hand, calls for a common-sense approach to depict the relationship between humans and nature. She stresses the benefits of experiencing nature on health, concentration, creative play and bond with nature can establish a

basement for environmental stewardship (Chawla 1999). Chawla further explore nature areas' effects on resilience and restoration. She finds that nature can alleviate stress, help focus attention, "build competence and form supportive social groups" (Chawla et al. 2014).

Three natural learning modes

Stephen Kellert (2002) formed a comprehensive theory by linking three ways of experiencing nature—direct, indirect and vicarious experiences—to children's three natural learning modes: cognitive, affective and evaluative. Kellert only addressed remembering and understanding in Bloom's cognitive development. He concludes that direct, indirect and symbolic experiences of nature all facilitate fact and terms understanding. As for comprehension development, when direct and indirect experience of nature are undertaken, since comprehension is a process of examining experience and knowledge, nature will provide the process with limitless context, and "few areas of life provide young people with as much opportunity as the natural world for critical thinking, creative inquiry, problem solving and intellectual development" (Searles 1960, Moore and Young 1978, Hart 1979, Berg and Medrich 1980, Chawla 1988, Kaplan and Kaplan 1989, Moore 1990, Pyle 1993, Trimble and Nabhan 1994, Thomashow 1995, Kahn 1999, Sobel 2001, Kellert 2002, 125, 2003).

Krathwohl, Bloom, and Masia (1964) affirm that affective development includes receiving phenomena, responding to phenomena, valuing, organizing and internalizing values. "Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable." Kellert (2002, 125-129) believes the emergence of values depends both on emotion and

intellection. Without both, this emergence will not effectively occur, and emotive development usually comes before cognitive development. Direct experience of nature stimulates multiple emotions in children, for which other experiences cannot substitute.

Kellert's evaluative development is composed of nine basic values. Those values together make up "biophilia". The nine values are: aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic, and utilitarian. Children in different age groups develop different values. According to Kellert, children in middle childhood from age 6 to 12 develop humanistic, symbolic, and aesthetic value, and knowledge of scientific value. They are more curious than in early childhood, and they gain cognitive and problem solving skills through interaction with nature. (Kellert 2002, 129-138)

Although cognitive, affective, and evaluative are three basic modes of natural learning, in the regular education process, affective development is usually ignored because it is difficult to evaluate. For example, this thesis assesses the Georgia Performance of Standards and finds that most education purposes are in cognitive and evaluative categories.

Naturalist intelligence

Howard Gardner (2003) adds "naturalist intelligence" to seven other types of intelligence to explain human potential in children and adults. The eight intelligences are: "linguistic intelligence ("word smart"); logical-mathematical intelligence ("number/reasoning smart"); spatial intelligence ("picture smart"); bodily-kinesthetic intelligence ("body smart"); musical intelligence ("music smart"); interpersonal intelligence ("people smart"); intrapersonal intelligence ("self smart") and naturalist

intelligence ("nature smart")." Naturalist intelligence addresses the ability to observe, comprehend, and arrange patterns in the natural environment.

"Attention-Restoration" theory related psychological benefits

Stephen and Rachel Kaplan (1998) developed attention-restoration theory based on William James's description of two kinds of attention: directed attention and involuntary attention. They use "directed-attention fatigue" to describe the fatigue of neural inhibitory mechanisms due to blocking competing stimuli, meaning that neurons are less likely to generate an action (Kaplan, Kaplan, and Ryan 1998). They found that nature's fascination factors, which allow directed attention to rest, is restorative, which helps to relieve people of directed-attention fatigue.

Wells's research on relocating homes for children living in poor urban environments supports this theory and found that children whose homes improved the most with regard to greenness after relocation tend to possess the greatest ability to focus their attention (Wells 2000). Wells and her colleague also found children who live in high-nature conditions appear not to have psychological distress from life's stressful events. Children living in more natural neighborhoods exhibit fewer symptom than children with less nature near their homes on measures of behavioral conduct disorders, anxiety, and depression (Wells and Evans 2003). Their explanation of the reason for the emotional benefits of nature is that nature fosters children's social interactions and provides more social support.

Nature and Attention Deficit Hyperactivity Disorder (ADHD)

Andrea Faber Taylor, Frances Kuo, and William C. Sullivan (2001) found natural environments facilitate creative play, support children's access to positive adult

interaction, and reduce the symptoms of attention-deficit disorder. According to their study, attention performance for unmedicated children with attention deficit hyperactivity disorder (ADHD) was better after a twenty-minute walk in natural environment than it was after a walk through well-kept downtown and residential areas (Taylor, Kuo, and Sullivan 2001).

Learning

Learning as studying modes has been clearly elaborated by Bloom's learning taxonomy (Bloom et al. 1956). Learning as an education process could also be classified by the arrangement of curricula. Loebach (2004) says that there are two main categories in the concept of learning. One is the formal activities managed by teachers within the required school curriculum, and the second is the informal activities undertaken mainly by children according to their own preferences. Both types contribute to the physical, cognitive, social, and emotional development of children. Moore and Cooper (2014) consider free play as an informal way to learn. The related design theories of free play contribute significantly to school ground design. However, this thesis aims to focus on the other side of coin, the formal learning activities in a school's outdoor environment. The following concept of place-based learning is assumed as a formal and organized process.

Place-Based Education

Sobel (2004) encourages place-based-education as a type of environmental education that focuses on learning directly within the local community of a student in response to environmental education at a large scale. Moore and Wong (1997) consider

that nature as a learning context tends to to offer a broader range of choices and intrinsic motivation better suited to children's different learning modes and characters than do indoor class processes. Lieberman and Hoody, in their study about environment-based programs, later found that this kind of education produces student gains in social studies, science, language arts, and math; improves standardized test scores and grade-point averages; and develops skills in problem-solving, critical thinking, and decision-making (Lieberman and Hoody 1998). Danks (2010, 26) affirmed the benefit of hands-on outdoor learning in three ways: the hands-on learning process makes children more engaged in the learning process; provides a rich cost effective learning context; and urges children to improve their local places.

Education Purposes

The outdoor education purposes or the outdoor learning intentions are critical for designers because the physical activity settings are directly connected to knowledge or values learned outdoors. Thus, a comprehensive overview of potential outdoor education purposes could guide the selection of outdoor learning settings which are the basic elements of an outdoor environment. Several scholars have summarized numerous outdoor learning themes and specific purposes. To establish a framework to stimulate ideas for developing lesson plans, Moore and Wong (1997) developed a curriculum switchboard. It contains five components: learning cycle of children, ecological concepts, inter-disciplinary learning, teaching-learning modes, and developmental skills. Activities are generated when each component fit to a specific category. Learning cycle includes explore, discover, record, express, apply, and transfer, depicting children's outdoor cognitive activities. Ecological concepts are change, adaptation, interrelationship, and

diversity. These concepts are widespread in natural contexts. Interdisciplinary learning includes regular subjects such as reading, math, language, science, art, and so on. In teaching, the learning modes are divided into fixed, flexible, and open modes. Fixed teaching modes usually have prescriptive instruction, while flexible modes relate to mutual learning processes. Usually children can choose and switch between tasks. The open mode includes the most informal experiences. Developmental skills include psycho-motor, dexterity, social, perceptive, affective, and cognitive skills gained during the outdoor learning process.(Moore and Wong 1997, 206-211)

Moore and Wong (1997) summarize a seris of starters or inputs that initiate outdoor curriculum. Special activities include seasonal activities, change-oriented learing, special events, overnight trips and so on. Themes or settings that initiate outdoor curriculums can be environmental issues, a community resource site, generic themes, and environmental learning stations and so on. From a general space, Moore and Cooper (2014) also find that environmental literacy, the idea of conservation, healthy living habits, and multidisciplinary learning are the main object of outdoor learning.

Johnson (2010) summarizes five common schoolyard garden types for outdoor learning: art garden, cultural history garden, ecological gardens, literacy gardens and vegetable gardens. Johnson's typology of schoolyard gardens will be used as a reference for the author's typology in Chapter Three. Moreover, Johnson also provides a number of ideas for teaching outdoors: pollination strategies, flower dissection, interdependence, seed dispersal, native bees, bats, growing places, soils, seasonal changes, microhabitat requirements, phenology and presence of pollinators, predator and prey, work comparing,

habitat requirements for an animal species, adaptations, baby insects, diversity of wild visitors to garden, plant identification, and sustainability.

Danks (2010) divides ecological teaching tools into different systems: wildlife sanctuaries, water systems, energy systems and agriculture. Danks also summarizes outdoor lessons with different themes: Language and literature studies include themes like alphabet, story circles, foreign language and culture, and so forth. History and social studies include settings such as gardens with traditionally grown crops or traditional dwelling settings, tree walks, and so forth. Geography includes demonstrating geographical information on pavement such as a map of the world or a map of local places. Geography can also include themes related to the passage of time. Various themes of science knowledge may be learned outdoors, such as weather stations, astronomy, and sensory studies. Art-related themes include visual art, music and performance art, and so on.

Landscapes for Learning

Having introduced literature related to learning and literature related to nature's impacts on children, the physical places and settings of outdoor learning are discussed. Before the discussion, certain concepts need introduction and clarification.

Nature Play and Learning Places as Applied to Outdoor Learning Environments in Schools

Moore and Cooper (2014, 21) defined nature play and learning place as:

> A designated, managed location in an existing or modified outdoor environment where children of all ages and abilities play and learn by engaging with and manipulating diverse natural elements, materials,

> organism, and habitats, through sensory, fine motor, and gross motor experience.

Since this thesis only focuses on formal and organized outdoor learning processes within regular curriculum, the outdoor learning environment precludes places that only accommodate free play.

Brief history of outdoor learning places

Before introducing design theories for outdoor learning spaces, the history of outdoor learning places is reviewed briefly. Moore (2014, 23) has demonstrated the historic development of relating natural play and learning places. The author only selects concepts that are related to outdoor learning.

Children's gardens and other land-based developments

The first school gardens date back to the1890s in Boston. In 1914, the New York Botanical Garden first opened its children's garden, which established a precedent in the world. The 4-H Children's Garden at Michigan State University is the representative of a new era of gardens for children and has become the archetype for new children's gardens throughout the country. In this garden, plants and other core settings are designed for children's physiological and emotional development (Miller 2005).

Originating in the Netherlands, Germany, and the U.K., urban/city farms or children's farms date back to the 1970s. They vary in size and facility type. Some possess domestic animals and even horses. Others focus on gardening. Children and adolescents are responsible for taking care of animals. On-site cafés provide the farms' products for tourists.

Forest kindergartens, nature-based preschools, and forest schools are models that apply to regular school curricula and provide more nature exposure. They were invented first in Denmark in the late 1950s, becoming popular in Germany in the 1960s, and now the variations are implemented across countries like the U.K., Japan and the United States. Practices vary from simplified building design with children staying outdoors all day in different seasons, to children going to normal classrooms but exploring all day in nearby natural areas frequently. At the Worldmind Nature Immersion School (2017) in Denver, Colorado, the children are connected to their immediate surroundings by having the locations of their classes spread throughout public land such as the City of Boulder Open Space and Mountain Parks. Hands on exploration sharpens their senses and results in "greater learning and retention rates as well as big picture thinking" (Doak 2016). The number of forest schools in the United States have greatly increased over the last several years (Knight 2013, Warden 2013).

Design Theories for Learning Spaces

Emblem/Expression dichotomy

This thesis deals with the design of outdoor school environments for formal learning activities within schools' curricular. Therefore, theories about communicative landscape design are needed as a knowledge base because meaning or information related to culture and nature are gained in the learning process and are used to establish values, and certain emotions arise during the experience that reinforc the meaning and values. Nadenicek (1991) suggests that the "emblem / expression dichotomy" set forth by Thomas Whately can be used as a guide in current discussion of meaning in designed landscapes.

According to Whately, an Emblem, often allegorical and always connected to nature, stands for something based in culture. By infusing a landscape with emblematic associations, such a landscape usually tells a story or conveys a lesson (Nadenicek 1991). Comparing emblematic and expressive landscapes in his book *Observations on Modern Gardening*, written in 1770, Thomas Whately explains the difference between elements of emblematic landscape and expressive landscape are as follows:

> …[Emblematic landscapes] make no immediate impression, for they must be examined, compared, perhaps explained, before the whole design of them can be understood; and though an allusion to a favorite or well-known subject of history, or poetry, or tradition, may not then animate or dignify a scene, yet as the subject does not naturally belong to the garden, the allusion should not be a principal; it should seem to have been suggested by the scene: a transitory image, which irresistibly occurred; not sought for, not labored; and have the force of metaphor, free from the detail of an allegory. (Whately 1793)

Whately's comparison was in response to examples of poor emblematic works in his period, and he considered expression superior to emblem because an expressive design is different for each person who encounters the landscape, and it connects directly with the material world and is based on experience. In those expressive landscapes, meanings emerge when the landscape's materials and its effect on humans interact together. They is metaphoric rather than didactic. In addition, the mutable and changeable qualities of expression are also essential. The eighteenth-century picturesque theorists also appreciated elements of expressive landscapes more than emblematic ones (Nadenicek 1991).

The concepts of emblem and expression were transformed in the United States. Because of the unique characteristics of American landscapes, 19th century knickerbocker writers equipped them with myth, legends, and stories (Hedges 1980). They emphasized

the inspiration of expressive potential of landscapes on both the human body and the mind (Callow 1967). Transcendentalist writers attributed spiritual effects to the expressive qualities of landscapes. They believed that connecting with God by experiencing nature would result in the enhancement of morality and a deeper understanding of truth and beauty. The emblem vs. expressive dichotomy in landscape design was largely forgotten during the modernism era, and it was not re-discovered by designers until the second part of the twentieth century. The Vietnam Veterans' Memorial by Maya Lin is a good example of the use of expression. Although sometimes explained by people in an emblematic way, using phrases such as "like a scar", the "downward movement", "the mass permanence of the stone", and " the reflectivity", it is an expressive design that affects visitors' emotions and has "a timeless quality" (Nadenicek 1991, 10).

Overall, Nadenicek (1991) claims that emblematic designs are not intrinsically bad, but they are often just didactic and "culturally overlaid", and sometimes inconsequently driven, with no immediate impression, and with limited opportunities for further contemplation. "Once the meaning was grasped, little would be left to ponder." Contrary to an emblematic landscape, an expressive landscape emphasizes processes. It often possesses dynamic and changeable qualities, and it can possess multiple layers of meanings and stimulate an emotional response. There are no formulas for an expressive landscape; however, "the meaning must begin with a direct connection of the physical and the sensual in the landscape, an interaction which both precedes and inspires thought" (Nadenicek 1991).

Using emblematic/expressive dichotomy to aid contemporary meaning in a landscape, as Nadenicek suggested, designers dealing with learning environments for children should not avoid emblems but should use emblems in the best way possible. Meanwhile, designers should not ignore the wonderful qualities of expressively designed landscape because affective development is also part of learning, as Kellert asserts, though difficult to embody and quantify in formal a curriculum. Following all this logic, this thesis identified emblematic gardens as one important category worth exploration.

Three inter-related concepts of free play: affordance, activity setting and territorial range

Moore (2014, 40) put forward three inter-related concepts that may be important for designers interested in designing free play and learning landscapes. The first concept, "Affordance", describes the possible activities children undertake in settings. Affordances are not specific activities, but the children need to act together to "actualize" opportunity.

The second concept is "activity setting", which means "a subspace with affordances that offer a predictable type of activity" (Moore 2014, 40). Activity settings can be utilized by different people at different times for different activities. "Settings affording the same type of activity may differ in character" (Moore 2014). Loose parts could extend the affordance of a setting.

The third concept is "territorial range", which describes a child's behavior in two aspects: territorial expansion and range development. Territorial expansion occurs when a child can explore a large space and find new settings and "actualize setting affordance". Range development occurs when children try to actualize the affordance of an old setting, through which the children may challenge their potential competence.

Basic vocabulary and common language for learning environments

Sharon Stine (1997), in her book *Landscapes for learning: Creating outdoor environments for children and youth*, generalizes basic vocabulary or common analytical language that can be used by designers to analyze outside space and to better understand the needs of both children and adults. The basic design dimensions in outside space for children are accessible vs. inaccessible; active vs. passive; challenge/risk vs. repetition/security; hard vs. soft; natural vs. people-built; open vs. closed; permanence vs. change; private vs. public; and simple vs. complex. Stine also found four elements—time, flexibility, legacy, and choice—that educators and designers can use as helpful clues to facilitate the planning and building of congruence in outside educational play spaces.

Loose part theory

The theory of loose parts proposed by Simon Nicholson (1972) has been adopted by landscape architects over the years and has been proven to work in the practice of nature play and outdoor learning place design. Nicholson believes that "In any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it" (Nicholson 1972). Natural settings such as water, trees, flowers, leaves, sand, and stone are good examples of loose part toys. Children can manipulate them through imagination and creativity. Creative play is defined widely:

> …playing with action figures and dolls; role-playing on imaginary battlefields and planets, and in mythical landscapes with fairies and queens; elaborate jump-rope routines; constructing buildings or objects from loose materials; and exploring the environment. (Louv 2008, 87)

Ecological strategy and sustainable design

"Connect the web": Wildlife needs food, water, shelter and space to survive. To attract nearby wild animal populations to form a microsystem, a school landscape could provide these living necessities and have built-in controls to balance nature (Moore and Wong 1997, Danks 2010, Johnson 2010). Danks (2010) states that an ecological schoolyard design should follow sustainable design principles. The sustainable water or energy design feature would also serve as learning settings for children. She also encourages using ecological-sensitive materials, which could enrich the learning context and improve usage quality as well.

Activity Settings

Moore (2014) affirmed a series of common activity settings as follows: Pathway; plants that include trees, shrubs, annuals, perennials, and permanent edible plants; natural surfacing; natural loose parts; natural construction; natural play structures; multipurpose lawns; meadows; woodland; landform; animals; aquatics; sand, soil, dirt; gathering; program base & storage; performance; signage; and boundaries. Johnson's (2010) summary of schoolyard design features mostly overlaps Moore's settings except for seating and walls.

However, in her book *Asphalt to Ecosystems: Design Ideas for Schoolyard Transformation*, Danks (2010) attempts to explore a variety of unique settings. Settings relating to wildlife are bee nesting blocks, nesting boxes, tree holes, hand-tiled birdbaths, bird blinds, and platform and observation areas. In edible gardens and domestic animals are animal husbandry, settings include greenhouses, cold frames, outdoor kitchens, food preparation areas, picnic areas, fire circles, fire pits, and outdoor ovens. Settings related

to science include solar panels driving the pump of a pond to recirculate water, a "floating" boardwalks, a green roof, storm water harvesting systems, solar thermal systems, wind turbines, geothermal climate control systems, solar boxes that cook with solar energy, outdoor sinks, weather stations and astronomy information on paving patterns. Settings related to literature and language are story circles with the storyteller's chair, an outdoor themed "cafe", and murals related to literature. Settings relating to social studies include traditional style dwellings; outdoor maps that depict local city streets, states, countries, or continents; a compass rose; lookout towers; sundials; solar calendar obelisks; posts; milestones; human sundials with related drawings on paving; solar calendar gardens; and logs with growth rings and rocks. Finally, settings relating to art include art work mosaics, outdoor art studios, sculptures, pavilions, wood board stages, and outdoor theaters.

The settings summarized by Moore and Johnson are more commonly used and have more "affordance", while Danks's collection of settings assumes ideal ultimate conditions, and most of the settings can be used in only one way.

Conclusion

In the beginning of this chapter, the introduction of the characters of middle childhood and preadolescence aimed to provide the scope and some basic knowledge of the research subject for this thesis. The benefits of nature on children explains the significance and supports this thesis's motivation. The cognitive, affective and evaluative modes of natural learning help to see a big picture of the relationship of nature to children's learning. Later, the learning settings collected by Danks and Moore are used in Chapter Three for classifying the schools' outdoor learning environments. The five types

of school gardens—art gardens, cultural history gardens, ecological gardens, literacy gardens, and vegetable gardens—act as a reference for the tripartite system developed in this thesis. Further, in the field observation, the concept and terms, such as “affordance”, “loose parts” and “activity settings” are used as the basic vocabulary to describe outdoor learning activities and conditions. Afterward, the Blooms’ Taxonomy of Learning is used to classify the knowledge level and learning mode of observed outdoor learning activities in the analysis. The different types of arrangement of the class are used as factors to study outdoor learning activities. Furthermore, core principles of the Emblem vs. Expression dichotomy are distilled to guide the design of the outdoor learning landscapes with a particular emphasis on the emblematic as applied to one types of children’s garden.

CHAPTER 3

METHODOLOGY

> The name that can be named is not the enduring and unchanging name.
> (Conceived of as) having no name, it is the Originator of heaven and earth;
> (conceived of as) having a name, it is the Mother of all things.
>
> — Laozi, *Dao De Jing* (trans. James Legge)

In Chapter Two, through the literature review, theories and evidence demonstrating nature's positive effect on children's bodies and minds were introduced and the benefits of place-based learning were demonstrated. Considering the lack of design theory on the outdoor learning environment, this thesis aims to explore outdoor learning activities in the hope of contributing knowledge to related design theory. This chapter explains the method to achieve this goal. The methodology aims to provide a way to achieve comprehensive understanding of the research subject: outdoor learning activities and a set of methods for synthesizing the gains from the research.

The Scope of the Research

Although this research project's subject concerns outdoor learning, the thesis will focus on middle school landscapes because middle school students are between middle childhood and preadolescence and are potentially receptive to the benefits of reconnecting with nature. Here, the this chapter limits the definition of outdoor learning

to instances of formal learning in which at least one teacher is supervising the class and in which learning processes occur only during class time. Thus, even though play or games appear in the following observations, they are not free play but rather activities that are carefully arranged by experienced educators.

Research Methods

As the thesis has already argued, the existing field of outdoor learning environment design lacks theories and specific descriptions of the relations between learning activities and their settings. Thus, conducting field observations on how children learn outdoors is the most essential part of this research. However, before observation can take place, the study population must be selected. The outdoor learning programs and the landscapes that comprise those behavior settings are the two dimensions of data selection. Since this research belongs to the field of landscape architecture, landscape types are prioritized as the major concern.

Classification Strategy

Creating a typology of outdoor learning landscapes is the foundation of this field study. Accordingly, two approaches are devised to conduct the study of the classification of learning environments. The first approach was to use general definitions to differentiate each type of learning landscape. The second approach, contrary to the general scope of the first one, was finding landscape types that are the least common multiples of both the common and unique outdoor settings introduced in Chapter Two. These two approaches, undertaken from opposite directions, would be established as effective if no great conflict existed between their results.

Data Selection

In order to conduct the observations, landscape types of the established typology are found in existing available outdoor learning programs. The author checked both school garden programs in the Athens-Clarke County school district and similar programs initiated by other organizations. Only teacher-supervised organized learning program and programs addressing middle school education purpose in the State Performance Standard of Georgia are considered. This will be discussed in Chapter Four.

Descriptive Strategy

After selecting the observation field and learning programs, a complex description of these outdoor learning activities is conducted with the institutions' permissions. Data were collected in several ways. Basic information such as time, location, program name, number of children, and age ranges was recorded at the beginning of each observation. Then the author took notes and photographs to record behaviors in different settings and order of activities. After observation, the author wrote a narrative that included the process as well as the learning purpose of the program. In addition, diagrams of stage location were created to mark the route and activity pattern of the programs. By using a complex descriptive strategy, the activity patterns, learning intentions, and settings of each landscape were all clearly recorded. Information relating to settings are not often demonstrated in a teacher's manual, thus the data collection is necessary. Chapter Four explains the strategy in more details.

Interpretive Strategy

In addition to the descriptive methods mentioned above, an in-depth interview was conducted with the selected teacher to provide more context and details. In the interviews, the teacher answered a series of open-ended questions and exposed his or her concealed concerns regarding the outdoor learning process. The in-depth interview would help to understand certain circumstances in the oudoor learning process and gain basic knowledge of the education field. This strategy will also be elaborated on in Chapter Four.

Classification in Analysis

After completing a field observation, the classification strategy is used again to systematically analyze the four factors of the outdoor learning. A matrix of school subjects and the level of knowledge in cognitive processes (Clark and Lyons 2010) is used to classify the learning purposes collected in the observation.

Next, the author applied three learning domains – cognitive, affective, and psychomotor – to classify the learning behaviors observed in the field study. Note that each domain of learning process has detailed categories, and the revised cognitive domain has six categories: remembering, understanding, applying, analyzing, evaluating and creating (Anderson, Krathwohl, and Bloom 2001). The affective domain has five categories: receiving phenomena, responding to phenomena, valuing, organization, and internalizes values (Bloom et al. 1956, Krathwohl, Bloom, and Masia 1964). The psychomotor domain is elaborated by several researchers. In this thesis, Dave's (1970) version (that contains imitation, manipulation, precision, articulation and naturalization) is selected to analyze the psychomotor domain of the observed learning behaviors.

In addition, three types of information – “intrinsic, emblematic and semantic meanings” –are used to classify the information transmitted by the observed activity settings. Moreover, the type of activity arrangement is classified by categories such as class organization modes, movement degree, dispersion degree and frequency.

Then, two relations are studied: abstract relations between the information carried by settings and the knowledge or values learned by children; and physical relations between learning activities’ patterns and settings.

The expected results were the characteristics of observed learning purposes and the several typical types of learning settings and information they carried.

Logical System Strategy

By applying the characteristics of outdoor learning purposes to the Georgia Performance Standards for grades six through eight, the author identified other purposes that were suited for outdoor learning but were not included in the programs due to research limitations. Furthermore, how activity settings facilitate the learning process is studied and the results and lesson learned from the observations and interviews are linked to a coherent system. By using the classification matrix, the author clearly documents the possible outdoor learning possibilities and the pros and cons of each type of landscape. These results will help designers determine whether to apply certain garden types to every school or to locate them in community parks that serve several schools in a region.

Typology of School Learning Landscape: Two Approaches

As mentioned in the discussion of the selected methods, a typology of school learning landscapes is essential for field observations of actual outdoor learning activities.

Two ways of classifying the school learning landscapes are devised. The first is analogy from general concepts. The second is induction from behavior settings covered in the literature review.

Ideal School Learning Landscapes: Miniature Worlds

In the field of landscape architecture, an environment can be divided into two categories: wilderness and cultural landscape. According to a definition from the Merriam-Webster Collegiate Dictionary, *wilderness* means “a tract or region uncultivated and uninhabited by human beings or an area essentially undisturbed by human activity together with its naturally developed life community”(Merriam-Webster 2017), whereas the Cultural Landscape Foundation (2016) defines *cultural landscape* as “landscapes that have been affected, influenced or shaped by human involvement”. Thus, we can conclude that human involvement is the distinguishing factor in this classification. (Diagram a in the following figure 1. illustrates this classification.)

If we go further into the cultural landscape realm, it can also be divided into different fields. Cicero (ca. 45 BC) in *De Natura Deorum* (The Nature of The Gods) stated that people created a second nature for life and production within the natural world (Cicero and Olivet 1775). He considered wilderness as “first nature” and believed that “second nature” depended on the “first nature.” Cicero’s formulation of the world inspired Jacopo Bonfadio, who added a “third nature” to the formulation. According to Hunt (2000), Jacopo Bonfadio’s letter to a fellow humanist described gardens as the “third nature,” and he invented in 1541 the term *una terza natura,* referring to nature improved by art.

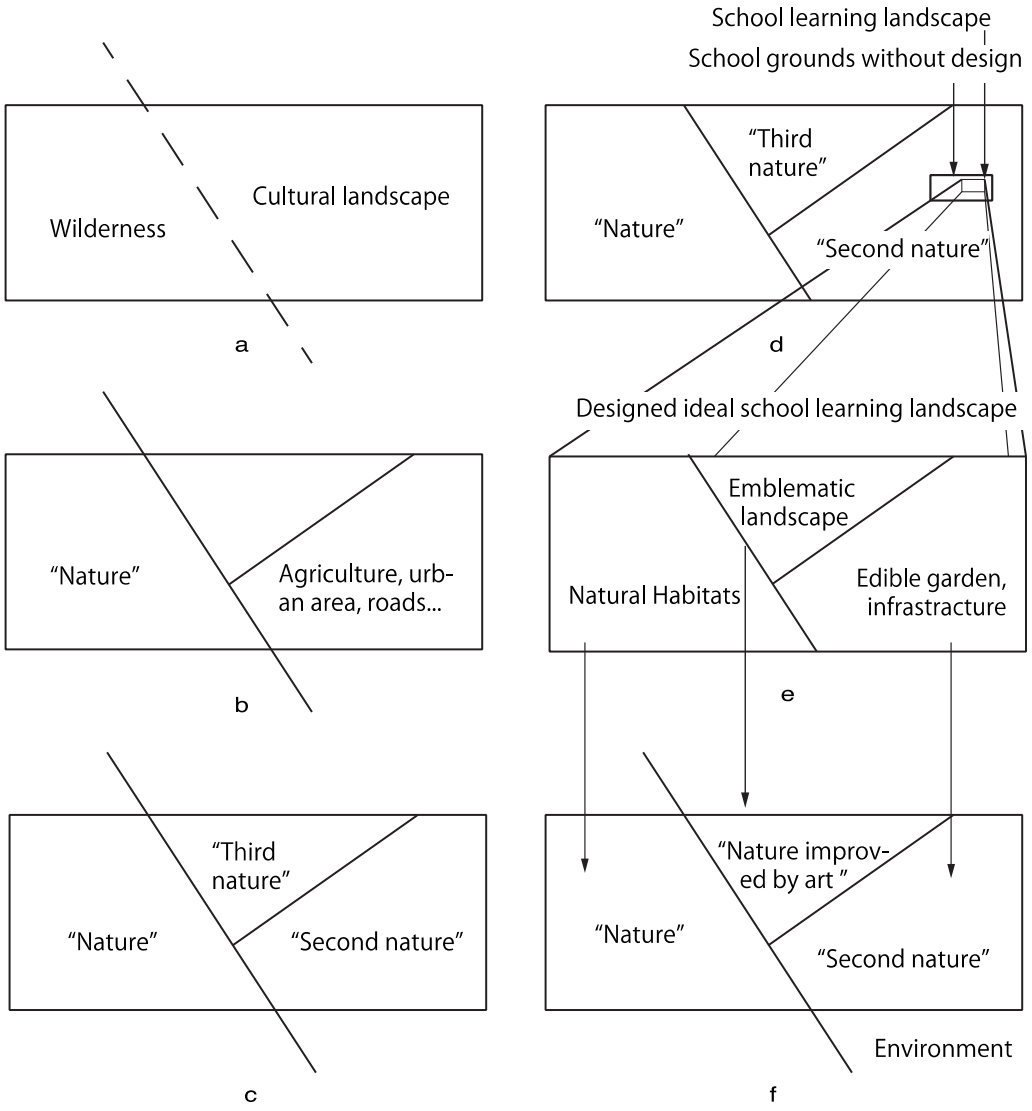


Figure 1. Typology Diagrams

Thus, cultural landscape can be divided into two types of landscape: "second nature," which means landscape for production and living such as agrarian land and urban areas, and "third nature," which means nature improved by art such as gardens. (See diagrams b and c in figure 1.) This classification is based on function, although the boundary between categories has been blurred since the emergence of the landscape architecture profession.

One of the subjects of this thesis, learning landscapes of schools, exists on school grounds and therefore falls into the “second nature” category before it is designed and improved by art (See diagram d of figure 1). However, if school is a place for students to acquire knowledge of the world under the direction of teachers, the ideal outdoor environment of a school should be a miniature of the entire natural environment, consisting of all types of nature and resembling a collection room for children to explore and learn about. Thus, under ideal conditions, outdoor learning environments in schools conceptually should encompass different landscape types that resemble the characteristics of the three types of nature. Diagrams e and f show that small-scale natural habitats and small wildlife sanctuaries are a kind of learning landscape in schools corresponding to the “wilderness.” Edible gardens, including animal husbandry and infrastructure designed with learning purposes in mind, are learning landscapes corresponding to the landscape for production and life. Emblematic landscapes in schools are an intersection of didactic landscapes designed to convey meaning and landscapes designed for aesthetic purposes.

The learning landscape is only a part of a school’s outdoor environment and does not encompass all of the school’s outdoor environment. Although a large parking lot could also be a place for children to learn about humans’ negative effects on the environment, for example, it should not be considered a school learning landscape since cognitive learning is not its major purpose. In addition, playgrounds and sports fields should also be excluded from the learning landscape category if their major design purposes are free play or physical development rather than organized learning.

Least Common Multiple of Unique Activity Settings

From a more detailed point of view, all the learning landscapes on school grounds consist of a number of settings. These settings accommodate children's learning activities and sometimes become the actual content of the children's lessons. Hence, a second method of classification is to study all the settings collected in the literature review, determine which settings cannot appear in every circumstance, and review the unique characteristics

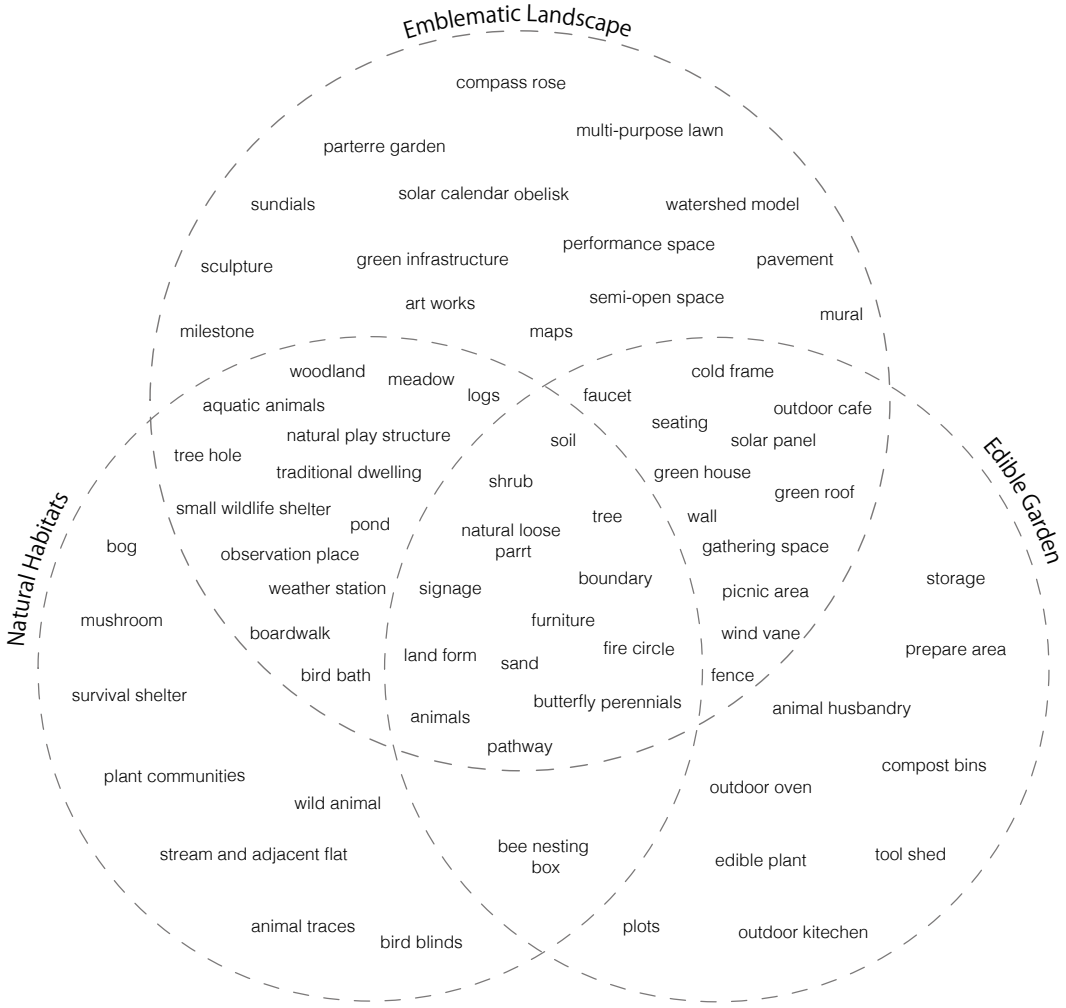


Figure 2. Typology Diagram of Outdoor Learning Settings

of those settings to determine if there is any least common multiple of certain setting groups.

In Figure 2, settings such as barns, tool sheds, outdoor ovens, and compost bins are all unique settings that only appear in edible gardens. Wild animals, bogs, natural streams, and so on are all features easily found in a natural habitat. Moreover, sculptures, murals, sundials, maps, and compass roses on the pavement all share two similarities. One is that they are all artificial or changed by people to some degree. Second, they all directly or indirectly convey some information other than their intrinsic material meaning directly, reflecting their purpose in facilitating children's outdoor learning. The term *emblematic* is used to represent this common quality.

Overall, three main types of landscape according are found to collected settings from the literature review: natural habitats, emblematic landscape, and edible garden. Because of the limitations of literature reviews, the types of learning landscapes found here do not cover every situation. However, compared to Johnson's typology, the author's emblematic landscape encompasses the art, cultural history and literacy gardens in Johnson's typology. The edible gardens have broader settings than the vegetable garden used by Johnson, and the natural habitats resemble Johnson's ecological garden. The author's typology attempted to approximate the real conditions of learning landscapes as closely as possible.

Conflict between the two Typologies

As we can see, both typologies share the common category of natural habitats. They differ with regard to the classification of "landscape for living", the infrastructure. In the first typology, the infrastructure of urban life should belong to "second nature" and

thus should be reflected in the school landscape. However, in the early discussion, school infrastructure as a type of school learning landscape was ignored because learning was not its main design concern. On the other hand, the provided examples of green infrastructure such as rain gardens and green roofs in the literature review are used as learning material in schools. Thus, infrastructure designed with a philosophy or concerns conforming to a school's educational purposes should be classified as part of the emblematic landscape.

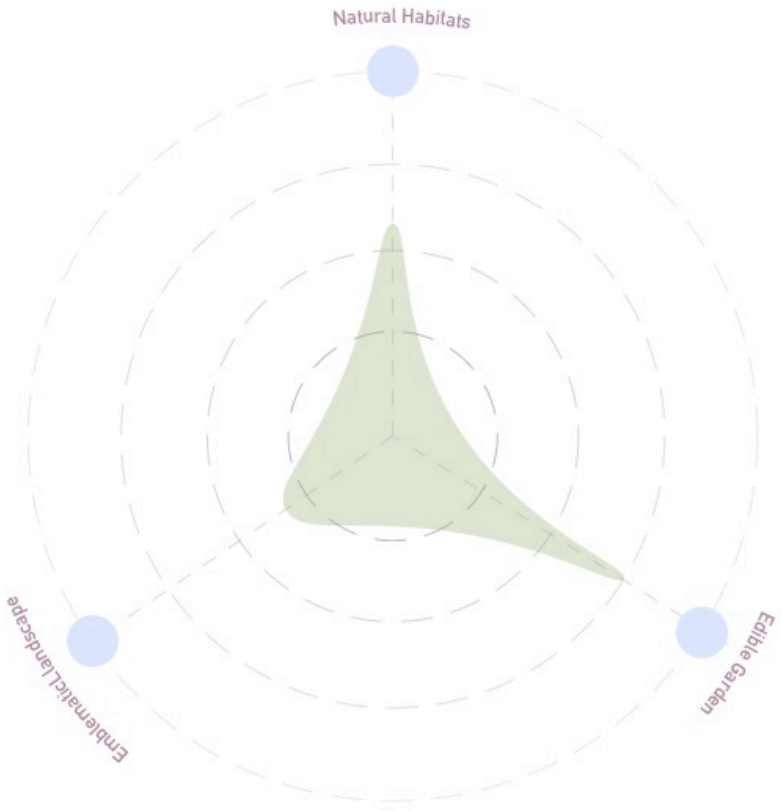


Figure 3. Diagram of the extremes and real-world conditions

This thesis chooses the second typology and leaves edible gardens as a main category of landscape for production. In actuality, as the development of the landscape architecture profession, the three categories of landscape have been mixed and blended in practice. Furthermore, a school learning landscape could be classified as one type with

the other two features as supplements. As illustrated in Figure 3., the three types of landscapes are extreme situations, and real-world examples commonly lie somewhere between those extremes. Even so, knowing what occurs in these ideal circumstances provides the opportunity for theoretical comparison and as a way of guiding learning in the landscape.

CHAPTER 4

PROCESS AND RECORD

> All perceiving is also thinking, all reasoning is also intuition, all observation is also invention.
>
> —Rudolph Arnheim, *Art and Visual Perception: A Psychology of the Creative Eye*

This chapter first explains how the research resources for this thesis were selected. Then the selected sites and their education programs are introduced and the reasons for selection are explained. Next, the method for conducting observations and the data collection method are introduced. Finally, the observation results are presented and a summary of the in-depth interview is provided.

Criteria for Observation Sites and Program Selection

Because this thesis is aimed to observe to organized outdoor learning activities processes, record their learning intentions and the relationships to outdoor settings, several factors were considered in the selection of observation sites. First, the site location had to include at least one of the three landscape types discussed in Chapter Three. Due to time and budgetary limits, the selected site had to be within the author's proximity, giving sites in Athens-Clarke County, GA first preference. Second, the targeted programs should be teacher-supervised organized learning activities such as regular curriculum activities conducted outdoors, instructional field trips, spring camping

programs, and so on. Third, the learning contents of the selected programs had to address the state standards for middle childhood to preadolescence since the knowledge obtained by students at this stage has a certain degree of complexity and breadth.

Selected Observation Sites and Learning Programs

Selected One: State Botanical Garden of Georgia, Athens, GA

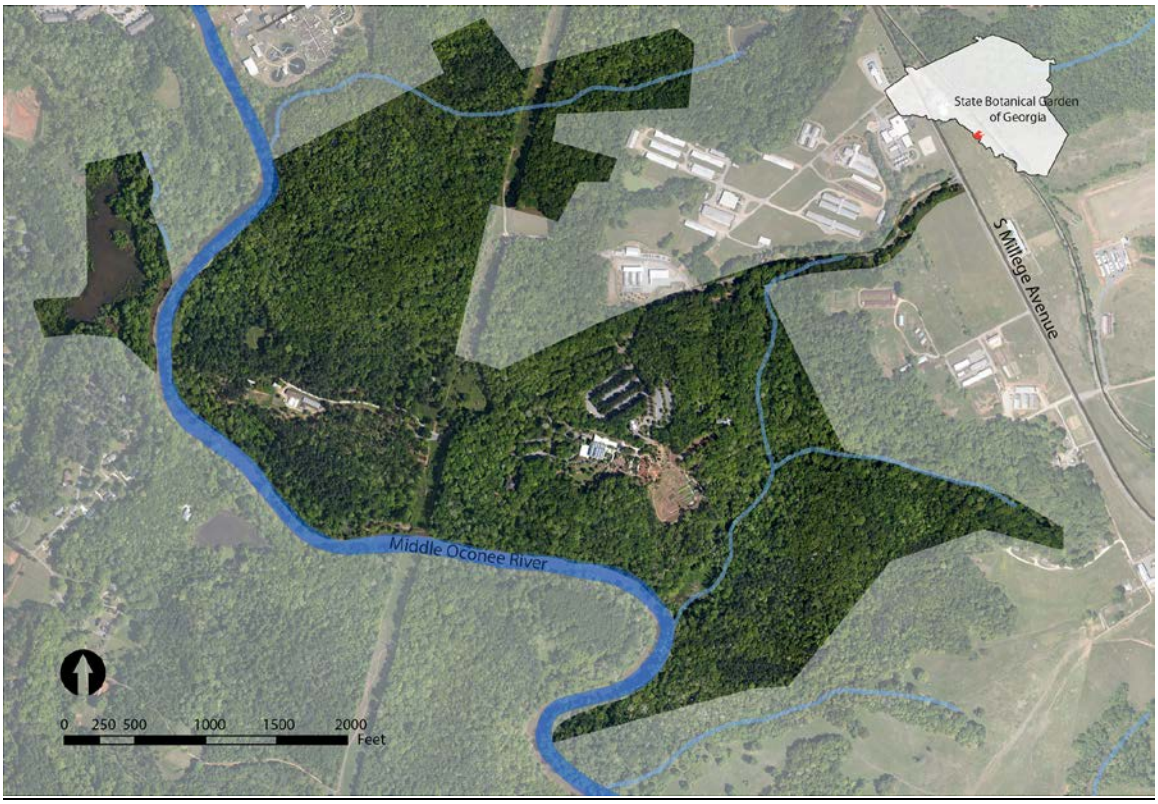


Figure 4. Location Map of the State Botanical Garden of Georgia (SBG)

Located on South Milledge Avenue, the State Botanical Garden of Georgia is a 313-acre preserve set aside by the University of Georgia for the study and enjoyment of plants and nature. As a public service and outreach unit of the University of Georgia, the Botanical Garden provides the public of all ages and UGA faculty and students with opportunities for recreation, events, research, and learning through its natural areas,

display gardens, and building spaces. As stated on the State Botanical Garden of Georgia official website (2017), “The mission of the Garden is to acquire and disseminate botanical knowledge and to foster appreciation, understanding and stewardship of plants and nature through collections and displays, horticultural gardens, research, educational programs, exhibitions and special events.”

The Botanical Garden contains several facilities, such as a tropical conservatory, and it includes two types of learning landscapes. It contains over five miles of nature trails and a number of display gardens that can be considered emblematic landscapes.

Instructional field trips that address Georgia Performance Standards are conducted at the Garden. Local schools sign up for programs according to their needs, and three programs are chosen because they fit the target childhood stage and offer plenty of learning activities in two types of learning landscape. “Experiencing UGA” is a program that teaches mostly middle school students the history and ecology of the Piedmont eco-region of Georgia. In this program, children learn about succession at the edge of the forest, test bio-diversity, and identify native species along the orange trail of the SBG. “Explore International Plants” is a program consisting of a visit to the tropical conservatory and an investigation of the properties of international, herb, and physic gardens. Children learn about the history of the world trade of plants, famous plant explorers, tropical food species, and pollination. The “Spring Break Camp” is a three-day program that includes learning in wetlands and international gardens and hiking through the oak-hickory forest, stream, and adjacent flat area. In this program, children learn to use a variety of scientific techniques to study soil, bio-diversity, and wildlife habitats, and they also learn to test stream water quality and build survival shelters in the forest.

Selected Two: Clarke Middle School of Athens, GA

Clarke Middle School is one of four middle schools in the Athens-Clarke County school district. The school is located on West Baxter Street next to Alps Elementary School. The school possesses two formal gardens, one pen with chicken cages, and a typical, large vegetable garden with four plots. Each plot is 50 feet by 20 feet. A greenhouse, toolshed, mulch pile and compost bins support its operations. On the northeast corner of the school property, there is a new reservoir. The previous loblolly pine trees were cut down, and succession has already begun. The food produced by the vegetable garden supplements the children's lunch and provides food for the goats. The flowers around the garden also attract pollinators and birds. Moreover, an historic

Figure 5. Location map of the Clark Middle School, Athens, Georgia

African-Americans cemetery on the south side of the school in the loblolly pine woods serves as the children's field trip area. Compared with the other three middle schools in the district, Clarke Middle School has a well-run edible garden and is the best choice for observing children learning in an edible garden.

Data Collection Procedure

Before the Observations

Receiving permission to access the teaching manual of the State Botanical Garden's outdoor education program, the outdoor learning sites are surveyed before conducting observations. On the day, basic information was recorded at the beginning of each observation, including:

a) Time
b) Location
c) Program name
d) Number of children
e) Age range

During the Observations

Photographs were taken and observations were recorded as notes:

a) Leaning activities
b) Education purposes
c) Learning-related settings
d) Organization of activities
e) Routes (if any)

The author did not have direct contact with either the teacher or the children during these observations.

After the Observations

A narrative of each activity was written based on the notes, including the process as well as the learning purpose of the program. In addition, diagrams of activities' locations, routes, and behavior maps (if needed) were created to mark the route and the activity pattern of the programs.

Observation Results

After selecting the observation site and program and receiving permission for observation from both institutions, the observations were conduced. The State Botanical Garden was four times and Clarke Middle School was visited three times to observe outdoor learning. A7th grade Experiencing UGA program was observed on October 21, 2014; a 6th and 7th grade special education program on international plants was observed on February 12, 2015; a "Spring Camp" program was participated on March 9 and 11, 2015, and an edible garden of the Clarke Middle School was visited on March 21, 22, and 29, 2016. Table 1. illustrates all the observation programs. The following paragraphs introduce some typical learning processes that occurred in the following three types of landscapes: natural habitats, emblematic landscape and edible gardens.

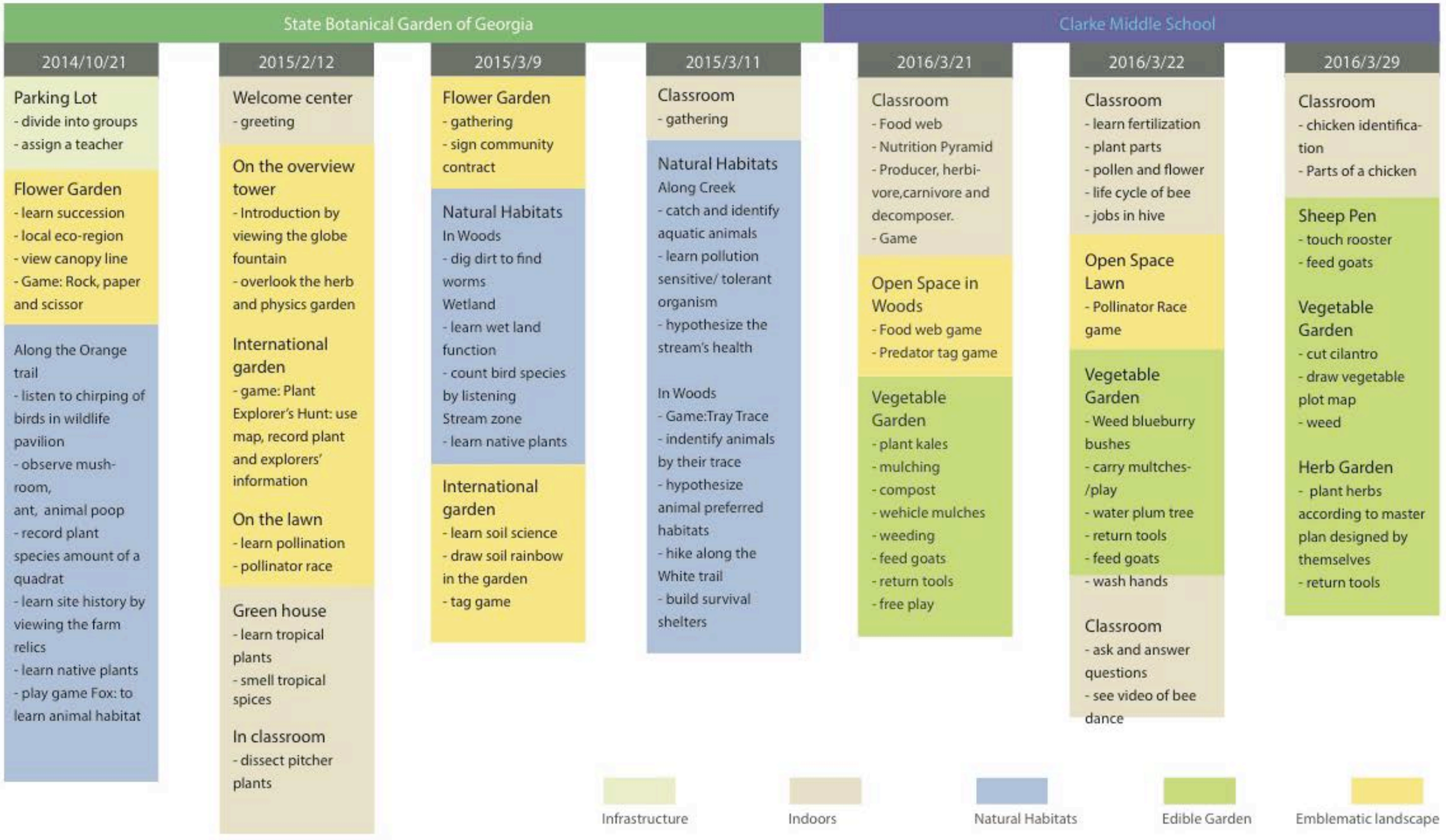


Table 1. Outdoor learning programs observed by the author

Learning in Natural Habitats

Predator-prey "fox": woody area, orange trail of the SBG, Oct 21, 2014, 7th grade, 7 persons.

Objectives: To show how certain forest communities are better hiding places for animals than others and to explore the importance of a habitat for the survival of a particular species.

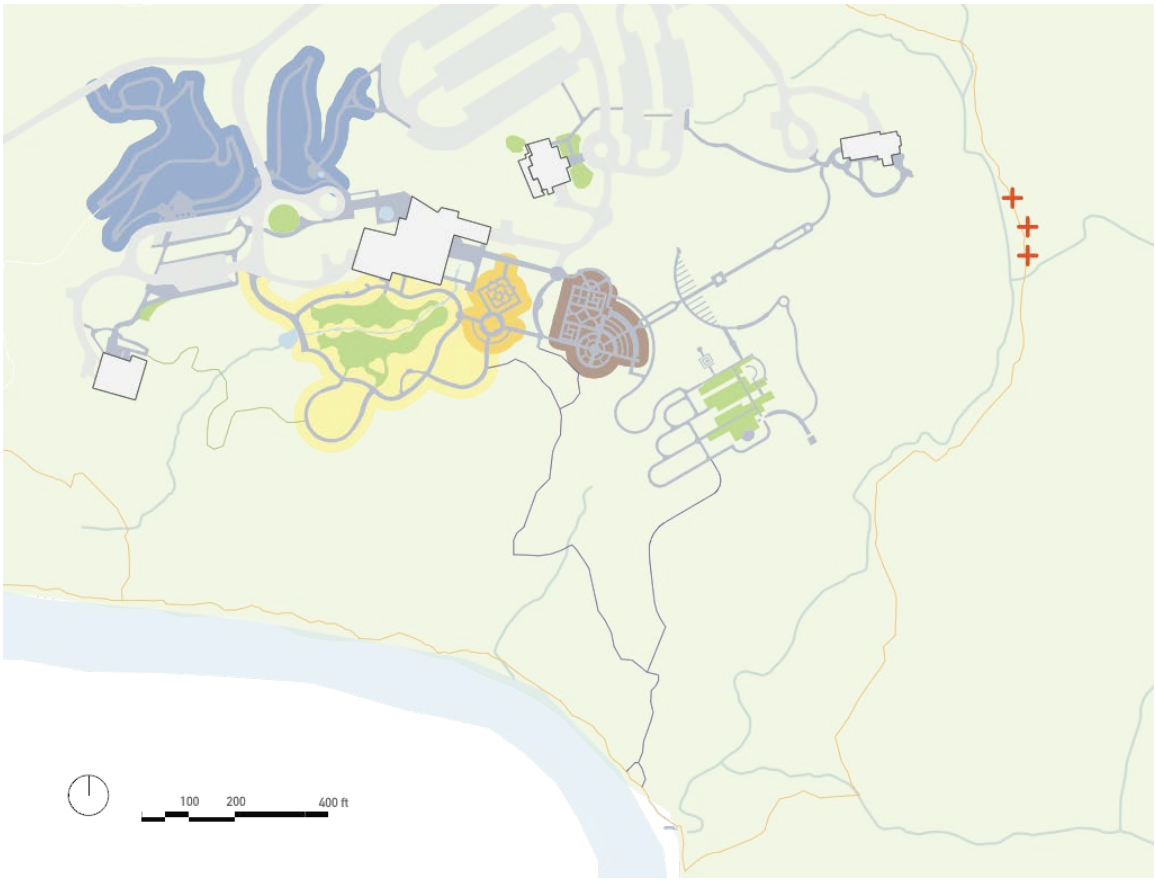


Figure 6. Location of the "fox" game on the orange trail at the SBG

Procedure: Before explaining the rules of the game, the teacher taught the meanings of *predator* and *prey* and allowed the students come up with several examples. This was done to make sure the children understood the meanings of those words. The teacher then explained the game's rules: The teacher plays the role of the "fox," and

students are “rabbits,” the fox’s prey. The game began with the teacher yelling out “Fox!” with her eyes closed, while, at the same time, all the students ran away and hid themselves in the woods. The “fox” then counted from one to ten. After doing so, she opened her eyes and looked around. When she saw someone, she called the student’s name, which meant the “rabbit” was caught. After the “fox” caught all the “rabbits” she could see, the she yelled “Carrot!” and then all the “rabbits” who had not been caught jumped out from behind big trees and shrubs. The rabbit closest to the predator won the game.

As the class went along the botanical garden trail, the teacher played the game several times with no advance notice. The students needed to hide themselves quickly in order to mimic responses to animal danger occurring in the real natural world. Although the organization of the activity was fixed, during the game, the children dispersed in the woods individually or in small groups. Sometimes, the game was conducted at the boundary of the woods; other times, it took place next to a creek or deep inside the forest. When they played the game in an open woods near the boundary, one student complained that “the game is harder here” because they were easily caught with few shrubs to hide behind. By playing the game several times in different habitats, the children became aware of which habitats were ideal for a rabbit to hide, feed itself, and survive predators. Acting as prey and considering prey, the students learned the interdependency between the prey, the predator, and the habitat. This activity was selected from the book *ABCs of Ecology* (Schutsky, Kaufman, and Signell 2006).

Track tray: wood area, orange trail of the SBG, March 10 and 11, 2015, mixed grades from 1st to 5th , 13 persons

Objectives: To find small animal signs and tracks in woods, identify small animals by their tracks and explore small animals' living habits by conducting field experiments.

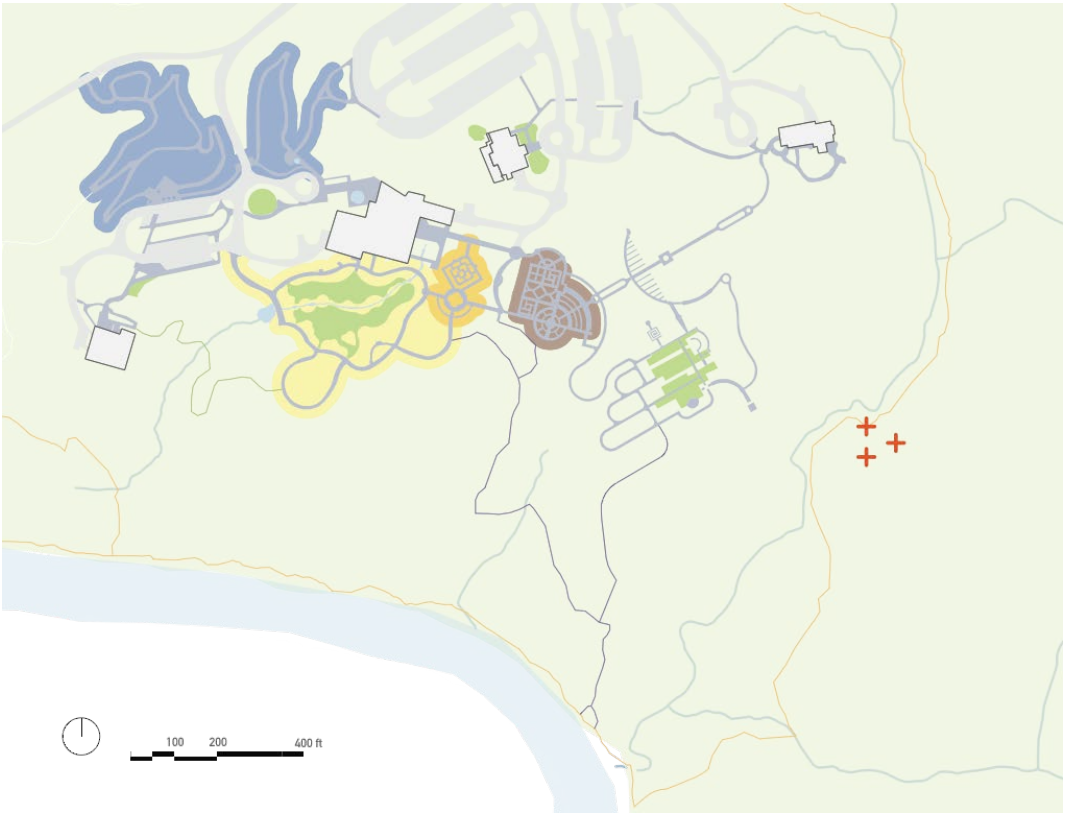


Figure 7. Location of "track tray" near the orange trail in the woods of the SBG

Procedure: The teacher divided the students into four groups. Each group chose a tray with a different color. Then, the teacher taught the students how to make food for animals. They first put dirt into their trays and then added water to make the dirt muddy. Next, the students placed some peanuts, pecans, walnuts, and biscuits in the center of their trays. After making the food trays, the teacher took the students with their trays to the wooded area of the botanical garden and asked the students to think about which

locations animals might pass. Each group then placed its food tray in a location they considered ideal.

Figure 8. Children checking for animals traces on trays

The following afternoon, the teacher took the students back to the woods to retrieve and compare their food trays. Only one tray was intact. The other three trays were clearly touched by animals of some kind. Most of the food had disappeared, with a few walnut shells and some footprints remaining in the trays (see figure 8). To identify the animal, the teacher gave each group a handout showing the shape and the size of the footprints of several common animals in the area. The students then discussed with each other the shape, number of digits, and size of each footprint and determined that the three sets of prints might belong to raccoons, beavers, and muskrats (see figure 9). To

conclude, the teacher asked the students to think about where those animals might live, which location attracted the greatest number of animals, and why one of the trays was intact.

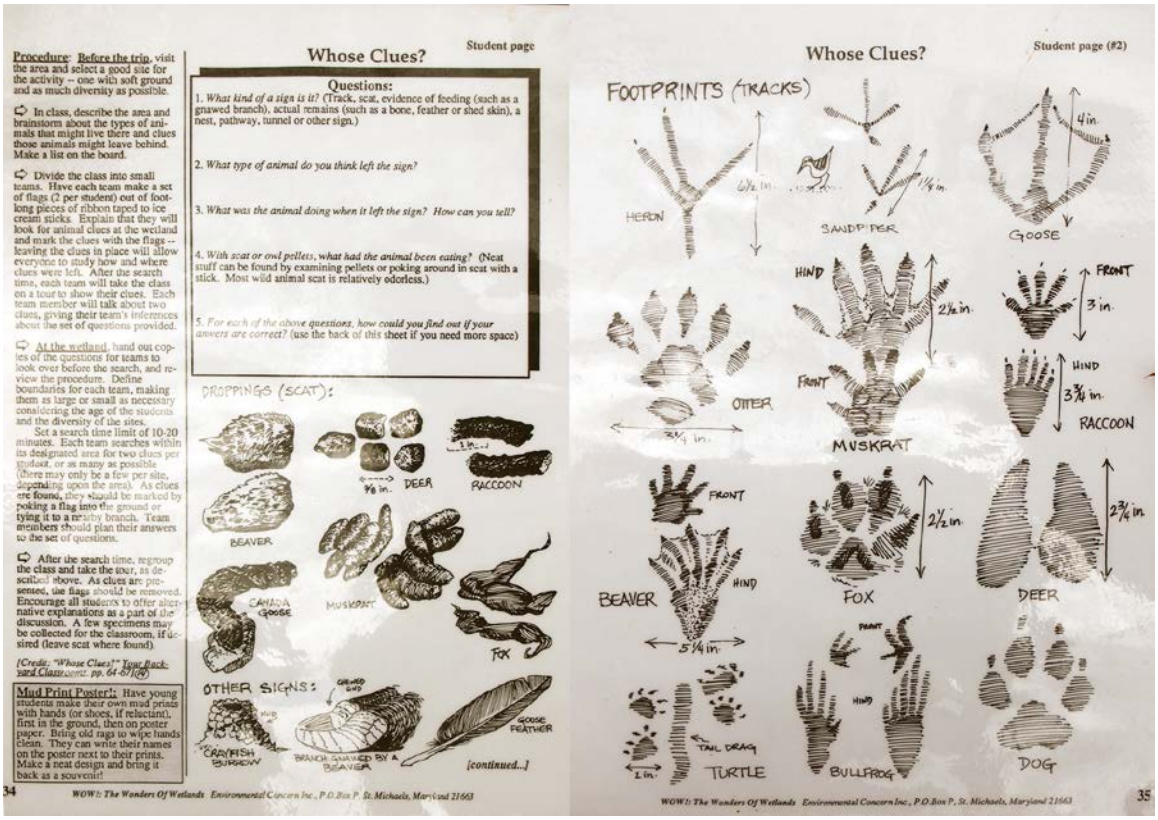


Figure 9. Student handout of animals' footprints. Photograph by the author. Data from *Wow! The Wonders of Wetlands, an Educator's Guide* (Slattery 1991, 34-35)

In this activity, the students formulated hypotheses about the kind of location that attracts the most animals, learned to make tools by themselves, and used those tools to facilitate the testing their hypotheses. Moreover, they identified species of animals by their tracks and modified their assumptions according to the results. This activity was also selected from the book *ABCs of Ecology* (Schutsky, Kaufman, and Signell 2006), as stated in the teacher's manual of the SBG outdoor learning program.

Stream study: stream in the SBG, March 11, 2015, mixed grades from 1st to 5th, 13 persons

Objectives: To determine factors affecting the health of a stream, to observe and measure physical characteristics of the stream, and to hypothesize about the health of a stream based on its conditions.

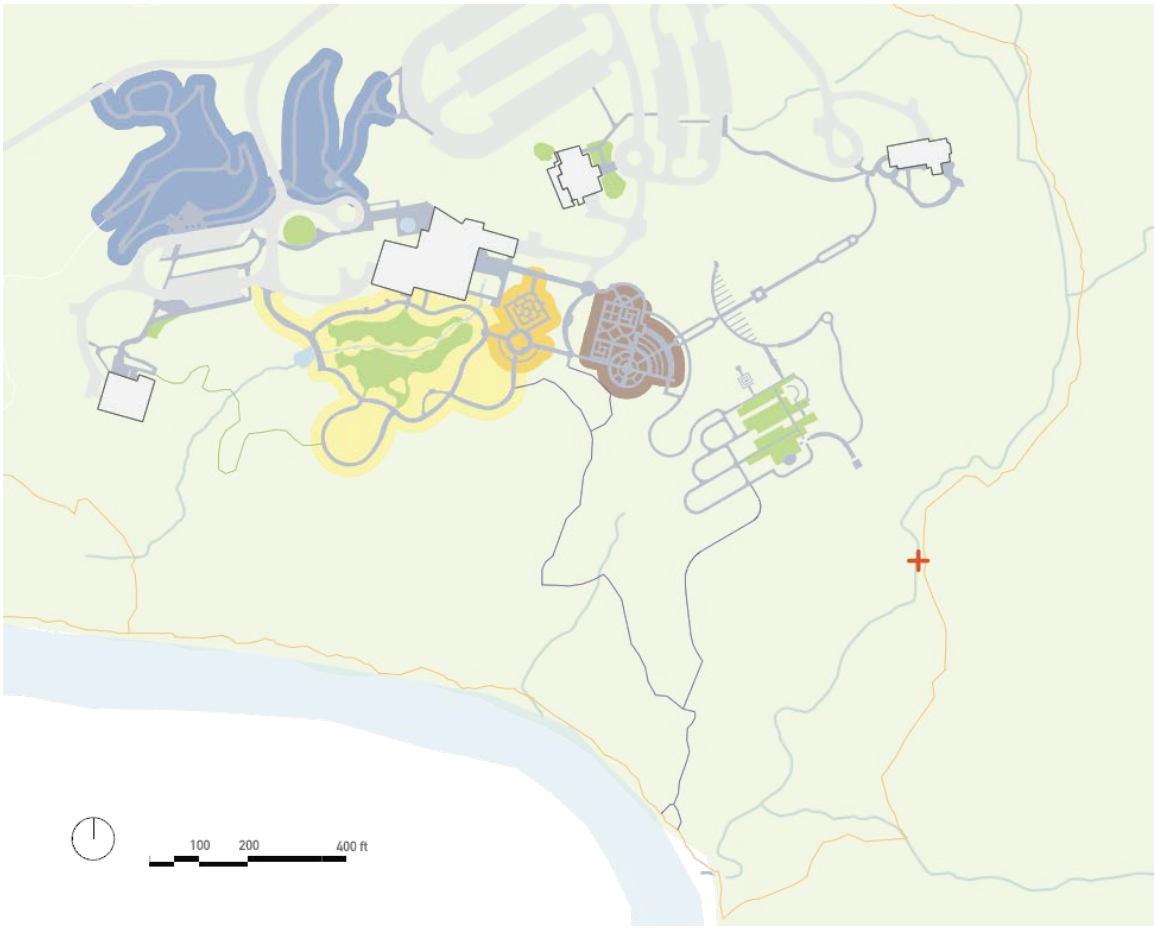


Figure 10. Location map of the “stream ecology ” study

Procedure: The teacher and the students walked to an open area adjacent to the stream in the Botanical Garden. While the teacher allowed the students have a rest by sitting on the boulders and the wood boardwalk next to the steam, the teacher also asked them to observe the stream. After their rest, the teacher reassembled the students and asked them to share their observation. The teacher guided the students to think by asking

several questions: “What do you think about the stream?” “Is it healthy or not?” “Would you drink the water?” “How would you test a stream to see if it is healthy?” “What would make a body of water not healthy?”

Figure 11. Children catching aquatic animals along the stream

Next, the teacher told the students that they would test the health of the stream by catching aquatic animals. The teacher put several white containers with water in them on the ground next to the stream and gave every student a sieve to catch aquatic animals. The students first stood in or along the stream, watched the water carefully, and, once they found something, used the sieve to catch the animal and put it into the container. Some students used small rocks to dig into the bottom of waterbed; others moved rocks away to see if any creature was hiding behind them. Twenty minutes later, the teacher reassembled the students and asked them to identify the animals they had caught using

handouts of stream insects and crustaceans. The teacher then explained pollution-sensitive organisms and pollution-tolerant organisms. Through classification and discussion, the students identified the aquatic animals they had caught. The pollution-sensitive organisms found in good quality water were gilled snails and caddisflies. Crayfish, crane flies, beetle larvae and dragonflies were identified as somewhat pollution-tolerant organisms that could exist in good or fair quality water, and pond snails and blackfly larvae were identified as pollution-tolerant organisms that could exist in any quality of water. Students were able to conclude that the stream quality was good because there were pollution sensitive animals in the stream. In the end, the teacher and the students released the animals back into the stream.

In this activity, the students enjoyed putting their hands in the water and catching aquatic animals. They formulated hypotheses about the stream's health from observation and then tested their hypotheses by collecting data and analyzing those data. When they yelled out excitedly the name of the captured animals, they learned identification, and when they concluded that the stream was in good condition, they gained the ability of analysis. By having them think about the factors that might influence stream quality, this activity also encouraged the students to consider how their own actions impact their watershed.

The route of the activity was mostly linear, and the only two spaces for gathering or assembling were the spot where they rested and the spot where they caught the aquatic animal. The activity organization was flexible. Only fine motor skill were used. The children dispersed along the stream and adjacent flat individually or in small groups and they could choose where to find aquatic animals.

Sounds of the bog: Wetland on the orange trail and lower parking lot of SBG, March 9, 2015, mixed grades from 1st to 5th, 13 persons

Objectives: To establish a mood of quiet observation so as not to disturb the wildlife and to become familiar with the sounds of a wetland and compare it to a developed area.

Procedure: The teacher started this activity as soon as the class arrived in the parking lot. They discussed listening first, and then the teacher asked the student to remain quiet and pay attention to their surroundings. The teacher also asked the students to keep a count of the number of different sounds. After two minutes, the students shared the sounds they heard by demonstrating the sounds, and the teacher noted all the different sounds (including moving cars, human breathing, and birdsong.)

Figure 12. Map of the "sound of the bog" on the orange trail of the SBG

Next, the teacher took the students to a bog located in the southeast of the SBG on the orange trail near the river. The teacher asked the students to be quiet again, spread out, and count the sounds in their surroundings. From the author's observation, there

were at least five different kind of birds singing in this wetland. After two minutes, the teacher asked how many sounds they had heard. “Five!” “Six!” “I’ve heard nine!” the students answered excitedly. Then the teacher asked for volunteers to demonstrate some of the sounds they had heard. A total of five sounds were demonstrated. The teacher then asked everyone to listen and count together, and the class went quiet again. Then, the teacher asked how many different sounds there were, and the students answered “Six!”

Figure 13. The bog in the State Botanical Garden of Georgia

In the end, the teacher and students compared the sounds of the parking lot to those of the woods. They concluded that the sounds in the wetland woods were more numerous and agreed that human development caused this difference.

In this activity, students learned to control themselves by being quiet. They also learned observation and analysis by counting sounds and comparing different results. The activity organization was fixed. Children do the same things together. Only fine motor skills were used.

Other activities

There were two more activities conducted in the natural habitats: counting plant species within a quadrant plot and building survival shelters in the forest of the State Botanical Garden of Georgia. The two activities were not record in detail in this chapter because the processes were too simple to narrate.

Learning in Emblematic Landscapes

Pollination Race: Lawn of the International Garden of the SBG, February 12, 2015, 6th and 7th grade, 11 persons. Lawn adjacent to the edible garden at Clarke Middle School, March 22, 2016, 6th grade, 24 persons.

Objectives: To fully understand and memorize the pollination process and to have some physical exercise.

Procedure: Before this game, the teacher introduced the concept of the bee pollination process in the classroom. Next, the teacher and students went outside to the lawn area of the International Garden. The teacher divided the students into three teams of four each and arranged the teams in lines at one end of the lawn before explaining the instructions of the game, a relay race for pollen and nectar. In the game, there were two "flower" baskets with "nectar" and "pollen" in them at each end of the lawn. Every student held a toy bee representing a working bee that could carry one "pollen," a yellow

loop, from one flower to another and collect one “nectar,” an orange loop, for their bee basket at a time.

Figure 14. Map of the “pollination race” in the International Garden of the SBGAfter the game began, each team’s first “bee,” holding a toy bee in one hand and carrying an empty nectar basket in the other, ran from one end of the lawn to the other, then picked up both one yellow loop and one orange loop, and dropped them in the nectar basket. They then ran back to the beginning and passed the nectar basket and the toy bee to the second student. The second students of each team first picked the pollen out from their nectar basket, placed it on the flower, and then picked one nectar loop and one pollen loop from the flower to put into their nectar baskets. Then they ran quickly to the other flower, went through the same process, and ran back. The remaining students repeated the same process. The team that finished two rounds first won the game.

Figure 15. Children playing on the lawn of the International Garden in the SBG

The game showed that bees do not attempt to pollinate deliberately but rather unintentionally transport pollen from one flower to the next. Some students were confused when holding several items, picking up and dropping loops of different colors, but through practice they gradually understood what each step meant and were able to finish the process quickly in the end. The students also had a great deal of physical exercise and used gross motor skills in this game. The activity organization was fixed and everyone needed to follow the game's rules.

The author wishes to note here that at Clarke Middle School, the author also observed a similar pollination game; however the game was conducted on the lawn next to their edible garden (see figure 16). Apparently, the place does not fall into the category

Figure 16. Map of the "pollination race" game played at Clarke Middle School (CMS)

Figure 17. "Pollination race" on the lawn of CMS

of edible garden or natural habitats. Also, Clarke Middle School does not have a designed emblematic landscape. However, since similar activity could occur on the lawn of the International Garden of the SBG, where an emblematic garden exists, the author also categorizes this learning activity in an emblematic landscape. Figure 17 shows children playing “pollination race” at Clarke Middle School.

Rock, paper and scissors: Flower garden, October 21, 2014, 7th grade, 7 persons.

Objectives: To fully understand ecological succession, learn about some typical successive vegetation in the Georgia Piedmont eco-region, and have some physical exercise.

Figure 18. Map of the “Rock, paper and scissors” in SBG’s Flower Garden

Procedure: Before this game, the teacher took the students to the lawn of the Flower Garden of the SBG, where students could have a good view of the forest

boundary around them. Then, the teacher introduced the concept of ecological succession: the process of change in the species structure of an ecological community over time. Taking the Georgia Piedmont eco-region as an example, the teacher introduced some typical successive vegetation: grass, pine, and oak. Some students were not familiar with the order of the oak and pine, so the teacher pointed out the woods boundary to show them that the oaks were gradually becoming the dominant species in the plant community and that they would live longer than the pines. Fire was also explained as a main disturbance of the succession process.

Figure 19. Forest outline seen from the Flower Garden of the SBG

Next, the teacher explained the directions of the game. Students would play rock, paper and scissors to move through the three successive vegetation roles – grass, pine,

and oak – and model the succession after a fire disturbance. As grass, students would squat around mimicking the height of the grass. As pine, students would move around on their knees. As oak, student would move freely on their feet. Everyone would start out as grass. Next, everyone found a partner and played rock, paper and scissors. The winner could then move to pine, while the loser remained grass. This process continued, grass becoming pine and then oak. When the teacher shouted “fire,” everyone returned to grass, modeling the fire disturbance.

Figure 20. Lawn and terrace wall of the Flower Garden in the SBG

At the beginning of the game, some students were confused about the order of the three vegetation species. After making mistakes and being corrected by other students, they gained an understanding of the succession process in the end. The game organization

was fixed, and all children played together. Besides practicing the knowledge gained through this game, the students also had a great deal of physical exercise.

The author categorizes the succession game into learning in an emblematic landscape not only because it was conducted in the emblematic flower garden of the SBG but also because the knowledge the children gained and practiced are related the surrounding of the space. Knowledge of the concept of succession can be gained by looking at the woods boundary. The space is influential to the learning activity. Without the soft lawn surface, the children would not have been able to run freely and move around on their knees. The retaining wall and terrace provided good enclosure for this learning activity (see figure 20).

Soil rainbow: International garden of the SBG, March 9, 2015, mixed grades from 1st to 5th, 13 persons.

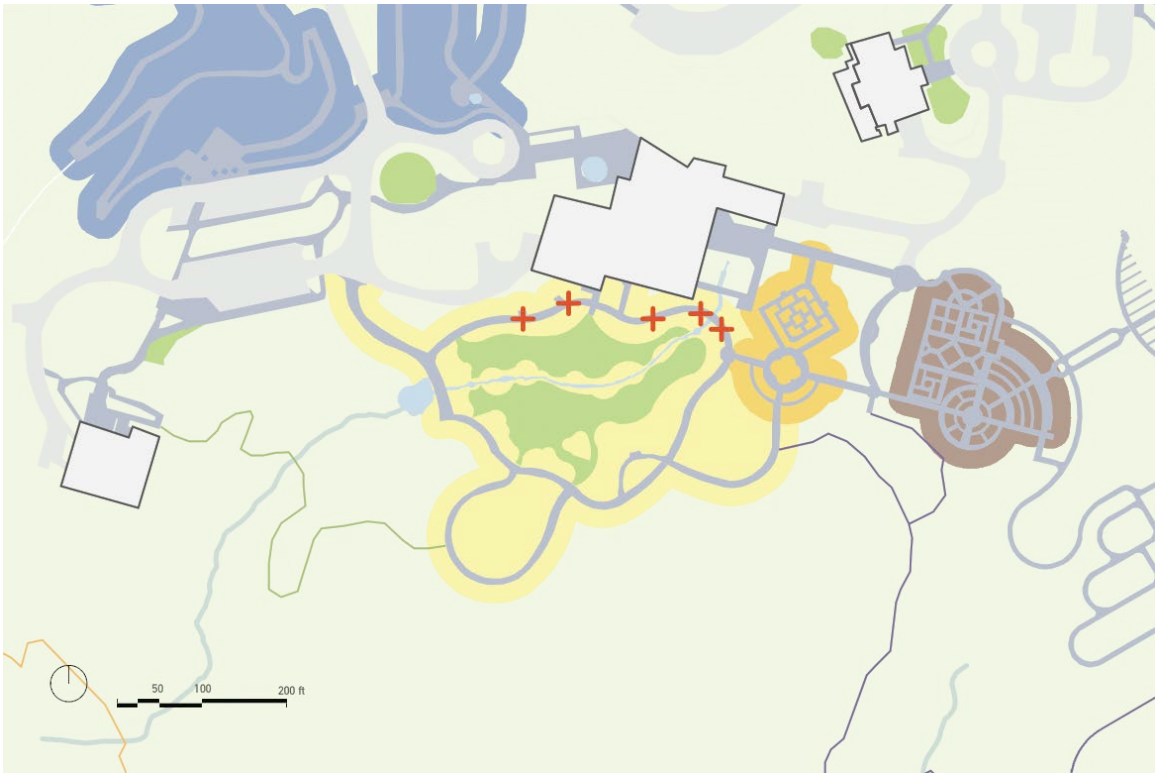


Figure 21. Map of the “soil rainbow” in the International Garden of the SBG

Objectives: To determine the color of soil in several different ecosystems and to understand the difference between several colors of soil in terms of nutrient content and elements.

Figure 22. Children drawing the “soil rainbow”

Procedure: First, the teacher introduced the background information about soil color, noting that observing the colors of soil is one way to discover what nutrients and different elements are present. Generally speaking, darker soils have higher carbon content and, therefore, more nutrients available for plants. Oxidation also affects soil color. For example, red soils have a high concentration of rust, which is oxidized iron. Next, the teacher gave everyone a handout with a rainbow for the children to fill out. Then the teacher guided the students through different gardens in the International

Garden. The International Garden consist of several parts: a Spanish-American garden, an American South garden, a pitcher plant mountain bog, a Chinese and Asian garden, and a Mediterranean and Middle Eastern garden. At each ecosystem checkpoint, students took a pinch of topsoil and smudged the rainbow on their worksheet with it. After completing the soil rainbow, the teacher and the students discussed some of the possible causes of the color differences and which ecosystem had the highest nutrient value.

In this activity, students collected data and inferred the nutrient content of the soil by observing color and analyzing the biodiversity of an ecosystem. Placing oneself into the natural world was the key component of this activity; students observed and touched the real thing rather that looking at pictures of soil indoors. The organization was flexible, and only fine motor skills were used. The linear path in the International Garden of the SBG allowed the children to obtain the topsoil and draw the rainbow individually at the same time.

Plant explorers' hunt: Herb and Physic Garden of the SBG, February 12, 2015, 6th and 7th grade, 11 persons.

Objectives: To learn to use a map to locate plants in the garden and to understand that plant explorers have been important in history. To practice the skills of observation, interpretation, map reading, collecting, and recording data.

Procedure: Before the activity began, the teacher gathered the group around the Kugel Fountain overlooking the Herb and Physic collection in the International Garden (see figure 23). Then the teacher explained that plant explorers played an important role in discovering and mapping the New World. The teacher asked the students if they knew of any famous plant explorers. When the students shook their heads, the teacher

introduced some famous plant explorers such as John and William Bartram, who explored much of Georgia before it was settled by Europeans.

Figure 23. Children assembling at the World Map Fountain in the overview tower

Next, the teacher told the students to pretend to be plant explorers as they followed a map to find useful plants from around the world. The teacher divided the students into three teams and passed out four maps to each team. The map illustrated the International Garden and marked three places for each team to find. There were also three clues for each marked place that described the characteristics of the plants there. The students needed to work as a team to arrive at the right location marked on the map and

record the plant's name and origin as the "proofs of discovery." After finding all three plants, they returned and shared their discovery with other teams.

In this activity, students practiced using a map and worked as a team because they had to reach an agreement their order of exploration. Some teams were slow in locating

Figure 24. Map of the "Plant Explorers' Hunt" in SBG's Herb & Physics Garden

themselves on the map, but with the help of the teacher, they learned to find a place as a reference point. Additionally, the students learned about several plants and their origins by recording the information on labels when they found the plants and sharing their findings with the other teams.

The author categorizes this learning activity as learning in an emblematic garden not only because the configuration of the garden represents a particular garden style in the history but also because the meaning and history behind the collected plants comprising the garden are directly related to the children's learning purpose. The activity

organization was flexible. The complex paths and the display parterre allowed the children to perform the same actions in small groups at the same time (see figure 25). Only fine motor skills were used here.

Figure 25. Children playing “Plant Explorers’ Hunt”

Food web: Semi-open lawn located in the northeast area of the Clark Middle School grounds, March 21, 2016, 7th Grade, 16 persons.

Objectives: To fully understand the ecosystem and food web.

Procedure: Before the game started, the teacher introduced the meaning of the term *food web*. After making sure the children understood, the teacher and the students went to the semi-open space on the boundary of the pine tree woods in front of the school building. First, the teacher handed out cards with the names of producers, herbivores, omnivores, carnivores, and decomposers in the food web. Then the teacher had the children stand in a big circle and used a thread to show the links between each species,

starting from seeds and progressing from shrubs to rabbits and beyond. After everyone in the circle was linked, a web appeared. The children learned that the more species in the web, the stronger the web would be.

Figure 26. Location of the "food web" game at CMS

This activity gave the children a concrete simulation of the abstract concept of food web, for which outdoor learning is a good option. The organization was fixed; everyone participated in the same activity together. The physical feature of the space and the settings of the place did not have any emblematic information and only served a supplementary function. The activity was included in the category of learning in an emblematic landscape because it was similar to "pollination race" and "rock, paper and scissors". However, it could be conducted in other convenient spaces that could accommodate this activity.

Figure 27. Children playing the “food web” game on the lawn of the CMS

Other activities in emblematic landscapes

The children in the “experience UGA” program learned Georgia agriculture history from the relics near the orange trail in the forest of the SBG. The author chose not to narrate this activity because its process was very short and straightforward. According to teacher’s interview (see in-depth interview at the end of this chapter), the children at Clarke Middle School also learn history and other related social knowledge on their field trip to the Brooklyn Cemetery, an African American cemetery adjacent to the school’s south side. The evergreen plants and gravestones are emblematic settings. The activity is included in the analysis in Chapter Five.

Learning in the Edible Garden of Clarke Middle School, Athens, GA

Figure 28. Children moving mulches with shovels and wheelbarrows

Based on the observations, there was no particular program for learning in the edible garden so “garden tasks” are used for the general activity name. The class’s organizations were usually flexible, except on March 29, 2016, when the teacher showed a chicken inside the pen and had the children identify different parts of the chicken. Usually, the children were permitted to work on different tasks at the same time, and they could switch to other tasks when they wanted. The children learned by imitating the teacher at first and then performing the task by themselves the next time.

Here, managing the edible garden at Clarke Middle School, applying acquired knowledge and skills such as designing the herb garden, are part of the comprehensive learning activities according to the teacher’s interview (see in-depth interview in the end

of this chapter), but this activity was not observed by the author directly. The author only observed children constructing the herb garden; thus, the design and other management activities are not included in the narrative of this chapter.

Figure 29. Children weeding blueberries

March 21, 2016, 7th grade, 16 persons

Objectives: Master garden tasks while cooperating with others.

Procedure: The teacher shows different tasks, and the children chose the tasks they wanted to do. The tasks included planting kale in plots, mulching by using wheelbarrows (see figure 28), composting, weeding, feeding goats with weeds, and returning tools. The children washed their hands after work.

March 22, 2016, 6th grade, 24 persons

Objectives: Master garden tasks while cooperating with others, learn about World Water Day, and appreciate available water resources.

Procedure: The teacher assigned different tasks, and children chose the tasks they wanted to do. The tasks included weeding blueberries (see figure 29), carrying mulch, watering plum trees, and feeding goats with weeds. The children washed their hands after work.

Figure 30. Children cutting cilantro

March 29th, 2016, 7th grade, 18 persons

Objectives: Master garden tasks while cooperating with others, remember and identify different parts of a chicken, and value the importance of healthy food choices.

Procedure: The teacher assembled the students in front of the pen and allowed the children to touch roosters and identify different parts of the roosters. Next, the teacher took the children to the plots and taught them how to cut cilantro (see figure 30). The teacher then assigned different tasks, with children again choosing tasks they wanted to do. The tasks included weeding blueberries, planting herbs according to the master plan

of their own plant design of the herb garden, drawing the vegetable plot map on a small black board, feeding goats (see figure 31), and returning tools to the toolshed. The children washed their hands after work.

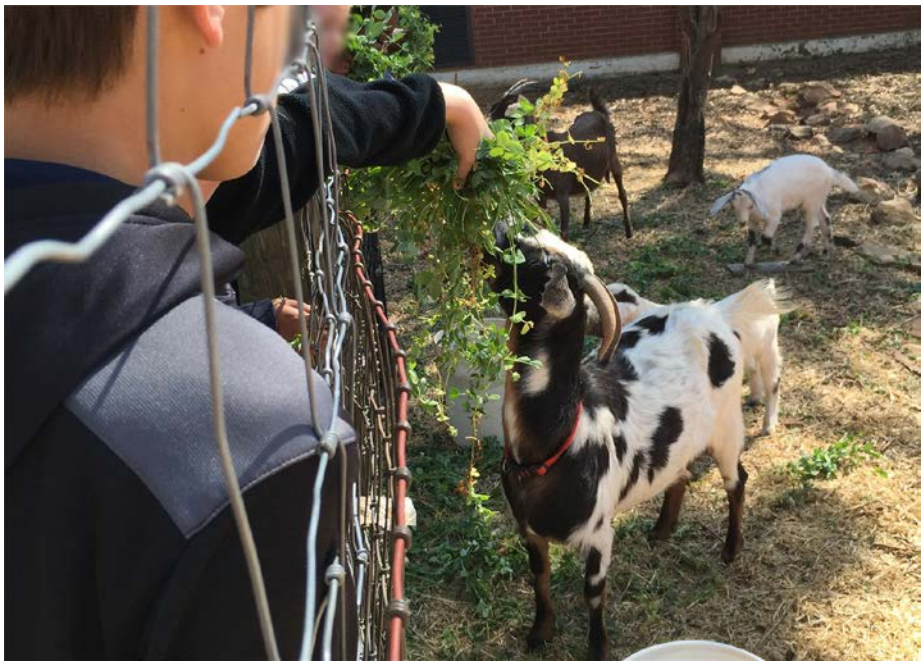


Figure 31. Children feeding the goats

The organization of the learning and working activities in the edible garden were flexible; the children often worked in different settings individually or in small groups at the same time and switched between tasks when they wanted. Most of the tasks used both fine motor and gross motor skills. The teacher attempted to supervise everyone when they were working. The permeable fences did not obstruct the teacher's view. However, because of the site unique distribution of different settings, the teacher was hardly able to supervise the children working in vegetable plots and near the chicken coop at the same time (see figure 32.). The learning settings recorded in these observations will be illustrated and analyzed in Chapter Five.

Figure 32. Behavior map of the activities in the edible garden

In-Depth Interview

In-depth interviewing is a qualitative research method that acquires the personal points of view of associated people by conducting individual interviews. Since the author has observed the learning processes in the three types of landscape, it is time present someone who is close to and familiar with school outdoor learning environments to confirm information from observations, explain certain typical circumstances to eliminate misunderstanding and provide more context for the observations.

Process of Selecting Interviewees

The interviewee for this interview needed to meet several criteria. The individual should be an educator experienced in outdoor teaching and familiar with the middle school class structure and the characteristics of children's learning. Additionally, the interviewee should be directly or indirectly involved in the outdoor learning programs that the author observed in order to provide more specific information and references with regard to the previous observations. Thus, the agriculture science teacher at Clarke Middle School in Athens, GA was selected as the interviewee of this study.

Limitations of This Method

This method is time-intensive. Before an interview, the interviewer does not know how much time each question will take, so it is difficult to estimate time. Information and data will be deficient if insufficient time is allotted. Moreover, the interviewer's bias or default view may affect the interview data. The interviewee's professional jargon may also add difficulties in comprehension. Furthermore, the conversation may stray from the expected topics.

Interview Protocol and Scripts

Setting up

"Hello, my name is Qianwen Sun. I'm a Master's candidate from the College of Environment and Design of the University of Georgia. I want to ask you some questions about your teaching experiences in outdoor environments, especially in edible gardens. I chose you as the interviewee because you are a member of the UGArden Corps program and your teaching objects, middle school students aged from 10 to 13, are the typical subjects of my research. The interview will take around one hour. It is an in-depth interview and you will be asked no more than 10 questions. The information will not be confidential. Some of your lines will be included in the final report, and your personal information might be recognized or inferred inadvertently by an audience. However, I will send you a draft report for your final consent. If you consent, please sign your name below. Thank you very much."

Beginning

"Thank you for taking the time to do this interview. Today's interview will focus on outdoor learning environments. We will talk from about 4:30 to 5:30 p.m. The information will be taped because I cannot write fast enough to take down every word, and I will use the recording to access content after our interview for summarizing. The audio will only be used in this report, and only I will be able to access it. Do you have any questions? If you agree to let me tape, we will start now."

Conclusion

"Do you want to add anything? I will analyze our interview and send a draft report for you to review. It's been really interesting to talk with you. Thank you so much for your time!"

During the interview, the interviewer recorded the conversations for later reference. After the interview, the author summarized the key information, submitted the draft to the interviewee to review, and received final consent.

Data Collection Time

The interview was conducted on Friday, September 23, 2016, from 4:30 p.m. to 5:50 p.m. at Clarke Middle School in Athens, GA.

Interview Guide

In the interview, teacher was first asked questions about the context of outdoor learning in school. The schools' schedules, the children's behavior characteristics, and the aims and intents of the school garden are included. Second, interviewer asked about the main factors involved in outdoor learning, including education purposes, activities in classes, settings associated with class, and class organizations. Third, the interview discussed the frequency of garden use, the effects of outdoor learning, the attitude of potential stakeholders, and detail design concerns in the school's outdoor learning landscape.

Key Findings

See the original interview record in Appendix I for a detailed transcript. The following are key findings summarized by the author.

Context

In the interview, the teacher first introduced some context regarding outdoor learning in school. Children at Clarke Middle School do not have long break times between normal classes, each of which are 57 minutes long. The outdoor time for students includes free time every day after lunch and a one-hour free-play time each week on Friday. Students have PE class every day, but whether they go outside depends on their coach's preferences. For the agriculture science class that is taught by the interviewee, the children meet twice per week from Monday to Thursday.

The characteristics of the middle school children observed by the interviewee provided evidence for the child development and classification theory in Chapter Two. Children in this age range are transitioning from middle childhood to preadolescence and beginning to become more interested in social interaction with their peers. Attention to appearance and the opposite gender increase. Some students show less interest in outdoor activities and would rather sleep in the classroom because they feel tired, which indicates that outdoor support such as seating or other outdoor furniture is essential for those preadolescents.

Establishment of the edible garden at the school was attributed to Michelle Obama's Let's Move Campaign. Aiming to fight poverty-related childhood obesity and diabetes, the campaign has allowed federal funding of new greenhouses and related settings, providing opportunities for children to be exposed to fresh vegetables and to influence their food choices.

A profile of school outdoor learning

The interviewee said she conducted her class in several places in or near the school. She talked about what the children did and learned in each place.

Edible garden

The children observe, grow, weed, and water crops in plots. They taste fruits after they harvest them and compost the waste. Here, they can learn practical skills for future careers. They also learn about pollinators, life cycles, and genes in the vegetable garden.

Animal husbandry

The children feed sheep and chickens, collect eggs and check their quality, and look for goat or sheep food such as honeysuckle in nearby woods. In this process, children treat animals as pets and learn animal science and responsibility at the same time. It is effective because it is learning through living things.

Nearby woods and emblematic landscape

According to the interviewee, there is a woody natural habitat called Brooklyn Cemetery adjacent to the school's south side, and the classes have "tree walks" along the natural trails, especially when seasons change. Since a class's duration is 57 minutes, the teacher needs to fit the trip into the normal class schedule and obtain parents' permission before they can go. Although these regulations might add complexity to teachers' planning, students' learning opportunities are abundant. The children identify plants, write journals, or draw pictures in the woods, getting to know the difference between a tree and a forest and becoming aware of the importance of natural habitats for wild animals. They also learn the shapes of the leaves, flowers, and bar of more than 10

different trees species and understand ecological concepts such as diversity, succession, ecosystem, native vs. invasive species, taxonomy, and morphology. Except for the natural settings, the Brooklyn Cemetery, which is a historic African American Cemetery, can also be treated as an emblematic landscape because children can learn history and social related knowledge from the evergreen plants and the gravestones. These experiences can sharpen their focus skills and always provide vivid material and context for learning.

Other places

Other places mentioned by the interviewee are similar to the three places introduced above. Classes might go to the very front of Baxter Street on the north side of the school to measure loblolly pine trees or help elementary students at Alps Road Elementary School next door to plant their beds. They might also search for goat food around the playing fields behind the public library.

Children's holistic development in outdoor education

Besides cognitive development, the outdoor education provides great opportunities for children's holistic development. Digging and spreading compost with shovels and moving soil and mulch in wheelbarrows facilitate overall physical development, while cutting plants and transplanting seedlings provide finer physical training.

The children also share their tools and communicate in groups, which develops social skills. In addition, the children share their concerns with the teacher while carrying out tasks in the garden, which relates to emotional development. Finally, children gain problem-solving skills and ability at analysis while working. Students who speak English

as a second language and new students usually communicate more easily when learning by doing.

Class arrangement

The teaching-learning mode in the woods is different from that in gardens. While wandering in the natural habitat adjacent to school, the mode is actually quite strict, and students participate in activities organized by the teacher. However, in the edible garden and animal husbandry units, the mode is flexible after the teacher demonstrates the work method; the children can choose to do the task they like and switch to another one if they become bored. According to the interviewee, because the children are working on different tasks at the same time and because of the class's flexibility, they seldom become bored.

Outdoor learning effects

The interviewee emphasized "differentiation" in education. Although not all the children behave better outdoors, learning outdoors was indeed beneficial for children who work well with their hands and who might do not do well in the formal indoor learning mode. Furthermore, though nature environments will calm some children down, they might have an opposite effect on other children. Thus, avoiding distractions in outdoor learning is important.

Frequency

Since Georgia's climate is warm and wet in the summer, the planting time of different vegetables can be overlapped. Except in winter, the class goes outdoors at least once per week.

Design concerns in edible gardens

Teachers need to control the class to some degree, so fences in plots are necessary. The fences also prevent intrusion by deer and strangers, since the school grounds are public property and should be accessible to everyone. The plot installations support large machines such as tractors and mowers to suit a vocational class's needs. There are four 50ft by 20ft plots, and multiple plots are used for rotation and fallow.

Potential stakeholder's view

From the teacher's point of view, the principal and some parents support outdoor learning and hope to have outdoor gardens. While she found that many teachers do not use outdoor environments as teaching media, she inferred that those teachers are not trained in outdoor teaching methods and would gradually discover a method of outdoor teaching if the garden is there (Mitchell 2016).

Limitations of the Information

Due to limited time and school conditions, the full intentions of outdoor learning could not all be discussed in the interview. In addition, the interviewee's point of view may only reveal a part of the truth. Moreover, the attitude of parents toward outdoor learning is also not clear enough to draw any conclusions.

CHAPTER 5

RESULT AND ANALYSIS

> The synthesis consists in assuming the causes discovered and established as principles, and by them explaining the phenomena proceeding from them, and proving the explanations.
>
> —Isaac Newton

The physical settings of an environment sometimes influence one's activities, while the meaning contained in the settings relates to one's cognition. After illustrating the field observations and the in-depth interview, the four key elements involved in outdoor learning activities are systematically analyzed: the outdoor learning contents, the individual's learning modes, the patterns of group outdoor learning activities, and the characteristics of outdoor settings and their relationships both to the learning intentions and to the activity patterns. First, the outdoor learning contents and the individual learning modes are analyzed, and the characteristics of outdoor learning of individual are then summarized. By applying these characteristics to the Georgia Performance Standards (GPS), potential learning intentions are discovered. These potential learning intentions provide clues to the characteristics of other possible outdoor learning settings for the three landscape types. Second, the patterns of outdoor group learning activities are analyzed. The results are several typical group activity types of outdoor learning. Finally, the observed outdoor settings are analyzed in terms of two aspects: physical and abstract. The relationship between physical settings and outdoor activities, and the relationship

between a setting's information and learning intentions are analyzed as well. In discussing all of them together, a complex matrix is created later to categorize the observed settings. The expected results are different types of outdoor learning settings in the three types of landscapes. Figure 33 shows the analysis procedure of this chapter.

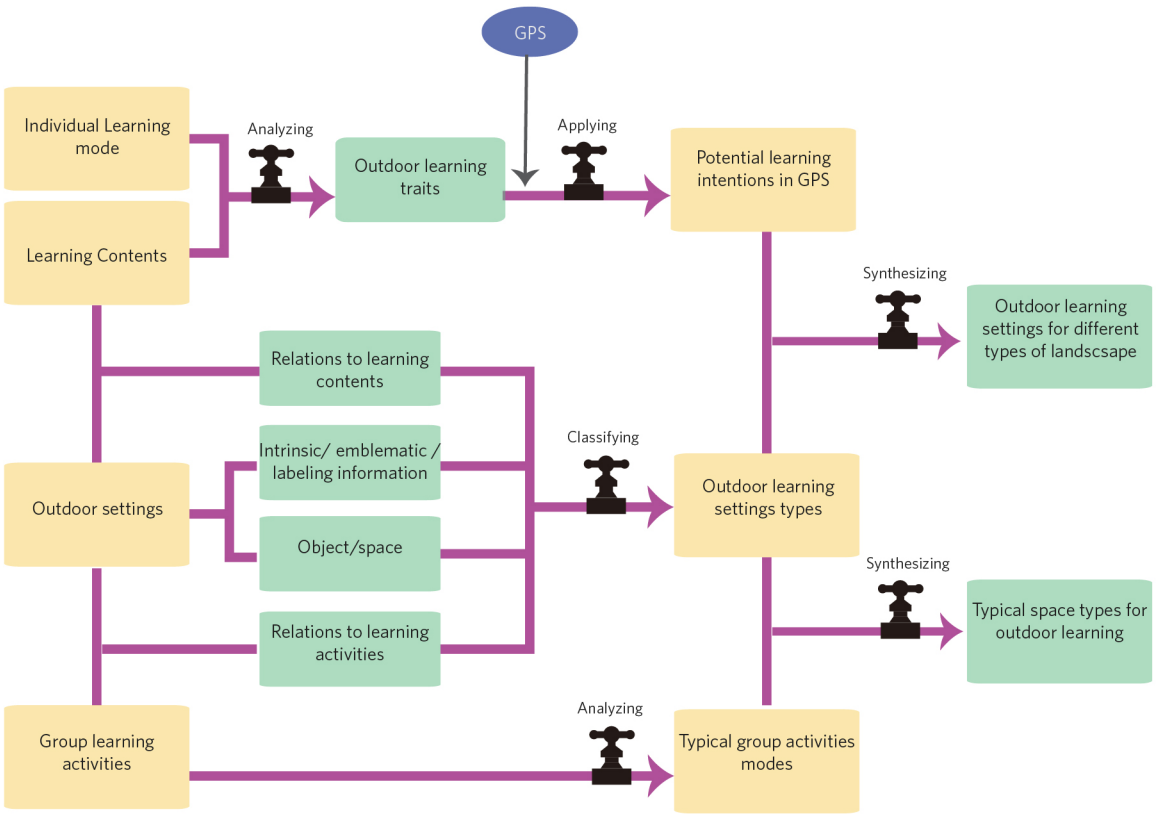


Figure 33. Analysis procedure

Introduction of the Relationship between Key Elements of Outdoor Learning

There are four key elements for the outdoor learning activities: individual activities, either physical or mental; group activities; outdoor learning settings; and the knowledge or values the children learned through the learning process. With regard to the physical aspect, the individuals' activities constitute the group activities, and the group

activities occur in the learning landscape. With regard to the abstract aspect, through certain learning modes, either cognitive, affective or psychomotor, a child gains knowledge, practices skills or experiences certain concepts or processes in the outdoor learning. Most of the received information comes from the intrinsic, emblematic or labeling information of the outdoor settings. The relationships of the four key elements of outdoor learning are illustrated in Figure 34.

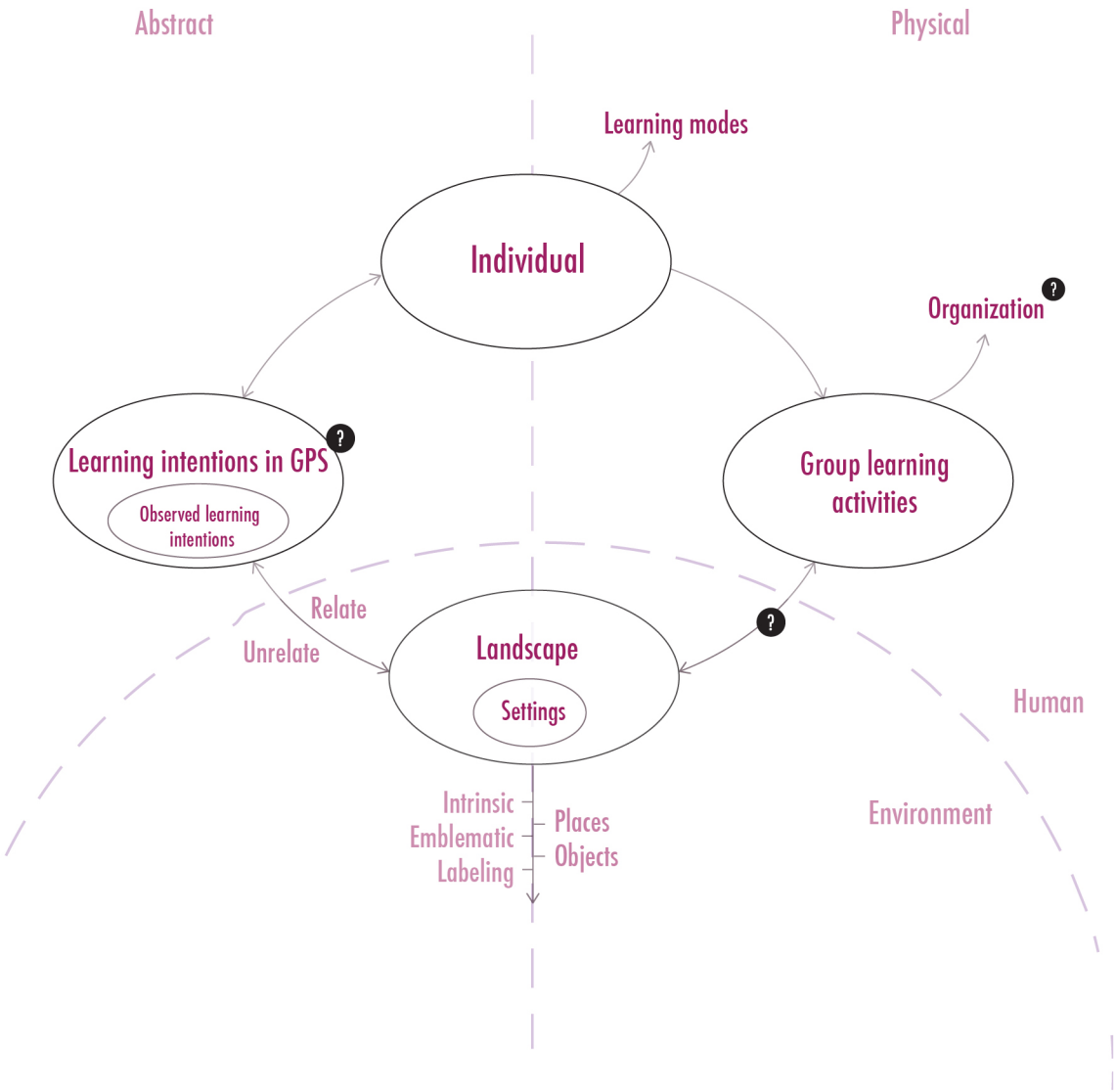


Figure 34. Four key elements of the outdoor learning

Analysis of Outdoor Learning Elements

Learning Contents

A matrix of learning subjects and levels of knowledge in cognitive learning is used here to classify the learning purposes collected in the field observations. The subjects included are common subjects in middle schools: mathematics, science, social studies, English, fine arts, health, and a "career, technical, & agricultural education (CTAE)" class, agriculture science. The reason for including the agriculture science class is that it is one of the most popular CTAE courses relating directly to outdoor environments. According to Georgia's CTAE Annual Report 2015 (Woods 2015), 7.79% middle school children chose an agricultural science course as their elective, with the three most popular courses being business management and administration, STEM (science, technology, engineering, and mathematics courses), and human services or family and consumer sciences.

The levels of knowledge encompass six categories: fact, concept, process, procedure, principle, and meta-cognition (Anderson, Krathwohl, and Bloom 2001, Clark and Lyons 2010). The matrix is filled with all the learning activities observed, and it could serve as a reference for teachers.

The Results of analysis

As illustrated in Table 2, most learning contents in the three types of landscapes relate to science. Learning purposes in the edible garden mostly concern agriculture science, but they also cover general science, mathematics, and health knowledge. This latter category of knowledge makes sense given that the aim of

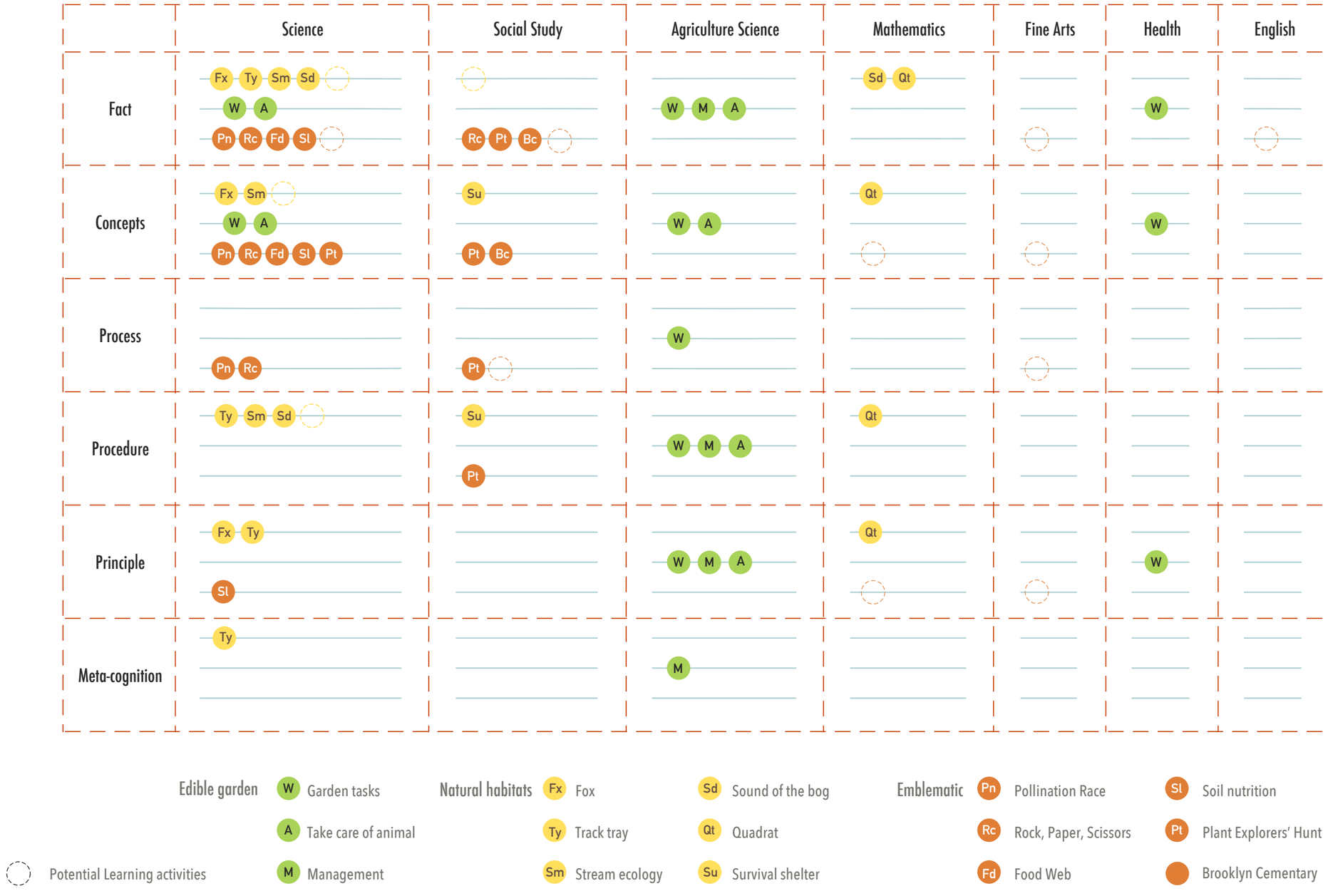


Table 2. Learning purposes analysis

having vegetable plots on school grounds is, in part, to fight against unhealthy food choices. Learning activities in both the emblematic landscape and in the natural habitat promote the acquisition and application of knowledge from social studies, and in the natural habitat they required the use of math concepts and record-keeping skills.

At the knowledge level, most learning activities dealt with facts and concepts. However, learning in the edible garden involved a balance of all six levels. It should be noted that no learning activity in natural habitats dealt with process. It is surmised that was because the time limit of the outdoor learning activity prevented children from observing processes that occur slowly. However, learning in the emblematic garden involved processes because the "pollination race" game; "rock, paper and scissors" and the "plant explorers' hunt" all simulated processes such as pollination, succession, and the world plants trade. The garden tasks in the edible garden also taught processes because the frequency of their work allows the children to observe and experience natural processes of plant growth. Thus, one can assume that if the learning in natural habitats was conducted systematically and repeatedly or was conducted when observable changes occurred (e.g. snow melting), the children would certainly learn natural processes as well.

Learning activities in natural habitats did impart a great deal of knowledge about procedure. As can be seen in the "track tray," "stream study," and "sound of the bog" activities, the children either developed strategies or followed certain procedures to explore the ecosystem in natural habitats. At the meta-cognitive level, the management of an edible garden provided students with opportunities to take care of the garden and learn how to approach certain tasks by themselves. Learning in the other two landscapes also offered the potential to teach procedures if educators wanted to explore related programs.

As suggested in Danks' book, the potential learning activities in emblematic landscapes will likely involve more social studies knowledge, geology, and even concepts from fine arts, mathematics, and English classes. For instance, children could learn about similar triangles by using ornamental posts and sunlight. Children could also learn about poetry from murals and pavement drawings in an emblematic garden. However, such possibilities require future exploration by educators.

Learning Modes

Three domains of learning: cognitive, affective, and psychomotor

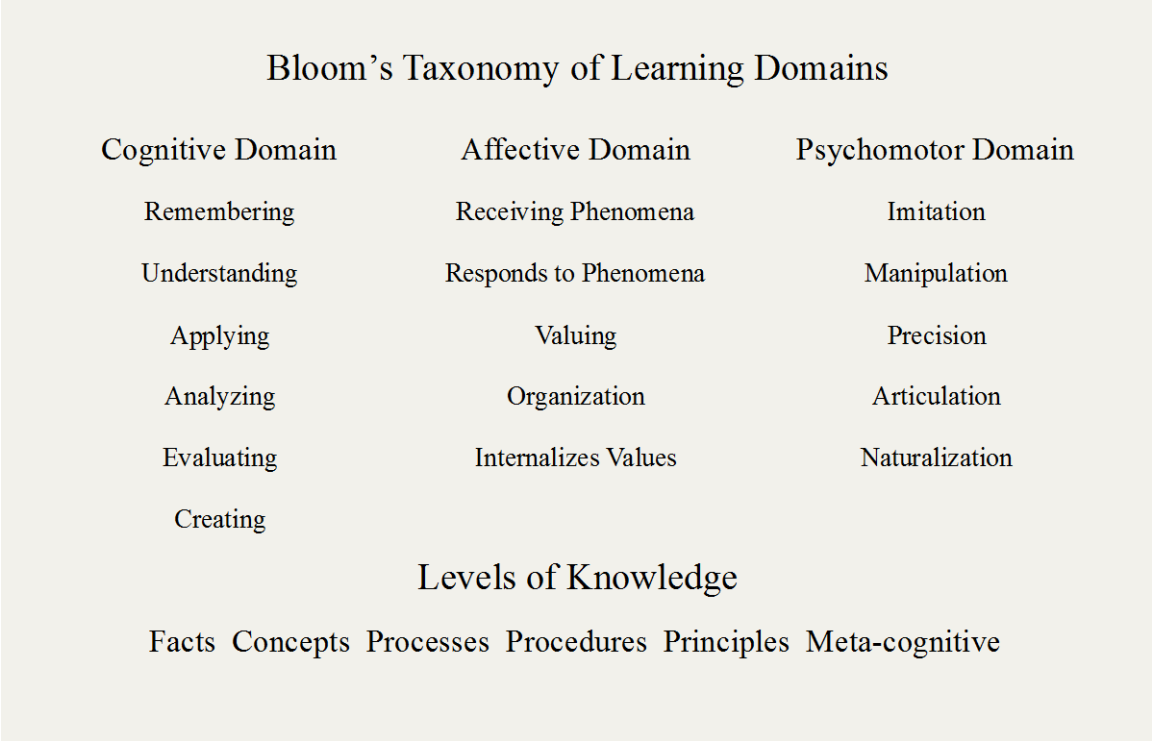


Figure 35. Bloom's Learning Taxonomy. Diagram created by the author. (Bloom et al. 1956, Krathwohl, Bloom, and Masia 1964, Dave 1970, Anderson, Krathwohl, and Bloom 2001)

These three learning domains was set forth by Bloom et al. (1956), and each domain contains several categories. Although a number of researchers have proposed

their own categories, Figure 35 presents the categories that the author feels most appropriately classify outdoor learning modes. For the future reference of educators, the individual learning modes of all the observed outdoor learning activities are shown in Table 3. Because of research limitations, one should not conclude that the observed activities' deficits in certain learning modes reflect limitations in outdoor education. Potential learning modes of outdoor education may exist. The following results of analysis thus are based only on the observed existing learning activities. Though they may not cover all situations, they could be used to explore other potential outdoor learning intentions and possible class designs.

Results of analysis: the characteristics of outdoor education for middle school children

According to the analysis of the outdoor learning mode and intentions, four types of learning are typically seen in the outdoor education.

First, if the learning content is focused on a natural habitat, living organisms, natural loose parts or the ephemeral phenomena of these settings, then the learning could be conducted outdoors for close observation and an experience utilizing all the senses.

Second, if the education intentions are to gain vocational or living-essential skills that can be acquired in an outdoor environment (e.g., map use, garden tasks), then the outdoors is a highly suitable location for learning by doing.

Third, if the learning intentions are related to the cultural connotations or emblematic information of an outdoor settings in terms of either places or objects, for example, the Native American relics in the school's nearby woods or the

	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating	Receiving	Responding	Valuing	Organizing	Internalizing	Imitation	Manipulation
Facts	W A M Pn Rc Fd Sl	Fx Sm Qt W A M Pn Fd Sl Pt Bc		Sd Fx Ty Qt M Sl	Qt Fx M Bc	Su	Qt Sm Fx Ty Sd W A Bc Sl Pt	Fx Sm A M Pt Sl Bc	Sm Sd M	Pt			
Concepts	Su W A M Pn Rc Fd Sl	Sm Qt Su W A Pn Rc Fd Sl Pt Bc	Qt W M Pn Rc Fd		M Bc	M	Bc Sl Pn Fd Pt	Pn Pt	Su W M Fd				
Process	A M Pn Rc	W Pn Rc Fd Pt	Pn Rc	Qt M Fd	Fx M		Fx W A M Pn Rc Fd	Fx Sd W A M Pt Pn Rc Fd	Su W	Su			
Procedure	Su W A M	Sm Qt Su W A M Pt	Su Ty Sm W M Pt	Qt M	M	Su M Sl	Pn Pt	Pn	Su M	Su Pt	Su W M	Sm Sd Su M W A Pn Sl Pt	Sm Su W A M Pn Pt
Principle	Su W A M Sl	Fx Qt W A M Sl Bc	Qt Su W M Rc Fd Pt	Sl	M Bc	Su M	Rc Fd Sl Bc	Fd Rc Bc	Fd	Su Pt	Su W M		
Mata-Conitive		M	M	M	Fx M				M		M		M

Edible garden
- W Garden tasks
- A Take care of animal
- M Management

Natural habitats
- Fx Fox
- Ty Track tray
- Sm Stream ecology
- Sd Sound of the bog
- Qt Quadrat
- Su Survival shelter

Emblematic
- Pn Pollination Race
- Rc Rock, Paper, Scissors
- Fd Food Web
- Sl Soil nutrition
- Pt Plant Explorers' Hunt
- Bc Brooklyn Cementary

Table 3 Relations between learning activities and learning modes

global fountain with a world map carved on it, outdoor education can be conducted.

Forth, if a concept is hard to comprehend due to its scale or complexity, or if an abstract process that is far removed from daily life needs to be understood, an outdoor landscape can be used as a container to accommodate these activities. Teachers may design and conduct outdoor games with themes abstracted from these concepts or processes. The respective places are usually open spaces such as a lawn; however, they can also be particular landscapes providing appropriate spatial experiences that can be used to simulate the processes that are intended to be learned.

By applying the four types of outdoor learning to the Georgia Performance Standards from grades six to eight, intentions that are suitable for outdoor learning but were not included in the author's observation due to research limitations are revealed (see Appendix II).

The Organization of the Group Outdoor Learning Activities

Moving from the analysis of the learning activities at the individual level, the activity arrangements at the groups level are discussed in this section. Four aspects are considered here: First, are the learning activities fixed or flexible? Are the children all performing the same activity or different activities at the same time? Second, do the children learn by themselves, cooperate with others or learn together? Do they switch between the three working modes? Third, with regard to the degree of movement in the children's learning activities, do they use gross motor or fine motor skills? Finally, the

		Class Organization		Degree of Dispersion			Degree of Movement		Frequency		
		Fixed	Flexible	Individual	Small groups	Together	Gross motor	Fine motor	High	Medium	Low
Edible Garden	Garden tasks		✔	✔	✔	✔	✔	✔	✔		
	Animal		✔	✔	✔	✔		✔	✔		
	Management		✔		✔	✔		✔		✔	
Natural Habitats	Fox	✔		✔	✔	✔	✔			✔	
	Track Tray	✔			✔	✔		✔		✔	
	Stream Ecology	✔		✔	✔	✔	✔	✔		✔	
	Sound of the Bog	✔				✔		✔		✔	
	Quadrat	✔			✔			✔		✔	
	Survival		✔		✔		✔	✔	✔		
Emblematic Landscape	Pollination Race	✔				✔	✔	✔			✔
	Rock, Paper, Scissors	✔				✔	✔	✔			✔
	Food Web	✔				✔		✔			✔
	Soil		✔	✔		✔		✔			✔
	Plant Explorer's Hunt	✔			✔	✔	✔	✔			✔

Table 4. Relations between learning activities and class organizations

frequency of each learning activity is considered. Table 4 is a record of all the observed activities' pattern characteristics.

Results of the analysis

As shown in Table 4, the class organizations in the edible garden are all flexible. The children usually perform different tasks individually or in small groups at the same time, and they switch to other tasks if they become bored. Both fine and gross motor skills are used in in the garden tasks; caring for the animals and garden management require fine motor skills in most situations.

With regard to learning in natural habitats, class organizations usually are fixed. Although the children all perform the same activity at the same time, they are usually separated into groups or even work individual sometimes, and they alternate between being in small groups and being together within one activity. Fine motor skills are also used more frequently than gross motor skills.

For learning activities in the emblematic landscape, most class organizations are also fixed, and the children learn together most of the time because of participation in games. Gross motor skills are used more than in the other two landscapes, but they are still less used than fine motor skills.

The garden tasks in the edible garden can be conducted about one or two times per week. These tasks are repeated most frequently. The learning processes in natural habitats have less frequency than the garden tasks. They can be repeated several times every semester because each repetition can produce a different result and provide a unique experience due to the changes in nature. In terms of the emblematic landscape, activities with the same content are not repeatable because most of the learning content

can be learned only once. However, the procedure of these games could be duplicated and applied again with new content or themes. For example, the tag game “rock, paper and scissors” used to learn the succession process in the observation can also be used to learn concepts like biotic and abiotic following the same game procedure.

Four types of outdoor learning activity organization

Based on the analysis, four typical types of outdoor learning activity patterns are summarized. The activity patterns can provide reference for the space design of outdoor learning landscapes. They are discussed with the appropriate space types in Chapter Six, design principle one, strategy two.

Outdoor Learning Settings

Outdoor learning settings can be analyzed in two aspect: physical and abstract. The physical aspect deals with the settings’ scale and their relationship with learners’ activities. The abstract aspect deals with the meanings behind settings and their relationship with outdoor learning intentions.

Regarding the physical aspect: two categories of outdoor learning settings

The outdoor learning settings can be classified by their relationship to people. Are they places or elements that are part of a place? Are they objects whose scale is small enough for children to manipulate or carry? Here, the learning settings are divided into two categories: places and objects. Places consist of a group of activity settings, and these settings act together to accommodate learner’s activities. For example, the bog in SBG is an undivided whole for children to explore; the compost area in the edible garden at the CMS is composed of several small settings, but on the whole, it afford children’s activity

of composting. Objects are small-scale settings that can afford children's activity solely. Examples are an animal or other loose parts in natural habitats.

Regarding the abstract aspect: three types of information concerning the meanings of settings

Because the information carried by the learning settings is crucial for researching how learning settings facilitate the outdoor learning process, a classification can assist the understanding of that information. McCullough (2013, 37) puts forward the concept of *intrinsic information* to describe the content that is inseparable from the form of a material. He also uses *semantic information* to denote the abstract meaning of things and text in an environment. For example, a wooden table's intrinsic structure is made up of certain type of wood materials. The form or the function of the table allows people to define it as a table but not as another object, so the word *table* is its *semantic information*. If there is a production date and company name and address on the table, these texts also constitute part of its *semantic information*.

Here, the author divides *semantic information* into two further categories: emblematic meaning and labeling. The emblematic meaning of an object is generated when raw materials are changed and designed for certain functions—such as when wood is made into a table. Labeling refers to the text that exists on certain objects, like the manufacturer's label. Figures 36-41 illustrate the settings observed in each landscape.

Settings in the Edible Garden

Places

Vegetable plots | Intrinsic & Emblematic

Compost area| Emblematic

Mulch pile| Emblematic

Nectar flowers| Emblematic

Herb garden| Emblematic

Goat pen| Emblematic

Tool shed| Emblematic

Water supply area| Emblematic

Green house| Emblematic

Fence with plantings| Intrinsic & Emblematic

Fence| Emblematic

Figure 36. Settings in the edible garden

Settings in the Edible Garden

Fence| Emblematic

Path| Emblematic

Plant in plot| Intrinsic

Signage| Labeling

Plot map| Labeling

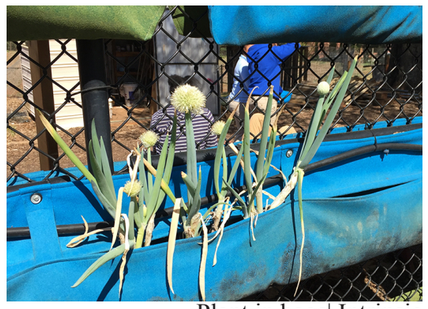
Gate| Emblematic

Chicken| Intrinsic

Wind vane| Emblematic

Objects

Pavillion| Emblematic


Plant in bags| Intrinsic

Goat| Intrinsic

Signage| Labeling

Figure 37. Settings in the edible garden (objects)

Settings in the Emblematic landscape

Places

Semi-open space| Emblematic

Lawn and bare ground| Emblematic

Overlook tower| Emblematic

Path and terrace| Emblematic

Path| Emblematic

Lawn| Emblematic

Planting beds of a formal garden| Emblematic

Gathering place| Emblematic

Figure 38. Settings in the emblematic garden

Settings in the Emblematic landscape

Objects

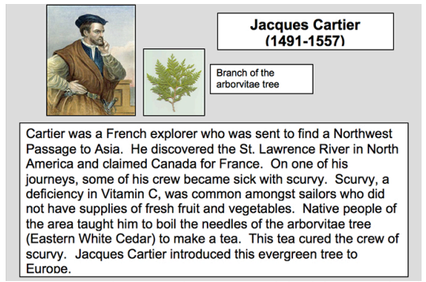
Exotic plant| Emblematic

Teaching tool: thread representing food web of ecocyctem| Emblematic

Teaching tool representing nectar and nectar busket of a bee| Emblematic

World map fountain| Emblematic

Obelisk| Emblematic



Leaning tools: text added in garden| Labeling

Plant and label| Labeling

Clue for games | Labeling

Soil| Intrinsic

Figure 39. Settings in the emblematic garden (objects)

Settings in the Natural habitats

Places

Stream and adjacent flats| Intrinsic

Trail in woods| Intrinsic

Bridge| Emblematic

Survival Shelter| Emblematic

Gathering place| Emblematic

Gathering places shortage| Emblematic

Stream| Intrinsic

Bog| Intrinsic

Trail in woods| Intrinsic

Boardwalk and wildlife pavillion| Emblematic

Figure 40. Settings in the natural habitats

Settings in the Natural habitats

Objects

Signage| Labeling

Sign| Emblematic

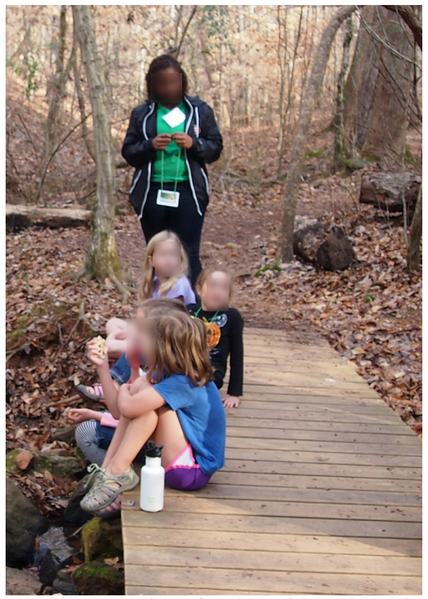
Plants| Intrinsic

Native species| Intrinsic

Boulders| Emblematic

Aquatic animals| Intrinsic

Worms| Intrinsic



Outdoor furniture | Emblematic

Signage| Labeling

Signage| Labeling

Animal trace| Intrinsic

Mushroom| Intrinsic

Figure 41. Settings in the natural habitats (objects)

Relationships between outdoor settings and learning

The abstract relationship between the settings' information and learning intentions

The relationships between the information contained by learning settings and the learning contents are fairly clear. There are only two relationships: related and unrelated. Thus, if we apply the three types of settings' information to the two relationships, we will obtain a matrix of settings information.

	Relates to learning	Not relates to learning
Intrinsic Information		
Emblematic Information		
Labeling		

Table 5 Matrix of the settings' information and relationships to learning purposes

The physical relationship between settings and outdoor learning activities

According to the author's observations, there are three types of relationships between learning settings and learning activities: 1) Restrictive relationship: the setting restricts learning activities to particular uses; 2) Influential relationship: the setting narrows or shapes the usage and influences the experience of learning activities; 3) Weak relationship: the setting has a weak relationship with children's learning activities. The first type of relationship can be seen in a setting group like a compost area. The second type can be seen in a setting such as a formal garden, which shapes children's learning activities but does not restrict them to a particular use. The last type can be seen in a

setting such as signs in vegetable garden plots. The signs attract attention but do not influence learners' behavior very much.

	Place	Object
Restrictive		
Influential		
Weak		

Table 6. Matrix of learning settings

Thus, if we apply the three types of relationships (restrictive, influential and weak) to the two physical types of settings (place and object), then we can obtain a new matrix of learning settings. The matrix is illustrated in Table 6.

The author has further combined the two relationship matrixes into one (see Table 7). All of the settings observed in the field are located in the matrix. The matrix shows each setting's or setting group's information type, physical scale, whether or not it is related to learning intentions, and the degree to which it influences learners' behavior.

			Abstract			
			Relates to learning			Does not relate to learning
			Emblematic	Intrinsic	Labeling	Emblematic
Physical	Restrictive	Place	survival shelter plots, goat pen, compost area, tool shed, green house, water supply, herb garden, mulch pile			
		Object	faucet, spade, compost bins			
	Influential	Place	board walk, wildlife pavillion, planting beds in formal garden, overview tower	trails in woods, bog, stream and adjacent flat plant communities		gathering place semi-open space, lawn/bare-ground, path fence, wall, gate, pavillion, gathering place
		Object	teaching toos: hoops, thread global fountain, exotic/ endanger/ native plant branches, boulders	plant quadrat, mushroom,aquatic animal animal trace topsoil plant, mulches, goat, chicken		outdoor furniture
	Week	Object	wind vane	canopy outline	label, information card label, signage, map	signs along a trail in the woods sculpture, obelisk

Settings in Emblematic landscape Settings in Natural habitats Settings in Edible garden

Table 7. The complex matrix of outdoor learning settings

Analysis result: ten types of outdoor learning settings in the three types of landscapes

Based on the complex matrix of outdoor learning settings, four types of places and eight types of objects are classified. Combining some types of places and objects, the author further simplifies the classification into a total of ten types of outdoor learning settings.

The first type is a setting or setting group (place) having specific uses for learning purposes. In these settings, children learn by doing. Most settings in the edible garden belong to this type (e.g., the faucet, spades and compost bins). This type of setting, if movable such as a spade, needs to be well-managed by specialists. Fixed objects, such as the faucet, need to be carefully considered before they are installed.

The second type includes places with settings that could facilitate, shape or influence outdoor learning behavior but do not restrict it to a specific way of use. Most of them can be found in an emblematic landscape. For example, the complex paths in the herb and physics gardens of the State Botanical Garden of Georgia (SBG) provide children with an experience similar to that of plant explorers finding and discovering plants. The form and pattern of the garden shapes learners' experiences of the situation that the educator wants to simulate. The overview tower, the boardwalk for bird viewing, and the wildlife pavilion all belong to this type. They act as a media for learning, relating the learners' activities to other objects with useful intrinsic information.

The third type includes objects related to learning content but usually without a fixed function. For example, the global fountain with a world map carved on it has information about geology for children to learn. At the same time, children can touch

the water or just stand back a little, listening to the murmur of the fountain. Other settings observed are plants with certain characteristics that could be learned by children, and the branches and building materials that relate to local history or survival in forest. Teaching tools such as hoops and thread used in outdoor games are also included in this type because they represent certain concepts. All of the three types of outdoor learning landscape can possess this type of settings.

The forth type contains organisms like living plants and animals and loose parts of raw materials that children can observe, touch and manipulate. Each type of learning landscape is rich in these objects. Children learn the intrinsic information of these settings.

The fifth type includes places mostly in natural habitats whose intrinsic information serves as learning content for children. The bog, the stream, and the trails in the SBG all fall into this category. Generally, having this type of settings on a school's property is the ideal situation but is not necessary most of the time. This type of place can be replaced with small natural habitats if the school's size is small.

The sixth type includes objects or places that are not related to learning intentions directly but are supplementary for learning activities. A lawn, a gathering place accommodating learning activities, outdoor furniture for relaxing, paths, fences, walls, gates, and pavilions, as well as other common settings, are of this type. However, while unrelated to learning, these common settings can be upgraded to settings that facilitate learning by careful design. This will be discussed in Chapter Six.

Labels and text added by teachers, signage, and maps constitute the seventh category of outdoor learning settings. This type has a weak influence on learners' behavior but is common in each type of learning landscape.

The last three types of settings are not common in outdoor learning landscapes.

The eighth type is objects with emblematic meaning that relates to learning content but are unlikely to influence learner's activities, for example, the wind vane resembling a rooster at Clarke Middle School. This type is unusual because children cannot manipulate it and thus the learning effect is not ideal. In reality, they are often upgraded to the third type.

The ninth type is settings with useful intrinsic information to learning but with a weak relationship to outdoor learning activities. A typical example is the canopy outline along the forest edge of the SBG; children observe it and learn the forest's succession condition, but they could not interact with it. Other examples are the clouds in the sky or pavement of raw material such as a certain type of rock.

The last type is objects that either are not related to learning content but serve as a supplement for outdoor activity or have a weak relationship to learning activities. These objects include ribbons tied on the trees along the trails in the SBG to provide direction, or sculptures such as the obelisk in the flower garden of the SBG, which is not related to a learning purpose. Chapter Six discusses how to apply certain design strategies to transform these objects into learning-related settings.

CHAPTER 6

UNDERSTANDING SCHOOL OUTDOOR LEARNING ENVIRONMENT: REFERENCE FOR EDUCATORS AND DESIGNERS

An essential aspect of creativity is not being afraid to fail.

— Edwin Land

In this chapter, the typical outdoor learning-related settings, outdoor learning activity patterns and the potential outdoor learning intentions are used to synthesize the design principles and related strategies of outdoor learning environments. Additionally, three factors having positive effects on outdoor learning are discussed, and six qualities that are important to outdoor learning environment are provided. The principles, strategies, and qualities together form a system of theory for the design of outdoor learning environments.

Conclusion: Principles and Strategies for Designing Outdoor Learning Landscape

Principles One: Facilitating Outdoor Learning through Design

Strategy one: Using outdoor learning-related settings in design

According to the potential outdoor education intentions found in the Georgia Performance Standards and the summarized outdoor learning setting types, particular settings are recommended for the three types of landscapes.

In the edible garden, frequent work and maintenance are required. The settings are primarily with restrictive uses, and the diversity of those settings determines the quantity of useful information. Settings should be connected in a food web system, thus allowing children to learn about the interrelationships between different species. The crops planted in the garden need to have obvious biological traits and byproducts. Both sexually and asexually reproductive species need to be included. On the boundary of edible garden, forest and other natural resource with endangered wildlife habitats are encouraged. As a supplementary setting, a tool shed is necessary for placing hand tools. For the scale, the planting plot should be planned in consideration of the operation of large machines. Moreover, at least one type of renewable resource, such as solar panel, should be installed.

In the emblematic landscape, the meanings of settings are correlated by multiple layers of themes. The useful information is either predetermined by the designer with the conceptual underpinning of the landscape or defined temporarily by teachers by adding labels or text in the garden. The landscape may not need frequent maintenance if sustainability has been incorporated into design. The gathering spaces in the emblematic garden could also have functions related to outdoor theater and the exhibition of outdoor art. Sculptures and other three-dimension art works of children can be installed decoration for the garden. Moreover, outdoor furniture is needed for drawing outdoors and observation. Signs promoting safety for placement in the garden can be created by students to acquire health-related knowledge. Other common themes in the garden are geography, energy consumption, location and maps.

In the natural habitats or small sanctuary of wild animals, most settings are natural loose parts or living organisms that children could observe and manipulate. The useful information is mainly the intrinsic information of the settings. The arrangement of the learning activities switches between fixed and flexible; thus, the diversity of the species and the small living conditions is important. In the natural habitats, children can learn the nature of science and develop a scientific habit of mind. By conducting repeated investigation, children can learn topics such as proper units, the nature of sampling, and differentiating physical and chemical properties and changes. They can also gain knowledge of topics in biology such as sexual/asexual reproduction, natural selection and inhered traits, and become familiar with ideas from ecology such as diversity, the food web, the energy pyramid, and conservation of natural resources such as water, soil and air. Natural habitats are highly independent and can exist with less human input and management.

Strategy two: Provide typical appropriate space volumes to facilitate typical learning activities in design

The design approaches for facilitating learning activities deal with designing spatial volumes. Based on the observed learning activities, four basic types of patterns of outdoor learning activities exist:

The first type is a fixed class arrangement with all children playing together on a lawn or a gathering place. In this situation, the spaces should be large enough to accommodate children's gross motor activities but still provide some degree of enclosure. The ground should consist of soft materials to prevent children from becoming hurt if they fall. (See Figure 42. a)

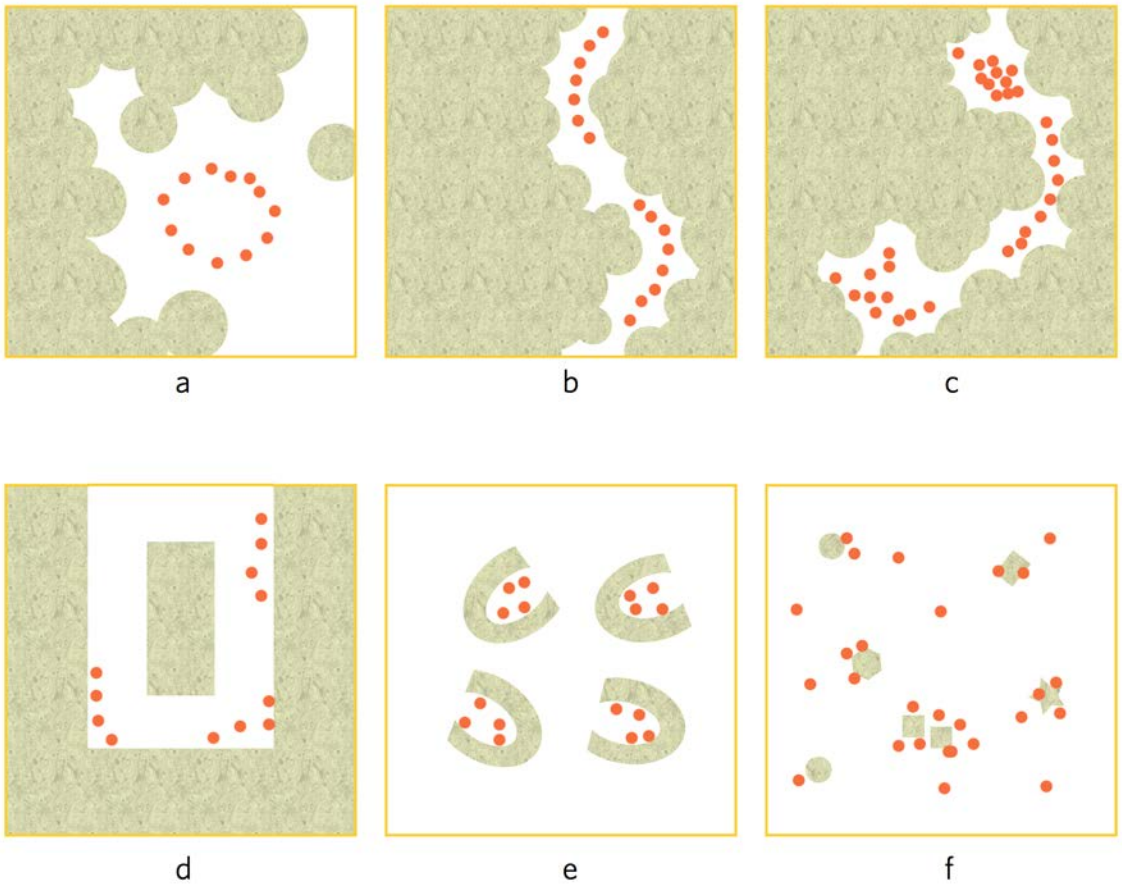


Figure 42. Diagrams of typical space volumes

The second type is also a fixed class arrangement with teachers and children walking in a linear space, usually inside a natural habitat. Attractions are located along the route. Children disperse in games or relaxation when they encounter an open space. Thus, the respective space configuration should be a combination of linear and gathering spaces of varying degrees for stops. (See Figure 42. b, c)

The third type is a fixed class arrangement with children dispersing in small groups. The space configuration should be homogeneous to some extent because the class requires children to do the same tasks in groups at the same time. Symmetric, central-symmetric forms, or forms with repeated parts in a rhythm are suitable for

spaces accommodating small group work. The herbs and physics garden and the heritage garden in the SBG are great examples of this type. Figure 42.d, e presents some examples of space forms with certain degrees of homogeneity.

The last type is a flexible class arrangement mode with children dispersing in one large space but performing different tasks in different settings at the same time. In this situation, the space configuration should represent a whole to allow the teacher to supervise. The detail configurations of the plane of the earth or the settings in this type should be diverse for children to choose to stay and manipulate. (See Figure 42. f)

The emblematic landscape often contains the first type as a lawn and the third type as a formal garden. The edible garden as a whole belongs to the last type, while the planting plots belong to the third type. In addition, the natural habitats usually have the first, second and last types of spaces. The first type in a natural habit would be a lawn or bare ground, or the boundary of woods; the second type of space could be trails in the forest; and the last type could be a stream and the adjacent flat that has a rich, small, and unique space for children to explore.

Principle Two: On the Basis of Sustainable Development, Optimize Outdoor Learning through Design

At a conceptual level, three factors have positive correlations with learning: the quantity of information, the depth of learning, and the frequency of the learning activity. If the depth of the learning activity and the usage rate of the learning settings are kept the same, the more points of knowledge one can obtain in the learning environment, as one is exposed to such an environment, the more one will learn. If the learning contents and

degree are kept the same, as the frequency of the usage of the learning environment increases, so too will the amount of learn. In addition, if the information quantity and the usage rate are kept the same, one will learn more as the depth of the learning increases.

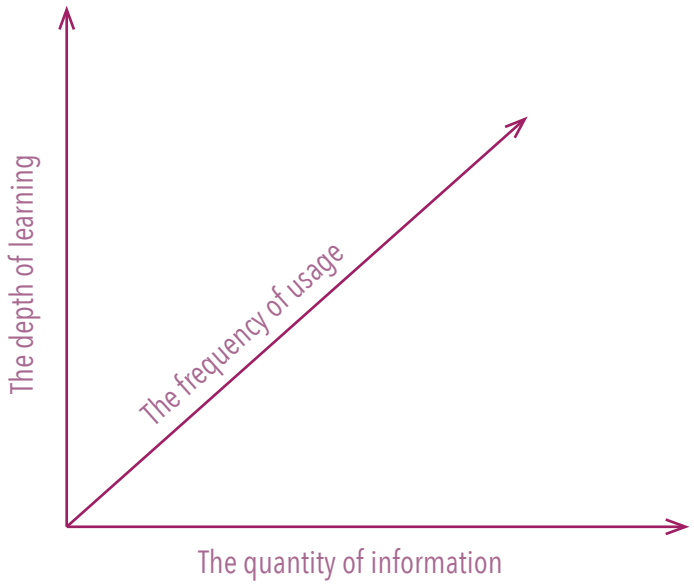


Figure 43. The three factors having positive correlations with learning

The quantity of the information in a learning environment

As explained in the previous chapter, three types of information or meanings regarding a setting in an outdoor environment exist: intrinsic information, emblematic information and labeling or text.

Intrinsic information is the best type for outdoor learning. As shown in the complex matrix of learning settings in Chapter Five, all the intrinsic information of a setting in an outdoor environment can be related to learning. The settings with exclusively intrinsic information do not restrict learners' activities in any way because

most of these types of objects are living organisms or loose parts of natural materials. Thus, no human-defined meaning is needed for those settings.

In terms of the characteristics of settings with exclusively intrinsic information, changeability and diversity are particularly important for information quantity. The changes in the pattern of settings with intrinsic information or the setting's ephemeral effects will add to the total amount of information in an environment. The growth of a plant, the melting of snow, and the occurrence of a temporary rain garden are likely examples. The diversity of the settings and the natural phenomena of the site together can increase the spatial complexity of the landscape and thus enrich sensory experiences and add to the total information amount.

In terms of settings with emblematic meanings, the feature of multi-layered meaning, and open-ended usage are encouraged in an outdoor learning environment. For example, a compass rose drawn on a pavement is an embellishment for the ground, which can also be used as a tool to learn time and direction. Settings with multi-layered meaning can increase total information quantity. Open-ended usage can provide rich possibilities for creative learning activities.

Labeling or text in outdoor environments should be succinct, changeable, and limited in amount. Although words or language can increase communication efficiency, they can decrease the richness and liveliness of the environment's experience as well. Directive static text with highly detailed explanations can discourage explorations of environmental settings and use of imagination. If the labels are changeable in outdoor environments, they will provide more information and learning possibilities.

Strategy one: Transfer unrelated settings to related learning settings to increase the information present in the outdoor environment

Not all of the information of a setting is recommended for learning. In Chapter Five, the author used the relationships to learning as a feature to classify the meanings of outdoor settings. Thus, the first way to increase the total quantity of useful information is to transfer settings that are not related to learning to learning-related settings.

Settings with particular functions

First, settings with a specific form of use or a particular function, such as the compost area in an edible garden, need to be directly related to learning purposes. For settings that are not related to learning, such as a playground or a parking lot on campus, consideration should be given to designing these settings with learning functions when the school size is small (Such design is beyond the scope of this thesis). Unrelated objects, such as a vending machine, should not be located in the important places of a learning environment because they will distract children from learning.

Supplementary settings that influence learner's activities

According to the complex matrix of settings in Chapter Five, gathering places, open spaces, lawns or bare ground, paths, fences, walls, gates, and pavilions are all supplementary settings that are not related to outdoor learning purposes, but they can influence a learner's behavior. For these settings, both teachers and designers can help to relate them to learning. For example, based on the author's observation of the games that were played on a lawn or in semi-open places, teachers could organize children to play games that include certain useful concepts related to learning in those supplementary settings. The settings then become a "container" to accommodate learning activities.

Teachers could also add temporary labels or texts that relate to learning purposes to the settings. For example, teachers could allow children to temporarily paste stories they have written on the posts of a pergola, and with these stories, the pergola is transferred to an exposition of unique stories.

For designers, supplementary settings that are unrelated to learning could be transferred to learning settings in three ways:

First, designers could consider designing the supplementary setting with settings that have exclusively intrinsic information. Also, they could consider attracting or supporting living things while designing them. For example, a pavilion that is not related to any learning purposes could be designed together with a native vine that is discussed in a story or poem. The children's association of the work of literature with the pavilion and vine could then help them learn the related literature, history, and biology of the setting. The posts at the end of a wall could be designed for bird baths that would attract nearby bird populations and provide them with water. The presence of birds at the bath could encourage children to observe the birds and learn their habits.

Second, designing the supplementary settings with themes relating to school subjects could be another way for designers to attach useful meanings to settings. For example, a gathering place could be designed to have maps of the world or local places, and the central sculpture could be designed as a sundial for children to trace the passage of the sun, check the time of a day, and gain geological knowledge. In this case, if the added information is specific and accurate, it should have a certain

complexity to encourage frequent exploration. Otherwise, the multi-layer meaning and the open-ended uses should be considered.

The third way for designers to transfer the supplementary settings is to use natural materials as much as possible. By using natural materials, the settings themselves will contain rich intrinsic meaning that can provide learning material for children.

For supplementary objects that influence learner's activities, similar strategies could be used. Natural and native materials are recommended for outdoor furniture. When a school size is small, another way of transforming supplementary objects is to make them indivisible from the surrounding landscape and a part of the landscape embodiment. For example, outdoor seating area could be designed as steps or a retaining wall that is combined with the landscape.

Settings that have weak influence on a learner's activity

From the complex setting matrix in Chapter Five, we can see that sculptures in landscapes usually are irrelevant to learning content and often do not influence usage very much. For this kind of setting, the first two strategies are the same as those for supplementary settings: to use natural materials or to introduce meanings related to school subjects into the design. A sculpture that resembles relics from a Greek temple could be used to teach geology, social studies, and art history. The third strategy is to add a function to those objects; for example, the rooster sculpture in the edible garden of Clark Middle School also acts as a wind vane. Children use it to determine the wind's direction and speed in addition to enjoying its aesthetic function.

Strategy two: Increase the diversity of learning-related settings and the spatial complexity for experience

For settings with specific functions that are relevant to learning content, such as the settings in an edible garden, and for natural settings with rich intrinsic information, adding the type and amount of these settings will increase the quantity of information. For schools with small size and limited budget, designers could combine small natural habitats with other types of landscape. For example, designers could combine a stream with an emblematic garden or add a native flower community to the boundary of an edible garden.

In terms of settings with emblematic meaning, designers could consider adding multiple layers of meaning or theme and designing for as many open-ended uses as possible. With regard to labels and text in the learning landscapes, they should be changeable, succinct, and limited in amount as discussed at the beginning of this section.

The Depth of Learning Activities

The depth of learning activities mainly depends on an educator's class organization and pedagogy. This type of planning is beyond the scope of this thesis and the author's specialization. However, from the view of landscape architecture, certain issues caused by design could also influence the learning depth. An increase in information can cause a deficit in the amount of attention paid to each setting and thus lead to a reduction of learning. Based on the landscape's advantages in the field observation, two strategies to prevent such reductions are developed.

Strategy one: systematization of learning settings

It is clear that a large amount of information could lead to chaos. For example, if the different settings in the edible garden are not related to each other, the edible garden will be more of an outdoor exhibition than an organized landscape. If the information and its settings are correlated with each other and with the learning purpose, then they will not be chaotic or decrease the learning experience. In the edible garden of Clark Middle School, the settings are related by a food web system. Bees take nectar from the flowers and help with their pollination. Children and teachers plant vegetables and consume the yield as their meals. Goats feed on the weeds that grow with the vegetables, and the goats' waste becomes fertilizer for the vegetable in the plots after composting.

Settings with primarily intrinsic information perform well in systems and hardly cause distraction. Because the patterns of natural settings are often in coherence with ambient settings, when their information is not explored by learners, they can be silenced and ignored. When the unique patterns appear in an apparent way, they attract attention and thus are learned by learners.

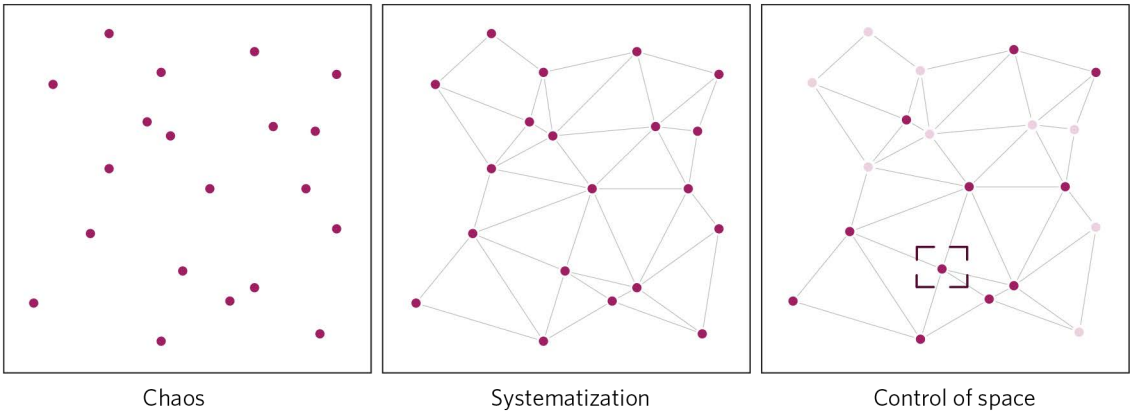


Figure 44. Information of outdoor learning settings

Strategy two: Control learning spaces for concentration

Though connected in systems, settings may still cause distraction for some children. Thus, the control of the learning spaces for teachers and children is necessary.

Design approaches for controlling spaces

Two design approaches are commonly used. The first is the use of vertical settings to define or enclose a space. Walls, fences, and gates are often used in edible gardens and emblematic landscapes. With these settings, teachers can conduct classes without being concerned about children running outside. Planting masses are frequently used to control spaces in all of the three landscape types. The second approach is using the configuration of the plane of the earth to control spaces. For example, the configuration of a bowl-shaped amphitheater controls a space for gathering.

The scales of the learning spaces

Scales need to be considered while designing learning spaces. Different factors can influence the scale of the space. The first is the scale of focus, which can vary from the detail of a plant to the outline of a forest. Usually, the scale of a place should be aligned with the scale of focus because an individual does not feel comfortable if he or she must focus on tiny leaves in a large open space and vice versa. In the example of the children learning ecology in the woods of the SBG, when the space is linear and can only accommodate two people side by side, the learning settings are tiny mushrooms along the trail. When the space opens up at the stream and the adjacent flat, the children's focus also expands to the aquatic animals, rocks, and boulders in the stream.

The second factor affecting the scales of learning spaces is the length of time for a normal class with regard to the situation such as a tree walk in nearby woods. Since the field trip needs to fit into the school schedule, the duration of the walk from the classroom to the destination of the field trip should not extend beyond 15 minutes, which equates to around 1.25 km, because a normal class is around 50 minutes. Additionally, time for planned activities after arriving at the destination needs to be subtracted.

Other factors specific to a setting may also influence the scale of a learning place. For example, there are a total of four 20 by 50 foot plots in the edible garden of Clarke Middle School. The size is large because the children are required to learn how to operate the large machines used to harvest the crops, and plots are left fallow after rotation for several seasons.

The frequency of the learning activity

The usage frequency is another factor affecting outdoor learning. Leaving aside factors like the teacher's preferences and the weather, the usage frequency is influenced by two qualities: the proximity of outdoor learning settings and a character of setting, "independence". The proximity of settings describes the likelihood that one can encounter the outdoor learning settings as part of everyday routine. It also encompasses an aspect of accessibility. Dense plant communities along a routine route will not increase the usage frequency. The independence of a setting describes the degree to which a setting can exist without human assistance. For example, a meadow with wild flowers has more independence than a lawn that needs mowing. A rain garden treating the storm water has more independence than ponds that need water from municipal infrastructure. In order to increase the maintenance efficiency of the learning landscape,

settings with low independence should be located near the school building rather than those with high independence. This can lead to low energy consumption and requires a philosophy of sustainable design. The following are two strategies to optimize the frequency of outdoor learning.

Strategy one: Locating settings on children's everyday routines

Locating settings in children's everyday routines can ensure usage. One way to achieve this efficiently is to combine the indoor and outdoor experience in design and shift between the two conditions frequently. Thus, landscape architects are encouraged to participate in the planning before school buildings are designed. If keep the built-up area the same, buildings with longer perimeter can possess more indoor and outdoor transition area. Additionally, adding gray spaces such as porches can smooth the spatial transition between indoors and outdoors.

Strategy two: Install settings with low independence to ensure usage of outdoor learning settings.

Applying settings with low independence decreases the maintenance efficiency; however, it will ensure certain usage. Teachers and designers need to find a balance between dependence and independence of settings and avoid installing low independence settings such as an edible garden when they cannot provide necessary maintenance and usage.

Summary

Six qualities of learning landscapes are summarized in this chapter. They are changeability, diversity, controllability of space, systematization of information, proximity of settings, and the independence of settings. Moreover, the aesthetic aspect of

designing a setting is also essential because it can positively influence children's experiences over the years. Finally, the values and design philosophy underpinning the outdoor learning landscape should not conflict with the values that educators aim to establish.

Limitations

The conclusion above may not include all the situations of outdoor learning landscapes due to time and funding limits. However, the author hopes this conceptual structure can contribute to understanding the design of outdoor learning landscapes and inspire future researchers. Furthermore, school landscape should not be categorized crudely in design. In fact, there should be no threshold between learning landscape, play space, and school infrastructure. Considering them as a whole system and with a big picture in mind, designers can make wise decisions when design a school's grounds.

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APPENDIX I

In-Depth Interview Record

Main Text

The setting up, beginning and conclusion introduced in Chapter Four are omitted here. The following paragraphs are original questions and answers in the interview.

When and how often will students stay outdoors per week in the school?

Children have PE class every day. The class could be both indoors and outdoors. That depends on the coach's preference. Other than that, children have free time after lunch every day and one hour free-play on Friday. Students could have two elective classes after school. The elective class such as my class, agriculture science, would be twice per week from Monday to Thursday.

What are the characteristics of students from grade 6th - 8th grade?

In this age group, they tend to play with each other. Even if there is no equipment, they could have "horse play". When they first came in the 6th grade, boys and girls tended to play separately. Now, they do start having boyfriends and girlfriends. And they pay attention to their appearance a lot. Another thing I have noticed is that, as they aged, especially the 8th graders, not everyone wants to go outside. A lot of them would prefer to sit inside to use a laptop than go outside. I feel like they are tired, they would rather sleep than get sweaty outside.

What is the intent of using the edible garden in your class?

Vegetable garden learning is different from the others. It is to do work. It falls into Mitchell Obama's Let's Move campaign at that time. All that happened right about that time. There was federal money that was put into schools to make green houses and to help vegetable gardens happen. It's a national thing that was based on children's health. People are realizing that there were great increases in childhood obesity and diabesity. In order to control that, they focused on vegetables garden. The goal is to get children to be more exposed to fresh food and vegetables, so they might choose them over junk food. At least they would know there is something different there. That's why we have the vegetable garden.

What do children do in the vegetable garden?

Children see vegetables, taste them, and want to know how to grow them. We grow things through seeds that are really not hard. We sow the seed, take care of it, grow and put it into the grounds. And there's a time when things get fruited, and children can learn about pollinators, life cycles, seasonal plants, etc. The favorite thing children would like to do is pick things. It's very difficult to stop them from picking one that's too small. If they pick them early, they would never be a full-size plant. So, instead of picking them, we weed them, and then we make food out of them. (Children have free breakfast and lunch at school.) We made eggplant, gumbo with okra, fried green tomatoes, green tomato salad, kale smoothies and so on. The reason why it was vegetable is because of the health concerns. Now, a lot of other benefits come along with it. It provides chances for nature exposure and physical activities.

What other outdoor area do you use for teaching? What do you teach them there?

There is a cemetery nearby and it serves as our natural trail. Because one of our class's standards that we address is forestry and natural resources, we learn ten tree species. And we will focus on that right around when the leaves start to change. Next month or so, we will go there for a walk. Since it would be a long walk, I have to get permissions to make sure parents know that the students are going a little further away. It's still on public land but not on the school's property. Other than that, all of it have to fit in the regular class period of 57 minutes, to fit within the school's structure.

We learn ecology and eco-systems there. The ten trees we learn are right around here. They are singular trees planted, which is very common in landscape. They are often native trees. But then we take our walk after learning the ten trees. The difference they see is between a tree and forest. In the forest, they will hear more birds, and they are going to see different things, the ecosystem. We do learn the leaf shapes, flowers and bark. They would do a small journal, draw it and then they will realize the difference in leaf shape. I'm getting them to learn some taxonomy and morphology. They also learned genes and species. It actually helps them to focus, and sharpen their observation skills. From my observation, some kids have already known certain trees. Other kids have never thought about it. And all of a sudden, they realize the difference. I meet the standards that the state is asking me to meet, but to me, it's more than that. It's knowledge that the students have awareness of environment and awareness of the diversity. When children are outside, they are going to hear birds or see butterflies. They can also look at the screen all day, but there might not be a butterfly there. I think the outside can teach them more than I can.

Another thing that we do in class is we go and look for goat food. We go and get to the edge of the woods and we cut honeysuckle. That is not a native plant, so we talk about the harm of invasive species, and how to deal with it. Some students from 6th grade have participated in a program called "Chew Crew"[ii] after school, which is using prescribed grazing to control invasive plants on the bank. That's not play. It's learning with living things. There are things people used to know because they live on farmland or a village where that happened. We have moved away from that, so we don't know that any more. Children have never seen that. So it's brand new to them.

Will outdoor learning affect students' performances or grades?

I haven't noticed that across the board, but some students, yes. There are some students who do very well in my class, but do not do well in other classes. They do well in my classes because they work with their hands well. But in other classes, they have to sit still and so on. I think that comes down to the individual student. Some students would calm down outside, but inside, they are hyper energetic. And for other students, the outside almost increases the distraction. So it can work both ways. Although "differentiation" in education these days is a big word, a teacher could not let students in with same cognitive mode in one class. Our education system doesn't work that way. However, generally, for this age group, outdoor learning probably helps more than younger age.

[ii] The UGA Chew Crew website (2017) is a student-led program to restore neglected green spaces on campus to their former glory by using goats to do prescribed grazing.

Do students' attention spans affect your class structure?

In the garden, students can choose their tasks and how long time they will do them. At first, I have to teach and expose them to all the tasks. Then, another time, I can assign different tasks to students at the same time. If students get bored, I will let them to do something else. The point is first you have to start showing them how to do, then they will know and they can choose. That's my intent for the way I would like to see it to go. The students who have short attention spans indoors sometimes have short attention spans outdoors, too. So I think it has been said before that students have an attention span of plus or minus two minutes of their age, so if they are ten-years old, they might have only an eight-minute attention span. So that's why things are "chop-chop" like that.

How often do you take students outside?

We can grow all year round, but we do go less frequently in winter. The students come to my class either twice a week or three times a week. So we definitely go out once a week. All semester long, we always have something planted. Because we have good climate, we can overlap. So one will be growing and this one will be taken down and that one will be up. Usually, after our summer garden has finished, we will start our winter garden.

What are the considerations about the fence, size of the plots and having chickens and goats?

For the fence, the purpose to have them is to prevent deer from eating vegetables. The fence also helps enclosing when I take my class. It's a classroom and it helps children focus on the vegetables. If it wasn't there, children could be running here and there.

For the plots, they work well because we use large machines as equipment. Students get to run the tractor and mower because it's a vocational class. With those skills, they could build on that some day. And since we have changed the size of the plot three times, it would be impossible to realize if it was planting beds with constructed pavements. We have four plots rotate. And each of them is in a typical plot size of 40ft by 20 ft. While two gardens are running, the other two will lay fallow and rest. We rotate around.

The goal of having chickens and goats is to learn to care for things. Children love to chase them or to hold them. We collect their eggs, make omelets or sell the eggs. We have two teachers who buy the eggs as soon as we have a dozen. We let the students check the eggs' quality because we want to make sure the eggs are good. As for the goats, we have a restaurant that needs lamb and the herd stop will milk the goats and make cheese from the milk. But they are also pets. It's to learn to care for other things. Students feed them in the morning, and they learn responsibility. Usually, some children say they really want to do that. So I teach them how, and they can do it by themselves. We also learn animal science from them.

What's your opinion about other teachers' attitudes on outdoor learning? How about patents?

The principal would completely support other classes using the outdoor area regardless of discipline. However, some teacher may not know how to do it because they weren't trained that way. If there was already a garden in place, along with the principal's support, teachers would figure out how to do that. We have an outdoor class area now, but it's just not used very often. I've only seen two teachers use it. Typically, in the school, there isn't a person to maintain, to take care of, to fix or to build it in the first

place. I think there are a lot of parents who want to help to do that (to help to build an outdoor classroom).

Supplemental Question Added after the First Interview

Except for all the knowledge in the Georgia Performance Standard, what other knowledge do you teach?

As a vocational course, CTAE students should learn job skills (including communication skills). Because we focus on living things and the environment, my added goal is that they learn life skills to sustain themselves in the future. In addition to practical skills, students learn to care for and respect living things other than humans and care for the environment itself. For example, they learn to identify plants for the purpose of providing browse food for the goats (feeding them but caring for them by providing a varied diet). We identify trees on our Tree Walk in the Brooklyn Cemetery. We identify butterflies and birds around the gardens and grounds. We learn that we are always in a watershed and we can make choices that positively (or negatively) impact our natural environment and natural resources.

We also compost and recycle at school. My classes promote this among the students of the rest of the school. We provide PSAs and banners with information about WHY we are doing this (images of plastic islands in the ocean and filling land with trash that could have been repurposed). We harvest, prepare and eat food from the garden. Students learn the health benefits of fresh produce and cooking skills using inexpensive ingredients.

Except for the vegetable garden, green house, and animal house, where else do your classes take place?

We get browse food for the goats from the woods edges around the playing fields (behind the public library). We also go to the very front by Baxter St. to measure Loblolly Pine trees. The name is Brooklyn Cemetery (also called Bethlehem Cemetery). My students also work with elementary students at Alps Road Elementary School next door to plant their garden beds.

Except for cognitive development, does your teaching facilitate any other types of development for children? What are they?

Physically. On a large scale, we use shovels to dig and spread compost; we move soil and other materials in wheelbarrows; on a finer scale, we take cuttings from plants and transplant seedlings

Socially**.** We have to share tools and work in small spaces. Classes can be large, and some students have to teach others in small groups

Emotionally. Many students have time to share concerns with me and with others when we are doing gardening work or walking to find trees or goat food

Problem solving. Many situations of how to get a job done (e.g. how to prop up a table with a broken leg or how to substitute ingredients for a dish).

Also, students who have just moved here and speak other languages are able to communicate more easily in the garden about gardening and other activities we are doing with our hands. (Mitchell 2016)

APPENDIX II

Possible Learning Intents in Georgia Performance Standards (Woods, 2015b)

Edible Garden

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

MSAGED7-1: Express the importance of agriculture in daily life.

a) Identify products and byproducts from agriculture commodities.

c) Describe and demonstrate safe operation of agricultural lab equipment.

d) Identify the sources of different types of food and fiber.

MSAGED7-3: Demonstrate an understanding of the National FFA Organization.

d) Design and carry out a Supervised Agricultural Experience Program based on career goals and industry needs for each individual.

MSAGED7-5: Build an understanding of the area of forestry & natural resources.

a) Identify and explain the careers in forestry and natural resources.

b) Identify and explain the function of wildlife and tree species in Georgia.

c) Explain the interrelationship between animals and plants.

MSAGED7-6: Critique the area of agricultural mechanics.

c) Describe and demonstrate safe operation of agricultural lab equipment.

d) Identify and explain the function of basic hand tools.

e) Demonstrate knowledge of measurement tools.

MSAGED8-3: Develop leadership skills, characteristics, and responsibilities.

Demonstrate knowledge of parliamentary procedure.

MSAGED8-4: Develop and use verbal and nonverbal communication skills.

a) Compare and contrast verbal and nonverbal communication.

b) Develop effective people skills.

MSAGED8-5: Develop work ethic and employable skills through agricultural education and leadership programs.

a) Maintain accurate records on Supervised Agricultural Experience project.

b) Demonstrate proper workplace etiquette.

MSAGED8-7: Students will identify plant parts and their functions.

a) Identify vegetative parts of the plant (roots, stems, leaves) and their functions.

b) Identify and use terms that describe reproductive parts of the plant (flower and seed) and their functions.

MSAGED8-8: Students will define methods of plant propagation either by sexual or asexual reproduction.

a) Demonstrate sexual and asexual plant reproduction methods.

b) Compare and contrast sexual and asexual plant reproduction methods.

MSAGED8-9: Students will identify plant growth requirements.

a) Explain what nutrients plants need.

b) Describe the environmental conditions for plant growth (light, air, water, soil).

MSAGED8-11: Students will identify the importance of the forest.

b. Explain various forest management practices. (Examples include prescribed burns, wild fires, clear cut, thinning, reforestation, etc.)

MSAGED8-12: Students will be able to classify and list examples of trees specific to our region.

a) Identify the two types of trees. (Evergreen and Deciduous)

b) Identify the major tree parts.

MSAGED8-13: Students will explain the importance of conservation and preservation of natural resources.

c) Compare and contrast renewable and nonrenewable resources.

MSAGED8-14: Student will be able to describe wildlife and their habitat.

a) Identify local wildlife species and their relationship to the forest.

b) Identify Georgia's endangered wildlife species.

S7L1 – Students will investigate the diversity of living organisms and how they can be compared scientifically.

S7L2 – Students will describe the structure and function of cells, tissues, organs, and organ systems.

S7L3 – Students will recognize how biological traits are passed on to successive generations.

S7L4 – Students will examine the dependence of organisms on one another and their environments.

S7L5 – Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

S7CS1 – Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

S7CS4 – Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

S7CS5 – Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

M6,7 D1 – Students will pose questions, collect data, represent and analyze the data, and interpret results.

M6,7P4 – Students will make connections among mathematical ideas and to other disciplines

M6D2 – Students will use experimental and simple theoretical probability and will understand the nature of sampling. They will also make predictions from investigations.

M6M2 – Students will use appropriate units of measure for finding length, perimeter, area, and volume and will express each quantity using the appropriate unit.

M8D4 – Students will organize, interpret, and make inferences from statistical data.

M8P1 – Students will solve problems (using appropriate technology).

M8P3 – Students will communicate mathematically.

M8P4 – Students will make connections among mathematical ideas and to other disciplines.

SSEF6 – The student will explain how productivity, economic growth and future standards of living are influenced by investment in factories, machinery, new technology and the health, education and training of people.

Health Education

HE6.1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

a. Compare how healthy behaviors and risk practices impact personal health. Examples: Compare different cultures food preparation practices and their impact on health.

c. Examine how one's surroundings impact health and wellness. Examine how environmental dangers impact personal health and wellness.

HE6.2: Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.

j. Describe how school policies can influence health promotion. Examples: Describe the changes in the lunch menu as a result of implementing a School Wellness Policy.

HE7.1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

a. Examine how healthy behaviors influence personal health. Examples: Examine how nutritional choices can positively or negatively affect one's immediate and long term health.

Natural Habitats

Habits of Mind (similar to Grade 7 &8)

S6CS1. Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

a. Understand the importance of—and keep—honest, clear, and accurate records in science.

b. Understand that hypotheses are valuable if they lead to fruitful investigations, even if the hypotheses turn out not to be completely accurate descriptions.

S6CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

S6CS3. Students will use computation and estimation skills necessary for analyzing data and following scientific explanations.

a. Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as integers and decimals.

b. Use metric input units (such as seconds, meters, or grams per milliliter) of scientific calculations to determine the proper unit for expressing the answer.

d. Draw conclusions based on analyzed data.

S6CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

a. Use appropriate technology to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.

b. Estimate the effect of making a change in one part of a system on the system as a whole.

c. Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various quantities.

The Nature of Science (similar to Grade 7 &8)

S6CS8. Students will investigate the characteristics of scientific knowledge and how it is achieved.

Students will apply the following to scientific concepts:

a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.

b. When new experimental results are inconsistent with an existing, well-established theory, scientists may require further experimentation to decide whether the results are flawed or the theory requires modification.

S6CS9. Students will investigate the features of the process of scientific inquiry.

Students will apply the following to inquiry learning practices:

a. Scientific investigations are conducted for different reasons. They usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations.

b. Scientists often collaborate to design research. To prevent bias, scientists conduct independent studies of the same questions.

c. Accurate record keeping, data sharing, and replication of results are essential for maintaining an investigator's credibility with other scientists and society.

d. Scientists use technology and mathematics to enhance the process of scientific inquiry.

e. The ethics of science require that special care must be taken and used for human subjects and animals in scientific research. Scientists must adhere to the appropriate rules and guidelines when conducting research.

Co-Requisite-Content

S6E3. Students will recognize the significant role of water in earth processes.

a. Explain that a large portion of the Earth's surface is water, consisting of oceans, rivers, lakes, underground water, and ice.

S6E5. Students will investigate the scientific view of how the Earth's surface is formed.

h. Explain the effects of human activity on the erosion of the earth's surface.

i. Describe methods for conserving natural resources such as water, soil, and air.

S7L1: Students will investigate the diversity of living organisms and how they can be compared scientifically

S7L3. Students will recognize how biological traits are passed on to successive generations.

a. Explain the role of genes and chromosomes in the process of inheriting a specific trait.

b. Compare and contrast that organisms reproduce asexually and sexually (bacteria, protists, fungi, plants & animals).

c. Recognize that selective breeding can produce plants or animals with desired traits.

S7L4. Students will examine the dependence of organisms on one another and their environments.

a. Demonstrate in a food web that matter is transferred from one organism to another and can recycle between organisms and their environments.

b. Explain in a food web that sunlight is the source of energy and that this energy moves from organism to organism.

c. Recognize that changes in environmental conditions can affect the survival of both individuals and entire species.

S7L5. Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

b. Describe ways in which species on earth have evolved due to natural selection

S8P1. Students will examine the scientific view of the nature of matter.

d. Distinguish between physical and chemical properties of matter as physical (i.e., density, melting point, boiling point) or chemical (i.e., reactivity, combustibility).

e. Distinguish between changes in matter as physical (i.e., physical change) or chemical (development of a gas, formation of precipitate, and change in color).

M6M2: Students will use appropriate units of measure for finding length, perimeter, area, and volume and will express each quantity using the appropriate unit

M6,7D1: Students will pose questions, collect data, represent and analyze the data, and interpret the results.

M6D2: students will use experimental and simple theoretical probability and understand the nature of sampling. They will also make predictions from investigations

Emblematic Garden

S6E5. Students will investigate the scientific view of how the earth's surface is formed.

i. Describe methods for conserving natural resources such as water, soil, and air.

S6CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

S7CS9. Students will investigate the features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing competing theories.

S7L4. Students will examine the dependence of organisms on one another and their environments.

c. Recognize that changes in environmental conditions can affect the survival of both individuals and entire species.

S8P1. Students will examine the scientific view of the nature of matter.

d. Distinguish between physical and chemical properties of matter as physical (i.e., density, melting point, boiling point) or chemical (i.e., reactivity, combustibility).

SB4. Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

d. Assess and explain human activities that influence and modify the environment such as global warming, population growth, pesticide use, and water and power consumption.

e. Relate plant adaptations, including tropisms, to the ability to survive stressful environmental conditions.

SSWG2 The student will explain the cultural aspects of geography

a. Describe the concept of place by explaining how the culture of a region is product of the regions physical characteristics

SSEF1 The student will explain why limited productive resources and unlimited wants result in scarcity, opportunity costs and trade offs for individuals, businesses and governments.

a. Define scarcity as a basic condition which exists when limited productive resources exceed unlimited wants.

SSEF5 The student will describe the roles of government in a market economy.

b. Give examples of government regulation and deregulation and their effects on consumers and producers.

Social Studies skills:

9. Use latitude and longitude to determine location.

10. Use graphic scales to determine distances on a map.

11. Compare maps of the same place at different points in time and from different perspectives to determine changes, identify trends, and generalize about human activities.

12. Compare maps with data sets (charts, tables, graphs) and /or readings to draw conclusions and make generalizations.

Information Processing Skills

3. Identify issues and/or problems and alternative solutions.

10. Analyze artifacts

12. Analyze graphs and diagrams

16. Check for consistency of information

Health Education

HE6.1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

c. Examine how one's surroundings impact health and wellness. Examine how environmental dangers impact personal health and wellness.

HE6.2: Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.

b. Identify the influence of culture on health beliefs and practices.

d. Identify how the community can affect personal health practices and behaviors.

HE6.8: Students will demonstrate the ability to advocate for personal, family, and community health.

b. Demonstrate how to support others in positive choices regarding their health. Examples: Participate in a role play demonstrating effective bystander strategies to use when bullying takes place.

c. Plan with others to advocate for healthy lifestyles or choices. Examples: Plan with others to make signs promoting safety to place in an elementary school. Work in a group to develop a skit utilizing skills to avoid a conflict.

HE7.1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

c. Analyze how the environment can impact personal health. Examples: Identify environmental conditions (e.g., physical, social, community) that are potentially harmful to personal health.

HE8.5: Students will demonstrate the ability to use decision-making skills to enhance health.

c. List healthy options to a health-related issue or problem. Identify options for improving the health of one's environment.

Fine Arts

VA6CU.2 Investigates and discovers personal relationship to community, culture, and the world through making and studying art.

a. Examines how forms and styles of visual and/or media arts are found in own community.

d. Participates in activities (e.g., discussion, reading, writing, art making, art events) that promote personal engagement in the community and/or study of art history.

VA6PR.1 Understands and applies media, techniques, and processes.

c. Produces three-dimensional artworks using selected material and techniques.

VA6PR.2 Creates artwork reflecting a range of concepts, ideas, and subject matter.

a. Uses selected sources for artworks (e.g., direct observation, personal experience, self-perception, memory, imagination, fantasy, traditional events, pop culture).

VA6PR.3 Incorporates an understanding of the language of art (elements and principles of design) to develop and organize own ideas, resolve specific visual arts problems, and create works of art.

a. Organizes art elements (e.g., space, line, shape, form, value, color, texture) using the principles of design (e.g., contrast, repetition and rhythm, variety, movement, proportion, balance, harmony, and unity) to compose artworks.

VA6PR.4 Plans and participates in appropriate exhibition(s) of artworks.

d. Participates in art exhibits in the school and/or local community.

VA6C.1 Applies information from other disciplines to enhance the understanding and production of artworks.

b. Investigates and articulates how personal beliefs, cultural traditions, and current social, economic, and political contexts influence the interpretation and creation of artworks.

VA6C.3 Expands knowledge of art as a profession and/or avocation.

a. Identifies and discusses design in daily life (e.g., buildings, clothing, furniture, automobiles, advertising).

VA7MC.2 Identifies and works to solve problems through creative thinking, planning, and/or experimenting with art methods and materials.

a. Uses art media to independently explore, discover and reflect on personal identity, interests, motivations and themes.

VA7CU.1 Discovers how the creative process relates to art history.

a. Identifies and analyzes universal themes, symbols and ideas from diverse past and present cultures and interprets how factors of time and place (climate, resources, ideas, politics, and technology) influence meaning of artworks.

d. Recognizes the varied reasons for making art throughout history, how history and culture have influenced art, and how art has shaped culture/history.

VA7CU.2 Investigates and discovers personal relationship to community, culture, and world through creating and studying art.

a. Examines how forms and styles of visual and media arts are found in own community.

d. Participates in activities (e.g., discussion, reading writing, art making, art events), that promote personal engagement in the community and/or study of art history.

VA7PR.1 Understands and applies media, techniques, and processes with care and craftsmanship.

c. Explores various techniques/processes as well as the properties of art materials in preparation for art making (e.g., printmaking, sculpture, fiber arts, ceramics).

VA7PR.2 Creates artwork reflecting a range of concepts, ideas, and subject matter.

a. Uses selected sources for artworks (e.g., direct observation)。

VA7PR.3 Uses the elements and principles of design along with a variety of media, techniques and skills to produce two-dimensional and three-dimensional works of art.

b. Applies color theory (e.g., color schemes, relationships, properties) to create visual effects and communicate ideas.

VA7AR.2 Critiques personal artworks as well as artwork of others using visual the and verbal approaches.

g. Presents work in a group setting for formal/informal evaluation.

VA7AR.4 Plans and presents appropriate exhibition(s) for work(s) of art.

a. Prepares own artwork to be exhibited in the classroom and in the school community.

d. Attends art exhibits in the school and/or local community.

VA8MC.3 Demonstrates how artists create and communicate meaning in artworks.

c. Studies contemporary and/or historical works of art to determine influences that shaped the development of the work.

VA8CU.1 Discovers how the creative process relates to art history.

a. Identifies and analyzes universal themes, symbols, and ideas from diverse past and present cultures and interprets how factors of time and place (climate, resources, ideas, politics, and technology) influence meaning of artworks.

d. Recognizes the unique contributions of past and/or present artists, art periods and movements, including but not limited to contemporary/historical art forms and Georgia artists (e.g., Regional Art, Folk Art, Cherokee and Creek cultures).

VA8CU.2 Investigates and discovers personal relationship to community, culture, and world through making and studying art.

a. Investigates how forms and styles of visual and /or media arts are found in own community.

d. Participates in activities (e.g., discussion, reading, writing, art making, dramatizations, art events) that promote personal engagement in the study of art history and culture.

VA8PR.3 Produces an array of two-dimensional and three-dimensional artistic processes and techniques using a variety of media and technology.

e. Develops three-dimensional artworks from materials such as clay, *papier-mache*, plaster, wood, wire, found objects and/or combinations of materials.

VA8AR.1 Critiques personal artworks as well as artwork of others using visual and verbal approaches.

g. Evaluates and explains how selected principles of design and elements of art are used in an artwork to express purpose and how they affect personal response to that artwork.

VA8AR.3 Plans and presents appropriate exhibition(s) for work(s) of art.

a. Prepares art for presentation.

VA8C.1 Applies information from other disciplines to enhance the understanding and production of artworks.

c. Integrates themes, ideas and concepts from variety of disciplines as inspiration for artwork.