

## ABSTRACT

ZAMANI, ZAHRA. Affordance of Cognitive Play by Natural and Manufactured Elements and Settings in Preschool Outdoor Learning Environments. (Under the direction of Professor Robin Moore.)

Existing research demonstrates that characteristics of the physical environment may hinder or develop children's play behavior; in particular, that diverse outdoor environments increase motivation to play, improving children's physical, social, and cognitive development. However, there is a lack of knowledge about how specific outdoor physical environments in preschools stimulate children's play. Cultural changes in lifestyles have increased the number of working parents that now enroll their children in childcare centers, where they spend the majority of their waking hours year round. Thus, providers have an obligation to ensure that childcare environments are high quality settings not only for healthy child development, but also to serve as places for learning through play. Research is required to understand how the physical features of preschools, both indoors and outdoors can support this goal. Existing research suggests that the experience of nature may have a beneficial effect on children's development, but further research is needed to understand how specific natural features and settings within outdoor preschool settings can contribute to children's play, learning, and development.

The single case study reported here uses a mixed-method approach aimed at understanding the role of the designed built environment of outdoor preschool settings for supporting cognitive play behavior affordances. The research site is located in the Research Triangle Park region of North Carolina. This study examined three outdoor learning environment zones: a zone close to the classrooms with predominantly manufactured settings, a second zone featuring mixed natural and manufactured settings, and a third zone containing predominantly natural settings. Theories of affordance and behavior setting distinguished the functional properties of these outdoor environments. Independent variables included zones (manufactured, mixed, natural), behavior settings (manufactured, mixed, natural), and elements (manufactured fixed, manufactured loose, natural fixed, and natural loose). Dependent variables included children's cognitive play behaviors (functional, constructive, exploratory, dramatic, and games with rules). Data collection included behavior mapping as the quantitative method. Thirty-six children were coded for their cognitive play behaviors while interacting with elements and behavior settings in each zone. Sixteen rounds of observation were conducted in each zone, resulting in 6801 data points. Qualitative methods included photo preferences, drawings, and interviews; a sub-sample of 22 four-to-five year old children participated in the qualitative portion of the study. In addition, the four preschool classroom teachers of the observed children were interviewed to assess their perceptions and educational understanding of the role of outdoor play in different zones for children's play and development.

The findings indicate that the natural zone provided the main opportunities for constructive, exploratory, and dramatic play. Further, mixed zones afforded the most functional, exploratory, and games with

rules play. The results imply how natural and mixed settings, such as the trees, hills, or sand areas, provide opportunities for a diverse range of cognitive play. The results suggest that mixed settings have the potential for affording functional play behaviors. Children themselves appreciated the natural and mixed settings for their different cognitive play opportunities. Results suggest that manufactured fixed elements support children's functional and dramatic play behaviors (for example, the complex manufactured structure or the "green tube"). Further, inclusion of manufactured loose and natural loose elements encouraged constructive play (including sand, shovels, and buckets). The combination of methods showed that natural loose elements (sticks, leaves, dirt) motivated children's constructive, exploratory, and dramatic play opportunities. Finally, natural fixed elements created behavior settings that included many natural loose elements, such as sticks, leaves, and seeds, that supported children's exploratory and dramatic play.

The primary conclusion of the study is that diverse elements and behavior settings afford varied cognitive play opportunities for children. The study provides valuable information for administrators, landscape designers, and policymakers to guide developing outdoor preschool settings that stimulate children's cognitive play. Limitations of the study include the focusing on a single case, challenges for coding cognitive play behaviors, small sample size, and short memory spans of children. Future research is needed to compare different preschool outdoor learning environments in varied socio-economic contexts that have diverse settings and elements affording cognitive play. Employing a longitudinal research approach and controlling for children's cognitive development can produce a more robust support for this study.

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Affordance of Cognitive Play by Natural and Manufactured Elements and Settings  
in Preschool Outdoor Learning Environments

by  
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## **DEDICATION**

To my mother and father for all their sacrifices, kindness, and support that developed me. I will always remember how you devoted your lives for your children's success and well-being.

## BIOGRAPHY

Zahra Zamani was born in Tehran, Iran. Zahra was recognized for her artistic abilities from childhood, encouraging her to study architecture design. After receiving her bachelor's degree in Architecture from the University of Tehran, Tehran in 2006, she aimed to extend her knowledge in design. Zahra graduated with a Master's degree in Landscape Architecture from the University of Tehran in 2009. For her master's thesis, she explored eight primary schoolyards of Tehran for their physical environment qualities. She understood how children lack contact with nature and diverse play opportunities in urban schoolyards. Afterwards, Zahra practiced her knowledge in the field of architecture and landscape architecture in Tehran.

To fulfill her passion for knowledge, in 2010 Zahra decided to continue her education with a Ph.D. degree in Design from North Carolina State University. She was advantaged to work in the Natural Learning Initiative (NLI) under the direction of Robin Moore and Nilda Cosco for three years. During this period, she learned different topics in the area of healthy stimulating environments and policy suggestions for young children. Zahra valued distributing her passion for research and presented papers in the Environmental Design Research Association (EDRA) and the Council of Educators in Landscape Architecture (CELA). Related to her interests, she received second place in the "Student Full Paper Award" in the 2012 EDRA conference, where she presented "The comparison of cognitive play affordances within natural and manufactured playgrounds."

Recently Zahra cooperated in the Center for Earth Observation Lab (CEO) at NCSU, which explores how people perceive or prefer different environments. The research involved the awareness toward contingent valuation of multifunctional agricultural landscapes using visually stimulated environments and online marketplaces. Beyond her research successes (eight papers and presentations to date), she has been fortunate to accomplish various teaching experiences in different fields. Zahra's teaching roles includes teaching assistant and instructor responsibilities in landscape architecture studio and environment and behavior courses. Her talents in drawing also led her to teach drawing classes at NCSU's Craft Center. As a designer and researcher, Zahra intends to follow her passions to improve the built environment conditions of humans and extend knowledge.

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## CHAPTER 1: INTRODUCTION

Children are individuals, each with his or her own particular mix of skills, moods, and personalities. A body of scientific, autobiographical, and documentary literature enlighten the critical result that environment can have on the inner life of a child (Marcus, 1998). Previous studies have explored the relationship between the characteristics of outdoor settings and children's play behavior (Campbell & Frost, 1985; Fjortoft & Sageie, 2000; Frost & Klein, 1983; Moore & Wong, 1997). Studies also report how direct contact with natural outdoor environments enables children to develop a bond and affinity between themselves and nature (Kahn & Kellert, 2002; Kellert, 2002; Tai, Haque, McLellan, & Knight, 2006).

Currently, the physical features of outdoor learning environments are not conducive to children's fascination for diverse, stimulating learning environments (Fjortoft & Sageie, 2000; Francis, 1998). Contact opportunities with natural elements in outdoor learning environments are also decreasing for children (Louv, 2005; Rivkin, 1990). This decreased contact correlates with children's lack of time, unsuitable play spaces, parental fear, and car dependency (Cosco, Moore, Thigpen, Verzaro - O'Brien, & Mendel, 2005; Loukaitou-Sideris & Sideris, 2010; McKendrick, Bradford, & Fielder, 2000; Moore & Wong, 1997; Tai et al., 2006).

The following section briefly explains the importance of built environment features for children's development, children's play in the outdoor preschool setting and in natural settings. The review points how children are lacking contact with outdoor environments, which is a significant factor in their development and health. This section show an imperative need for researching how the physical environment attributes of the outdoor preschool settings associate with children's development.

### **1.1 Significance of the Built Environment for Children**

Children develop an understanding of themselves through interactions with events and materials within the environment (Piaget, 1962). Research suggests a significant relationship between the qualities of the physical environment, cognitive development, and social well-being (Boldermann, Blennow, Dal, Martenson, Raustrop, Yuen, & Wester, 2006; Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Caplan & Harrison, 1993; Cummins & Jackson, 2001; Evans, 2003; Jackson, 2003; Johnson, 2007; Moore & Cosco, 2010; Spencer & Woolley, 2000; Striniste & Moore, 1989). To perform based on a child's best interest, the built environment needs qualities that encourage a healthy lifestyle and behavior (Boldermann et al., 2006; Moore & Marcus, 2008). Researchers recommend that adults provide such health and developmental benefits through intentionally designed outdoor environments (Fjortoft & Sageie, 2000; Moore, 1985; Moore, 1986). Indeed, stimulating, equipped outdoor environments can have certain advantages in supporting specific types of play for children (Henniger, 1985).

Many disciplines are currently exploring how physical environment attributes associate with children's developmental behaviors (Ozdemir & Yilmaz, 2008; Striniste & Moore, 1986). A growing body of research

suggests social, cultural, and physical qualities of the environment relate to children's experience and development (Berk, Mann, & Ogan, 2006; Moore, 1986; Kyttä, 2003; Plotnikoff, Mayhew, & Birkett, Loucaides, & Fodor, 2004; Striniste & Moore, 1989; Wachs, 1985; Weinstein, 1987). Literature also suggests children's opinion and experience differs when compared to adults (Matthews, 1992). For instance, even a moderate variation in physical space, such as change in light, area, height, or scale, can stimulate children's senses (Cele, 2006; Olds, 1987).

Environmental and behavioral researchers recognize the effect of physical environment on human behavior (Evans & Lepore, 1997). Among the many methods available, environmentally oriented scientists measure the environment through direct observation or manipulation. Observation reveals the many dimensions and vibrant qualities of the environment, while the individual can intrude on the environment's effects (Wachs, 1983). It is necessary for environmental and behavioral researchers to develop evidence-based research that enables design resolutions promoting children's development (Moore & Marcus, 2008). For instance, several studies have explored how specific elements in physical environment promote the physical activity (Baranowski & Jago, 2005; Cosco, 2006; Ozdemir & Yilmaz, 2008; Potwarka et al., 2008). Further research needs to explore the environmental variables that support physical activity behaviors (Dishman & Sallis, 1994; Ozdemir & Yilmaz, 2008; Sallis & Owen, 1997).

The physical environment can also contribute to children's mental health and learning (Caplan & Harrison, 1993; Evans, 2003; Korpela, Kyttä, & Hartig, 2002; Spencer & Woolley). Evans (2003) describes two ways the built environment can affect mental health. First is the direct impact of environmental characteristics, and the other effect associates with the environment's indirect influence through psychosocial change with mental health results. Evans (2003) highlights the link between personal control, social support, and restoration from stress with the properties of the built environment. Research suggests the association of children's knowledge of the environment with their experience and interaction with the space (Cosco, 2006; Moore, 1985; Talen & Coffindaffer, 1999). Further, children's motivation to interact and learn from their surroundings associates with the variety, complexity, and responsiveness of the materials (Striniste & Moore, 1989).

Sociology indicates that children are part of the society and have the right to express their opinions (Christensen & James, 2000; Corsaro, 1997). There is increased interest in hearing children's voice and giving the right to express their ideas (Einarsdottir, 2005; Mayall, 2002). Since 1989, many worldwide governments have accepted the United Nations Convention on the Rights of the Child (CRC), a human rights treaty concerned about the cultural rights of children. The Convention describes children as human beings younger than 18 years old (Convention on the Rights of the Child, 1989). The Convention manages child-specific needs and rights, necessitating states to act in the best interest of children when making decisions (CRC, 1989). In addition, Article 12 of the Convention declares children's right to participate in decision making and to express their thoughts and opinions (CRC, 1989). Therefore, policy makers, designers, and researchers of children's

outdoor environments are encouraged to recognize how children experience or sense the outdoors and support children's right to express their viewpoints.

Designers can contribute to children's health through developing spaces that support various experiences for them which stimulate healthy behavior (Boldermann et al, 2006; Monore, 1985; Moore & Cosco, 2007; Moore & Wong, 1997; Olds, 1987). However, researchers need to realize the impact of environmental qualities on children's development and play (Bradley, 1985; Pack & Michael, 1995). While the physical environment is substantial for children's health and well-being, researchers understand little about its contribution to children's play behavior. Therefore, this study contributes to the existing body of literature by focusing on how outdoor preschool environment features effect children's cognitive play behavior. The following section explains the value of the outdoor environments for children's development.

### **1.2 Significance of the Outdoor Learning Environment for Children**

Outdoor environments are physical environments that offer children moderate levels of readily available stimulation (Striniste and Moore, 1989). Outdoor learning environments are critical for children's development, as environment is associated with the quality of play (Marcus, 1998; Moore, 1985; Monore, 1985). While outdoors, children have more freedom of movement, thus enabling them to develop their visual and motor abilities (Cosco, 2006; Pica, 1997). The outdoor environment's variable and less constraining qualities provide more opportunities than indoor environments for children to make decisions, solve problems, and stimulate creative thinking (Burdette & Whitaker, 2005). Opportunities for independent mobility help develop children's sense of wonder and imagination (Pica, 1997). Developmentally designed outdoor spaces lend themselves to spontaneous interaction, while offering children a chance to adjust to individual differences. Outdoor environments set the stage for children's exploration, construction, and problem invention and solving. These exploratory experiences develop children's scientific curiosity to create realistic theory about the world (Natural Learning Initiative, 2007).

Although outdoor environments offer many benefits for children's development, outdoor play opportunities have declined for many urban children. According to a United Nations report from 2005, half of world's population and 87% of the United States population live in cities (Tai et al., 2006). Unsafe neighborhoods and adults' fear of strangers in public spaces (Cahill, 1990; Hillman, 1999; Valentine, 1996) have restricted children's independent mobility in cities (Baranowski et al. 2005; Korpela et al., 2002; Kytta, 2003; Kytta, 1997; Tranter, 1993). Since children living in urban environments usually spend most of their time indoors, outdoor learning environments can play a significant role in their daily contact with nature (Marcus, 1998; Moore & Wong, 1997).

Research recommends innovative approaches that increase children's outdoor interactions, and as a result, children's development (Frank et al., 2007; Tester & Baker, 2009). Therefore, developmental experts and

landscape architects need empirical evidence to understand how specific features of children's outdoor learning environments can associate with children's developmental behavior.

### **1.3 Significance of Natural Outdoor Environments for Children**

The potential hazards of outdoor urban spaces, demolished local natural spaces, parental fear of danger, children's daily occupation, and the manufactured nature of outdoor play environments has diminished children's daily contact with nature (Herrington & Studtmann, 2004). While natural environments offer a critical role for children's development, health, and learning, designers and educational policy makers often neglect the importance of incorporating natural features in the design of outdoor play environments (Fjortoft, 2001; Fjortoft & Sageie, 2000).

Wilson (1984) proposes the concept of Biophilia, describing it as an innate affection and love towards Earth and nature. While learning to protect the biosphere, children gain a deeper understanding of nature through experiencing and contacting natural features (Moore & Wong, 1997). Indeed, constant contact, experience, and interaction with basic natural elements can develop a sense of unity and Biophilia toward the natural world (Kellert, 2002; Harvey, 1989; Rhode & Kendle, 1994). Developing Biophilia in children promotes their sense of stewardship and responsibility towards nature (Harvey, 1989). In fact, natural learning environments can provide interaction opportunities for children to ecosystems and seasonal change (Freuder, 2006).

Previous research has focused on the role of nature in decreasing stress and increasing attention span (Hartig, Evans, Jamner, Davis, and Garling, 2003). Being in nature can motivate a sense of relaxation, an outcome of a slower sense of time (Nettleton, 1992). Natural settings also contribute to increasing concentration among children, reducing their need for medication and in the long term, improving their health (Taylor, Kuo, & Sullivan, 2001). The restorative effect of nature (Bedimo-Rung, Mowen, & Cohen, 2005; Maller, Townsend, Brown, & St Leger, 2002; Wells & Evans, 2003) suggests the necessity of natural learning environments for children's psychological health.

Intrinsic curiosity stimulates children's discovery and learning, thus promoting their learning (Fjortoft, 2000). Exploration within natural settings develops a positive attitude in children toward nature (Bixler, Floyd, & Hammut, 2002). Natural elements can also provide children with opportunities to experience formal and scientific education (Chermayeff, Blandford, Losos, 2001). For instance, natural settings afford countless discovery opportunities, enabling children to engage in diverse, creative, and imaginative play behaviors (Fjortoft, 2000; Lester & Maudsley, 2007; Bixler et al., 2002). Herrington and Studtmann (1998) remark that installing natural elements and other landscape features in an outdoor play environment alter children's spatial-cognitive awareness. After reviewing 41 playgrounds in North Carolina, Hestenes, Shim, and DeBoard (2007) suggest the natural environment supports children's constructive play. However, children engaged less in

functional play within natural play environments. These studies accentuate the importance of natural spaces for children's cognitive development.

Nicholson (1971) describes "the theory of loose parts" as recognizing how children can interact and use open-ended play materials and manipulative elements. While most built environments cannot support constructive or dramatic play opportunities, natural settings provide various loose parts. These loose elements allow children to manipulate their environment and develop their creative and constructive abilities (Moore, 1985; Moore & Wong, 1997). Loose parts also encourage children to create imaginative spaces, elements, and stories (Maxwell, Mitchell, & Evans, 2008; Moore & Wong, 1997).

The results of this study extend previous research by providing insight toward the benefits of natural behavior settings and elements for cognitive play behavior opportunities. This research aims to identify important natural elements and settings that enhance learning opportunities for children within the outdoor preschool settings. Incorporating such spaces offers children the opportunity for daily contact with natural features, which will develop their sense of stewardship and Biophilia. The following section explains the value of outdoor preschool environments for children's development.

#### **1.4 Significance of Outdoor Preschool Settings for Children**

Currently limited in their outdoor play opportunities, urban environments demand child-spaces, where children can play freely and have daily experience and contact with nature (Kyttä, 2003; Moore & Wong, 1997). Most children in the U.S. under five years old spend their awake time in community institutions while their parents work (Macomber, Adams, & Tout, 2001; Moore & Cosco, 2010). Since young children are spending long periods at preschools, the associated outdoor environments can become supportive spaces to stimulate different play. It is necessary for these settings to offer children a means to meet their developmental needs through various play opportunities.

Adults have paid inadequate attention to the learning capacity of outdoor childcare centers (Moore & Marcus, 2008). Designed landscapes in outdoor preschool settings can support children's education and health (Kirkby, 1989; Moore, 1987; Titman, 1994). Considered as an extension of the indoor classroom, outdoor preschool settings have the potential to stimulate children's cognitive development (Moore, 1987). For example, research suggests the increase of dramatic play in outdoor preschool settings compared to indoors (Frost, Wortham, & Reifel, 2001). Preschool and daycare settings are ideal for integrating guidelines that promote unstructured outdoor play, especially in natural settings. Design policies for everyday urban spaces, such as preschools, can improve the quality of the built environments through concentrating on a "Biophilia design" that provides daily contact with natural spaces (Moore & Marcus, 2008).

With the many benefits of environmental yards compared to traditional playgrounds, designers of advanced educational spaces are focusing on transitioning current playgrounds to a more natural environment

(Moore & Wong, 1997; Tai et al., 2006)<sup>1</sup>. Natural outdoor learning environments can improve children's education and increase their cognitive abilities by offering diverse learning opportunities (Fjortoft & Sageie 2000; Fjortoft, 2004; Moore & Cosco, 2007; Moore & Wong, 1997; Wechsler et al 2003). This characteristic of natural outdoor play environments is critical for children with learning problems (Moore & Wong, 1997).

Research on Washington Environmental yard connects children's sense of place development towards their school to outdoor natural educational reservations (Moore & Wong, 1997). Additionally, Moore and Wong (1997) recognize how the environmental yard stimulates children with various learning styles in different hands-on learning opportunities. These experiences can stimulate a sense of excitement and set up a foundation for future learning (Moore & Marcus, 2008). Environmental education programs assume an outdoor experience will increase children's environmental awareness (Taylor & Kuo, 2006). Given that outdoor preschool settings are significant spaces for child development, landscape architects and policy makers call for effectively designed strategies. Some studies have evaluated how the physical environment characteristics of outdoor preschool settings associates with children's play behavior. Nevertheless, there is a need to understand how naturalized outdoor preschool settings can offer several play opportunities for children.

### **1.5 Conclusion**

This chapter presents the importance of and lack of research associated with young children's outdoor play opportunities. Previous research has identified many developmental and health results associated with children's play within natural settings, such as reducing stress, increasing concentration levels, and promoting constructive and dramatic play. However, recent research suggests children's lack of daily contact with nature. Few studies evaluate the importance of natural environments for children's cognitive play behavior within an educational context. Hence, this study aims to explore how an outdoor learning environment with natural features can stimulate children's cognitive play behaviors. By understanding the cognitive play behavior value of natural features, policy makers may promote daycare centers that use natural play environments to promote children's cognitive development. If policy makers implement these natural play environments, children will benefit from the daily contact opportunities with natural environments. The following chapter describes how the characteristics of the physical environment inspire children's play. It also defines cognitive development and cognitive play behaviors.

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<sup>1</sup>Having a robust history of quality initiatives, North Carolina intends to improve the quality of educational settings for preschoolers. The Division of Child Development (DCD) addresses early childhood issues. In 2007, the NC Outdoor learning Environment Alliance encouraged the NC Division of Child Development and Early Learning Child Care Rules to redefine the "playground" term to the "Outdoor Learning Environment" (Cosco & Moore, 2013). The DCD recognizes children's need to spend time outdoors to play freely, develop, and grow. The division obliges childcare centers to offer daily outdoor play opportunities for children and expose them to natural elements, air, and sunlight (North Carolina Division of Child Development, 2009).

## CHAPTER 2: LITERATURE REVIEW

The purpose of the following literature review is to uncover child development research regarding the value of play for children's development. The review explains how the physical features of the outdoor learning environment can encourage children's play and development. The chapter points out how children can benefit from coming in contact with natural learning environments. The chapter describes cognitive play behaviors and the studies that evaluated their association with children's cognitive development. The review explains previous studies that evaluated children's cognitive play behaviors and the associated outdoor environments. This chapter also reveals the lack of knowledge and methodology approaches on these topics. The following section describes the importance of play for children's physical, cognitive, and social development.

### 2.1 Children's Play

Play is children's way of learning about the world through exploration and experience (Chermayeff et al., 2001; Piaget, 1962) and is critical for their maturation (Golinkoff, Hirsh-Pasek, & Singer, 2006; Monore, 1985; Rubin, 2001). Many studies have explained the fundamental role of play on children's social, cultural, cognitive, language, and physical development (Burdette, & Whitaker, 2005; Fisher, 1992; Piaget, 1962; Malone & Langone, 1999; Monore, 1985; Vygotsky, 1967). Cognitive functioning during play is essential for independent decision-making and influences success in daily tasks (Burdette, & Whitaker, 2005; Golinkoff et al., 2006), including promoting children's ability to control their behavior and emotions (Golinkoff et al., 2006).

Play is a significant means to strengthen and outline patterns of problem solving, language, memory, creativity, and social-emotional development (Burdette & Whitaker, 2005; Fewell & Rich 1987; Kennedy, Sheridan, Radlinski, & Beeghly, 1991; Flavell, 1992; Piaget, 1962; Zigler & Bishop-Josef, 2006). Play promotes children's physical abilities and stimulates them to practice communication, thus contributing to their physical, social, and cognitive development (Borman & Kurdek, 1987; Rubin, Fein, & Vandenberg, 1983). In addition, by developing their abilities and skills through play, children improve self-confidence and self-esteem (Harter, 1982).

Apart from being recreational, play regulates children's interpretation of the world (Burya, 1983; Matthews, 1985, Tai et al., 2006; Weiningger, 1979). Play can also help children adjust to the school setting, improve their readiness to understand issues, and enhance their problem solving skills (Fisher, 1992; Coolahan, Fantuzzo, Mendez, & McDermott, 2000). Research suggests the outdoor environment's potential to provide free play opportunities for children (Burdette, Whitaker, & Daniels, 2004). "Free play" means that children can select their own activities without adult intervention (Belsky & Most, 1981; Burdette & Whitaker, 2005; Rubin, 1979). Aguilar (1985) states how playfulness is the child's perception or behavior inspiring their spontaneous involvement in actions. Playfulness is the result of having no boundaries, rules or expected consequences of behavior (Aguilar, 1985).

While play is necessary for children's development, many children currently have less time, access, and free play opportunities. For instance, a longitudinal study conducted by Hofferth and Sandberg (2001) between 1981 and 1997 shows that American children engage mostly in structured activities, while their chances of free play decreased by 25%. By reviewing such literature, we understand the value of providing various unstructured outdoor play opportunities for children with different skills. Considering children's decreased free play opportunities, this study highlights the importance of outdoor preschool settings for children's free play possibilities. The following section describes the three types of play behaviors and the value of the built environment in contributing or hindering children's play opportunities.

### **2.1.1 Play behaviors and children's development.**

Play behaviors can predict a child's developmental status, accounting for their interactions with objects and peers (Howes, 1988; Howes & Smith, 1995). Psychologists have classified play behavior into three main types: physical, cognitive, and social (Beckwith, 1982; Friedberg, 1975; Johnson & Hurley, 2002; Kytta, 2003). The following paragraphs briefly describe these categories.

The active or vigorous part of play immediately affects children's motor skills development (Burdette & Whitaker, 2005; Tai et al., 2006). Physical development mainly correlates with large muscle or gross motor behavior, and eye-hand coordination (Bjorklund & Brown, 1998; Marcus, 1998; Williams, 1986). Through physical activity, children learn about their bodies and their skills and limitations, as well as develop a sense of control or self-esteem (Hoffman, Knight, & Wallach, 2007; Marcus, 1998; Weinstein, 1987). In addition, research associates children's physical activity with their cognitive development, social growth, and reduced stress (Flook, Repetti, Ullman, 2005; Hills, 1998; Pellegrini & Smith, 1998a).

Many researchers and psychologists believe that play is a child's way of learning about the world through exploring and experiencing (Chermayeff et al., 2001; Piaget, 1962; Tai et al., 2006; Vygotsky, 1967; Weiningger, 1979). Researchers consider children's play behavior as a symbol of their recently gained knowledge (Cornett, 1998; Piaget, 1962). Through educationally focused and free play opportunities, children can learn creativity, vocabulary, literacy, memory development, and problem solving skills (Zigler & Bishop, 2006). The following sections thoroughly discuss this category of play behavior.

Play improves children's social abilities by offering opportunities for taking turns, collaboration, and motivation (Zigler & Bishop, 2006). Social play involves the environment and materials that inspire children's cooperation and discovering their relation to peers (Hewes, & Beckwith 1975; Marcus, 1998; Matthews, 1985; Moore, 1986). Vygotsky (1978) connects children's social interaction ability to their cognitive development level. For instance, social play introduces responsibilities and social rules to children, which in turn promotes their communication and problem solving skills (Chia, 1985; Woolley & Lowe, 2012). Children further advance their social skills through language and vocabulary improvement (Marcus, 1998), which is directly associated with children's cognitive skills (Burdette & Whitaker, 2005; Zigler & Bishop-Joseph, 2006).

This literature review suggests the critical role of each play category for children's development. Further, the review associates the physical, cognitive, and social developments of a child. As a result, design suggestions that promote cognitive play behaviors may also encourage other play behaviors. The following section discusses how physical environment attributes can contribute to children's play and development.

### **2.1.2 Physical environments and play.**

Play is an important source of learning (Garza, Briley, & Reifel, 1985). Developing children's play behavior requires inspiring certain interactions and experiences through appropriate equipment and environments (Fischer, 1980; Gottlieb, 1976; Peiper, 1963; Moore, 1985; Ridgers, Fairclough, & Stratton, 2010). Children's play behavior results from the physical characteristics of the site and whether those characteristics promote or hinder their environment-behavior interaction (Barbour, 1999; Moore, 1985; Moore & Cosco, 2010; Woolley & Lowe, 2012). Interaction with the physical environment influences children's physical, social, and cognitive development (Caplan & Harrison, 1993; Evans, 2003; Jackson, 2003; Johnson, 2007; Marcus, 1998; Striniste & Moore, 1989). Therefore, the physical, social, or symbolic qualities of an environment depend on whether it encourages or hinders the child's development (Kytta, 2003).

Stimulating, flexible environments heighten children's knowledge, understanding, and development (Hesletine & Holborn, 1987; Moore, 1986; Wachs, 1979; Weinstein, 1987). For example, manipulative, quiet, and interactive environments support children's development (Kytta, 2003; Moore, 1986; Reifel & Yeatman, 1993). Conversely, environmental characteristics that can delay children's development are noise, lack of space, conflict, or use of force (Kytta, 2003; Van den Berg, Hartig, & Staats, 2007; Zimring & Barnes, 1987).

Another aspect of an environment associated with children's development is its degree of excitement for children. Indeed, children's physiological development develops through sensory and physical functions (Woolley & Lowe, 2012). Piaget (1963) and Olds (1987) describe ideal play environments as spaces that are aesthetically pleasing and stimulate all senses (e.g., shapes, colors, patterns, views, light gradation of music, voices, fresh flowers, opportunities to taste and touch). These environments encourage children to move and exercise. This study recognizes the importance of built environment attributes for children's experience, development, and play motivation.

The effects of environmental attributes on children's play need to be evaluated (Pack & Michael, 1995). Meanwhile, research highlights the value of design on creating and strengthening hands-on, simulative, and engaging environments for early childhood learning and development (Beckwith, 1982; Matthews, 1985; Moore, 1985). Building on literature, this study explores the physical environment of outdoor preschool settings and identify behavior settings and elements that contribute to or hinder children's cognitive play behaviors. The following section reviews studies that evaluate the importance of the outdoor play environments for play motivation.

### **2.1.3 The physical qualities of outdoor play environments and children's play.**

The dangers of urban life led to the design of particular spaces for children's play, termed "playgrounds" (Hart, 2002). Playgrounds are important for children's development as they associate with their play behavior (Monore, 1985). Children prefer playgrounds that are more challenging and complicated (Titman 1994). Few studies evaluate various design features within play environments and children's play behavior. For instance, Bruya (1985) compared children's play behavior while engaging with traditional and contemporary play structures. The random sample included 58 three-to-five-year-olds. The researcher measured the time spent on each structure, while coding for children's motor patterns (standing, sitting, etc.). The results show the complexity of play opportunities develop broader ranges of behavioral play patterns. The study found that the contemporary play structures stimulated four-year-olds' play behavior, increased peer interaction, and reduced adult contact.

After comparing traditional, contemporary, and adventure play environments, Frost and Campbell (1977) realized that children display a wider range of play behavior within adventure playgrounds due in to their varied play opportunities. Children mostly engage in gross motor play on creative and traditional playgrounds. The researchers assume that children's play type correlates with the characteristics of the equipment. Frost and Campbell (1985) later evaluated equipment choices of 45 second-grade children. The study compared a traditional playground with a lack of equipment variety and a creative playground comprised of various complex play equipment. The results show that children's use of play equipment increased in creative playgrounds. The researchers also recognized that children favor action-oriented equipment, such as swings, seesaw, and merry-go-around. Additionally, play features that support complex dramatic plays intrigue children, compared to single-function equipment.

Hayward, Rothenberg, and Beasley (1974) explored the opinion of six-to-thirteen-year-old children about their outdoor learning environment. The researchers collected data about children's characteristics, group size, pattern of equipment use, and behavior in each play environment. Interviews with children enabled researchers to understand children's impressions of the play spaces and preferred activities. The results indicate that contemporary playgrounds have the highest number of users and median attendance. Additionally, preschool children are the dominant users of contemporary playgrounds (35.23%). In this study, children preferred compound play structures than isolated items. They also favored the playhouses and buildings within the adventure playground.

Steele and Nauman (1985) analyzed how infants of different ages respond to various play elements within outdoor learning environment settings. Thirteen infants and toddlers participated in the study. The results revealed that equipment designed to correspond with the physical size of various children stimulate play in children with different motor abilities. Complex play equipment attracted older children and simultaneously allowed several children to play differently.

Sandseter (2009) compared the play behavior of 29 four-to-five-year-olds in traditional and natural outdoor preschool settings. Data collection involved videotaping the children's behavior and conducting interviews with children. The results show the natural outdoor learning environment provides riskier play than traditional outdoor preschool settings, but children prefer riskier and thrilling play opportunities, based on their responses during the interviews. Children's play abilities increased in natural preschool environments, as opposed to traditional playgrounds.

Barbour (1999) explored how the outdoor play environment's characteristics associate with children's play behaviors. The study involved eight second-grade children with varying competence levels. The researcher purposefully selected playgrounds with difference design approaches. The traditional playground focused on exercise play, while the natural play environment offered various play opportunities. The result shows a relationship between the physical characteristics of the playgrounds, children's peer relationships, and their physical skill development. The variety of equipment and design allowed children with various abilities to participate in different activities and the less physically able children to develop their motor skills. Reviewing these studies demonstrates how different features and elements within the play environments hinder or encourage children's development and play behavior. These studies stress the value of various play opportunities for children. Thus, it is necessary for designers to propose design suggestions that encourage children's development while realizing the play value of various physical environment features. The next section examines studies exploring the value of natural outdoor play environments for children's development.

#### **2.1.4 Natural learning environments and children's development.**

Natural environments heighten healthy behaviors by providing opportunities for exercising, socializing, and relaxing (Corraliza, Collado & Bethelmy, 2011; Van den Berg et al., 2007; Wells & Evans, 2003). Research indicates a positive relationship between child development and contact with nature (Berto, 2005; Wells & Evans, 2003). Many outdoor educational environments have recently incorporated hands-on contact with nature in their curricula to create sustainable and environmental education for children (Louv, 2005). Supplementing outdoor learning environments with nature provides exploratory opportunities for children to interpret the environment (Moore & Wong, 1997). This approach develops a sense of ownership between children and nature, while increasing their environmental awareness (Maller & Townsend, 2012).

Natural learning environments are outdoor spaces that incorporate natural escapes, such as forests, ponds, prairies, mazes, rocks, or gardens (Moore & Marcus, 2008; Moore & Wong, 2008). These environments create opportunities for creativity and exploration through natural features (Freuder, 2006). Indeed, natural learning environments increase the aesthetic value and habitat restoration of the environment, while developing a sense of affinity towards nature (Louv, 2005; Moore & Wong, 1997; Rivkin, 1997). Natural learning environments offer learning opportunities to interpret cause and effect about children's surroundings (Moore & Wong, 1997). Daily nature-based occupations within outdoor learning environments increase children's

awareness towards nature (Stolzelzle, Midden, & Chambers, 2000; Nagata & Raid, 1997). These interactions provide opportunities for joyful, interactive learning (Somerset, Ball, Flett, & Geisman, 2005). Freuder (2006) describes how natural learning opportunities increase children's environmental awareness and sense of stewardship toward natural environments. Literature has identified many learning benefits through contact with nature, including language and cooperation improvement (Johnson, 2007).

In natural learning environments, children's learning develops through interacting environmental features for educational purposes and the children's participation (Dyment, 2005). For example, Leiberman and Hoody (1998) found combining hands-on opportunities with the school's formal curriculum associated with children's improvement in tests and enhanced concentration levels. This approach motivated children to learn and understand the observed occurrences. Indeed, natural outdoor learning environments develop children's sense of responsibility, patience level, and appreciation towards nature (Bell & Dyment, 2008).

Fjortoft and Sageie (2000) found that children love to explore and experience the challenges that natural environments provide. Another study by Heseltine & Holborn (1988) pointed out how natural playgrounds afford manipulation, exploration, experimenting with loose parts, and interacting with other children. The intent of natural playgrounds is to reconnect children to nature while providing various open-ended play options that stimulate creativity and imagination in children. For instance, Fjortoft and Sageie (2000) found that natural features stimulated different play types. The study indicates that children understand how natural features provide diverse functions. Nevertheless, contact opportunities with natural elements in outdoor playgrounds are decreasing for children (Rivkin, 1990; White, 2004).

The review of these studies underscores the importance of natural outdoor environments for children's development and health. The literature suggests the play value of natural features through their diverse and interactive qualities. However, there is a lack of knowledge about the natural learning environments' play value for children. There is a need for research that explores the value of natural features within educational settings and how nature stimulates different play behaviors. The following section reviews how the outdoor physical environment can motivate children's cognitive play behaviors.

## **2.2 Children's Cognitive Development**

Piaget was a psychologist who studied cognitive play development for more than 50 years. From his observations of children's play, Piaget developed a theory for children's cognitive development. Piaget (1951) believed children's interaction and play complexity influences their cognitive development. Piaget considered children's cognitive development as a self-motivated process. Within this process, children interact with the stimuli, gradually building their understanding through a process of accommodation and assimilation (Bradley, 1985; Piaget, 1962). Piaget defines accommodation as what the child notices, while assimilation evaluates how children interpret the environment. Each structure resulted from the growth of a preceding one through constant accommodation and assimilation (Cornett, 1998; Flavell, 1996; Piaget, 1951; Piaget, 1963).

Additionally, Vygotsky (1967) argued that children learn through play and interaction with peers or adults. He also claimed that when children use objects in their play to represent other objects, they are developing abstract thought. In this way, play allows children to separate the object from its associated meaning. The four types of cognitive play behaviors developed by Smilansky (1968) are in a relatively fixed sequence, with functional play appearing first and games with rules appearing last (Rubin, Maioni, & Hornung, 1976).

Siegler (1989) connects children's cognitive development to mental processes supporting their ability to manage information. Cognitive development is associated with children's interest and knowledge about themselves or environment (Cornett, 1998; Flavell, 1996; Ozdemir & Yilmaz, 2008). Children gain meaningful evidence from the environment and transform or represent that evidence based on their cognitive development (Flavell, 1992). Cognition is a complex concept, usually referring to knowledge of the physical world or particular skills (Fischer, 1980; Flavell, 1992).

Developmental experts cite factors that advance a child's cognitive development. Research indicates that basic processes, strategies, meta-cognitions, and content knowledge improve children's cognitive development (Brown & DeLoache's, 1978; Siegler, 1991). Flavell (1985) proposes seven cognitive development modes during middle childhood and adolescence: a) information-processing capacity development, b) domain-specific knowledge development, c) concrete and formal processes, d) engaging in quantitative mental procedures, e) the acquirement to have a 'game' thinking intelligence, f) the acquisition of meta-cognitive awareness and practice, and g) development in cognitive abilities.

Some studies examine the universal likenesses and differences among children in cognitive development (Maccoby, 1984; Wohlwill, 1973). Several studies investigated how children's cognitive development links to their neuropsychology conditions (Hillman, Castelli, & Buck, 2005; Llamas & Diamond, 1991; McClelland, 1991), physical activity (Bailey, 2006; Hills, 1998; Shepherd, 1997), or emotional-social systems (Hillman et al., 2005; Taras, 2005; Trost, 2007; Zigler & Bishop, 2006). Other studies evaluated how children's cognitive development correlates with their creativity (Kogan, 1983) or infancy cognition levels (Bornstein & Sigman, 1986).

Ploimn & Rende (1991) suggest an association between genetic differences and diverse cognitive development levels. Their study indicates that children from the same family, yet raised in dissimilar environments, possess different abilities. Conversely, Feuerstein (1979) suggests that poor cognitive development in children does not result from genetics but rather from a lack of learning experiences. Such literature underscores the value of simulative learning opportunities for children in their associated spaces. The following sections describe studies exploring the relationship between children's cognitive play behaviors and their cognitive development.

### **2.2.1 Children's cognitive play behaviors and cognitive development levels.**

The complex nature of cognitive abilities has resulted in the development of many different tests to measure this construct. During the early 1900s, Alfred Binet proposed the first test to measure intelligence levels of children, focusing on the reasoning and thinking abilities. The test scores identified children who required special education or functioned better in classes (Binet, Simon, & Town, 1913; Weinberg, 1989). After some years, Binet and Simon (1916) suggested the "Binet-Simon" test to recognize students requiring special education. Later that year, Lewis Terman (1916) proposed the popular "Stanford-Binet" test that defined intelligence based on four different factors: verbal reasoning, quantitative reasoning, abstract reasoning, and short-term memory. This test evolved into a comprehensive score termed as "intelligence quotient," or "IQ." David Wechsler (1974) developed another IQ test for children, the "Wechsler Intelligence Scale for Children (WISC)." This test measures general intelligence, verbal IQ score, and performance IQ.

Researchers continued to develop other standardized tests as traditional methods for evaluating children's cognitive development, such as the Battelle Developmental Inventory (BDI). The BDI approximates a child's developmental functioning by evaluating several significant domains (personal-social, adaptive, motor, communication, and cognitive) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984). This test also proposes a total developmental score for the age range of birth to 8 years (Glascoe & Byrne, 1993). Traditional assessments are norm-referenced or criterion-referenced measurements that measure children's affection, intellect, and achievement domains (Nuttall et al., 1992). These assessments define the problem for the children, and they are encouraged to complete the task through concentration (Belsky & Most, 1981).

With research increasingly supporting the value of play as a development assessment tool (Cornett, 1998), studies shifted to focusing on how various facets of play explain children's skills and development (Neisworth & Bagnato, 1988). Apart from traditional assessments, researchers now employ other approaches for evaluating children's development described as play observation tools, such as Transdisciplinary Play-based Assessment (TPBA), Play Observation Scale (POS), or Systems for Observing Play and Leisure in Youth (SOPLAY). Play behavior assessments are procedures in which trained professionals observe play behaviors to evaluate an individual's psychosocial performance (Schaefer et al., 1991). Play observation assessments recognize play behaviors as signs for evaluating children's cognitive development, motor skills, and problem solving abilities (Cornett, 1998). These assessments diagnose, evaluate, or predict future behavior (Fewell & Kaminski, 1988; Katz, 1989; Linder, 1993; Schaefer, Gitlin, & Sandgrund, 1991). The behavioral assessments also offer data that is useful for developing a treatment plan or evaluating the context (Cornett, 1998).

Investigators trace children's cognitive development through play behavior observation assessments (Belsky & Most, 1981; Cornett, 1998; Farmer-Dougan & Kazuba, 1999; Malone, Stoneman, & Langone, 1994). For example, Burdette and Whitaker (2005) discuss how problem solving during play develops executive functioning. This executive functioning "integrates attention and other cognitive functions such as planning,

organizing, sequencing, and decision making” (p. 48). Research on cognitive play behaviors usually employs Piaget or Smilansky’s classification (Campbell & Frost, 1985; Pack & Michael, 1995). Such studies apply cognitive play behavior categories for evaluating age trends, play behavior association, and social-cognitive development (Connolly & Doyle, 1984; Guralnick, Connor, Neville, & Hammond, 2006; Kerbel, Grunwell, & Grundy, 1996; Pack & Michael, 1995; Rubin 1982; Rubin, Fein, & Vanderberg, 1983; Rubin, Watson, & Jambor, 1978).

Behavioral observation tools replace traditional cognitive development testing as a means of understanding children’s natural behavior within outdoor settings. Some researchers consider behavioral assessment a more reliable and valid approach for evaluating children’s social and cognitive development (Nuttall, Romero, & Kalesnik, 1992; Linder, 1993). This reliability may associate with children’s engagement in diverse behaviors within familiar environments, as compared to laboratory settings (Cornett, 1998; Farmer-Dougan, & Kaszuba, 1999; Linder, 1993). Noting such behaviors increase their ecological validity, since the gathered data indicates environmental, personal, and behavioral causes (Cornett, 1998). Cornett (1998) further states that traditional assessments assume all children follow the same systematic sequence of development. However, children with disabilities may not gain the same skills as a regular child (Cornett, 1998). By recognizing different circumstances and characteristics, the behavioral observational tool is more valid for evaluating children’s cognitive play behaviors. The following sections describe literature that evaluated the validity of this observational tool for estimating children’s cognitive development.

### **2.2.2 Cognitive play behavior categories.**

As previously described, cognitive play behaviors have a hierarchal sequence. In other words, children improve their cognitive development when they engage in games with rules (Gravey, 1978). Researchers classify cognitive play behaviors as 1) functional, 2) constructive, 3) exploratory, 4) dramatic, and 5) games with rules (Guralnick, et al. 2006; Rubin, 2001). This section explains the literature suggesting significant correlations of each cognitive play behaviors to children’s cognitive development.

**1) Functional play behavior:** According to Piaget (1962), functional play behavior connects with the child’s learning about the environment through repeated behaviors. Functional play incorporates muscles and brain performance, thus developing children’s fine and motor abilities (Wardle, 2000). This play behavior recognizes repeated actions that may not involve objects (Reifel & Yeatman, 1993; Rubin, 2001). While engaged in this behavior, the child focuses on bodily coordination, sensory-motor balance, and spontaneous behavior (Bjorklund & Brown, 1998; Cornett, 1998; Williams, 1986), which, in turn, develops their attention spans (Pellegrini & Smith, 1998b). Through challenging experiences, children gain a sense of control and expertise that cultivates their early cognitive development (Jennings et al., 1979; Yarrow, MacTurk, Vietze, McCarthy, Klein, & McQuiston, 1984). For example, Malone et al. (1994) recognized that children’s non-play

and functional play behaviors associate with the child's cognitive, receptive, and expressive interaction development stage.

**2) Constructive play behavior:** Constructive play happens when the child links previous information from functional play to manipulate or to create objects towards a direct goal (Cornett, 1998; Johnson, Christie, & Wardle, 2005; Linder, 1993; Reifel & Yeatman, 1993; Rubin, 2001). Constructive play develops children's learning about the physical environment qualities through manipulation (Reifel & Yeatman, 1993; Wardle, 2000; Woolley & Lowe, 2012).

Researchers believe the variety of experiences in constructive play associates with children's cognitive development (Miyakawa, Kamii, & Nagahiro, 2005; Moore, 1985; Pickett, 1998). This may happen when children physically build connections between mental images and objects to develop their creativity and visual symbolization (Pickett, 1998). By creating new linkages, children express a lifelong process of accommodation and improvisation (Bowman & Moore, 2006). Positive learning, such as enthusiasm, resilience, creativity, and task completion, forms a child-focused wisdom that incorporates constructive play (Day, 2006). Interestingly, children become more attracted to constructive play as they grow older, accounting for more than 50% of their preschool play activity (Rubin et al., 1983).

**3) Exploratory play behavior:** Piaget (1962) explains how infants explore their surroundings and manipulate senses to gain knowledge of different environments, based on their intelligence stage. Most importantly, researchers consider children's exploratory play a symbol of their current cognitive functioning, mastery levels, and environmental learning (Belsky & Most, 1981; Jennings, et al. 1979). For instance, a few studies examined infants' exploratory play behavior and children's developmental changes through interacting with play props as a symbol of cognitive development (Fein & Apfe, 1979; McCall, 1974; Zelazo, 1980). Exploratory play provides children opportunities for developing routines, skills, and strategies that later incorporate into complex and goal-oriented behaviors (Belsky & Most, 1981; Weisler & McCall, 1976). The child can explore a manipulative object, and think about what they can create (Belsky & Most, 1981; Weisler & McCall, 1976). Through exploring the environment, children recognize their physical senses and progress towards a more social play involving complex thoughts (Cornett, 1998). Exploration can involve whole-body movement, supporting children's physical, social, and cognitive development (Fjortoft & Sageie, 2000; Pellegrini, Horvat, & Huberty, 1998).

**4) Dramatic play behavior:** Dramatic play correlates with detached meaning from immediate representation of objects, people, and circumstances that isolate play from its context (Bates, 1979; Belsky & Most, 1981; Reifel & Yeatman, 1993; Rubin, 2001). Dramatic play is the discovery of new situations and characters through employing language, ideas, symbols, gestures, and emotions (Vygotsky, 1967; Wardle, 2000) to represent objects or words (Cornett, 1998). This enables children to practice future roles, symbolic actions, and group play, thus developing their cognitive and social abilities (Berk et al., 2006; Chia, 1985;

Weinstein, 1987). Dramatic play improves children's abstract thinking, problem solving (Christie, 1983; Van Hoorn, Monighan-Nourot, Scales, & Alward, 1993; Weinstein, 1987), language development (Bergen, 2002; Cornett, 1998; Linder, 1999), self-regulation growth (Berk et al., 2006), literacy and numeracy development (Zigler & Bishop, 2006; Weinstein, 1987), attention span (Berk et al., 2006), and creativity skills (Weinstein, 1987).

**5) Games with rules:** According to Piaget (1962), games with rules represent the final stage of development in which specific rules with associated meanings involve play behavior (Reifel & Yeatman, 1993; Rubin, 2001; Winter, 1985). Progression of symbolic play is necessary for children's learning and growth, reflected in participating in games with rules (Rubin, 2001). Researchers connect games with rules with children's cognitive development (Blatchford, Baines, & Pellegrini, 2003). For example, Zigler and Bishop-Josef (2006) explain how children's rules adoption during play develops their self-regulation abilities. Through games such as football, chasing, seeking, and catching, children grasp complex rules that involve social and physical skills (Blatchford, et al., 2003; Opie & Opie, 1969).

Children may coordinate their ideas with peers during games with rules (Blatchford et al., 2003). In fact, games with rules behavior is a cooperative form of play (Rubin, et al. 1976), training children to react in social circumstances that rules and borders govern (Moore & Wong, 1997; Woolley & Lowe, 2012). While playing games with rules, children propose orders, discuss games procedures with peers, and transit from pre-operational to concrete operational thoughts (Cornett, 1998). For example, the study by Rubin colleagues (1983) reveals that games with rules behavior is more obvious in six-to-seven-year-olds. In a similar study, Pack and Michael (1995) suggest games with rules behaviors are more typical in older children between 7-to-11 years old. These results indicate that children need certain levels of maturation and time to acquire the rules. These studies support the validity of the cognitive play behavior categories for evaluating children's cognitive development. The next section describes literature exploring the association between children's play behaviors and their development.

### **2.2.3 Validity of the play behavior assessment.**

Are children's cognitive play behaviors, identified through play observation tools such as POS, associated with children's cognitive development? After Piaget, children's cognitive development research progressed in certain ways. As Flavell (1992) points out, the discovery of novel methods including observational tools raised disputes of Piagetian theory and raised new assumptions about young children's development. Such innovative data both confirms and refutes the main features of Piagetian theory, such as the general stages of cognitive development. Additionally, scientists understand more about acquisitions that Piaget had neglected. Scientists agree that applying play observation tools as a means of assessing children's development should ideally to settle arguments between researchers that may not be scientifically valid (Cornett, 1998; Farmer-Dougan, & Kaszuba, 1999; Kratochwill & Shapiro, 1988). In fact, research has not

completely validated cognitive play behavior assessments as indicators of children's cognitive development (Malone et al., 1994).

There are limited studies associated the sequence of cognitive play behaviors and children's developmental age (Borman & Kurdek, 1987; Malone et al., 1994). For example, the study by Borman & Kurdek (1987) explores the play behaviors of second and fifth grade children during school recess. A follow up study one year later assessed children's logical reasoning, interpersonal understanding, and interpretation of the game rules. Activity logs indicate the most frequent actions during unsupervised recess, including hopscotch, freeze tag, baseball, kickball, football, and watching others. Children selected activity logs referencing their play engagement in the 20-minute recess time. If the activity logs were not sufficient, children drew their activity on a blank frame. The results showed that grade and gender affect the complexity of the activities. Older children and boys engage in games that are more complex and spend more time playing kickball or football; meanwhile, girls participate in hopscotch, bars, and jump rope activities. Game complexity positively associates with interpersonal understanding among girls.

Belsky and Most (1981) explore the validity of development progression from mediocre exploration to de-contextualized play. The researchers observed forty infants between the ages of 7 to 21 months playing with toys in their homes. Researchers watched the infants' play behaviors for a 12-level sequence of play development. The results reveal play behaviors wherein a child figures out appropriate and inappropriate relationships between objects before proceeding with dramatic play behavior. The empirical results of this study support the developmental sequence of early exploratory play. Using the POS scale, Rubin and Maioni (1975) demonstrate that preschool children engage more in functional and constructive play than in dramatic play and games with rules. The results indicate a positive correlation between children's dramatic play, spatial-relational abilities, and organization skills.

A few studies document the association between marked play behaviors with children's cognitive development (Belsky & Most, 1981; Cornett, 1998; Malone et al., 1994; Rubin, et al. 1976). These studies reveal children who engage in less complex play behaviors have lower social and cognitive skills (Rubin & Maioni, 1975; Connolly & Doyle, 1984; Farmer-Dougan & Kaszuba, 1999). For example, Kaszuba (1996) explored children's cognitive, social, and physical play behaviors and their cognitive and social development. The study positively associates the Battelle Developmental Inventory (BDI) results, the Social Skills Rating Scale Test (SSRST) results, and play observation tests.

Farmer-Dougan and Kaszuba (1999) evaluated the Play Observation System (POS) and the standardized cognitive and social skills assessment by observing 42 children in a local preschool setting for 10 minutes each. Play behaviors ranged from the lowest level of play (solitary-functional) to the highest (cooperative games). The researchers compared children's rated play behaviors with their BDI evaluation and

found that children with high BDI results engage in higher level of play behaviors (cooperative-constructive, associative-dramatic, etc.).

Likewise, the study by Malone et al., (1994) explored 22 preschool children aged 10 to 53 months with developmental delays. The researchers observed seven preschools during free play at home and in classrooms and used BDI measurements to evaluate children's cognitive and intellectual developmental stages within the cognitive and communication domains. Researchers videotaped the play behavior of each child during 30-minute play sessions in two visits. The researchers provided various toys for children, stimulating different play behaviors. The researchers used mutually exclusive codes for evaluating children's behavior, including functional, constructive, exploratory, pretend, game with rules, and non-play categories. The researchers then correlated BDI values with each play behavior. Their results support employing observation tools, as they drew an association between assessed developmental age and measured play behavior.

Pack and Michael's (1995) evaluated the social and cognitive play behavior of 30 kindergarten children. The study aimed to understand the association between play and development by comparing indoor and outdoor play. The research employed the POS categories for evaluating children's cognitive play. The researchers randomly selected each child's code sheet and observed that child for 15 seconds, eventually watching each child 10 times while he or she played both outdoors and indoors. The second method based on the same observation procedure. However, it also followed an interview with the children about cognitive aspects of their noted play behavior. For reliability issues, the three observers discussed the observation categories and individually collected data until they achieved 80% coder agreement. The results indicate that there are significant differences between functional play and dramatic play categories. Additionally, the research suggests less functional and more dramatic play with the observation-interview technique.

This review of research supports the validity of play observation tools, such as POS, for evaluating cognitive play behaviors. The studies link children's cognitive play behaviors to their cognitive functioning within outdoor preschool environments. To promote learning environments, the POS tool may help recognize physical features within the outdoor environment that stimulate children's cognitive play behaviors. In addition, combining observational assessment tools with interviews only intensifies the validity of the results. The next section describes research evaluating how cognitive play behaviors correlate with the characteristics of the physical environment.

#### **2.2.4 Cognitive play behaviors and the physical environment.**

Literature suggests that specific elements in the outdoor space enhance children's cognitive, social, and physical abilities (Escalante, Garcia-Hermoso, Backx, & Saavedra, 2013; Hart, 1979; Moore, 1985; Stine, 1997; Zigler & Bishop, 2006). Nevertheless, few studies have explored the impact of a child's acquaintance with the environment and degree of development (Pack & Michael, 1995; Tobias, 1989). Several studies have examined how the built environment can stimulate and promote children's physical and social development (Barbour,

1999; Fjortoft & Sageie, 2000; Ozdemir & Yilmaz, 2008; Pellegrini & Smith, 1998b; Rigters, Faircolough, & Stratton, 2010; Woolley & Lowe, 2012). Aside from environmental characteristics, children's cognitive levels may change their play behavior (Jennings et al., 1979; Pellegrini & Smith, 1998b; Piaget, 1963; Schaefer et al., 1991).

While observation can measure social and physical development, researchers can determine the cognitive play behavior type and the child's purpose from such observation (Fischer, 1980; Pack & Michael, 1995). Few studies thus far have explored the connection between the qualities of the physical environment and children's cognitive development. Most cognitive development facts are without scientific qualifications (Flavell, 1992). This results from the complexity of measuring cognitive development through observation. Current studies are still unable to measure child's knowledge or skills regardless of the different methods (Perner, 1991; Flavell, 1985). Therefore, further research needs to extend knowledge in this domain of environment and behavior research.

Some studies employed cognitive play behavior categories to explore children's outdoor experience (Henniger, 1985). One such study is that of Campbell & Frost (1985), who examined the cognitive play behaviors of 45 second grade students in an elementary school. The school outdoor space included both a traditional and a creative playground. The study employed Smilansky's (1968) cognitive play behaviors as researchers watched each child during free play on both playgrounds, each for one day in 10 weeks. The results signaled that functional play was stimulated mostly in the traditional playground through play equipment while children played parallel to each other. The creative playground, conversely, promoted all types of cognitive and social play.

Kontos and Hsu Loraine's (1994) research compared childcare centers to family daycares for their potential in influencing children's social and cognitive development. The sample included 170 children aged 30 to 60 months, in which 60 children were from centers and 57 were from family daycare homes. During the first and second visit, the researchers noted for children's play, coding the caregiver's interaction toward children as ignoring, routine, minimal, simple, elaborate, and intense. The cognitive play behaviors included no cognitive play, "functional play with active use of objects, functional play with passive use of objects, functional play with active use of objects, constructive play, and dramatic play" (p. 396). The results suggest that daycare centers are more helpful for children's cognitive development than family daycare centers.

Table 1 displays the summary of this literature review on cognitive play behavior within outdoor environments. The table indicates the applied methodological approaches and associating cognitive play behavior and environmental features.

Table 1. Literature review of children's cognitive play behavior in outdoor environments.

	<b>Researcher</b>	<b>Setting</b>	<b>N</b>	<b>Age</b>	<b>Instrument</b>	<b>Purpose</b>	<b>Tactic</b>
1	Campbell and Frost (1985)	Outdoor learning environment	45	Second grade	Smilansky (1968) functional and cognitive play behavior	Contrasting traditional and creative outdoor learning environment	Observation
2	Sanders and Harper (1976)	University's nursery	42	3 – 5 years	Fantasy play behavior codes	Outdoor and indoor play gender	Time sampled observation of free play
3	Henniger (1985)	Preschool	28	3 – 5 years	Smilansky (1968) cognitive play categories and Parten's (1932) social play categories	Outdoor and indoor play	Observation
4	Pack and Michael (1995)	Kindergarten	30	5 years	Rubin (2001) categories of social and cognitive play behavior	Outdoor and indoor play	Observation
5	Kontos and Hsu (1994)	Childcare centers and family child care	170	30 – 60 months	Smilansky's cognitive play scale and Howes and Stewart's play with objects scale	Comparing childcare centers and family child care	Observation
6	Moore (1985)	Inner city neighborhood that included adventure outdoor learning environment	6000	3 years and 6 months to 14 years	Designed instrument	Comparing cognitive play behavior in adventure outdoor learning environments and neighborhood setting	Behavior mapping
7	Winter (1985)	Outdoor Preschool	20	24 – 34 months	Designed instrument based on Piaget categories	Equipment choices and cognitive and social play behavior	Observation
8	Hart and Sheehan (1986)	Outdoor preschool	40	36 - 54 months	Piaget (1962) and Smilansky	Traditional and contemporary outdoor learning environments on physical, social, and cognitive play	Random Video tapping

The table suggests that most studies applied Smilansky and Piaget's instruments for coding cognitive play behaviors, indicating the instruments' appropriateness for current research. The table also points to the lack of empirical research for understanding the cognitive play behavior affordances of outdoor learning environments. Additionally, most of the studies were inadequate in correlating children's play behavior to outdoor play environment's physical qualities. That is, applying merely observation techniques for data collection reveals the lack of literature associating individual behaviors to environment location and features. The numbers of participants in these studies range from 20 to 50 children, which raises questions of generalization. Finally, these studies lack combined qualitative data collection techniques from young children, to better understand their opinions and voices. Thus, this study intends to complement previous literature by combining observational and qualitative methods to understand how outdoor preschool characteristics associate with cognitive play behaviors.

### **2.3 Conclusion**

Education's goal is to provide each child with unique characteristics and training services based on their needs (Cornett, 1998). Previous studies accentuate the value of outdoor environments for children's play, learning, and development. Natural environments offer various complex and diverse elements for children that motivate play. Natural outdoor environments in preschool settings can increase children's contact with nature, while providing a variety of explorative, constructive, and hands-on learning opportunities. Play is essential for children's development and understanding of the world, as it develops children's physical, cognitive, and social skills. Through watching children's play behavior, researchers identify each child's developmental level. Researchers classify cognitive play behaviors into five hierarchy levels: functional, constructive, exploratory, dramatic, and games with rules. This review showed that the POS scale is a valid tool for evaluating children's cognitive development evaluation. While there are notable studies of children's physical and social play related to environmental features, research on cognitive play behavior is lacking. Few studies explored four-to-five-year-old children's cognitive play behavior and the outdoor physical characteristics. To extend our knowledge, the current study aims to explore how children's contact with the physical qualities of the outdoor learning environment links to their cognitive play behaviors. The following chapter explains the theoretical perspectives directing the assumptions and critical thinking throughout this research.

## CHAPTER 3: THEORETICAL PERSPECTIVE

Theoretical perspectives direct research assumptions and provide frameworks for understanding the observed phenomena (Groat & Wang, 2002). The theoretical perspective of this research finds its roots in Bronfenbrenner's (1974) theory of ecological development, Gibson's (1986) theory of affordance, and Barker's (1976) concept of behavior settings. Based on an ecological developmental perspective, this study considers how children's experiences in the outdoor preschool environment associate with the qualities of the proximal environment, the teacher's perspectives, and the preschool's culture. The affordance theory offers a methodological tool for identifying the functional properties of the outdoor preschool environment. In this study, the affordance concept identifies elements or behavior settings that encourage cognitive play behaviors. The behavior setting theory divides the outdoor learning environment into its functional parts (Moore & Cosco, 2010). This study employs the behavior-setting concept as the unit of analysis, dividing and comparing functional parts of the site. Furthermore, this research recognizes behavior settings as units incorporating various elements that afford cognitive plays. This chapter reviews these theoretical perspectives' backgrounds and assumptions. Additionally, the chapter evaluates how the literature employed these theoretical perspectives in prior environment and behavior research. The following section explains Bronfenbrenner's ecological development theory as one that stresses the importance of recognizing different ecological systems in order to understand human development.

### 3.1 Bronfenbrenner's Ecological Developmental Psychology

Developmental experts consider the link between an individual's psychological development, the features of the interacting environment, and socio-cultural context (Bronfenbrenner, 1979). Bronfenbrenner (1993) classifies four factors for individual psychological development. The first characteristic is the personal initiatives that promote or limit interactions with the environment. These control others' reactions toward an individual. The second factor associates with sensitivity toward the context's physical and social features. Bronfenbrenner considers the third characteristic to be the desire for shaping, altering, or recreating the environmental features. Finally, Bronfenbrenner recognizes individual leadership based on an individual's belief in developing a vibrant connection with the environment.

Bronfenbrenner (1974) defines children's ecology as having two layers. The first layer is the immediate setting containing the child, school, playground, etc. Immediate settings have three qualities, including the design of the physical space and applied materials, the interactions and duties toward the child, and the engaged actions in settings with or without the child. The surrounding layer is the second layer of a child's ecology. This layer wraps the immediate setting, changing and regulating the immediate settings' events. This layer consists of geographical-physical qualities and institutional-social systems (social services, etc.). The

surrounding layer embraces systems that indirectly alter children's life, such as their location, transportation type, or parental working hours.

Bronfenbrenner (1979) recognizes the ecological environment as a set of nested structures termed Microsystems, Mesosystems, Exosystems, and Macrosystems. The environment model embraces the developing individual from the Microsystem to the Macrosystem. The nearest environmental system to the individual's life has the maximum interaction with one's development, yet there are non-stop interactions between all four environmental systems.

The Microsystem, or proximal environment, is the closest layer to the developing person and contains the structures in which the developing person has direct contact. Bronfenbrenner (1997) describes Microsystem as a "pattern of activities, social roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical, social, and symbolic features that invite, allow, or inhibit engagement in sustained, progressively more complex interaction with, and activity in, the immediate environment" (p. 39). Bronfenbrenner (1993) suggests evaluating the characteristics of the environment in various levels, including the Microsystem, which for a child is usually the home, school, or daycare center. Based on the ecological system theory, several studies evaluate how Microsystems, such as the family and classroom, may predict a child's developmental patterns (Bronfenbrenner & Morris, 1998; Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Feldman & Wentzel, 1990; Ladd, 1990; Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, Kagan, et al. 2001).

The Mesosystem connects the Microsystem structures for the developing individual (Bronfenbrenner, 1997). A Mesosystem is a system of Microsystems, and it associates with the processes between two or more settings that contain the developing person. For example, the culture of a preschool is a Mesosystem; it is important to a child's development, but it can be complicated in its effect on the child. The Exosystem defines the larger social environment in which the developing individual may indirectly interact. Exosystems are connections and processes between two or more settings. Indirect incidents may alter processes of immediate settings where the developing person lives. Several studies have evaluated Exosystems associated with children's health or development, such as parents' workplaces (Eckenrode & Gore, 1990; Frone, Russell, & Barnes, 1996; Rosenzweig, Brenna, & Ogilvie, 2002), neighborhood-community context (Brooks-Gunn, Duncan, & Aber, 1997; Gephart, 1997; Brooks-Gunn, Duncan, & Maritato, 1997; Holt, Spence, Sehn, & Cutumisu, 2008; Pence, 1988), or the relation between school and neighborhood community (Arum, 2000; Bowen & Bowen, 1999; McDonald, Billingham, Conrad, Morgan, & Payton, 1997; Smith, Connell, Wright, Sizer, Norman, Hurley, et al., 1997).

Finally, the Macrosystem includes the Microsystem, Mesosystem, and Exosystem, knitting together the environment's cultures, customs, life styles, hazards, and knowledge (Bronfenbrenner, 1997). Macrosystems

are models in which culture, beliefs, and customs transform Microsystems. How social and psychological levels within the Macrosystem modify Microsystem processes needs to be identified (Bronfenbrenner, 1986, 1993).

The interactions between the child and context shape patterns and relationships that correlate with the child's development over time (Rimm-Kaufman & Pianta, 2000). Regular and potent relationships between the child and context enhance the child's development (Bronfenbrenner, 1986; Duncan & Raudenbush, 1999). These types of relationships may be useful in directing purposefully designed environments that aid in children's development (Rimm-Kaufman & Pianta, 2000). The following paragraphs explain research examples applying Bronfenbrenner's concept for evaluating child-environment interactions.

### **3.1.1 Previous application of the ecological development theory.**

Several studies have employed Bronfenbrenner's ecological development theory to understand how the physical environment or social-cultural context can correlate to children's development. For instance, Burchinal et al. (2002) explore how family beliefs and child-teacher relationships can predict children's academic competence within diverse social and ethnic backgrounds. Their research determined the language and academic skill of 511 children ranging from preschool to third grade, based on surveys of their parents and teachers. The results indicate that children with educated parents who have progressive parenting beliefs have better academic and practice results. The results also suggest that for African-American children, a child's relationship with the teacher influences development of language skills. Burchinal et al. (2002) highlight the value of social processes in classrooms for academic competence of children with academic problems. The study also confirms Bronfenbrenner's theory that developmental growth happens through the interaction of people and contexts overtime (Bronfenbrenner & Morris, 1998).

Similarly, Peisner-Feinberg et al. (2001) explored the cognitive, language and socio-emotional development of 733 children aged four to eight years and how such development responds to the quality of community childcare centers. The results indicate that childcare quality, especially in kindergarten and second grade, has a moderate long-term effect on a child's pattern of cognitive and socio-emotional development. Childhood practices and the child-teacher relationship directly influence children's language and academic skills. Recognized as a moderating variable, family characteristics suggest a strong positive correlation with childcare quality for children. The findings support the long-term effect of childcare quality on children's social and cognitive skills through elementary school. The study confirms the bio-ecological model of development, suggesting that children's experience in multiple environmental contexts can influence their development.

Tonyan and Howes (2003) evaluated the relationship between children's ethnicity, gender, age, and classroom quality and children's interactions and development in childcare contexts. The researchers first clustered 1052 randomly selected children based on the time spent on activities and interaction type. To validate the primary grouping, the research grouped 1142 additional children. The researchers assumed that culture and ethnicity differences affect children's activities and intended to analyze if difference in outermost layers

changes the innermost layers. The clustering suggested six patterns of use by children: creative, language arts, didactic, gross motor, high-level adult involvement, and individualized adult interactions. The analysis signals developmental and activity difference between children 10 to 36 months old, 37 months old, and older children. Indeed, daycare quality, ethnicity, and gender transform how children spend their time in daycare settings.

Kontos, Burchinal, Howes, Wisseh, and Galinsky (2002) analyzed how children's characteristics (age, gender, language type) and classroom qualities (activity, teacher involvement) associates with peers and object interactions. Two hundred twenty-five children with a mean age of 59.5 months old from 61 classrooms in 46 daycare centers in Hawaii participated in the study. Using eco-behavioral framework, the researchers evaluated ecological causes that correlate children's complex behaviors with objects and peers. According to their findings, English-speaking girls are involved more in complex interactions when teachers are not interfering. English-speaking children mostly engaged in complex interactions with objects and in creative activities. Islam (2008) applied Bronfenbrenner's ecological model in understanding how children's behavior, such as outdoor activity, associates with the built environment. Islam focused on how objective realities connect with children's outdoor activity and explored different levels of environmental influence on children's activity. Variables explored in the study include gender, connection between school and home, parent's employment status, or parent's workplace. The sample included 109 children between 10 and 12 years of age from Dhaka, Bangladesh. Parent's opinion, the child's gender, and the density of built forms emerged as significant predictors of children's independent mobility and their average time spent outdoors.

Such literature notes the value of child-environment, peer, teacher, and parental interactions for children's development. Hence, researchers must recognize the indirect and direct influence of context, culture, and child characteristics on children's health, development, and behavior. This study applied Bronfenbrenner's ecological model to understand how the preschool culture and teacher's viewpoint support cognitive play behaviors. Given the importance of the Microsystems for children's development, the following section describes Gibson's theory of affordances. This theory stresses the importance of spatial relationships and object possibilities for motivating certain behaviors in the environment.

### **3.2 Gibson's Theory of Affordance**

Ecological psychology recognizes an organism's qualities and its interrelations with habitats (Reed & Jones, 1979; Sallis, Owen, & Fisher, 2008). The goal of ecological psychology methods is to describe behavior and the laws of behavior (Wright, 1967). This theory insists on "objective" evaluation of psychological facts (Georgiou & Carspecken, 2002). In addition, ecological psychology explains the importance of quantitative research methods and behaviors (Georgiou & Carspecken, 2002; Sallis et al., 2008).

Gibson (1979) describes two different forms of awareness: direct perceptual cognition (knowledge *of* the environment) and indirect, representative, or transmitted cognition (knowledge *about* the environment). According to Gibson (1979), the direct perception of meanings is primary. Hence, the perceiver immediately

notes an object that supports a wanted activity. Recognized as the direct perception framework, this theoretical perspective considers the person-environment relationship to be direct and based on activity. Indirect perception develops and approves the information recognized through direct perception (Kyttä, 2003). However, indirect perception may not transfer all meanings perceived through direct perception (Reed, 1987).

Environmental psychologists link certain physical features of the environment with their functional properties (Clark & Uzzell, 2002). Gibson's theory of affordance leads to a useful method for exploring the functional qualities for different user groups (Clark & Uzzell, 2002; Kyttä, 2003). Gibson (1979) explains that when an environment's composition invariantly supports a specific behavior of a given organism, it *affords* that behavior. Therefore, affordances depend on the object and actor characteristics. The affordance theory concentrates on the interaction between objects and people who use them. Moreover, Gibson (1979) explains that natural assortments gradually harmonize the organisms' appearance to its associated affordances. This concept concerns different domains such as perception, action, metaphor, and learning (Gaver, 1991).

Rather than considering affordances as phenomenon, it is desirable to argue about various levels of affordances (Greeno, 1994). Kyttä (2003) sorted affordances as potential and actualized. Potential affordances refer to existing affordances, associated with the individual's characteristics. Actualized affordances consist of perceived, utilized, and shaped affordances. Perceiving and actualizing the affordances depends on an individual's features, the person's intent, and the social-cultural characteristics of the environment. In fact, perception connects the measure of facts and the perceiver who comprehends them (Cosco, 2006). Users can shape the environment to create new potential affordances for others (Heft, 1989). For instance, when a child mixes water with dirt in an environment, the resulting mud becomes a new potential affordance for future users. Potential, perceived, actualized, and shaped affordances therefore develop a cycle (Kyttä, 2003). This research explores the actualized cognitive play behavior affordances of potential outdoor environment characteristics, taking into account the children's skills. The following section reviews different studies that employed the theory of affordance to evaluate the functional properties of outdoor environments for children's development.

### **3.2.1 Previous applications of the affordance theory.**

Several studies have employed the affordance concept to explore children's use of outdoor environments. Heft (1988) was one of the first to employ Gibson's theory of affordance. Heft proposed an arrangement that described the functional properties of children's outdoor environments. This classification, for instance, points out how water affords swimming, fishing, and general water play. However, this arrangement neglected the affordances people can offer in children's environment.

Clark and Uzzell's (2002) research measured the affordances of two developmental needs, social interaction and retreat, in the home, neighborhood, school, and town centers. They explored the differences and likenesses among the affordances of these environments and examined the frequency of actualized affordances. The results indicate that homes afford retreat involving close friends and security, while the school,

neighborhood, and town center all afford social interaction. This study did not focus on the specific features of the environment that afford the social interaction and retreat.

Fjortoft and Sageie (2000) studied a natural forest outdoor learning environment that was part of a preschool setting. They suggest that natural features afford various play types in accordance with Gibson's theory (1986). Children are aware of the functions the natural environment offer; for instance, spaces with trees and shrubs afford symbolic and construction play behavior. The study recognizes a positive association between children's play and the diversity or physical characteristics of trees and shrubs. Table 2 presents how previous studies applied the affordance theory in exploring the relationships between youth and children and the environment.

Table 2. A review of research on outdoor environments' affordances for children.

	<b>Researcher</b>	<b>Setting</b>	<b>Sample size</b>	<b>Age</b>	<b>Instrument</b>	<b>Purpose</b>	<b>Data Collection Tactic</b>
1	Fjortoft and Sageie (2000)	Wild natural forest outdoor learning environment	46	5-7 years	Frost (1992) play categorization (functional, construction, and symbolic)	Relation between diversity and children's physical activity	GIS data points GPS
2	Cosco, 2006	Preschool outdoor learning environment	90	3-5 years	Physical activity coding in relation to setting	Play setting qualities and physical activity level	Behavior mapping
3	Clark and Uzzell (2000)	Home, neighborhood, school and town center	539	11-16 years	Likert scale of ranking of 34 affordances in each environment	Relation of each environment and Social interaction and retreat affordances	Questionnaire
4	Kytta (2002)	Cities, small towns, suburbs and rural village	98	8-9 years	Heft (1988) functional taxonomy Heft's sociality affordance and Andels (1984) activity categories	Level of perceived, utilized, and shaped affordances , and degree of affordances found	Interview
5	Kytta (2004)	8 Different neighborhood of different urbanization level	223	8-9 years	Scale developed by children's interview of 29 different affordance	Extent of actualized affordance and independent mobility	Interview Questionnaire

Table 2. Continued.

6	Woolley and John (2001)	Three urban centers	200	11-22 years	Not specified-	The affordances certain urban spaces provide for skateboarders	Questionnaire Interview
7	Korpela, Kytta and Hartig (2002)	Two city centers composed of parks, buildings, and residential services	55	8-9 or 12-13 years	Based on preliminary interviews and essay methods questionnaire was developed Some 5 point scales	Place preference in relation with and restorative and self-regulation	Open and close ended in a structured interview

This review highlights the efficiency of combining interviews, behavior mapping, and Geographic Information Systems (GIS) for evaluating play behavior affordances. The review also spotlights the lack of research for cognitive play behavior affordance within outdoor preschool settings among four-to-five-year-olds. In addition, little research applies the behavior mapping technique for understanding the affordances of outdoor environments. Thus, this study aims to extend previous knowledge on the cognitive play behavior affordances that outdoor preschool environments offer for young children. The following section explains Barker's concept of behavior settings that relate the built environment with the occurring behaviors.

### 3.3 Barker's Concept of Behavior Settings

Barker (1976) proposes the concept of behavior setting based on children's behavior during play. Recognizing behavior settings to have boundaries and locations in time and space and to include events and processes, Barker (1976) identifies behavior setting as subspaces of the physical environment that can predict behavioral affordance. Barker (1976) suggests that behavior settings have distinguishable spatial and temporal boundaries and recognized that behavior settings have constituents that perform independently of the adjoined eco-behavioral units. He explains that behavior settings are units of analysis for evaluating design policies. Behavior settings are ecological units that link the built environment and behavior (Cosco, Moore, & Islam, 2010; Moore & Cosco, 2007). Behavior settings include people, behaviors, and the physical parts of settings, distinguishing each functional part of the site (Cosco et al., 2010). Heft (1988) considers one's behaviors and environmental attributes to be immediately observable and perceived. He further explains that an individual acts in harmony with the perceived activities in the setting, contributing to the consistency of environment-behavior, or one that is "synomorphic."

Moore and Cosco (2007) state that behavior settings are ecological units consisting of individuals and events (people, objects, behavior) and active procedures (sound, shade, etc.). They further explain how performances in behavior settings are independent of adjoined eco-behavioral units. The researchers' own

application of behavior setting theory in their research offered an analytical tool for built environment assessment and future design development (Moore & Cosco, 2010).

Environmental design researchers in various fields have applied behavior setting theories to their research analysis. Behavior setting evaluation can help manage how researchers measure the level of use and develop future design tactics (Moore & Cosco, 2007; Moore & Cosco, 2010). This evaluation offers specific design implications that support certain behaviors (Moore & Cosco, 2010). Employing the behavior setting concept for evaluating cognitive play behavior affordances in preschool settings is critical for understanding how design affects children's developmental behavior. Building on this concept, this study divides outdoor learning environment into behavior settings. Subsequently, the study intends to compare the cognitive play behavior affordance of each setting. The next section reviews previous studies that employed the behavior settings concept as the unit of analysis for evaluating environmental and behavioral interactions.

### **3.3.1 Previous applications of the behavior setting concept.**

The behavior setting concept is critical for identifying environments based on a behavioral perspective (Cosco, 2006). Nevertheless, few researchers have applied the behavior setting concept for evaluating the functional properties of outdoor environments. The behavior setting concept compares different site layouts with their pattern of use or provided affordances. For example, Cosco and colleagues (2010) applied this concept to compare two daycare centers with relatively similar square footage and number of behavior settings, yet with different site layouts and behavior setting types. They divided behavior settings into dramatic play area, gathering, open area, pathway, play equipment, porch/transition, and sand play. The researchers applied a predefined observational system for coding children's physical activity to create behavior mappings of two childcare centers. Their findings reveal that children prefer specific behavior settings. Nonetheless, the centers were unique in the activity distribution of some settings. The play equipment area, open area, dramatic play setting, and looped pathway had the highest number of activities in one of the centers.

The behavior setting concept helps evaluate children's use and preference in the behavior settings of various environments. For instance, Moore and Cosco (2010) compared the amount of use in different settings of two childcare facilities. The same settings in both childcare centers had the highest amount of use. However, the centers differed with regard to activity distribution within the same setting. The results showed that 87% of activities occurred in three particular settings: open area, pathway, and dramatic play setting. Children's preference for particular behavior setting becomes evident when comparing behavior mapping results.

Researchers analyze behavior settings based on certain features to interpret children's behavior. To distinguish various activities in childcare settings, Gump and Sutton Smith (1955) identified behavior settings based on associated task-place qualities, enabling the researchers to understand children's use of place. The researchers coded activity settings based on children's interaction with places and props, describing the interactions as 1) simple-complex, 2) open-closed, 3) common-uncommon, 4) high or low arousal, and 5) risk

and daring. The simple-complex behavior settings explain how themes develop, as they recognize the increase in site complexity with props availability. Open activities are behaviors that have no right or wrong answer (sand play, dough, etc.); while closed activities have a single correct answer. Uncommon activities are behaviors that often go undetected by researchers (collecting worms, making rivers in sand, etc.). The high or low arousal activities indicate the amount of excitement the activity offered children (high arousal can be playing Batman, playing drums, etc.). Risk and daring interactions are actions with danger potentials (jumping off a high place, jumping from a swing, etc.).

Cosco's (2006) study is another example of behavior setting identification based on particular features. This study compared three types of outdoor preschool environments in terms of their physical activity affordance for three-to-five-year-old children. The outdoor environments classified into three major types: manufactured, natural, and mixed. Additionally, Cosco ranked the diversity within each behavior setting (1=low, and 4=high). Cosco reports that mixed behavior settings afford higher physical activity levels. This study and the other studies described in this section are indicative of the behavior setting concept's effectiveness in identifying the subspaces of the outdoor environment and predicting associated behavioral affordances.

### **3.4 Conclusion**

This chapter reviewed the main theoretical frameworks for this study. Based on Bronfenbrenner's layers, this study assesses children's ecology and recognizes the immediate setting to be children's interaction with teachers and physical environment. The surrounding layer includes the institutional and geographical qualities of the environment. The chapter explained environmental affordances allow individuals to perform an action. This study applies the affordance concept to understand functional qualities of outdoor learning environments.

Behavior settings enable recognizing subspaces of outdoor environment to predict associated behavioral affordances. This study compares different functional properties of the outdoor learning environment for their cognitive play behavior affordances. The study extends knowledge by considering the elements of the outdoor environment as the unit of analysis to compare their functional properties. The following chapter explains the multi-method approach of this study to evaluate different relationships between the child's behavior and the physical environment's qualities.

## CHAPTER 4: RESEARCH METHODOLOGY

To explore complex phenomena, researchers combine qualitative and quantitative methods to develop a mixed-method approach (Leedy & Ormrod, 2010). Mixed-methods can neutralize or limit the drawbacks of a single method (Creswell, 2003). Additionally, employing multiple methods enables triangulation of the results and creates a comprehensive analysis of the research questions. This chapter explains the purpose of conducting each method to understand children's cognitive play behaviors within each physical environment. The research assesses the suitability of each method through a pilot study (Appendix A). This chapter presents the conceptual framework of the research and dependent and independent variables. This chapter also describes how combining the quantitative and qualitative methods address the research questions. Finally, this chapter explains the strategies for selecting a particular outdoor learning environment for evaluating the research questions. The following section explains the value of a multi-method approach for interpreting complex matters.

### 4.1 Multi-Method Approach

Multi-methods allow the researcher to collect robust evidence that deals with complicated questions (Yin, 2009). The combination of qualitative and quantitative methods extend the internal validity of findings in that it accentuates the strength and neutralizes the weakness of each method (Groat & Wang, 2002). This research is concerned with performing quantitative and qualitative methods to evaluate the research questions. Within quantitative methods, the researcher attempts to evaluate specific measures through previously validated tools (Leedy & Ormrod, 2010). Direct observation is a type of quantitative data collection method (Creswell, 2003). This study aimed to observe children's behavior within the outdoor preschool environment and record their interaction through pre-defined tools. Systematic observation offers a more reliable data, compared to children's own account (Blatchford et al., 2003). However, this quantitative result is incapable of explaining the interactions within the physical environment.

In addition to the quantitative methods, this research employs qualitative methods to interpret and describe complex phenomena (Leedy & Ormrod, 2010). Some qualitative researchers argue that objective measures are not suitable for human behavior research. They assert that researchers need to understand and make deductions about what they observe in order to figure out social events (Leedy & Ormrod, 2010). It is essential for research on children's place experience to regard children as individuals within a community with a right to express themselves (Cele, 2006). Rather than making inferences based on observations or parental report, researchers suggest collecting children's accounts of their experiences to understand their opinions (Clark, 2005; Clark, Moss, & Kjørholt, 2005; Garbarino & Stott, 1992; Wesson & Salmon, 2001). However, limited data is available on the views of young children, specifically those younger than school age (Clark, McQuail, & Moss, 2003). Malguzzi's concept of "the hundred languages of children" (Edwards, Gandini, & Forman, 1998) proposes a broader concept for listening to young children. The mosaic approach of listening to

young children unmask their perspectives by bringing together visual and verbal tools, which supports “the hundred languages of children” (Clark, 2005; Clark & Moss, 2001). Employing the mosaic approach for researching on 4-to-5-year-old children empowers their communication and helps adults to hear their voices (Clark & Moss, 2001; Clark & Slatter, 2004; Clark & Statham, 2005; Clark et al., 2005; Fargas-Malet, McSherry, Larkin, & Robinson, 2010).

Combining visual and verbal languages improves communication with children, especially when seeking information about their daily experiences in the outdoor preschool setting. Previous researchers have applied the child-friendly practice photo selecting and drawings in their child and environment studies (Castonguay & Jurtas, 2009; Darbyshire et al., 2005; Dodman, 2003; Dodman, 2004). However, few researchers have applied photo selecting and drawings in health-related issues involving young children (Castonguay & Jurtas, 2009; Hume, Salmon, & Ball, 2005; Pearce, Kirk, Cummins, Collins, Elliman, Connolly et al., 2009). Some researchers have applied the photo preference method to identify individuals’ perceptions and preferences toward landscape elements (Buhyoff, Arndt, & Propst, 1981; Houts, Doak, Doak, & Loscalzo, 2006; Scott & Canter, 1997; Yamashita, 2002). In addition, scientists consider interviews and drawings as traditional methods for involving children in research (Cele, 2006; Clark & Statham, 2005; Darbyshire, MacDougall, & Chiller, 2005). Drawings are effective in promoting the children’s verbal report because the drawings aid in their retrieval of information (Clark & Slatter, 2004; Clark & Statham, 2005; Wesson & Salmon, 2001). Drawings can also provide means by which to communicate information with children (Butler, Gross, & Hayne, 1995; Hudson, 1990).

This study aims to, in a child-friendly manner, explore the dominant beliefs and customs of the culture shaping children’s daily experience. The research evaluates how the culture of an early learning center associates with its physical characteristics, daily routines, and teaching forms. The qualitative approach offers comprehensive facts on how children enjoy the outdoor environment. The following section explains how this study employed a correlational statistical method to evaluate the relationship between the physical environment characteristics and children’s cognitive play behaviors.

#### **4.2 Correlational-Based Approach**

Correlational research is concerned with how a naturally occurring pattern alters another natural variable (Borland, 2001; Martella, Nelson, & Marchand-Martella, 1999). Correlational research evaluates behavioral patterns of complex natural variables (Borland, 2001; Groat & Wang, 2002). Conducting a correlational research design is worthwhile in understanding a naturally occurring phenomena when manipulation is not ethical or feasible (Groat & Wang, 2002). Variables are specific, measured, and quantified during correlational research. Furthermore, the research relies on statistics to explain or adjust patterns (Groat & Wang, 2002). For these reasons, this study employed a correlational design for evaluating the connection between children’s cognitive play behaviors, with elements, behavior settings, gender, and teachers’ interaction.

Correlational studies present a broad understanding of the playgrounds rather than a profound understanding of the phenomenon (Groat and Wong, 2002). Causal-comparative correlational studies focus on causal relationships by selecting comparable cases. When choosing comparable examples, the goal is to isolate causes that may reveal major differences (Fraenkel, Wallen, & Hyun, 1993; Groat & Wang, 2002). While the researcher cannot control different variables, causal-comparative design offers an ideal way to identify naturally occurring connections or comparable groups (Leedy & Ormrod, 2010; Martella et al., 1999). Causal-comparative research design explains consistent patterns of relationships without distinguishing cause (Borland, 2001; Martella et al., 1999). The researcher can only assume this causality (Borland, 2001; Groat & Wong, 2002; Leedy & Ormrod, 2010). This study employs a causal-comparative correlational approach to evaluate children's behavior within the outdoor preschool environment. The following section explains the main questions that guided the research analysis and arguments.

### **4.3 Research Questions**

This study aims to assess the cognitive play affordances of an outdoor learning environment comprised of various behavior settings and elements. The research aims to identify elements or behavior settings that support the affordance of various cognitive play behaviors. The primary research question seeks an association between the outdoor learning environment's physical characteristics (zones, behavior settings, and elements) and 4-to-5-year-old children's cognitive play behaviors. The following sub-questions arise from the main research question:

1) What is the relationship between different zones and actualized cognitive play behavior? Outdoor preschool settings may consist of different play zones. (The following section explains the concept of zone.) This study aims to compare different zones with specific characteristics in order to evaluate their cognitive play affordances.

2) What is the association between different behavior settings or elements with children's cognitive play behaviors? The study aims to understand how various cognitive play behaviors are stimulated through different elements or behavior settings. This question proposes exploring categories of elements and behavior settings for their cognitive play behavior affordances.

3) What are children's favorite behavior settings and the associated cognitive play behaviors? This study employs qualitative methods to explore young children's preference for behavior settings that observational methods cannot provide (Creswell, 2003). Since the observational method disregards children's perceptions and feelings, this question aimed evaluating their viewpoint towards the play opportunities within outdoors. Prior research provides evidence of children's favorite places or play types (Korpela et al., 2002; Kyttä, 2003; Loukaitou-Sideris & Sideris, 2010; Myers, 1985; Talen & Coffindaffer, 1999; Van den Berg et al., 2007).

4) What are children's favorite elements and the cognitive play behaviors they afford? Identifying the elements children prefer contributes understating the features they mostly enjoy. Few studies have explored children's favorite places in terms of their cognitive play behavior affordances. This question values children's right to reflect their ideas and feelings (Clark, 2005; Clark et al., 2005) to interpret their experience of the outdoors. Through this insight, outdoor learning environments can offer pleasurable activities that stimulate children's cognitive play.

5) Do teachers recognize cognitive play and learning opportunities of the outdoor preschool environment in their interactions with children during outdoor play? According to Bronfenbrenner's theory of development, children's growth happens through their interactions with people and context (Bronfenbrenner & Morris, 1998). The purpose for addressing this question is to interpret how teacher's education, view, and knowledge towards children's play can hinder or develop play opportunities for young children. The following section explains the conceptual framework outlining the ideas this research employed to address these questions.

#### **4.4 Conceptual Framework**

The conceptual framework provides a foundation for the study and explains the concepts and definitions used to address the research questions (Groat & Wang, 2002). The main purpose of this research is to interpret how the outdoor learning physical environment features afford various cognitive play behaviors for 4-to-5-year-olds. The study regards cognitive play behaviors as the dependent variable. This study aims to propose design and policy guidelines to improve outdoor learning environments. Therefore, the research evaluates the outdoor learning environment from different environmental and behavioral perspectives. The study recognizes how the Microclimate of the play environment includes zones, behavior settings, and elements that associate with children's cognitive play behaviors. The independent variables assessed in this study are zones, behavior settings, and elements. Further, the study recognizes that teacher interaction, gender, and weather conditions are moderators that may change cognitive play behaviors. The following paragraphs explain the independent variables and moderator variables and how they formed the conceptual framework.

##### **4.4.1 Zones.**

Based on a geographical perspective, zones are areas of land with unique qualities and applications. Zones have a particular design, incorporate boundaries, and include certain behavior settings and elements. Previous studies (Golicnik & Thompson, 2010; Moore & Cosco, 2007) evaluated the pattern of behaviors on a zone basis within outdoor environments. Particular characteristics represent various zones on outdoor playgrounds. These zones include natural, mixed, or manufactured zones.

**1) Natural zone:** This zone is mainly composed of wild and natural spaces, creatures, and loose materials (Fjortoft & Sageie, 2000; Lee, 1999). Natural zones offer diverse natural materials, plants, and

animals for children's interaction (Stine, 1997). Natural zones can incorporate mixed and natural behavior settings.

**2) Mixed zone:** This zone combines a blend of natural and manufactured elements (Cosco, 2006) that enhance children's play opportunities.

**3) Manufactured zone:** This zone type mainly supports children's gross motor development by incorporating manufactured fixed equipment (Moore, 1985; Stine, 1997). Natural components in this zone are limited or lacking. This zone mainly embraces manufactured settings and sometimes consists of mixed settings.

Outdoor play environments in the preschool setting are mostly manufactured zones composed of immovable structures, such as swings, bars, or slides (Moore & Bond, 1975). These zones neglect the unique opportunities that outdoor preschool spaces offer for children's development. However, some research has compared the play value of natural and mixed with manufactured zones. Moore and Wong (1997) state that children prefer natural landscapes over than manufactured zones. Children are able to explore and interpret the environment within natural zones (Moore & Wong, 1997). Natural and mixed play zones enable children to appreciate and understand nature (Freuder, 2006). Recognizing the importance of these environments for children's play, this study aims to compare the cognitive play opportunities that each zone provides for young children. In its assessment of physical environment and behavior, this study segregates zones into behavior settings. The following section defines behavior settings and their classifications as they relate to the zones.

#### **4.4.2 Behavior settings.**

Behavior settings allow a more detailed analysis based on clearly bounded subareas and their affordances. Behavior settings correspond to how children use and interact with the physical characteristics of each zone. Limited studies have evaluated the cognitive play behavior affordance that behavior settings offer for young children. This study aims to understand how the behavior settings of various elements stimulate children's play. This research intends to extend current knowledge about the play value of natural environments. Therefore, the variation of behavior settings in terms of natural components is the foundational criteria for evaluating behavior settings. Employing Cosco's (2006) approach, this study assigns behavior settings to the three zones:

**1) Natural settings:** These settings primarily contain vegetation, trees, gardens, and play spaces defined by plants.

**2) Mixed settings:** These settings encompass a balanced proportion of natural and manufactured environments (pathway, sand-climber, etc.).

**3) Manufactured settings:** These settings mostly include fixed and human-built elements (play equipment, shade structures, etc.).

Subdividing the environment into behavior settings provides information about the functional properties of elements, events, and the layout of the zones that stimulate cognitive play. Comparing the

affordances of natural, mixed, and manufactured settings offers a perspective of their play value. Children's behavior patterns in various settings highlight the quality of relationship between the individual and the environment (Moore & Cosco, 2010). Designers can employ this information to propose outdoor learning environments that stimulate various degrees of cognitive play. This study extends previous studies by recognizing elements as the unit of analysis for evaluating the cognitive play affordances of the Microclimate. The following section defines these elements as sub-units of the outdoor environment.

#### **4.4.3 Elements.**

The built environment includes manufactured and natural objects and elements (Moore & Marcus, 2008). At a smaller scale, the outdoor environment includes elements such as plants, water, or sand that associate with children's play behavior (Moore & Cosco, 2010). The third level of analysis examines children's interaction with elements in behavior settings. Elements are physical features that build behavior settings. The variety of elements in behavior settings is a significant indicator of the outdoor environment's play value. In fact, studies associate children's physical, emotional, cognitive, social, and educational development with the diversity of the elements within the environment (Stine, 1997; Weinstein, 1987; Woolley & Lowe, 2011).

Some studies have explored how the physical elements of the environment can stimulate play (Frost & Strickland, 1985; Potwarka et al., 2008). However, few studies look at the cognitive play affordances of natural elements. This study intends to extend previous knowledge by comparing the different natural and synthetic elements found in young children's outdoor play environments. Literature documents the value of natural or loose elements for children's play and development (Boldermann et al., 2006; Moore, 1985; Moore & Cosco, 2010; Moore & Wong, 1997; Striniste & Moore, 1989). However, few studies have evaluated how combining natural and manufactured elements with various behavior settings may inspire cognitive play behaviors. Based on Cosco's (2006) classification and the pilot study results (Appendix A), this research classifies the elements into natural loose, natural fixed, manufactured loose, and manufactured fixed groups.

**1) Natural loose elements:** These natural features are flexible, manipulative, and portable, such as flowers, sand, dirt, or leaves.

**2) Natural fixed elements:** These natural components are permanently located in space, such as shrubs, trees, or large rocks.

**3) Manufactured loose elements:** These artificial elements are transportable, and sometimes manipulative, such as dolls, balls, tricycle, or shovels.

**4) Manufactured fixed elements:** These fabricated physical features are steady, enduring, and rigid, such as benches, play structures, or swings.

**5) No element:** Based on the pilot study results (Appendix A), the research evaluates children's engagement in cognitive play with no elemental interaction.

Using this classification, the study intends to extend knowledge about the various cognitive play opportunities that elements offer. From this understanding, designers can incorporate elements with regard to their cognitive play behavior affordances. The following section explains how teachers' interaction with children during outdoor play is an important moderator variable that may affect children's interaction with the built environment.

#### **4.4.4 Teachers' interactions.**

Children directly interact with Microsystems, such as teachers, or the physical environment features of the childcare center. Studies suggest that teachers' responsive and positive interaction during children's play can increase children's social and cognitive development (Johnson et al. 1999). Research further suggests that the quality of the daycare and teacher involvement influences children's play and behavior during preschool period (Kontos & Keyes, 1999; Tonyan & Howes, 2003). Trained teachers are more sensitive and alert toward children's development and interaction with peers (Kontos et al., 2002). In addition, appropriate and positive interaction with teachers can have positive developmental outcomes for children, such as increased cognitive or social activity levels (Johnson et al., 1999).

Research requires an evaluation of different programs and various teacher practices in daycare centers consisting of different ethnic and cultural groups and how they shape children's daily experiences (Tonyan & Howes, 2003). Literature suggests the childcare facility's quality and teacher-child interaction influences children's development (Egeland & Heister, 1995; Howes, Matheson, & Hamilton, 1994). Teacher involvement within children's activities can have varied outcomes (Kontos & Keyes, 1999). For instance, Cosco et al. (2010) suggested the intensity of children's physical activity in open spaces associates with how teachers and children children's play that may link to children's cognitive development (Tonyan & Howes, 2003).

This study evaluates teacher's interaction with children during play as a catalyst that may change children's behavior. Teacher behavior is coded the child is within three feet of a teacher (Howes & Smith, 1995; Tonyan & Howes, 2003). This study employs Cosco's (2006) classification of teacher intervention during play as neutral, custodial, positive, negative, and none.

**1) Neutral:** The teacher demonstrates a neutral attitude toward children when they display no particular manner towards the child's play.

**2) Custodial:** This behavior is recorded when the teacher takes care of the child (giving water, cleaning, etc.).

**3) Positive:** This behavior is noted when the teacher encourages and supports the child's play.

**4) Negative:** This behavior is recorded when the teacher prevents, hinders, or rejects the child's play.

**5) None:** This behavior is noted when the teacher does not interact with the child, yet is present in the environment.

Through this understanding, this study aims to interpret children's behavioral patterns in relation to teacher behavior. This result also provides a foundation for assessing how the teacher's behavior informs his or her beliefs toward children's outdoor play. This study also considers children's gender and weather conditions as moderator variables. The following section defines the cognitive play behaviors children may exhibit while at play.

#### **4.4.5 Cognitive play behaviors.**

Children's cognitive play behaviors are the dependent variables in this study. The following paragraphs briefly address each category of cognitive play as defined by Rubin (2001):

**1) Functional play behavior:** This behavior associates with an activity that a child engages in for the physical sensation it stimulates. Functional play involves simple or repetitive motor behavior that can include objects, including climbing on gym equipment or jumping on and off a step (Rubin, 2001).

**2) Constructive play behavior:** During constructive play, children manipulate and shape material with a direct goal in mind. Rubin (2001) explains the major distinction between constructive play and functional play is the child's concern or goal during play. Constructive play differs from exploratory play, as the child already is familiar with the task.

**3) Exploratory play behavior:** According to Rubin (2001), exploratory play occurs when the child examines the qualities of objects to gather visual data about its physical features. Observers sometimes confuse exploratory play behavior with on-looking behaviors. To clarify, children receive visual information from another person during on-looking behavior; during exploratory play, the child gathers information from an object (Rubin, 2001).

**4) Dramatic play behavior:** When the child displays the role of someone, engages in a pretend activity with an object or someone, or assigns life to an inanimate object, the observer codes for dramatic play behavior (Rubin, 2001). Occasionally, the observer may confuse dramatic play with functional or constructive play. In this case, Rubin (2001) suggests the observer look for contextual signals, such as sounds, to decide the cognitive play behavior type. If there are no contextual clues, the observer may code for functional play.

**5) Games with rules:** Game with rules emerge when the child and peers employ a sense of competence while creating regulations for games (Rubin, 2001). Other behaviors associated with games with rules include a child waiting for his or her turn in a game or play opportunities wherein there is a chance of winning or losing (Rubin, 2010).

**6) No play:** Rubin (2001) recognizes on-looking behavior, transitional activity, and unoccupied play as non-play behaviors. On-looking behavior occurs when a child observes the activities of other children. Transitional activity happens when a child creates a new activity or switches from one activity to another. A child wandering without any purpose or involving in any activity is a characteristic of unoccupied play. Non-

play is a child fighting. The following section presents the conceptual framework and its association with the addressed theoretical perspectives.

#### **4.4.6 The conceptual framework diagram.**

Figure 1 illustrates the conceptual framework for this research. The framework displays how independent and moderating variables correlate with dependent variables. The independent variables include zones, behavior settings, and elements. Moderating variables consist of teacher interactions, weather condition, and gender. Finally, dependent variables include cognitive play behaviors of young children, including the following:

**1) Zones:** The broad separation of the preschool outdoor learning environment based on the dominant behavior settings and elements defines zones. In this research, the outdoor learning environment segregates into manufactured, mixed, and natural zones.

**2) Behavior setting:** Researchers distinguish the physical environment into subs-spaces that represent their behavioral affordances (Moore & Cosco, 2007). In this study, examples of behavior settings are sand areas, the gazebo, or the hill. Behavior settings classify into natural, manufactured, and mixed.

**3) Elements:** This study considers elements to be physical environment features that children interact with during play, such as sand, rocks, ropes, climbers, etc. The current research organizes element categories into natural loose, natural fixed, manufactured fixed, and manufactured loose types.

**4) Teacher intervention with children:** The study explores teacher interactions during children's outdoor play. This moderator variable determines how teachers' educational backgrounds, ethos, and values affect children's cognitive play behaviors. Teacher intervention levels include neutral, custodial, positive, negative, and none.

**6) Cognitive play behaviors:** As previously defined, the study employs five categories of cognitive play behaviors: 1) functional, 2) constructive, 3) exploratory, 4) imaginative, and 5) games with rules (Guralnick, et al. 2006; Rubin, 2001).

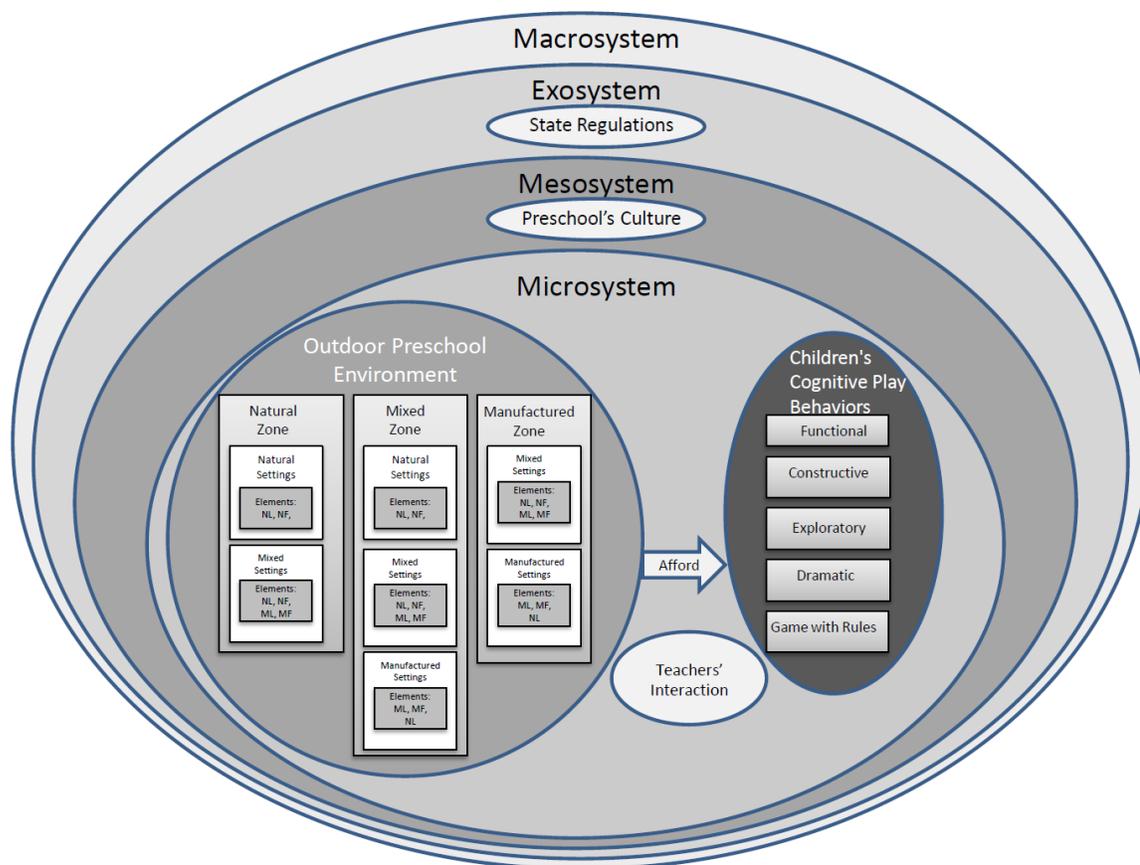


Figure 1. Conceptual framework of the study.

The conceptual framework recognizes the outdoor preschool environment and teacher interactions as Microsystems. The outdoor physical environment is composed of zones, behavior settings, and elements that afford cognitive play behaviors for children. The preschool's culture is a Mesosystem that covers the Microsystem and may change the conditions of the Microsystem. State regulations and policies are the Exosystem that covers this Mesosystem. The following section explains how this study intends to address generalizations regarding the qualities of independent variables.

#### 4.5 Generalization

The external validity of the findings indicates if the results of a study can generalize to similar settings (Yin, 2009). Kennedy (1979) explains how generalization occurs with both numbers and characteristics of the units of analysis (Donmoyer, 2000; Kennedy, 1979). Employing multiple units of analysis containing multiple existing cases within an outdoor environment enables comparisons of units and suggests generalizations (Leedy

& Ormrod, 2010). Using behavior settings as the unit of analysis connects the research findings to design policy (Moore & Cosco, 2010; Moore & Cosco, 2007) as the impact of design on children's behavior is realized (Moore & Cosco, 2010). Recent environmental and behavioral research have applied behavior setting as the unit of analysis within a single case (Cosco et al., 2010; Moore & Cosco, 2010; Moore & Cosco, 2007; NLI, 2007). Behavior settings offer an evidence-based method to divide the outdoor preschool setting into functional units that are comparable to the affordances provided in other functionally similar real life behavior settings (Moore & Cosco, 2007).

This study also employs available physical elements as another unit of analysis. While some elements within an environment may not generalize with other outdoor play environments, many elements represent common features such as sand, tools, bushes, or trees. Researchers can compare constituent elements with other to real life examples to ascertain their common functional affordances. Examining behavior settings and elements entails evaluating multiple units of analysis for their cognitive play behavior affordances. Kennedy (1979) asserts that the commonality of behavior settings and elements with other behavior settings and elements in real world settings can be the basis for generalization. Reflecting on Donmoyer's (2000) and Kennedy's (1979) declarations, robust support of research assumptions can develop through repeated observations of children's behavior. Hence, this study aims to gather plentiful observation data associated with each zone, behavior setting, and element. This data can determine the ongoing behavioral patterns within each unit of analysis. The next section explains how the combination of different methods in this study increases its internal validity.

#### **4.6 Research Design**

Research design is a logical sequence connecting empirical data to the research question and eventually to its conclusion (Yin, 2009). Research design provides the general arrangement that the researcher follows, and it explains data collection and analysis techniques (Leedy & Ormrod, 2010). Other researchers emphasize the importance of mixed methods in social science research to explore complex phenomena (Patton, 1990). In combining the numeric results of the quantitative methods and the detailed description of the qualitative methods, researchers can understand a problem more effectively (Creswell, 2003). The combination of methods can assist interpreting the results of each method. Despite this, research infrequently employs quantitative and qualitative methods to investigate children's behavior and perception toward the outdoor learning environment.

This study employs qualitative and quantitative methods to gain a comprehensive insight into the cognitive play behavior affordances of the outdoor learning environment. The qualitative methods in this study explore children's environment and behavior interactions associated with their observed behavior (Moore & Cosco, 2010). The results provide significant explanations that clarify children's perspectives toward the outdoor environment. This study used pilot studies to evaluate the appropriateness of each method (Appendix

A). The following section explains the value and qualities of each data collection technique, including 1) behavior mapping, 2) photo preference, 3) drawings, 4) semi-instructed interviews with children, and 5) structured interviews with teachers.

#### **4.6.1 Method 1: Behavior mapping.**

This study employs behavior mapping as a quantitative research method that objectively records individuals' behavior within an environment (Moore & Cosco, 2010). Behavior mapping documents observable qualities, such as age, sex, and group type (Sommer & Sommer, 2002). Behavior mappings guide future design in the development and design of high quality outdoor environments for children (Moore & Cosco, 2010). This study seeks to collect behavior data to learn about children's behavior patterns in different behavior settings. However, this method cannot provide information about children's opinions or feelings, suggesting that the researcher should utilize other methods.

Environment and behavior researchers apply the behavior mapping technique to evaluate schools, parks, children's museums, and zoos (Cosco et al., 2010). Some studies employ this method to explore children's outdoor play behavior, mostly within residential neighborhood settings (Bjorklid, 1982), parks, outdoor learning environments, and remodeled schoolyards (Moore & Wong, 1997). For example, the Natural Learning Initiative (NLI, 2007) aimed for a qualitative-quantitative approach for exploring the Bay Area Discovery Museum (BADM). The study investigated how the outdoor design features of a museum affects behaviors of young children and caregivers. The researchers collected qualitative data through surveying caregivers' patterns of use, viewpoints, and explanation of outdoor spaces. The study coded for children's learning behaviors based on an early pilot study (NLI, 2007; Moore & Cosco, 2010). Finally, the GIS program recorded 897 data points connected with events, activities, and location.

Behavior mapping details how the built environment supports various behaviors. For example, in Moore and Cosco's (2010) research on two childcare settings, the behavior mapping results identify specific environmental features and their associated physical activity level. In another study by Cosco and colleagues (2010), behavior mapping proved to be an effective method in analyzing the built environment qualities of outdoor childcare settings in preventing sedentary lifestyles. The behavior mapping results of Cosco (2006) study show the spatial pattern of behaviors in the behavior settings of childcare centers. Cosco explored how different behavior settings prompt various levels of physical activity. Behavior mapping offers an objective viewpoint on the association between behavior settings, elements, and children's cognitive play behavior. However, behavior mapping lacks insight into children and teachers' viewpoints of outdoor environment affordances. To gain this insight, this study combines photo preference, drawing, and interviews as a qualitative means of interpreting children's and teachers' perceptions. The following sections detail these qualitative research strategies.

#### **4.6.2 Method 2: Photo preference.**

Children of varying skills can all share their opinions through multisensory means of communication (Clark, 2005). Applying a method that does not rely on verbal communications helps children explain important facets of their daily lives (Einarsdottir, 2005). The use of photographs during interviews of young children may overcome some communication obstacles (Epstein, Stevens, McKeever, & Baruchel, 2008; Harper, 2002). Some researchers have discovered children's environmental preference through photographs (Bunting & Cousins 1985; Bernaldez, Gallardo, & Abello, 1987; Talen, & Cofindaffer, 1999). Photo preference helps children combine their visual and verbal language, making this method more advantageous when interviewing children with weaker written or verbal language or younger children (Clark, 2004; Cook & Hess, 2003).

Collier (1987) originally integrated photographs with interviews in a research setting while studying migration due to technological and economic change. Collier reports this method sharpened memories and contributed to longer, more complete interviews (Epstein, et al., 2008). Some researchers have asked children to take the pictures without the researcher present (Clark, 1999; Clark & Moss, 2001; Hanna & Jacob, 1993) or asked children to take photos of their favorite themes while walking within a neighborhood (Cele, 2006). Other researchers have taken the photos themselves if they are following a particular research framework or exploring specific ideas (Diamon & Hestenes, 1996; Magilvy, Congdon, Nelson, & Craig, 1992; Weinger, 1998). This commonly occurs when researchers are focusing on younger children (Aschermann, Dannenber, & Schulz, 1998; Salmon, 2001), indicating the aptness of the photo preference method as a means of communicating with young children. This study uses photo preference to recognize children's preferred settings and elements. The following section explains drawings as another visual tool to enhance young children's communication.

#### **4.6.3 Method 3: Drawings from children.**

Visual research is becoming more popular because it is user-friendly and inexpensive (Epstein, et al., 2008), and it underscores the value of methods that help children recall and report information (Rudy & Goodman, 1991). Children exhibit thinking that is more diverse when the research methods reach multiple learning styles (Clark, 2005). Drawings give children an alternative to pictures and words as a means to share essential topics of their inner world (Clark, 2005; Green, 2008; Green, Crenshaw, & Kolos, 2010; Malchiodi, 2011). Drawings can represent a different way of assessing children's beliefs and understanding their world (Green et al., 2010; Talsma & Krajcik, 2002). Drawings are mental representations of places or objects. They are visual representations involving emotional and imaginative meanings, revealing more about the child than an object or place (Di Leo, 1970; Thomas & Silk, 1990).

Younger children have shorter attention spans than older children for past information retrieval (Cele, 2006; Punch, 2002). Subsequently, artistic activities are not only fun for young children but are also a means to increase their attention spans and gain more knowledge about their views (Schneide & Bjorklund, 1998; Wesson & Salmon, 2001). Researchers broadly apply children's drawings in clinical contexts, thus simplifying

the communication of information between children and researchers (Garbarino & Stott, 1992). Older children demonstrate greater skills to convey information to others because of their advanced drawing abilities (Hudson & Shapiro, 1991). Nevertheless, younger children's drawings are valid communications with researchers. Young children's interview response improves through the combined application of drawing or photo methods (Butler et al., 1995; Clark, 2005; Tamoutseli & Polyzou, 2010; Wesson & Salmon, 2001). Interview methods incorporating drawings have considerable potential for enabling children to express their experiences (Wesson & Salmon, 2001) because drawings are such effective tools for exchanging thoughts between adults and young children. The following section explains how combining drawings and photo preference methods with interviews with children is an important means of conveying children's perspectives.

#### **4.6.4 Method 4: Structured interviews with children.**

Children's communication with adults is most beneficial when researchers use methods that are conducive to successful communication (Punch, 2002). Studies report that children can recall their experiences from early preschool years (Fivush et al., 1995; Hudson & Shapiro, 1991). Smith (1995) employed semi-structured interviews to explore how five-to-twelve-year-old children perceive their play environments during school holidays and after school hours. Several studies have employed interviews with children as a means of understanding their view of outdoor environments (Barbour, 1999; Larson, Green, & Castleberry, 2011; Korpela et al., 2002; Kytta, 2003; Moore, 1986; Myers, 1985; Ozdemir & Yilmaz, 2008; Ozdemir & Corakci, 2010; Sandseter, 2009). However, these studies have not focused on four-to-five-year-old preschool children (Aubrey & Dahl, 2005). This may be because interviewing preschool children can be difficult, as they are still learning grammatical construction rules and display a personal use of language (Powell et al., 2002; Walker, 1994). Given this, it is important to provide direct questioning instead of general questioning when interviewing young children (Butler et al., 1995).

The technique of questioning young children, as well as the child's age, gender, and family experience, may influence their interview response (Aubrey & Dahl, 2005; Hay, Zahn-Waxler, Cummings, & Iannotti, 1992). These variables accentuate the value of sensitive interview strategies that consider children's strengths and balance their weaknesses. Methods such as observation or interview inherently respect children as subjects of research (Mauthner, 1997), but integrating methods such as art, photography, songs, or drawings offer new approaches to further facilitate children's communication during interview (Alderson, 2000; Cele, 2006; Christensen & James, 2000; Einarsdottir, 2005). Hence, studies employing interviews with young children usually integrate these methods into the interviews.

Researchers typically use interviews when observation opportunities are restricted, to explore personalities, beliefs and opinions, or when working with complex and emotionally loaded issues. The absence of responses in an interview does not influence the results, giving the interview an advantage over other techniques, such as the questionnaire. Researcher can also encourage subjects to answer incomplete questions or

offer more details (Leedy & Ormrod, 2010). Interviews offer an effective tactic for understanding children's ideas, perceptions, and feelings, none of which an observation can provide. The next section describes how understanding the teacher's perspective is a valuable means of evaluating how children interact with the environment.

#### **4.6.5 Method 5: Structured interviews with teachers.**

Literature states that teachers' training and philosophies are critical in promoting children's play behaviors. Trawick-Smith and Dziurgot (2011) demonstrates that preschool teachers' training and skills offer an indirect contribution to children's play. Howes (1997) suggests that teachers with four years of experience or a master's degree in early childhood education are more bonding and child-centered when playing with children. Interviews with teachers offer comprehensive insight into children's daily interactions. Teachers' explanations can verify cross-sectional observation results about the cognitive play value of zones, behavior settings, and elements. This study uses interviews to recognize how teachers envision the value of outdoor play for children's development. From this interpretation, the study intends to emphasize the value of trained teachers and the culture of preschool environments in shaping children's everyday experiences.

Based on Bronfenbrenner's theory, the teaching style and preschool curriculum reflect the teacher's values, expectations, and educational goals (Farver, Kim, & Lee, 1995; Hirsh-Pasek, Hyson, & Rescorla, 1990; Reynolds, 1994). Considering the culture of the preschool as a Mesosystem, research suggests cultural differences in dissimilar settings correlate with children's developmental outcomes (Bronfenbrenner & Condry, 1970; Farver et al., 1995). Through teacher interviews, this study uncovers the preschool culture that may encourage or hinder children's daily interaction with the outdoor preschool.

#### **4.6.6 Data collection methods addressing research questions.**

Understanding the complex interactions between contexts requires a balance between qualitative and quantitative research methods (Rimm-Kaufman & Pianta, 2000). This study employs a combination of qualitative and quantitative methods to address four main questions regarding the cognitive play affordances of the outdoors. The combination of methods establishes a comprehensive insight toward different aspects of outdoor play behaviors and areas. Quantitative methods test correlations between the observed cognitive play behaviors and the physical environment attributes. Qualitative methods provide information about unobservable interests, perceptions, and feelings (Creswell, 2003). Table 3 illustrates how each research method fits into a quantitative or qualitative category. Table 4 further explains how each methodology addresses each research question.

Table 3. Type of collected data based on data collection methods.

Type of Method	Data Collection Methods				
	Behavior Mapping	Photo Preference	Drawing	Interviews with Children	Interviews with Teachers
Quantitative	•				
Qualitative		•	•	•	•

Table 4. Data collection methods related to research questions.

No.	Research Question	Data Collection Methods				
		Behavior Mapping	Photo Preference	Drawing	Interviews with Children	Interviews with Teachers
1	What is the relationship between different zones and actualized cognitive play behavior?	•				•
2	What is the relationship between different behavior settings, elements, and cognitive play behaviors?	•	•	•	•	•
3	What are children's favorite behavior settings and the cognitive play behaviors they afford?		•	•	•	•
4	What are children's favorite elements and the cognitive play behaviors they afford?		•	•	•	•
5	Do teachers recognize cognitive play and learning opportunities of the outdoor preschool environment in their interactions with children during outdoor play?	•				•

#### 4.7 Site Selection

Given the purpose of the study, the researcher sought an outdoor learning environment with a rich natural landscape and various fixed and loose, natural and manufactured elements. The researcher reviewed all existing outdoor learning environments designed by the Natural Learning Initiative (NLI). This university-based enterprise produces knowledge through research of outdoor environments. Focused on improving children's health, NLI develops evidence-based design guidelines and creates "naturalized outdoor learning environments" in various settings including childcare centers. Hence, the review of their "naturally designed" projects was an

effective approach in selecting an appropriate study site. An evaluation of all existing natural outdoor learning environments revealed only one site that met all the requisites: the First Environments Early Learning Center (FEELC). FEELC has an exceptional outdoor environment for children’s play. This early learning center includes three manufactured, mixed, and natural zones. Including both manufactured and natural behavior settings and elements provide a variety of daily experiences for children. The researcher’s intent for comparing the cognitive play affordances of different zones, behavior settings, and elements corresponds with the diversity of the outdoor learning environment.

The FEELC is a non-profit childcare facility situated in North Carolina’s Research Triangle Park. The early learning center complies with the U.S. Environmental Protection Agency, the National Institutes of Environmental Health and Science, and their contactors. The preschool’s nearly 200 infants, toddlers, and preschool children take advantage of the program’s emphasis on nature as a “third” teacher. The school building accentuates the use of natural light and uses solar panels for energy. According to its website, the preschool provides a sustainable environment, introducing children to nature, plants, and insects, and preserving natural habitats (Figure 2). Additionally, the preschool recruits professional teachers who stimulate children’s creativity and development.

The accessible outdoor learning environment for four-to-five-year-old children sits on approximately 0.99 acres. As previously discussed, one reason for selecting this early learning center is the variety of available elements and behavior settings. Table 5 and Table 6 note the accessible elements and behavior settings based on their categorical division. FEELC provides a unique combination of three manufactured, mixed, and natural zones (Figure 2). The children and teachers recognize these zones as “bikes” (manufactured), “hill” (mixed), and “woods” (natural). This site incorporates diverse natural, manufactured, and mixed behavior settings. Figure 3 and Figure 4 illustrates the variety and location of each behavior setting within the three zones.

Table 5. Provided elements within the FEELC.

<b>Manufactured-Fixed</b>	<b>Manufactured-Loose</b>	<b>Natural-Fixed</b>	<b>Natural-Loose</b>
<b>Name</b>	<b>Name</b>	<b>Name</b>	<b>Name</b>
Play structure	Tire	Tree	Creature
Green tube	Rope	Rock	Sand
Swings	Bike	Trunk	Log
Seating (tables or chairs)	Tool or toys	Bush	Stick
Climbing structure			Mulch
Borders			Dirt
Rocker			Leaves
			Flower

Table 6. Behavior settings within the FEELC.

Natural	Mixed	Manufactured
Hill	Looped Path (manufactured zone)	Tables
Camp	Pathway (mixed zone)	Swings
Stone-lined swale	Sand-Rope	Rockers
Stick-pile	Sand-Climber	Music Wall
Trail (woods)	Rope	Gazebo
Trees	Green Tube	Play Structure
	Play House 1	Storage
	Green Patches	House 2
	Stage 1	Stage 2



Figure 2 The First Environment Early Learning Center's building and outdoor environment's aerial view. The figure displays how the building is incorporated with trees, building a natural surrounding for children's everyday experience. Source: <https://maps.google.com/maps?hl=en&tab=w1>

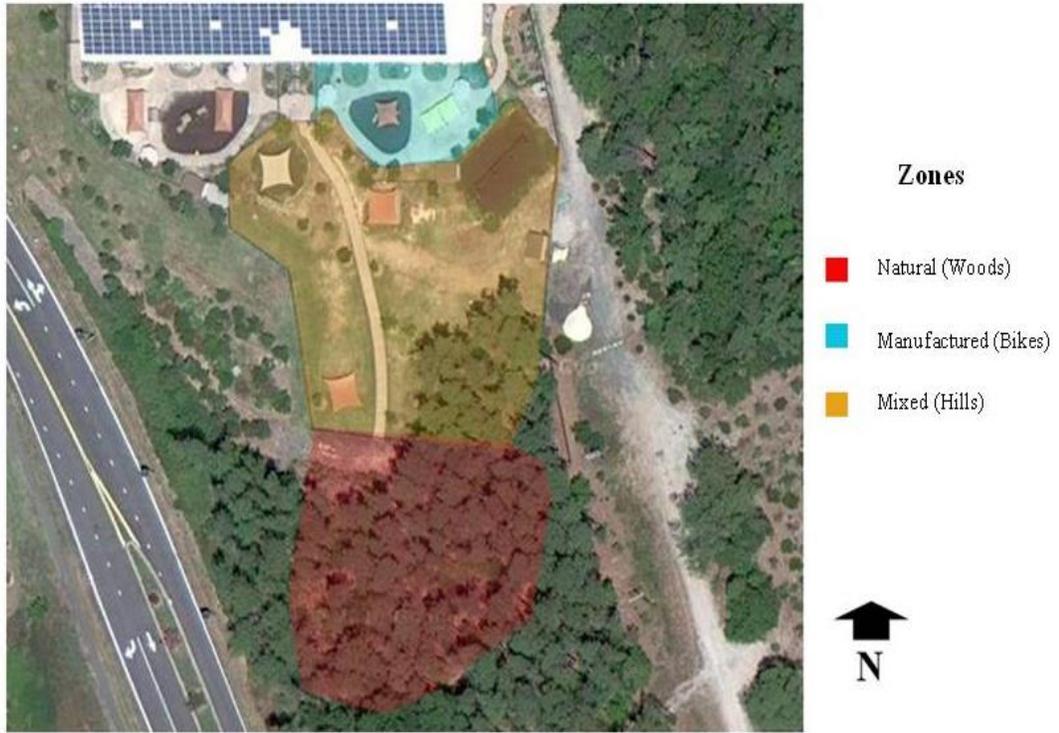


Figure 3. The aerial view of the FEELC with configured zones.



Figure 4. Behavior setting categories.

#### 4.7.1 Comparing the three zones.

The FEELC outdoor play area consists of manufactured, mixed, and natural zones. The following paragraphs explain the qualities of each zone.

**1) The manufactured zone:** The manufactured zone is adjacent to the preschool building and incorporates the following features: a dramatic play setting (play house), a looped pathway, a composite play structure, a porch, a sand play setting (covered with a shade structure), bike sheds, bikes and scooters, storage (for storing toys and loose material), three gathering settings (benches and tables), a swing pergola, and a basketball loop. Metal fences mostly surround the area. This zone also includes a transitional space between the indoors and outdoors. The manufactured zone has a smaller square footage (0.11 acres) compared to the other zones. Figure 5 offers a view of the play structure covered with mulch. This zone has small portions of shrubs and plants at each corner. The teachers provide manufactured loose elements, such as buckets, toys, baskets, or balls, to stimulate children's play in this zone.

**2) The mixed zone:** A widespread mixed outdoor environment of 0.48 acres referred as the "hill" (Figure 6) lies next to the manufactured zone. The mixed zone has a recognizable, yet moderate, downward slope from its entrance. On the left are four rocking equipment, which children term as "short swings." The outdoor environment has a linear pathway along the hill, a music wall with a stage, a set of six swings, a sand box, a gazebo, a stoned stone-lined swale without water, and two dramatic play settings. One significant behavior setting in this zone is the "woods," consisting of several trees extending from the natural zone. This area of the zone includes a wooden platform, ropes, and musical instruments attached to the trees. The center staff provides many manufactured loose elements, such as ropes, toys, or buckets in this zone.

**3) The natural zone:** The woods, or "back woods," is an extended portion of the jungle. This zone is a wild landscape with non-structured green space encompassing 0.40 acres. The natural zone is rich in natural loose elements, such as leaves, twigs, dirt, stones. The zone includes two looped and one straight pathway covered with dirt and natural loose elements (Figure 7). A rope barrier indicates the perimeter of this zone. Three massive boulders to the left of the zone define the play environment's boundary. The natural zone is adjacent to the mixed zone, and a metal fence provides a mostly transparent barrier between the two zones. The crawling equipment, referred as the "green tube" or the "tube," is the sole manufactured element within the natural zone. This zone also includes three rope settings, tied to the trees. Children balance on the logs to hold and swing on the ropes.



Figure 5. The manufactured zone included a complex play structure. Children enjoyed rolling in the mulch, sliding from the structure, and playing in the sand.



Figure 6. The mixed zone included a stone-lined swale and pathway. The picture illustrates the sand-climber behavior setting at the right corner. At the mid-top, the picture shows the gazebo. The picture implies the topographic variation of the mixed zone.



Figure 7. The natural zone was wild and non-structured with plenty of natural loose elements. Children enjoyed climbing and balancing on the tree trunks.

#### 4.8 Summary

This chapter explained the value of employing multiple methods to understand complex phenomena. The chapter described how the study employs qualitative and quantitative methods to gain an in-depth understanding of children's play behavior within the outdoor environment. The systematic observation provides quantitative data that validates and compares the environment and behavior relationships. Regarding the Mosaic approach, the study values child-friendly methods such as photo preference, drawings, and interviews. These methods prompt the collection of young children's viewpoints on the outdoor learning environment. In addition, the chapter described how teacher viewpoints play a critical role in understanding the values, culture, and ethos of the preschool regarding children's outdoor play. The multi-method approach contributes the triangulation of acquired data from young children.

The chapter further described how the study intends to explore the correlational nature between the existing outdoor environment features and children's cognitive play. The main research question explores the connection between behavior settings, elements, and 4-to-5-year-old children's cognitive play behaviors. The conceptual framework recognizes cognitive play behaviors as dependent variables. Zones, behavior settings, and elements are independent variables in this framework. Additionally, teacher interaction during children's play, children's gender and ethnicity, and weather conditions are moderator variables.

The chapter explained how each method addresses the research questions. In addition, this chapter explained the FEELC outdoor play area's three major zones: natural, mixed, and manufactured. This outdoor learning environment includes diverse behavior settings and elements. Thus, this outdoor preschool environment is ideal for addressing the research questions. The following chapter explains the procedures associated with each data gathering technique.

## CHAPTER 5: DATA GATHERING

This previous chapter explored the qualities of each data collection method, explaining how each research method provides valuable perspectives for evaluating the research questions. This chapter explains how this study employed these methods for evaluating the association between the outdoor learning environment characteristics and young children's cognitive play behaviors. The researcher is concerned with performing multiple methods to support comparison and triangulation. The study recognizes behavior mapping as a quantitative method for recording cognitive play affordances within the outdoor learning environment. The behavior mapping data links children's cognitive play behaviors to particular elements or existing behavior settings. The results of behavior mapping provide a standpoint by which to interpret environment-behavior interactions within the outdoor preschool setting. Additionally, the study relies on qualitative methods to describe and understand the complex interaction between the environment and young children. This chapter explains how the study combined photo preference, drawings, and interviews to understand the children's and teachers' perspectives. The following section explains the research protocols of this study.

### 5.1 Research Protocols

After visiting the preschool and speaking with the administration, the researcher collected basic data about the four-to-five-year-old children in the preschool, including total number of children, time of recess, and number of classrooms. The preschool had 36 children within the target age group (15 girls and 21 boys) split into two classes and among four teachers. Of these children, 31 were Caucasian, three Asian, one Indian, and one African-American. The administrators lacked knowledge about children's physical skills, family culture, cognitive development, socio-economic status, and personality type.<sup>2</sup> Table 7 briefly explains the number of participants in each of the data collection methods. Parental consent and data collection permissions informed the sampling procedure for each child. In order to compare different data, the study assigned an ID number for each child that participated in various data collection methods.

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<sup>2</sup> Before conducting the research with children, the Institutional Review Board (IRB) reviewed and approved the research methods and parents' and teachers' consent forms (See Appendix B). The teachers gave the printed parental consent forms to each child. Simultaneously, the coordinator emailed an explanation of the study to the parents of each four-to-five-year-old child. The consent forms permitted the researcher to capture videos, photos, and audio records from children. After one month, the preschools coordinator returned 22 consent forms to the researcher (representing 12 girls and 10 boys). The study evaluated these children via behavior mapping and qualitative methods. After the behavior mapping observations began, the parents of three children (1 girl, and 2 boys) consented for their child to take part in the study. Therefore, the study took account of these children during qualitative data collection but not during behavior mapping. Further, the IRB allowed the researcher to collect behavior mapping data from children without returned consent forms provided she did not record any visual data from them (See Appendix B).

Table 7. Number of participants in different data collection methods.

	Behavior Mapping	Photo Preference	Drawing	Interview
Female	15	13	13	13
Male	21	11	9	8
Total	36	24	22	21

Data collection occurred between 12 February 2013 to 11 April 2013, an inter-seasonal period (winter-spring). This study combined quantitative and qualitative methods to interpret how the outdoor learning environment offered various cognitive play opportunities. The following paragraphs briefly introduce the use of each method:

**1) Behavior mapping:** The main research method was the behavior mapping. Behavior mapping enables the researcher to use a systematic procedure to record behavior and the place of the behavior (Moore & Cosco, 2007; Sommer & Sommer, 2002). Behavior mapping enabled the recording of the children's behavior within the environment. The researcher systematically coded children's cognitive play behaviors during recess. The behavior mapping offered an objective viewpoint about the association between zones, behavior settings, elements, and cognitive play behaviors.

**2) Photo preference:** This study employed the photo preference method to sharpen children's memory and communication skills (Clark & Statham, 2005; Einarsdottir, 2005). The researcher captured photos based on particular behavior settings or elements of the outdoor preschool environment. The photos represented particular spaces in which children engaged in certain behaviors (Barker, 1976). The researcher used photo preference to ask children to select their preferred outdoor settings and elements and explain about their play.

**3) Drawings:** This research recognizes the effectiveness of incorporating interviews with drawings for understanding young children's thoughts (Butler et al., 1995; Powell, Clare, & Hasty, 2002; Wesson & Salmon, 2001). In most cases, young children willingly take part in drawing activities. Creative means such as drawing enable children to easily express their experience with places, and such means allow the children to guide the researcher (Cele, 2006). The researcher asked children to draw their favorite outdoor play spaces as a means for the researcher to evaluate each setting's cognitive play affordances and the elements children enjoyed.

**4) Interviews with children:** Young children can describe their experiences and communicate their feelings through interviews (Wesson & Salmon, 2001). Combined with the other methods, this research considered interviews as the most suitable method in understanding the full message children want to communicate about their experiences through photos or drawings. This approach amplifies the voices of young children, enabling the researcher to grasp their thoughts and feelings. Interview questions aimed toward understanding children's choice of photos, drawings, and opinions of the outdoor learning environment.

**5) Interviews with teachers:** Teachers play an important role in shaping children's experiences in childcare centers (Tonyan & Howes, 2003). Teacher involvement with children can result in various play behaviors for children (Kontos & Keyes, 1999). The researcher used teacher interviews to understand the teachers' perspectives toward the outdoor environment and children's daily interactions. The interview questions prompted teachers to discuss the play opportunities the different zones provided for children. The following section explains the protocols regarding each of the described methods.

### 5.1.1 Method 1: Behavior mapping.

The systematic observational data in this research offers organized and reliable information concerning children's interaction with the outdoor environment. The behavior mapping data collection involved observing 36 children for seven days in 12 observation sessions. Table 8 displays the weather during each day of data collection. Temperatures varied throughout the observation period. Since the study was cross-sectional, the researcher aimed to collect observation data in different seasons to detect any change of behavior. The observations occurred when rain chances were minimal. Additionally, the seasonal variation provided different natural changes, such as puddles, mud, flowers, or leaves. This condition provided further information about children's behavior with natural variables in the outdoor preschool settings. The researcher also recorded the change in temperatures for further correlational analysis. The researcher asked the preschool coordinator to organize children's play sessions in different zones so that an equal proportion of observation occurred during morning and evening play periods. However, the coordinator explained that observing the natural zone during the afternoons would be impossible due to accessibility issues as parents arrived to pick up their children.

Table 8. The weather conditions during behavior mapping data collection.

No.	Date	Recess	Zone	Temp.	Humidity	Wind speed (mph)	Conditions
1	2/12/2013	First	Mixed	57	31%	5.8	Scattered clouds
2	2/25/2013	First	Mixed	33.4	49%	8.1	overcast
		Second	Manufactured	37.8	51%	3.5	Mostly cloudy
3	3/04/2013	First	Natural	40	32%	6.9	Partly cloudy
		Second	Manufactured	50	23%	5.8	clear
4	3/08/2013	First	Natural	48.2	34%	10.4	Partly cloudy
5	4/02/2013	First	Natural	52	35%	9.2	Partly cloud
		Second	Mixed	59	27%	8.1	Scattered clouds
6	4/08/2013	First	Natural	71.1	57%	12.7	Mostly cloudy
		Second	Manufactured	75.9	42%	12.7	Mostly cloudy
7	4/11/2013	First	Manufactured	72	68%	15	Mostly cloudy
		Second	Mixed	79	50%	12.7	Mostly cloudy

*Note.* Retrieved from [www.wunderground.com/history](http://www.wunderground.com/history), based on the record time: 11.51 a.m and 4.51 p.m.

Recess hours began at 11:30 a.m. and 4:15 p.m. and continued for 45 minutes each session. Observation only occurred for one zone (mixed, natural, or manufactured) during each 45-minute session. Each zone divided into multiple observation zones, with the observer positioned in a pre-defined place for easy scanning. After the observer scanned each observation zone, she moved to the next observation zone. Each observation session included four rounds per recess. Physical sections within the site defined the behavior settings (Moore & Cosco, 2010). Based on the pilot study, the researcher defined the behavior settings before conducting the behavior mapping; she then systematically scanned each behavior setting while observing the observational zones, recording the child's location. The observer also recorded the child's gender, ethnicity, behavior setting type, physical elements, cognitive play behaviors, and teacher interactions with the child. The study did not apply handheld devices for data collection, enabling the observer to open code all the elements with which children interacted. The observer collected data after circulating on predefined clockwise and counterclockwise walking itineraries.

The researcher watched each child for 10 seconds and recorded for 20 seconds. An audio device with a pre-recorded 30-second interval assured the reliability of the time sampling sequence. Rubin's (2001) Play Observation Scale definition provided the basis for coding children's cognitive play behaviors. The researcher did not interrupt the children's actions. As addressed in the pilot study (Appendix A), the researcher was occasionally uncertain of a child's cognitive play behavior. These instances included particular behaviors wherein the clues for a play behavior were unclear. Cognitive play behaviors are indeed mental process that may not be conspicuous. However, as the pilot study results suggest, cognitive play behaviors are sometimes not recognizable (Pack & Michael, 1995). Following Pack and Michael's (1995) suggested data collection protocol during behavior mapping, the observer sometimes employed an observational method followed by a short interview with children. If the researcher wanted to ask the child about what they were playing, she stopped the recorder, approached the child, asked, "What are you playing?" and wrote down their explanations. This interruption was immediate and the researcher coded for the observed behavior before speaking with the child. The observer wrote the child's ID and explanation while coding for the fitting behavior.

When more than one category of cognitive play behavior occurred simultaneously, the observer coded for the theoretically higher code (Rubin, 2001). For instance, if the child engaged in the games with rules category while running, the observer coded for games with rules. Photos documented the behaviors of a crowd of children displaying a similar behavior pattern. The observer was careful to not photograph children without consent forms. Rubin (2001) provides the detailed protocols for coding cognitive play behavior that this study followed.

The observer open-coded the elements children interacted with to ensure recording of every affordance. If a child concurrently interacted with multiple elements, the researcher coded for category of element involved. For instance, if a child interacted with sand and a shovel, the observer assigned a value for

natural loose and manufactured loose elements. The researcher faced circumstances that suggested further observational protocols, such as when children tied ropes to trees. In such cases, the observer simultaneously coded for the trees and ropes. The elements later classified into four categories: manufactured fixed, manufactured loose, natural fixed and natural loose.

The coding for children included each child's gender, ethnicity, and associated ID number. The researcher coded for children's ethnicity based on the coordinator's account of each child. The researcher coded for teacher interaction when the child was within three feet of a teacher (Howes & Smith, 1995). Concerning teacher intervention during children's play, the study employed Cosco's (2006) codes described at the conceptual framework section. The researcher inserted the gathered data into the GIS program to create attribute tables. The behavior maps demonstrated patterns of relationships between the physical environment and cognitive plays. The researcher later imported the GIS data to the SPSS program for correlational analysis.

To test for reliability, the researcher and a colleague familiar with the data collection protocol evaluated three behavior settings in each zone, coding for selected children. Following independent scorings, the researcher calculated an average score for each child's code using Cohen's weighted kappa statistic (Cohen, 1960). Similar to kappa, the weighted kappa is the proportion of agreement beyond chance and considers the degree of disagreement between two independent raters. Representing an acceptable inter-rater reliability, the weighted kappa score was 0.74 (Altman, 1991). The following section describes the protocols for the photo preference method.

### **5.1.2 Method 2: Photo preference.**

Before the first recess, the researcher visited the four-to-five-year-old class with a teacher present. By that point, parents had already given consent to the researcher. The teachers continued their class activities during data collection. The researcher guided each child to a table beside a wall to reduce noise influence while they engaged in photo selection, drawings, or interviews. The researcher collected data in the mornings before the first recess (between 9:00 a.m. and 11:00 a.m.), or between 3:00 p.m. and 4:30 p.m. The researcher evaluated the appropriateness and protocols of the photo preference in the pilot study (Appendix C).

The researcher printed 22 pictures of the outdoor learning environment and cut each photo to a 5-inch by 6-inch size. The researcher first asked if the child wished to participate in the photo selection of his or her favorite play spaces. In the beginning of the conversation, the researcher explained to the child that she wanted to recognize their everyday play activities in the outdoor preschool setting, what they liked to do, and where they usually played with their friends. See Appendix C for examples of the photos used to survey the children.

The researcher asked the child, "These are the pictures of your outdoor play areas. Can you select three of your favorite pictures?" The researcher wrote the child's ID behind the selected photos for future reference. Once the child selected the photos, the researcher intentionally asked the child, "You have selected this setting; what is it called?" This allowed the researcher to learn specific names of the behavior settings in children's

casual conversations. The researcher recorded the child's explanations on an audio recorder. Through applying specific common names, conversations with children became easier and easier for them to understand. Furthermore, coding the behavior settings during the drawing coding was more accurate for the researcher.

Next, the researcher asked, "Can you explain to me why you have chosen this place as your favorite outdoor play area?" If the child had not mentioned the particular favorite play engaged in that setting, the researcher asked, "What do you usually play in this setting?" To add insight about the elements children interacted with in the particular setting, the researcher asked the child, "What do you usually play with when you are over there?" After the child finished his or her explanation, the researcher expressed gratitude and asked if the child wanted to draw his or her favorite places within the outdoor preschool environment. The following section explains the protocols for obtaining the children's drawings.

### **5.1.3 Method 3: Drawings from children.**

Combining drawings with interviews seeks to improve children's communication about their play memories within outdoor learning environments. To confirm the appropriateness of drawing method for this age group, the study conducted the pilot study explained in Appendix A. The following paragraphs explain the protocols for the drawing method.

While the teachers were present in the class and after the child had selected his or her favorite photos, the researcher asked each child to make a drawing of his or her favorite places. The researcher asked each child, "Can you draw me your favorite places and what you usually play in the preschool's outdoor environment? You can recall these spaces by looking at the photos on the table." Due to time and space constraints, multiple children would simultaneously draw at the same table, although no more than three children participated at the same time.

Children can remember their thoughts while they were drawing and what each drawing means, but only for a short time span (Cele, 2006; Talsma & Krajcik, 2002). As a result, after the child finished drawing, the researcher asked about the picture. The researcher coded for behavior settings or elements in the drawing based on this interview:

The researcher prompted further explanation by asking each child, "You showed the (X) setting in your drawing. Can you explain to me why this area is one of your favorite places in the outdoor environment?" The researcher then asked the child about the activities engaged in that behavior setting by asking, "What do you usually do over there? What do you play over there?" If the response did not include a description of any elements, the researcher asked the child, "How do you play that?" Through this approach, the child usually explained how he or she played with the elements or about game regulations. These questions encouraged the child to explain about his or her interests, exciting memories, and what the child dislikes about a place. The behavior setting and element codes on the drawings aided in future data analysis of the drawings. In addition to

the previously mentioned qualitative methods concerning the children, the researcher conducted interviews with both the children and teachers, as explained in the following sections.

#### **5.1.4 Method 4: Interviews with children.**

The researcher intended to look at how children used the elements and behavior settings detailed in their drawings. The interview acted as an integral part of the drawing and photo preference methods, as it provided deeper insight into the reasons children had drawn or selected particular behavior settings or elements. As seen in the pilot study (Appendix A), talking about the children's drawings created a natural approach for casual and relaxed conversation. Children's explanation about their drawings or photos reduced the power arrangement between the researcher and the child and contributed to a naturally-flowing interview. The researcher allowed the child to explain what they wanted to explain and sometimes asked further questions to aid in understanding their thoughts.

The researcher conducted the interviews during preschool hours in the school building. The interviews followed the photo preference and drawings sessions, using these sessions as starting points. The researcher and child looked at the selected photos or completed drawings and talked about them. The researcher asked children about the reasons they sketched or selected certain behavior settings or elements by asking such questions as, "Can you explain to me why you drew this?" To provide deeper insight, the researcher sometimes asked, "Which areas of the outdoors do you mostly like? Which area of the outdoors you dislike? Why?" Meanwhile, the researcher recorded each child's response with a digital audio recorder. If explaining opinions and feelings agitated children, the researcher led the conversation to an informal and unstructured interview. Later, the researcher transcribed children's interview response for data analysis.

#### **5.1.5 Method 5: Interviews with teachers.**

The researcher asked the four teachers associated with the four-to-five-year-old children to participate in interviews. These interviews provided insight toward the children's outdoor play, the value of preschool's outdoor environment for learning, and children's experience of natural environments versus manufactured environments. First, the researcher explained to the teachers about the research purpose. Next, the researcher individually interviewed each teacher during school hours, using a digital audio recorder to record the teachers' response. The researcher also asked teachers about their education level, years of experience, and training level. The researcher asked the following open-ended questions and later transcribed the teachers' responses for further evaluation.

- 1) Do you consider outdoor spaces as a learning environment? Why?
- 2) How often do children play in the woods? Why does the preschool assign a playtime in that area?
- 3) Do you notice a difference between children with various skills related to their play type?
- 4) Which part of the outdoor learning environment do children mostly like? How do they engage in these areas (what activity types, with what materials, etc.)?

5) Which part of the outdoor learning environment offer the most “educational” experiences for children? How do they engage in these areas?

6) Do you consider outdoor environment as part of the educational curriculum for children? Why?

## **5.2 Conclusion**

This chapter explained the protocols of the five methods of data collection employed in this study that aimed to understand how different zones, behavior settings, or elements associate with young children’s cognitive play behaviors. These methods included: 1) behavior mapping, 2) photo preference, 3) drawings, 4) interviews with children, and 5) interviews with teachers. During behavior mapping, the researcher noted 36 children aged four to five years from two classrooms. The researcher conducted behavior mapping sessions in different zones to evaluate how the outdoor learning environment affords cognitive play behaviors. The researcher coded for children’s cognitive play behaviors, behavior settings, elements, gender, ethnicity, teacher interaction, and weather conditions. Then, the study imported the data to the GIS for further analysis.

Intermixing qualitative and quantitative methods is a conjunctive approach in understanding children’s opinion of their environment. Compared to those used in the pilot study, the modified protocols of the behavior mapping were more efficient in evaluating children’s cognitive play behaviors. Indeed, the issues revealed during the pilot study helped in the development of coding procedures for this study. The qualitative results of this study showed that young children were aware of Microsystems, capable of applying maps, or understanding photographs of their surroundings.

Consistent with previous studies (Wesson & Salmon, 2001), the drawing method enabled children with various verbal skills to express their opinion. Drawings also encouraged children to remain focused and devote more time to expressing their thoughts (Butler et al., 1995), compared to the photo preference method. The drawings were most helpful in the exhaustive interviews, compared to the photo preference method. This may be associated with drawings’ support of memory retrieval. While drawing, children expressed new places or elements not included in the photos. However, some objects children selected in the photos were more difficult to draw. Therefore, children seldom drew visually complex play elements (the play structure, the green tube, etc.). In such instances, the photo preference enabled children to explain their inclinations more easily than through the drawings. The combination of verbal and visual tools helped improve children’s communication with the researcher.

## CHAPTER 6: RESULTS

This study explored the relationship between an outdoor learning environment's physical characteristics and the cognitive play behaviors of young children. Through systematic observation and qualitative data collection methods, rich and descriptive data were gathered. The data contributed to the interpretation of children's cognitive play behaviors afforded by various elements and the behavior settings within outdoor preschool environments. Analysis of the gathered data formed themed categories applicable to the research questions. This section addresses the results of the particular methodologies described in previous chapters: behavior mapping, photo preference, drawings, interviews with children, and finally, structured interviews with teachers.

### **6.1 Behavior Mapping**

This study aimed at evaluating the physical characteristics of the built environment that afford cognitive play behaviors for young children. Overall, the study collected 6801 data points through behavior mapping (Figure 8). The results show how children interacted in particular settings. The analysis assembled the behavior mapping data into the following clusters: zones, behavior settings, zones, children's characteristics, teachers' interaction, and cognitive play behaviors. The following section explains the procedures for the data analysis of behavior mapping and the outcomes.

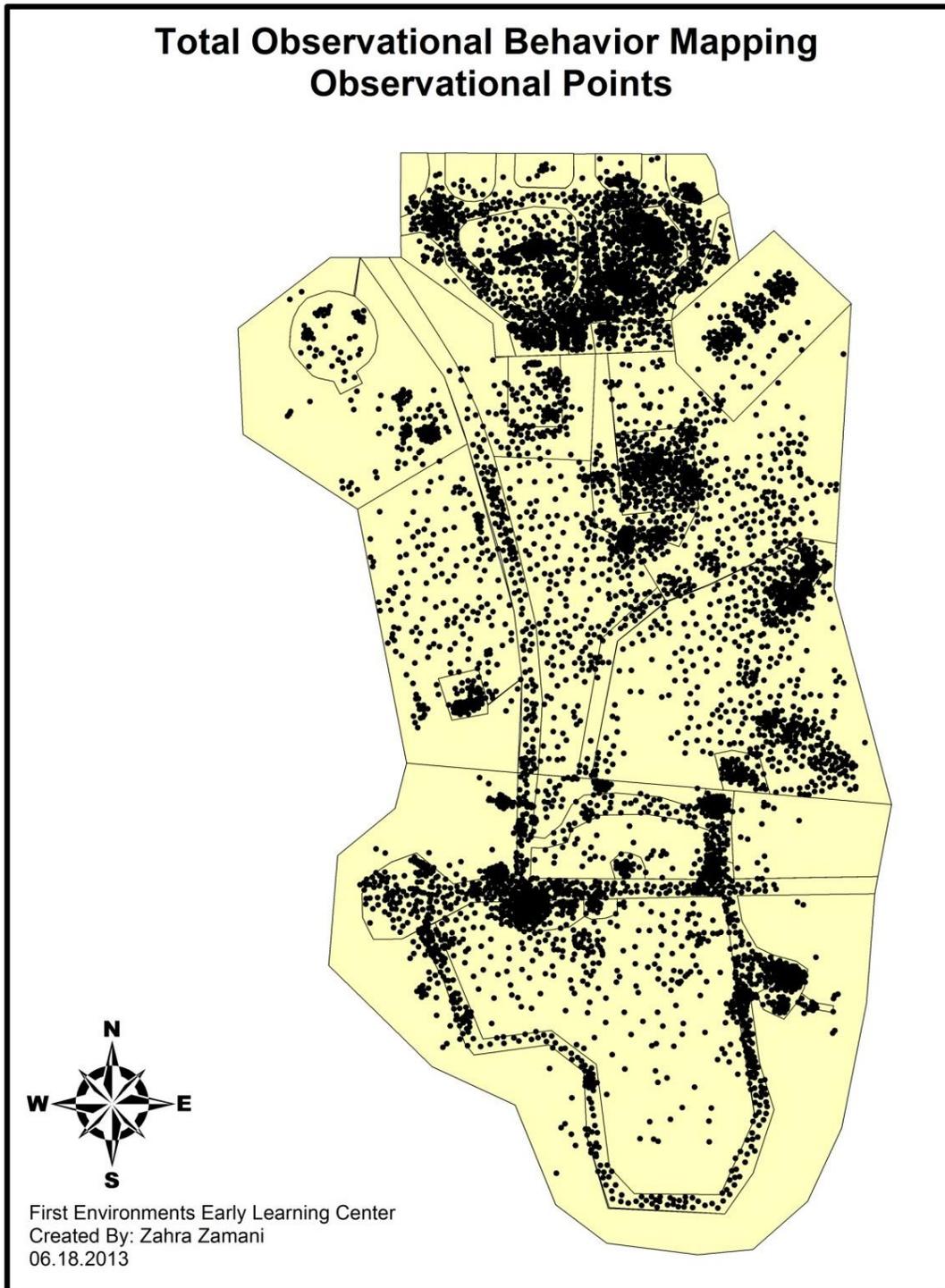


Figure 8. Total observation points collected in the behavior mapping.

### 6.1.1 Analysis of behavior mapping data.

The researcher entered the behavior mapping codes into the GIS program and subsequently pooled the data for further analysis. Table 9 includes examples of coded behavior settings, grouped into natural, mixed, and manufactured settings. Based on Cosco's (2006) hierarchy and pilot study results, the researcher assembled elements into manufactured fixed, manufactured loose, natural fixed, natural loose groups, and no elements (Table 10).

Table 9. Grouping behavior settings based on defined categories.

	Category of Behavior Settings		
	Natural	Mixed	Manufactured
<b>Behavior Settings</b>	Hill, camp (back woods), stone-lined swale, stick-pile, trail in the back woods, or trees.	Looped pathway (bikes), pathway (hill), sand, rope, green tube, tire, green patches, or play houses.	Tables, swings, rockers, music wall, gazebo, structure, or storage.

Table 10. Grouping the coded elements based on defined categories.

	Category of Elements			
	Manufactured-Fixed	Manufactured Loose	Natural Fixed	Natural Loose
<b>Element</b>	Play structure, green tube, swings, gazebo, climbing structure	Bucket, tools, bike, scooter, pipe, rope, cloth	Tree, bush, boulder, tree trunk	Stone, dirt, sand, leaves, stick, creatures

The behavior mapping data processed into a three-level analysis employing the SPSS program. First, the analysis explored the descriptive statistics of each measurement. Second, the Chi-square Test evaluated the likelihood of a remarked distribution because of chance, termed "goodness of fit." Third, the analysis conducted contingency tables for understanding any significant association between cognitive play behaviors, behavior settings, elements, children's gender, children's ethnicity, and teacher's interaction.

In the evaluation of weather conditions, temperatures fell into three categories. Pleasant temperatures ranged from 56 to 79 degrees Fahrenheit, chilly temperatures included 48 to 53 degrees Fahrenheit, and cold included temperatures ranging from 33 to 40 degrees Fahrenheit. The researcher then conducted a correlational analysis to determine any significant difference in children's behavior in different weather conditions. The study approached the data classifications of GIS maps through "quantile," or "equal intervals" methods. The quantile method classifies skewed data into a certain number of categories with an equal number of units in each category. In the equal intervals methods, the value range in each category is similar in size, thus splitting

the data into equally chosen sections (Mitchell, 1999). The following section explains the results of the descriptive statistics for the behavior mapping method.

### 6.1.2 Descriptive statistics for behavior mapping.

Descriptive statistics quantitatively explain the main features of collected data (Mann, 2007). This section aims to summarize the descriptive statistics of behavior mapping data in terms of observed cognitive play behaviors and children's interaction with zones, behavior settings, and elements. The section presents the descriptive results concerning children's ethnicity and gender and explains the distribution of data points related to the teachers' interactions with children.

#### 6.1.2.1 Observed cognitive play behaviors.

The five categories of cognitive play behaviors described in previous chapters served as the basis for this study. Table 11 displays the frequency and percentage associated with each category of cognitive play. The goodness of fit analysis pointed out a meaningful difference between these frequencies ( $P < 0.0001$ ). The results show that children mostly engaged in functional and dramatic play behavior. However, games with rules and constructive play have the lowest percentages compared to the other categories.

Table 11. Children's cognitive play behaviors during behavior mapping. (N=6801)

Functional		Constructive		Exploratory		Dramatic		Games with rules		None	
Count.	%	Count.	%	Count.	%	Count.	%	Count.	%	Count.	%
2482	36.5	381	5.6	634	9.3	2050	30.1	556	8.2	698	10.3

#### 6.1.2.2 Observed interactions within zones.

The outdoor preschool environment divides into three major zones: manufactured, mixed, and natural. Table 12 shows how the data points distribute among these settings. The results show that the data points for each individual zone is comparatively similar to other zones. This characteristic is important for comparing children's behavior within each zone.

Table 12. Frequency of children's interaction with zones in behavior mapping. (N=6801)

Category of Behavior Settings					
Manufactured		Mixed		Natural	
Count.	%	Count.	%	Count.	%
2093	30.8	2483	36.5	2225	32.7

### 6.1.2.3 Observed interactions within behavior settings.

Table 13 shows the frequency of data points in different behavior settings. The table clusters the behavior settings into natural, mixed, and manufactured categories. The results suggest that children mainly engaged with the trees, trails and looped pathway settings.

Table 13. Frequency of children's interaction with behavior settings in behavior mapping. (N=6801)

Category of Behavior Settings					
Natural		Mixed		Manufactured	
Hill	369	Looped Path (bikes)	675	Tables	116
Camp	132	Pathway (Hill)	132	Swings	159
Stone-lined swale	284	Sand-Rope	571	Rockers	48
Stick-pile	358	Sand-Climber	268	Music Wall	76
Trail (woods)	955	Rope	343	Gazebo	71
Trees	1015	Green Tube	112	Play Structure	425
		Play House 1	81	Storage	76
		Green Patches	610	Stage	76
				Play House 2	55

The behavior settings clustered into three categories: natural, mixed, and manufactured (Table 14). The findings suggest children's main interactions occurred within the natural and mixed behavior settings. However, manufactured settings had the lowest percentage of children's behavior.

Table 14. Frequency of children's interaction with category of behavior settings in behavior mapping. (N=6801)

Category of Behavior Settings (N=6801)					
Natural		Mixed		Manufactured	
Count	%	Count	%	Count	%
3151	46.3	2788	41	862	12.7

### 6.1.2.4 Observed interactions with elements.

As previously described, the observer recorded the children's interaction with elements. Table 15 displays the frequency and percentages for children's interaction with important elements. The table classifies these elements based on their categories. The results suggest that sticks (14.3%) and toys (16.4%) were popular elements during children's outdoor play.

Table 15. Frequency of children's interaction with elements in behavior mapping. (N=6801)

Category of Elements							
Manufactured-Fixed		Manufactured Loose		Natural Fixed		Natural Loose	
Name	Freq.	Name	Freq.	Name	Freq.	Name	Freq.
Play structure	187	Tire	169	Tree	595	Creature	239
Green tube	79	Rope	278	Rock	30	Sand	418
Swings	160	Bike	348	Trunk	76	Log	186
Seating (tables or chairs)	210	Tool or toys	1115	Bush	40	Stick	972
Climbing structure	57					Mulch	43
Borders	92					Dirt	226
Rocker	28					Leaves	55
						Flower	14

Further, Table 16 shows the frequency and percentage of children's interaction within each category of elements. The percentage results from dividing the number of data points for a category into the total number of observation points. The results imply that children mainly interacted with natural loose and manufactured loose elements. Additionally, the findings suggest in many occasions children did not interact with a particular element.

Table 16. Frequency of children's interaction with category of elements in behavior mapping. (N=6801)

Category of Elements									
Manufactured-Fixed		Manufactured-Loose		Natural-Fixed		Natural-Loose		No Elements	
Count	%	Count	%	Count	%	Count	%	Count	%
1165	17.1	2023	29.7	929	13.7	2160	31.8	2071	30.5

#### ***6.1.2.5 Children's gender and ethnicity and observed interactions with settings and elements.***

Based on the staff report, most children were from upper middle class families and had average or above average cognitive levels. However, the analysis ignored these variables. The researcher conducted the observation sessions when at least 85% of the 36 children were present. The behavior mapping results associated 4172 observation points to boys (61.3%) and 2629 data points to girls (38.7%). Appendix D displays the observed interaction of male and female children in the behavior settings. Tables 17 and 18 display each gender's interaction with settings and elements. The results show that both genders typically used natural loose and manufactured loose elements, as well as natural and mixed settings.

Table 17. Frequency of children's interaction with category of behavior settings in genders. (N=6801)

Category of Behavior Settings (N=6801)						
Gender	Natural		Mixed		Manufactured	
	Count	%	Count	%	Count	%
Boys	2060	49.4	1700	40.7	412	9.9
Girls	1091	41.5	1088	41.1	450	17.1

Table 18. Frequency of children's interaction with category of elements in genders. (N=6801)

Category of Elements										
Gender	Manufactured-Fixed		Manufactured-Loose		Natural-Fixed		Natural-Loose		No Elements	
	Count	%	Count	%	Count	%	Count	%	Count	%
Boys	598	14.3	1193	28.6	616	14.8	1392	33.4	373	8.9
Girls	567	21.6	830	31.6	313	11.9	768	29.2	151	5.7

Table 19 displays the behavior mapping data related to children's ethnicity. The goodness of fit test pointed out a significant difference between ethnicities ( $X=8853$ ,  $P<0.001$ ). The table shows that the majority of children were Caucasian. Thus, the researcher decided to remove race from the research analysis.

Table 19. Frequency of observed children based on ethnicity. (N=6801)

Caucasian		Asian		Other	
Count.	%	Count.	%	Count.	%
5902	86.8	803	11.8	96	1.4

#### ***6.1.2.6 Teachers' interactions with children and weather conditions.***

The researcher coded for teachers' interactions with children to evaluate their approach toward children's free play (Table 20). Working from this understanding, the researcher aimed to interpret how the teachers' behaviors promoted or hindered children's cognitive play. The Chi square goodness of fit suggested a meaningful difference between each category of teacher interactions with children ( $P<0.0001$ ). The findings suggest that teachers did not often interact with children during free play. Additionally, the study noticed the custodial and negative behaviors the least compared to other types of behavior.

Table 20. Teachers' different interactions with children during behavior mapping. (N=6801)

Neutral		Custodial		Positive		Negative		None	
Count	%	Count	%	Count	%	Count	%	Count	%
286	4.2	20	0.3	316	4.6	12	0.2	6167	90.7

In terms of weather conditions, cold days had 2277 data points (33.5%), chilly days included 2128 data points (31.3%), and pleasant days had 2396 data points (35.2%). Thus, each type of weather condition had about a third of the total data. The following section describes the correlational analysis results of the descriptive data.

### 6.1.3 Correlational analysis of independent and moderator variables and cognitive play.

The Chi square analysis examined the association between independent and moderator variables and cognitive play behaviors. The crosstab results represented how each variable encouraged different cognitive play behaviors. The following sections present the crosstab results of zones, behavior settings, elements, genders, teacher interactions, and weather conditions associated with children's cognitive play.

#### 6.1.3.1 Zones and cognitive play behavior affordances.

The outdoor preschool environment includes three zones. Table 21 shows how each of these zones afforded different type of cognitive play behaviors. The "within zone" row illustrates the percentage of cognitive play behaviors each zone offered. The "within cognitive" row describes the most supportive zone for affording each type of cognitive play. Table 22 visually summarizes these results.

Table 21. Cognitive play behavior affordances of zones. (df=5, N=6801)

Category of Behavior		Cognitive Play Behaviors						SUM	$\chi$
Settings		Functional	Constructive	Exploratory	Dramatic	Games with rules	None		
Natural	Count	683	180	285	825	68	184	2225	281.70
	% within Zone	30.7	8.1	12.8	37.1	3.1	8.3	100	4***
	% within Cognitive	27.5	47.2	45	40.2	12.2	26.4		
Mixed	Count	874	111	271	666	345	216	2483	201.46
	% within Zone	35.2	4.5	10.9	26.8	13.9	8.7	100	9***
	% within Cognitive	35.2	29.1	42.7	32.5	62.1	30.9		

Table 21 Continued.

<b>Manufactured</b>	<b>Count</b>	925	90	78	559	143	298	2093	224.86
									3***
	<b>% within Zone</b>	44.2	4.3	3.7	26.7	6.8	14.2	100	
	<b>% within Cognitive</b>	37.3	23.6	12.3	27.3	25.7	42.7		

Table 22. Cognitive play affordances of zones.

	<b>Cognitive Play Behaviors</b>				
	<b>Functional</b>	<b>Constructive</b>	<b>Exploratory</b>	<b>Dramatic</b>	<b>Games with rules</b>
<b>Natural</b>	●	×	×	●×	
<b>Mixed</b>	●×		×		×
<b>Manufactured</b>	●×				

● The highest percentage for a cognitive play within each zone.

× The highest percentage of an afforded cognitive play type, comparing zones.

The findings suggest that all zones mainly afforded functional play opportunities. The natural zone also afforded many dramatic play opportunities. The results suggest the natural zone was the most supportive play environment for constructive play, exploratory play, and dramatic play. The mixed zone was the most supportive in affording functional play, exploratory play, and games with rules. In contrast, the manufactured zone mostly afforded functional play and non-play opportunities.

### **6.1.3.2 Behavior settings and cognitive play behavior affordances.**

Table 23 displays the crosstab analysis results based on the afforded cognitive play behaviors of behavior settings. Further, Table 24 summarizes the findings regarding the most commonly afforded cognitive play within each setting.

Table 23. Cognitive play behavior affordances of behavior settings. (df=5, N=6801)

<b>Behavior Settings</b>		<b>Cognitive Play Behaviors</b>						<b>SUM</b>	<b>χ</b>
		<b>Functional</b>	<b>Constructive</b>	<b>Exploratory</b>	<b>Drama</b>	<b>Games with rules</b>	<b>None</b>		
<b>Hill</b>	<b>Count</b>	157	9	47	28	89	39	369	202.973***
	<b>%</b>	42.5	2.4	12.7	7.6	24.1	10.6		
<b>Camp</b>	<b>Count</b>	12	6	9	81	1	23	132	88.190***
	<b>%</b>	9.1	4.5	6.8	61.4	.8	17.4		
<b>Stone-lined swale</b>	<b>Count</b>	86	11	76	43	56	12	284	182.357***
	<b>%</b>	30.3	3.9	26.8	15.1	19.7	4.2		

Table 23. Continued.

<b>Green Patches</b>	<b>Count</b>	199	12	59	183	65	92	610	38.854***
	<b>%</b>	32.6	2	9.7	30	10.7	15.1		
<b>Stick-pile</b>	<b>Count</b>	43	124	10	164	3	14	358	718.526***
	<b>%</b>	12	34.6	2.8	45.8	.8	3.9		
<b>Trail</b>	<b>Count</b>	374	29	93	336	38	85	955	50.730***
	<b>%</b>	39.2	3	9.7	35.2	4	8.9		
<b>Trees</b>	<b>Count</b>	268	29	204	337	98	79	1015	212.007***
	<b>%</b>	26.4	2.9	20.1	33.2	9.7	7.9		
<b>Looped Pathway</b>	<b>Count</b>	423	10	34	62	72	74	675	293.366***
	<b>%</b>	62.7	1.5	5	9.2	10.7	11		
<b>Pathway</b>	<b>Count</b>	68	1	14	11	32	6	132	82.236***
	<b>%</b>	51.5	.8	10.6	8.3	24.2	4.5		
<b>Sand-Rope</b>	<b>Count</b>	204	72	5	175	13	102	571	164.104***
	<b>%</b>	35.7	12.6	.9	30.6	2.3	17.9		
<b>Sand-Climber</b>	<b>Count</b>	88	43	16	88	8	25	268	68.796***
	<b>%</b>	32.8	16	6	32.8	3	9.3		
<b>Rope</b>	<b>Count</b>	212	3	8	71	15	34	343	113.878***
	<b>%</b>	61.8	.9	2.3	20.7	4.4	9.9		
<b>Green Tube</b>	<b>Count</b>	1	0	0	78	0	0	79	178.604***
	<b>%</b>	1.3	0	0	98.7	0	0		
<b>Play House 1</b>	<b>Count</b>	4	0	1	60	12	3	80	94.194***
	<b>%</b>	5	0	1.3	75	15	3.8		
<b>Tables</b>	<b>Count</b>	10	0	0	85	1	20	116	128.897***
	<b>%</b>	8.6	0	0	73.3	.9	17.2		
<b>Swings</b>	<b>Count</b>	128	0	5	10	0	16	159	146.234***
	<b>%</b>	80.5	0	3.1	6.3	0	10.1		
<b>Rockers</b>	<b>Count</b>	27	1	0	19	0	1	48	19.277*
	<b>%</b>	56.3	2.1	0	39.6	0	2.1		
<b>Music Wall</b>	<b>Count</b>	9	25	21	1	12	8	76	169.279***
	<b>%</b>	11.8	32.9	27.6	1.3	15.8	10.5		
<b>Gazebo</b>	<b>Count</b>	3	0	0	57	7	4	71	92.767***
	<b>%</b>	4.2	0	0	80.3	9.9	5.6		
<b>Play Structure</b>	<b>Count</b>	176	6	25	142	39	37	425	26.201***
	<b>%</b>	41.4	1.4	5.9	33.4	9.2	8.7		
<b>Storage</b>	<b>Count</b>	31	0	6	21	3	15	76	13.425*
	<b>%</b>	40.8	0	7.9	27.6	3.9	19.7		
<b>Play House 2</b>	<b>Count</b>	11	0	1	40	0	3	55	49.731***
	<b>%</b>	20	0	1.8	72.7	0	5.5		
<b>Platform</b>	<b>Count</b>	14	1	4	36	9	12	76	21.876**
	<b>%</b>	18.4	1.3	5.3	47.4	11.8	15.8		

Table 24. The most supportive behavior settings in affording a cognitive play type.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
Hill	•				•
Camp				•	
Stone-lined swale			•		•
Green Patches					
Stick-pile		•			
Trail in Natural Environment					
Trees			•		
Looped Pathway	•				
Pathway	•				•
Sand					
Rope	•				
Green Tube				•	
Play House 1				•	
Tables				•	
Swings	•				
Rockers	•				
Music Wall		•	•		
Gazebo				•	
Play Structure					
Storage	•				
Play House 2				•	
Platform				•	

The results suggest swings, the looped pathway, and rockers offered the most potential for functional play. The stick-pile and music wall provided the most constructive play, while the music wall and the stone-lined swale afforded the most exploratory play opportunities. Children enjoyed the green tube, playhouse, gazebo, and tables for their dramatic play affordances. The hill and stone-lined swale were the most supportive behavior settings for games with rules.

Behavior settings belonged to three categories: natural, fixed, and manufactured (Table 25). The “within behavior settings” row illustrates the percentage of cognitive play behaviors each setting category offered. The “within cognitive” row evaluates the most supportive behavior setting for affording each type of cognitive play. Additionally, Table 26 visually summarizes the results based on the cognitive play afforded.

Table 25. Category of behavior settings and cognitive play behavior affordances in behavior mapping. (df=5, N=6801)

Category of Behavior Settings		Cognitive Play Behaviors						SUM	$\chi$
		Functional	Constructive	Exploratory	Dramatic	Games with rules	None		
Natural	Count	995	209	444	931	282	290	3151	220.576** *
	% in	31.6	6.6	14.1	29.5	8.9	9.2	100	
	Category of Behavior Setting								
	% within Cognitive	40.1	54.9	70	45.4	50.7	41.5	46.3	
Mixed	Count	1174	144	130	795	222	323	2788	220.576** *
	% in	42.1	5.2	4.7	28.5	8	11.6	100	
	Category of Behavior Setting								
	% within Cognitive	47.3	37.8	20.5	38.8	39.9	46.3		
Manufactured	Count	313	28	60	324	52	85	862	19.007*
	% in	36.3	3.2	7	37.6	6	9.9	100	
	Category of Behavior Setting								
	% within Cognitive	12.6	7.3	9.5	15.8	9.4	12.2		

\*\*\* Indicates the significance of the correlation with  $p < 0.000$ .

\* Indicates the significance of the correlation with  $p < 0.01$ .

Table 26. Category of behavior settings and cognitive play behavior affordances in behavior mapping.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
Natural	●×	×	×	●×	×
Mixed	●×				×
Manufactured	●			●	

● The highest percentage for a cognitive play within each behavior setting.

× The highest percentage of an afforded cognitive play type, comparing settings.

The results suggest that manufactured, natural, and mixed settings primarily stimulated functional play. Children displayed many dramatic play behaviors in the natural and manufactured settings. The findings demonstrate the potential of natural settings in affording constructive, exploratory, and dramatic play, and games with rules. Mixed settings surpassed the other settings in supporting functional and dramatic play and games with rules opportunities.

### 6.1.3.3 Elements and cognitive play behavior affordances.

The Chi square test explored the goodness of fit of each element's cognitive play behavior affordances (Table 27). The significance of the test suggests the unequal distribution of the observed frequencies. For instance, the play structure significantly afforded functional play more than the other types of cognitive play. Further, Table 28 summarizes the correlational analysis regarding the cognitive play affordances of elements.

Table 27. Elements and cognitive play behavior affordances regarding the behavior mapping. (df=5, N=6801)

Elements		Cognitive Play Behaviors						SUM	$\chi$
		Functional	Constructive	Exploratory	Dramatic	Games with rules	No		
Play Structure	Count	80	1	23	55	22	6	187	25.402** *
	%	42.8	.5	12.3	29.4	11.8	3.2	100	
Green Tube	Count	1	0	0	78	0	0	79	178.604* **
	%	1.3	0	0	98.7	0	0		
Swings	Count	144	0	1	1	1	13	160	211.456* **
	%	90	0	.6	.6	.6	8.1		
Seating	Count	24	2	6	99	5	74	210	217.898* *
	%	11.4	1	2.9	47.1	2.4	35.2		
Climbing Structure	Count	17	3	2	34	1	0	57	28.160**
	%	29.8	5.3	2	59.6	1.8	0		
Rocker	Count	18	0	0	10	0	0	28	15.697* **
	%	64.3	0	0	35.7	0	0		
Tire	Count	32	4	0	95	28	10	169	91.236**
	%	18.9	2.4	0	56.2	16.6	5.9		
Rope	Count	191	3	6	62	13	3	278	143.912** *
	%	68.7	1.1	2.2	22.3	4.7	1.1		

Table 27. Continued.

<b>Bike</b>	<b>Count</b>	238	0	38	56	0	16	348	190.517**
	<b>%</b>	68.4	0	10.9	16.1	0	4.6		*
<b>Tree</b>	<b>Count</b>	230	33	59	199	64	10	595	55.403***
	<b>%</b>	38.7	5.5	9.9	33.4	10.8	1.7		
<b>Rock</b>	<b>Count</b>	8	0	15	6	0	0	29	15.697*
	<b>%</b>	27.6	0	51.7	20.7	0	0		
<b>Trunk</b>	<b>Count</b>	8	1	45	21	1	0	76	234.851**
	<b>%</b>	10.5	1.3	59.2	27.6	1.3	0		*
<b>Bush</b>	<b>Count</b>	2	1	16	19	2	0	40	60.995***
	<b>%</b>	5	2.5	40	47.5	5	0		
<b>Creature</b>	<b>Count</b>	7	0	195	23	6	8	239	1536.761*
	<b>%</b>	2.9	0	81.6	9.6	2.5	3.3		**
<b>Sand</b>	<b>Count</b>	27	112	11	250	14	4	418	641.687**
	<b>%</b>	6.5	26.8	2.6	59.8	3.3	1		*
<b>Log</b>	<b>Count</b>	54	6	13	96	5	12	186	45.022***
	<b>%</b>	29	3.2	7	51.6	2.7	6.5		
<b>Sticks</b>	<b>Count</b>	60	151	128	528	94	11	971	809.136**
	<b>%</b>	6.2	15.5	13.2	54.3	9.7	1.1		*
<b>Mulch</b>	<b>Count</b>	5	3	3	31	1	0	43	39.162***
	<b>%</b>	11.6	7	7	72.1	2.3	0		
<b>Dirt</b>	<b>Count</b>	15	16	112	66	15	2	226	485.199**
	<b>%</b>	6.6	7.1	49.6	29.2	6.6	.9		*
<b>Leaves</b>	<b>Count</b>	1	11	8	35	0	0	55	70.278***
	<b>%</b>	1.8	20	14.5	63.6	0	0		
<b>Flower</b>	<b>Count</b>	0	5	0	9	0	0	14	36.330***
	<b>%</b>	0	35.7	0	64.3	0	0		

\*\*\* Indicates the significance of the correlation with  $p < 0.000$ .

\*\* Indicates the significance of the correlation with  $p < 0.001$ .

\* Indicates the significance of the correlation with  $p < 0.01$ .

Table 28. Supportive elements for affording a type of cognitive play regarding the behavior mapping.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
<b>Play Structure</b>					
Green Tubes				•	
Swings	•				
Seating					
<b>Climbing Structure</b>				•	
Rocker	•				
Tire					•
Rope	•				
Bike	•				
<b>Tool or Toys</b>				•	
Tree					•
Rock			•		
Trunk			•		
Bush					
<b>Creature</b>			•		
Sand		•		•	
Log				•	
Stick				•	•
Mulch				•	
Dirt					
Leaves				•	
Flower		•		•	

The results indicate that swings, ropes, bikes, and rocking equipment offered the most functional play. Loose elements such as sand or flowers afforded the most constructive play. Creatures, tree trunks, and rocks greatly afforded major exploratory play opportunities, while the green tube and mulch provided the most dramatic play. The play structure mostly afforded games with rules. Table 29 displays the Chi square results applied to each category of elements. Appendix E displays how the afforded cognitive play behaviors of element categories spread among behavior settings. The “within elements” row of Table 29 explains the percentage of cognitive play behaviors each category of elements offered. The “within cognitive” row evaluates the most supportive category of elements for affording a type of cognitive play. Table 30 visually summarizes these correlation results.

Table 29. Category of elements and cognitive play behaviors affordances in behavior mapping. (df=5, N=6801)

Category of Elements		Cognitive Play Behaviors						SUM	X <sup>2</sup>
		Functional	Construc- tive	Exploratory	Dramatic	Games with rules	None		
<b>Manufac- tured Fixed</b>	<b>Count</b>	434	45	89	432	61	104	1165	51.8 41 ***
	<b>% within Elements</b>	37.3	3.9	7.6	37.1	5.2	8.9	100	
	<b>% within Cognitive</b>	15.1	7.7	11.0	15.1	9.2	14.6		
<b>Manufac- tured Loose</b>	<b>Count</b>	756	154	124	740	181	68	2023	228. 192* **
	<b>% within Elements</b>	37.4	7.6	6.1	36.6	8.9	3.4	100	
	<b>% within Cognitive</b>	27.1	26.4	15.2	26.7	29.0	9.5		
<b>Natural Fixed</b>	<b>Count</b>	322	36	194	275	83	19	929	232. 641* **
	<b>% within Elements</b>	34.7	3.9	20.9	29.6	8.9	2	100	
	<b>% within Cognitive</b>	11.5	6.2	23.8	9.7	13.8	2.7		
<b>Natural Loose</b>	<b>Count</b>	191	347	375	1073	137	37	2160	2140 .281 ***
	<b>% within Elements</b>	8.8	16.1	17.4	49.7	6.3	1.7	100	
	<b>% within Cognitive</b>	6.8	59.4	45.9	38.2	21.7	5.2		
<b>No Elements</b>	<b>Count</b>	1089	1	33	292	173	483	2071	1315 .137 ***
	<b>% within Elements</b>	53.8	0	1.6	12.7	8.2	23.8	100	
	<b>% within Cognitive</b>	39.0	0.3	4.1	10.3	26.3	68.0		

\*\*\* Indicates the significance of the correlation with p &lt; 0.000.

\*\* Indicates the significance of the correlation with p &lt; 0.001.

Table 30. Category of elements and cognitive play behaviors affordances in behavior mapping.

	Cognitive Play Behaviors					
	Functional	Constructive	Exploratory	Dramatic	Games with rules	None
<b>Manufactured Fixed</b>	•			•		
<b>Manufactured Loose</b>	•			•	×	
<b>Natural Fixed</b>	•			•		
<b>Natural Loose</b>		×	×	•×		
<b>No Elements</b>	•×					×

• The highest percentage for a cognitive play within each element.

× The highest percentage of an afforded cognitive play type, comparing elements.

The results suggest that manufactured fixed, manufactured loose, and natural fixed elements afforded more functional and dramatic play opportunities than other cognitive play types. Functional play and non-play behaviors mostly happened when children were not interacting with any elements. Natural loose elements were the most supportive in affording constructive, exploratory, and dramatic play. In addition, manufactured loose elements provided the most games with rules opportunities compared to other elements.

#### 6.1.3.4 Gender and cognitive play within behavior settings and elements.

Table 31 describes the crosstab results between children's gender and their cognitive play behaviors. The Chi square goodness of fit analysis shows a significant association between gender and cognitive play behavior types ( $X=162.911$ ,  $df=5$ ,  $p<0.000$ ). The "within genders" row explains the percentage of cognitive play behaviors in which each gender engaged. The "within cognitive" row compares genders for by cognitive play behaviors. Table 32 visually summarizes the cognitive play behaviors that each gender engaged in during outdoor play.

Table 31. Observed cognitive play behaviors within genders during behavior mapping. (N=6801)

Gender		Cognitive Play Behaviors						SUM
		Functional	Constructive	Exploratory	Dramatic	Games with rules	None	
<b>Female</b>	<b>Count</b>	973	133	187	893	106	337	2629
	<b>% within Gender</b>	37	5.1	7.1	34	4	12.8	100
	<b>% within Cognitive</b>	39.2	34.9	29.5	43.6	19.1	48.3	
<b>Male</b>	<b>Count</b>	1509	248	447	1157	450	361	4172
	<b>% within Gender</b>	36.2	5.9	10.7	27.7	10.8	8.7	100
	<b>% within Cognitive</b>	60.8	65.1	70.5	56.4	80.9	51.7	

Table 32. The most cognitive play behaviors that genders engaged regarding the behavior mapping.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
Female	•			•	
Male	•			•	

The results show that girls and boys typically engaged in functional and dramatic play, more than the other cognitive play types. Boys participated more in cognitive play than girls did. Because the sample of boys participating in the behavior mapping was 18% higher than the sample of girls, the study neglected this significant difference in cognitive play evaluation.

Compared to other behavior settings, natural settings were the most supportive in affording functional (41.6%), constructive (64.9%), exploratory (71.6%), dramatic (49.4%), and games with rules (53.3%) play for boys. Mixed settings also supported functional play for boys (48%). Mixed settings stimulated more play behaviors for girls. The correlational analysis showed that mixed settings were the most supportive in affording functional (46.2%), constructive (56.4%), dramatic (38.1%), and games with rules (45.3%) play. Additionally, natural settings stimulated exploratory (66.3%) and dramatic (39.6%) play for girls.

The analysis of gender difference indicated that manufactured loose elements mostly stimulated functional (47.4%) and games with rules play (39.3%) for boys. Natural loose elements offered boys constructive (64.4%), exploratory (48.3%), and dramatic (47.4%) play. The correlational analysis showed that manufactured loose elements were the most supportive in affording functional (39.3%), dramatic (34.5%), and games with rules (33.9%) play for girls. Natural loose elements were the most supportive for constructive (51.7%), exploratory (47.1%), and dramatic (37%) play for girls.

#### ***6.1.3.5 Teachers' interaction and children's cognitive play behaviors.***

The crosstab analysis explored how teacher interactions with children altered children's cognitive play behaviors (Table 33). The "within teachers" row shows the percentage each teacher's interaction type promoted a cognitive play type. The "within cognitive" row shows the most supportive type of teacher interaction for stimulating a cognitive play behavior type in children. The Chi square results marked a significant correlation between children's cognitive play behaviors and teachers' interactions ( $X=525.766$ ,  $df=5$ ,  $p<0.0001$ ). Table 34 visually summarizes the cognitive play behaviors that children mostly engaged in and the associated teacher behaviors.

Table 33. Teachers' interaction and children's cognitive play behaviors during behavior mapping. (df=5, N=6801)

Category of Behavior Settings		Cognitive Play Behaviors						SUM
		Functional	Construc- tive	Exploratory	Dramatic	Games with rules	None	
Neutral	Count	122	17	11	22	11	103	286
	% within Teachers	42.7	5.9	3.8	7.7	3.8	36	100
	% within Cognitive	4.9	4.5	1.7	1.1	2	14.8	
Custodial	Count	2	0	0	1	0	17	20
	% within Teachers	10	0	0	5	0	85	100
	% within Cognitive	.1	0	0	0	0	2.4	
Positive	Count	124	52	25	46	47	22	316
	% within Teachers	39.2	16.5	7.9	14.6	14.9	7	100
	% within Cognitive	5	13.6	3.9	2.2	8.5	3.2	
Negative	Count	5	1	0	1	0	5	12
	% within Teachers	41.7	8.3	0	8.3	0	41.7	100
	% within Cognitive	.2	.3	0	0	0	.7	
None	Count	2229	311	598	1980	498	551	6167
	% within Teachers	36.1	5	9.7	32.1	8.1	8.9	100
	% within Cognitive	89.8	81.6	94.3	96.6	89.6	78.9	

Table 34. Teachers' interaction type and promoted cognitive play types.

	Cognitive Play Behaviors					
	Functional	Constructive	Exploratory	Dramatic	Games with rules	None
Neutral	●					●
Custodial						●
Positive	●					
Negative	●					●
None	●×	×	×	●×	×	×

● The highest percentage for a cognitive play regarding each interaction type.

× The highest percentage of an afforded cognitive play type, comparing different teachers' interactions.

The results show that teachers' neutral, custodial, and negative behaviors encouraged non-cognitive play behaviors. When teachers had neutral, positive, negative, or non-interacting behaviors during outdoor play, children mostly showed functional play behaviors. When teachers did not interact with children's play, the children engaged in dramatic play. The results indicate that children significantly engaged in different cognitive play behaviors when teachers were not interacting with the play. This may suggest the importance of free play opportunities for children.

#### 6.1.3.6 Weather conditions and children's cognitive play behaviors.

The researcher conducted a correlational analysis to detect any significant difference between the weather conditions and children's interaction with the environment. Table 35 shows the results of this analysis. The "within weather" rows show how children engaged in different cognitive play types in each weather condition. The "within cognitive" row compares the weather types to understand the most supportive weather conditions in affording each cognitive play behavior. Table 36 visually summarizes these results.

Table 35. Cognitive play behaviors in different weather conditions during behavior mapping. (N=6801)

Weather Conditions		Cognitive Play Behaviors					
		Functional	Constructive	Exploratory	Dramatic	Games with rules	None
Cold	Count	895	141	141	587	213	300
	% within Weather	39.3	6.2	6.2	25.8	9.4	13.2
	% within Cognitive	36.1	37	22.2	28.6	38.3	43
Chilly	Count	764	145	129	752	115	223
	% within Weather	35.9	6.8	6.1	35.3	5.4	10.5
	% within Cognitive	31.9	30.8	38.1	20.3	36.7	20.7
Pleasant	Count	823	95	364	711	228	175
	% within Weather	34.3	4	15.2	29.7	9.5	7.3
	% within Cognitive	33.2	24.9	57.4	34.7	41	35.2

Table 36. Weather and children's cognitive play.

	Cognitive Play Behaviors					
	Functional	Constructive	Exploratory	Dramatic	Games with rules	None
Cold	●×	×		×	×	×
Chilly	●×			●	×	
Pleasant	●×		×	●×	×	×

● The highest percentage for a cognitive play regarding each weather type.

× The highest percentage of an afforded cognitive play type, comparing different weathers.

The findings suggest that children engaged in functional play in all weather conditions. However, chilly and pleasant weather stimulated dramatic play, while cold weather incited constructive play. Children engaged more in exploratory play in pleasant weather conditions. Overall, the findings suggest no significant change in behavior with an increase in temperature.

#### **6.1.4 Summary of the behavior mapping findings.**

The behavior mapping provided significant objective data about children's interactions with the physical environment and the cognitive play that resulted. The following summarizes these results:

**1) Zones and cognitive play behavior affordances:** The natural zone provided the most opportunities for constructive, exploratory, and dramatic play. Mixed zones afforded the most functional, exploratory, and game with rules play.

**2) Behavior settings and cognitive play behavior affordances:** The manufactured settings mostly offered functional and dramatic play. Natural settings granted constructive, exploratory, and dramatic, and games with rules play. Mixed settings offered many dramatic and games with rules opportunities.

**3) Elements and cognitive play affordances:** Manufactured fixed and manufactured loose elements encouraged children's functional and dramatic play. Natural fixed elements mainly offered dramatic and exploratory play behavior. Almost half of children's interactions with natural loose elements were dramatic play behavior. Children mostly engaged in functional play when not interacting with any elements. Natural loose elements stimulated children's constructive, exploratory, and dramatic play. Manufactured loose elements were more encouraging for games with rules.

**4) Genders' cognitive play within behavior settings and elements:** The natural and mixed zones stimulated diverse cognitive play between both genders. Manufactured loose and natural loose elements inspired different cognitive play in both boys and girls.

**5) Teachers' interaction and children's cognitive play:** The teachers' neutral, custodial, and negative behaviors discouraged children's cognitive play. Children engaged in more cognitive play behaviors when teachers did not interact with children during outdoor play.

**6) Weather condition and children's cognitive play:** Warmer weather stimulated more exploratory play opportunities for children. However, an increase of temperature did not significantly change children's behavioral patterns. The following section explains the photo preference results.

## **6.2 The Photo Preference and Linked Interviews**

Children were energetic and engaged when asked to choose the photos of their favorite play spaces. This qualitative method was ideal for children who did not want to draw. Children browsed the photos and made remarks about the ones they chose. Some children explored the photos, attempting to identify peers. Asking children to identify their favorite play spaces is most successful when the photos represent the places they recognize. This following accounts how the study analyzed the photo preference results and the outcomes.

### 6.2.1 Analysis of the photo preference.

Data analysis of children's photo preferences involved four steps. First, the researcher organized the children's photo preference based on each child's ID number, then transcribed each child's interview. This enabled the researcher to analyze photo preference data, taking into account the children's explanations. The study identified all behavior settings and elements during this process (Appendix F). The data analysis also involved coding children's explanations based on the cognitive play behaviors they described. This required understanding children's explanations and interpreting the representative cognitive play. For instance, if a child mentioned that she enjoyed playing with the sand to make sand castles, the researcher coded for dramatic play behavior, sand element, and sand behavior setting. The pilot study describes examples of this procedure. Table 37 offers examples of children's explanations and their coding based on cognitive play behavior levels. The third step of data analysis involved using the SPSS program to run a crosstab analysis. The crosstab analysis explored associations between the categories of behavior settings, categories of elements, and preferred cognitive play behaviors. In the final stage of data analysis, the researcher compiled the coded responses and evaluated them for gender differences.

Table 37. Coding children's play accounts based on cognitive play behaviors.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
<b>Play</b>	Running, jumping,	Digging a hole,	Searching for ants,	Star wars,	Chasing, playing
<b>Examples</b>	sliding	building blocks,	finding bugs	princess, building sand castles	bad guys, frisbee

Overall, 24 children, including 11 boys and 13 girls, participated in the photo selection. Appendix F presents the element or behavior setting each child selected. The explanation column shows the child's reason why the picture depicted his or her favorite play area. Some children chose not to explain their choices. Further, some children did not describe cognitive play information. The following section explains the photo preference findings regarding the frequencies of codes and correlational association.

### 6.2.2 Frequency of codes in the photo preference.

The study classified the coded photos into elements, behavior settings, and cognitive play behaviors (Appendix A). The analysis also evaluated gender difference in photo preference. The following sections describe the codes as they relate to behavior settings, elements, and cognitive play behaviors.

### 6.2.2.1 Preferred behavior settings in the photo preference.

Figures 9 and 10 illustrate children's preferred behavior settings and category of settings as indicated by their photo preference. These findings suggest that children mostly preferred the green tube, swings, play structure, and trees behavior settings, indicating that they primarily enjoyed mixed settings. Girls' preferred the green tube, swings, and green patches, while boys typically enjoyed the trees, looped pathway, and ropes. Both genders liked the play structure and mixed behavior settings.

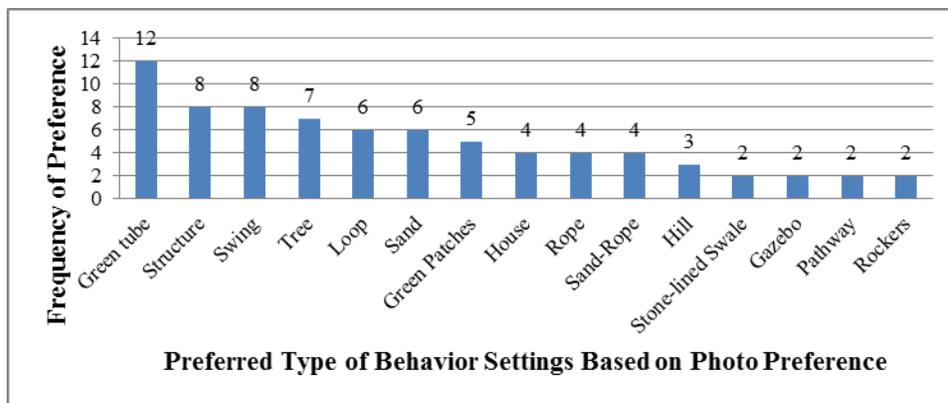


Figure 9. Frequency of preferred behavior settings in the photo preference. (Total number of codes=76, N=24)

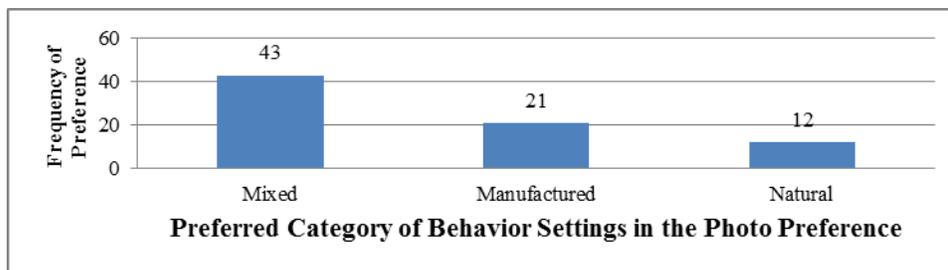


Figure 10. Frequency of preferred category of behavior settings in the photo preference. (Total number of codes=76, N=24)

### 6.2.2.2 Preferred elements in the photo preference.

The study classified the photos based on element types and categories of elements (Figures 11 and 12). The findings suggest that children enjoyed the green tube, swings, play structure, and sand elements. Overall, children mostly favored manufactured fixed elements. Consistent with their preferred behavior settings, girls mostly enjoyed manufactured fixed elements, such as the green tube, swings, and the play structure. Boys

preferred the ropes, trees, rocks, and the play structure, and interacted mostly with manufactured loose elements.

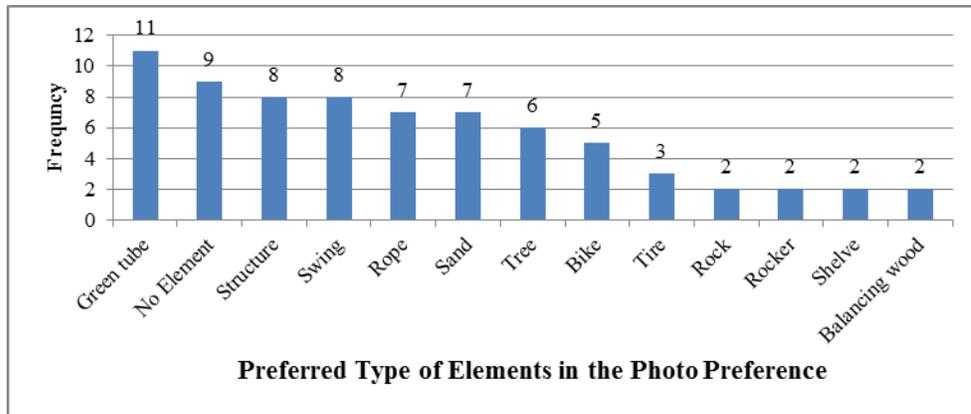


Figure 11. Frequency of preferred elements in the photo preference. (Total number of codes=76, N=24)

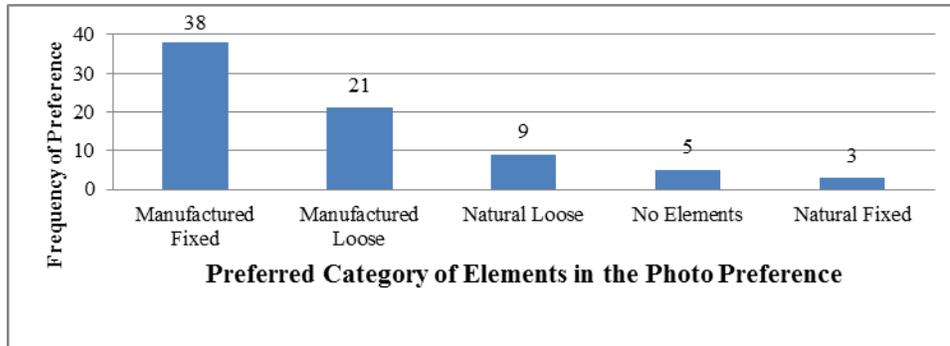


Figure 12. Frequency of preferred category of elements in the photo preference. (Total number of codes=76, N=24)

### 6.2.2.3 Preferred cognitive play type in the photo preference.

The researcher documented each child's explanation for preferred cognitive play behaviors; Figure 13 displays those behaviors. Children generally preferred functional and dramatic play behaviors, regardless of gender. The following section describes the correlational analysis of preferred settings, elements, and cognitive play associated with the photo preference results.

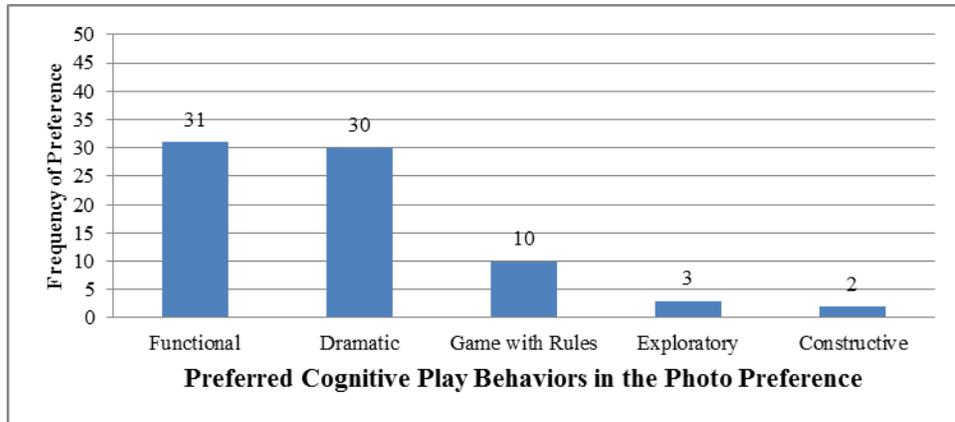


Figure 13. Frequency of preferred cognitive play behaviors in the photo preference. (Total number of codes=75, N=24)

### 6.2.3 Correlational analysis of the photo preference.

The correlational analysis explored the association between children's preference for behavior settings, elements, and cognitive play behaviors during the photo preference method. The following sections explain the significant associations revealed in this evaluation.

#### 6.2.3.1 Favored behavior settings and cognitive play behaviors in the photo preference.

Table 38 explains the association between preferred behavior settings and the cognitive play behaviors each setting afforded, based on children's responses to the photos. The "within behavior settings" row compares the cognitive play behavior types in each category of settings. The "within cognitive" row demonstrates the most supportive category of behavior setting for the cognitive play affordance identified in the photo preference. Table 39 visually summarizes the results based on the cognitive play behavior affordances and behavior settings.

Table 38. Preferred cognitive play behaviors and category of behavior settings in the photo preference. (Total number of Codes=76, N=24)

Category of Behavior Settings		Cognitive Play Behaviors					SUM	
		Function- al	Construc- tive	Exploratory	Dramatic	Game s with rules		None
Natural	Count	2	0	2	5	3	1	12
	% in Category of Behavior Setting	16.7	0	16.7	41.7	25	8.3	100
	% within Cognitive	6.5	0	66.7	16.7	30	100	15.8

Table 38. Continued.

<b>Mixed</b>	<b>Count</b>	18	2	0	17	6	0	43
	<b>% in Category of Behavior Setting</b>	41.9	4.7	0	39.5	14	0	100
	<b>% within Cognitive</b>	58.1	100	0	56.7	60	0	56.6
<b>Manufactured</b>	<b>Count</b>	11	0	1	8	1	0	21
	<b>% in Category of Behavior Setting</b>	52.4	0	4.8	38.1	4.8	0	100
	<b>% within Cognitive</b>	35.5	0	33.3	26.7	10	0	27.6

Table 39. Preferred cognitive play behaviors and category of behavior settings in the photo preference.

	<b>Cognitive Play Behaviors</b>				
	<b>Functional</b>	<b>Constructive</b>	<b>Exploratory</b>	<b>Dramatic</b>	<b>Games with rules</b>
<b>Natural</b>			×	•	
<b>Mixed</b>	•×	×		×	×
<b>Manufactured</b>	•				

• The highest percentage for a cognitive play regarding each category of behavior setting.

× The highest percentage of an afforded cognitive play type, comparing different category of behavior settings.

The results suggest children mostly preferred natural behavior settings for their dramatic play and exploratory play opportunities. Children enjoyed functional and dramatic play activities within mixed behavior settings and engaged in functional play in manufactured behavior settings. The findings suggest children's high favor for mixed behavior settings for their functional, constructive, dramatic, and games with rules affordances.

#### ***6.2.3.2 Favored elements and cognitive play behaviors in the photo preference.***

Table 40 depicts the association between children's preferred category of elements and cognitive play behaviors based on the photo preference results. The "within elements" row explains the percentage of cognitive play behavior types each category of element offered. The "within cognitive" row describes the most supportive category of elements for each particular cognitive play affordance. Table 41 visually summarizes these findings.

Table 40. Preferred cognitive play behaviors and category of elements in the photo preference. (Total number of Codes=76, N=24)

Category of Elements		Cognitive Play Behaviors					SUM
		Functional	Constructive	Exploratory	Dramatic	Games with rules	
Manufactured Fixed	Count	18	0	1	16	3	38
	% within Elements	47.4	0	2.6	42.1	7.9	100
	% within Cognitive	58.1	0	33.3	51.6	30	50
Manufactured Loose	Count	10	0	0	9	2	21
	% within Elements	47.6	0	0	42.9	9.5	100
	% within Cognitive	32.3	0	0	29	20	27.6
Natural Fixed	Count	0	0	2	0	1	3
	% within Elements	0	0	66.7	0	33.3	100
	% within Cognitive	0	0	66.7	0	10	3.9
Natural Loose	Count	0	2	0	5	2	9
	% within Elements	0	22.2	0	55.6	22.2	100
	% within Cognitive	0	100	0	16.1	20	11.8
No Elements	Count	3	0	0	0	2	5
	% within Elements	60	0	0	0	40	100
	% within Cognitive	9.7	0	0	0	20	6.6

Table 41. The most cognitive play behaviors that each category of elements offered based on the photo preference.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
Manufactured Fixed	●×			●×	×
Manufactured Loose	●			●	
Natural Fixed			●×		
Natural Loose		×		●	
No Elements	●				

● The highest percentage for a cognitive play regarding each category of element.

× The highest percentage of an afforded cognitive play type, comparing different category of elements.

These results suggest that children mostly preferred manufactured fixed and manufactured loose elements that offered functional and dramatic play opportunities. Children appreciated natural fixed elements for their exploratory play opportunities. In addition, children preferred natural loose elements for their dramatic and constructive play activities. All three categories of elements were effective in providing ample game with rules activities.

#### **6.2.4 Summary of the photo preference findings.**

The photo preferences signaled children's penchant for the green tube, swings, play structure, and trees. Similarly, children mostly selected the green tube, swings, play structure, and sand as their favorite elements. Furthermore, children preferred dramatic and functional cognitive play behaviors, as well as manufactured fixed elements and mixed behavior settings. Both genders preferred mixed settings. Females enjoyed manufactured fixed elements, while males preferred manufactured loose elements. Both genders preferred functional and dramatic play. The following section explains the results associated with the drawing analysis.

### **6.3 Drawings and Linked Interviews**

Most children enthusiastically drew their favorite places for outdoor play. Children considered drawing a fun procedure and enjoyed explaining their ideas and imaginations. Twenty-two children took part in the drawing portion of the research. Some drawings represented children's cognitive maps (See Appendix G for drawing examples). Children occasionally explained how they desired to draw complex elements, such as the green tube or the play structure, but found drawing those items too complicated. The following sections explain how the study evaluated the drawings and the associated outcomes.

#### **6.3.1 Analysis of the drawings.**

The analysis of the drawings included three stages. In the first stage, the researcher quantified all 22 drawings by coding their visual features (Sommer & Sommer, 2002; Zeisel, 2006; Moore, 1986). The drawing codes established the element or behavior setting types depicted in the image (Appendix H). The researcher further evaluated the drawings on the frequency that certain settings or elements appeared. The third data analysis stage compared genders for their chosen element and behavior setting types. The following sections describe the results of this analysis regarding the preferred behavior settings and elements depicted in drawings.

#### **6.3.2 Frequency of codes for behavior settings and elements in the drawings.**

The researcher coded each child's drawings for behavior settings and elements considering the described protocols. This section compares these frequencies within the drawings.

##### **6.3.2.1 Preferred behavior settings in the drawings.**

Figure 14 compares the preferred behavior settings that children represented in their drawings. Additionally, Figure 15 arranges the children's preferences based on categories of behavior settings. The results suggest children mainly enjoyed the sand, pathway, woods, and swings. Additionally, the findings indicate that

children, regardless of gender, favored mixed behavior settings. Both genders mostly drew the sand, pathway, and trees settings. However, girls also depicted the swings, while boys sketched the creek.

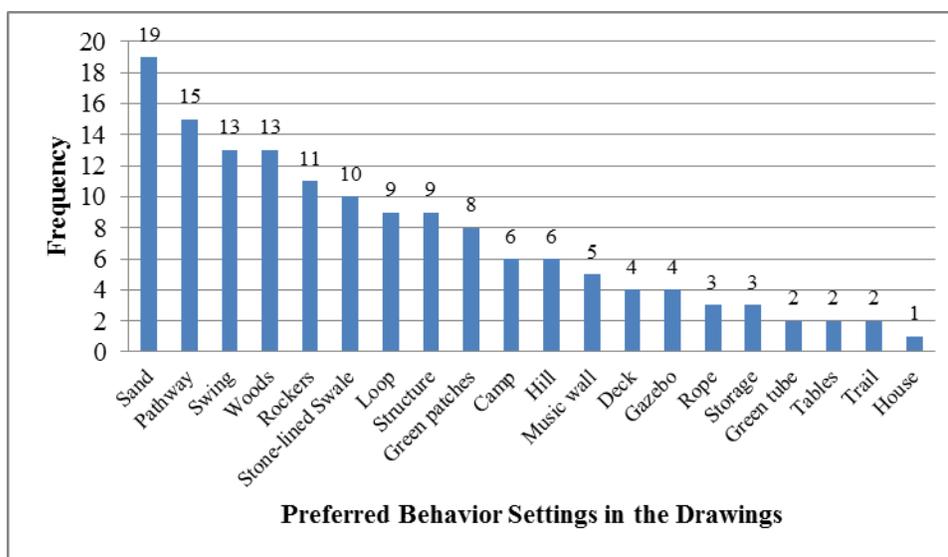


Figure 14. Frequency of behavior settings in drawings. (N=22, Number of depicted behavior settings=145)

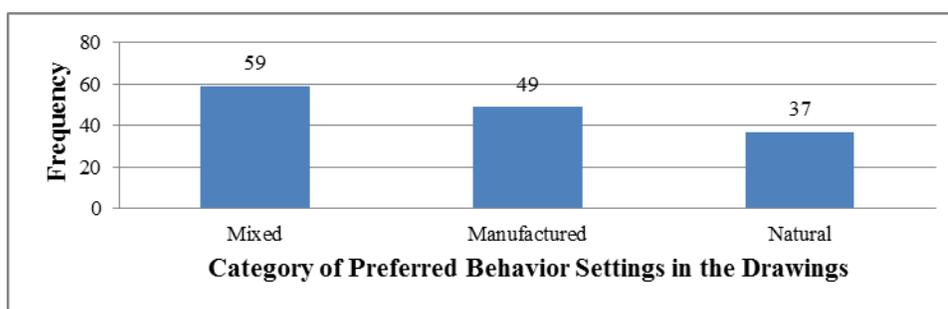


Figure 15. Frequency of category of behavior settings in drawings. (N=22, Number of depicted behavior settings=145)

### 6.3.2.2 Preferred elements in the drawings.

Figure 16 through Figure 19 compare children's preferred elements per the drawings. Additionally, Figure 20 arranges children's preference by each category of elements. The results indicate the swings, tires, trees, and sand were popular elements in the drawings. Further, children mostly preferred manufactured fixed and natural loose category of elements in their drawings. Girls typically depicted the swings, arches, rockers,

tires, bikes, trees, sand, and mulch. Boys generally drew bridges, swings, tire, ropes, trees, rocks, sand, and grass. The analysis suggests that both genders mainly preferred manufactured fixed and natural loose elements.

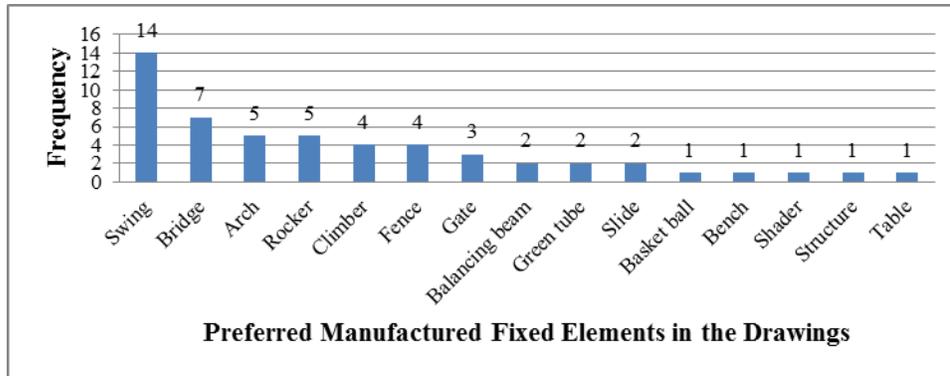


Figure 16. The frequency of manufactured fixed elements in drawings. (N=22, Number of depicted Elements=53)

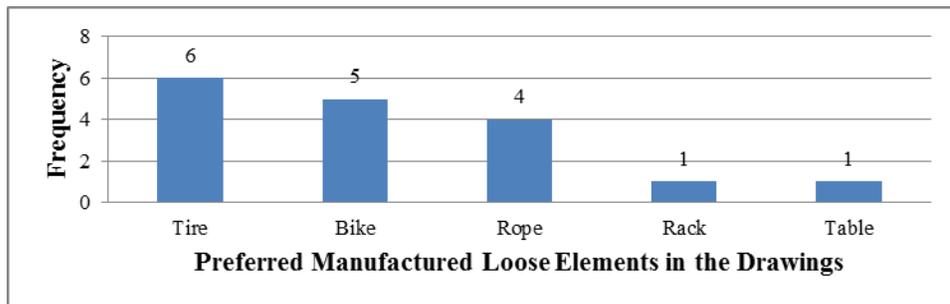


Figure 17. The frequency of manufactured loose elements in drawings. (N=22, Number of depicted elements=17)

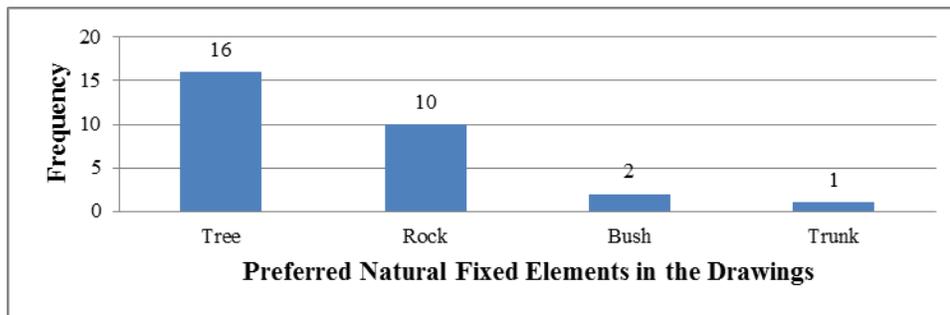


Figure 18. The frequency of natural fixed elements in drawings. (N=22, Number of depicted elements=29)

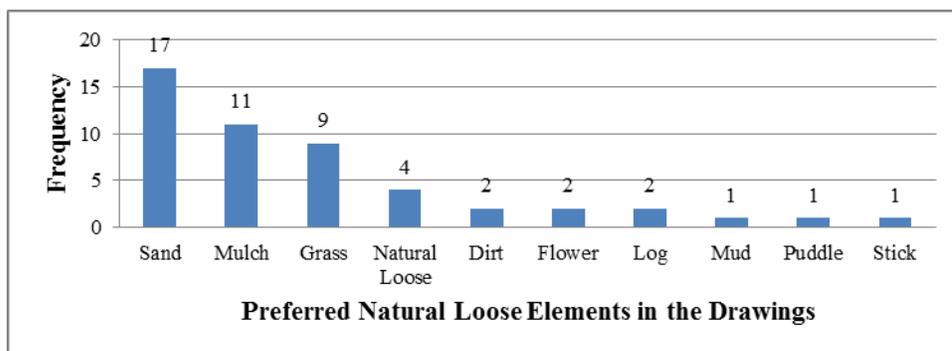


Figure 19. The frequency of natural loose elements in drawings. (N=22, Number of depicted elements=50)

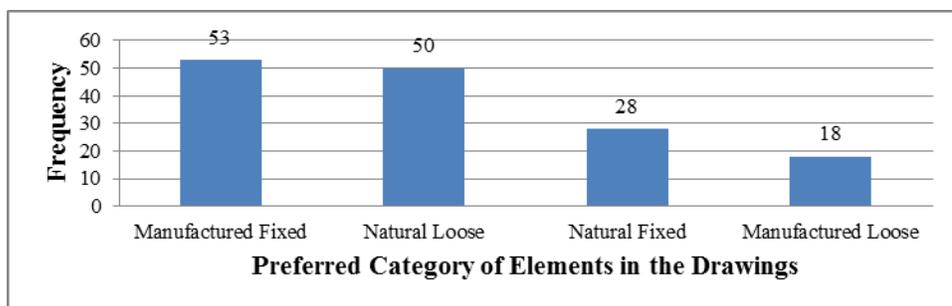


Figure 20. The frequency of natural loose elements in drawings. (N=22, Number of depicted elements=149)

### 6.3.3 Summary of the drawings' findings.

Children mainly sketched the sand, the pathway, trees, and swings as their favorite behavior settings. Swings, tire, trees, sand, and mulch appeared to be their preferred elements. Based on their drawings, children mainly favored mixed behavior settings, manufactured fixed, and natural loose elements. Both genders appreciated mixed settings, manufactured fixed elements, and natural loose elements. The next section describes the interview results.

### 6.4 The Children's Interview.

During the interview process, the researcher patiently listed and actively participated in conversations. The researcher attempted to establish a connection with children in the photo preference and drawing sessions. Despite having no previous relationship with the researcher, the children enthusiastically explained their favorite behavior settings, elements, or play activities. The researcher tried to create an informal atmosphere for the interview by considering small details, such as sitting on children's chairs and restraining from adult

dominance. The drawings and photos served as starting points for interviews. After each child had finished his or her drawing, the researcher asked the child about the drawing's content and the play in which the child usually engaged. The questions began in a structured format, but conversation continued to higher levels if the child demonstrated eagerness to explain his or her experiences further.

The data analysis of interviews started with the researcher transcribing children's explanations. Next, the researcher coded for these explanations based on cognitive play behavior affordances of elements or behavior settings. The following section describes the data analysis procedures in the interview stage.

#### **6.4.1 Analysis of children's interviews.**

As previously mentioned, the study aimed to glean the children's favored element types, behavior setting types, or cognitive play behaviors from their interview responses. The researcher first recorded and transcribed children's responses to be understandable and legible (Creswell, 2009; Sommer & Sommer, 2002) by keying results into a computer and arranging the results by themes (Sommer & Sommer, 2002). This study also aimed to understand how physical attributes of the outdoor environment stimulate children's cognitive play. Thus, the researcher coded children's explanations for preferred behavior settings, elements, and cognitive play behaviors. Crosstab analysis further explored the connection between favored categories of elements, behavior settings, and cognitive play behaviors. The third stage of data analysis compared genders for their preferences.

Twenty-one children, including 8 boys and 13 girls, participated in the interviews. Appendix I describes the children's explanations according to their ID code. The researcher coded for elements, behavior settings, and associated cognitive play behaviors based on each child's descriptions. However, some children could not clarify the reasons for picturing a specific behavior setting or element; this resulted in an empty code. If a child mentioned a certain game they played, the researcher asked how they played it. Children's explanations helped in interpreting their play behaviors during observation. The next section explains the results associated with code frequency.

#### **6.4.2 Frequency of behavior settings, elements, and cognitive play codes in the interviews.**

The researcher analyzed interviews for the behavior settings, elements, and cognitive play behaviors described therein. This evaluation provided insight toward children's interaction with the outdoor environment's features. The following sections address children's preference for the behavior settings, elements, and cognitive play behaviors.

##### ***6.4.2.1 Preferred behavior settings in the interviews.***

Figure 21 indicates children's preference for behavior settings, based on the interviews. The researcher grouped behavior settings into categories for further evaluation (Figure 22). Children mostly favored the trees, stone-lined swale, and sand behavior settings. Additionally, children mentioned their preference for mixed and natural settings. The gender difference analysis showed that both genders preferred the trees and sand settings.

Girls expressed more interest for the play structure and creek settings, and boys mostly preferred the hill setting. Both genders enjoyed both natural and mixed settings.

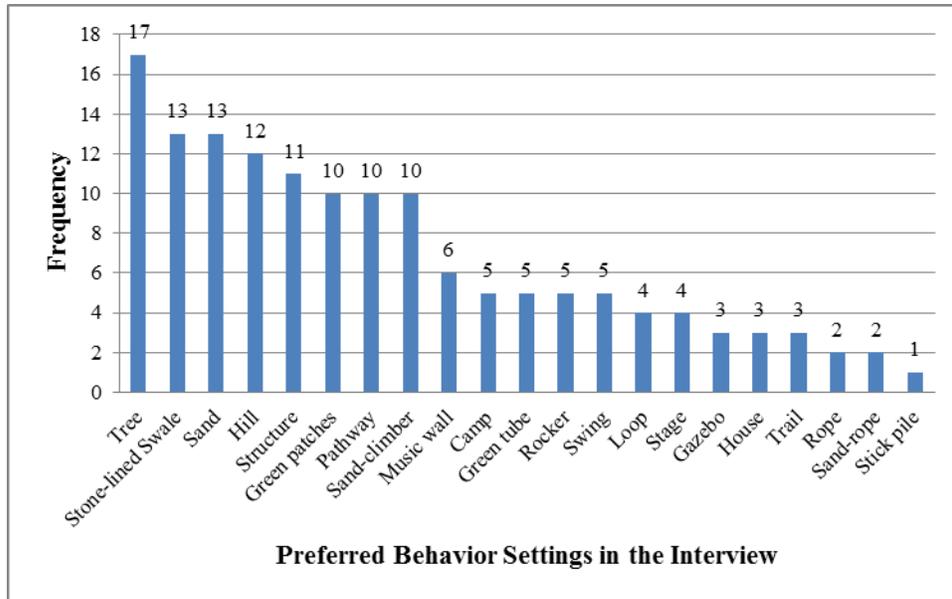


Figure 21. The frequency of preferred behavior settings based in the interview. (N=21; N of behavior settings=144)

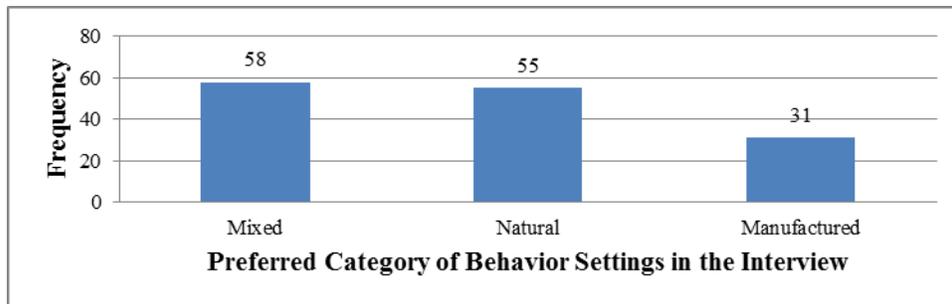


Figure 22. The frequency of category of behavior settings based in the interview. (N=21; N of behavior settings=144)

**6.4.2.2 Preferred elements in the interviews.**

Figure 23 displays the frequency children mentioned the elements. Figure 24 further classifies children’s preferred elements into categories. Children preferred the sand, trees, and tires and showed general favor toward natural loose and manufactured fixed elements. Both genders enjoyed the natural loose elements,

which sand being a common interest. Girls also interacted with the tires, and boys interacted with the trees. Both genders mainly preferred natural loose elements.

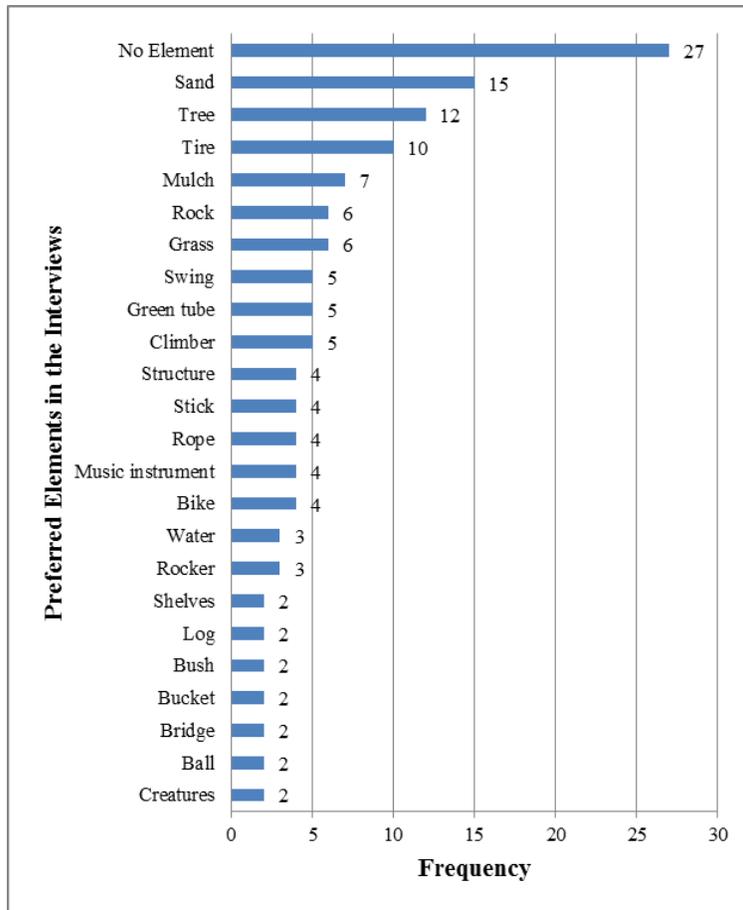


Figure 23. The frequency of preferred elements based in the interview. (N=21; N of elements=144)

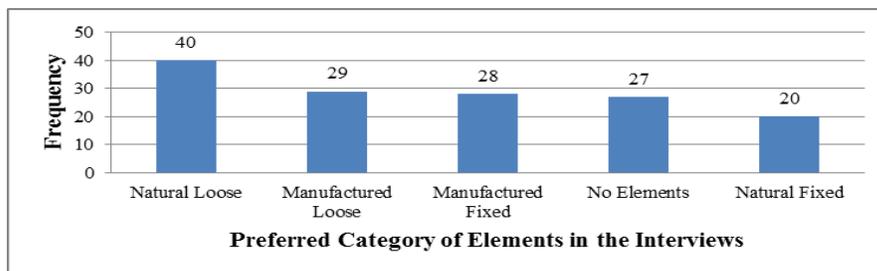


Figure 24. The frequency of category of elements based in the interviews. (N=21; N of elements=144)

#### 6.4.2.3 Preferred cognitive play type in the interviews.

The researcher coded children's preferences for cognitive play behaviors revealed during interviews (Figure 25). Children of both genders mostly enjoyed the dramatic and functional play opportunities stimulated by the outdoor environment.

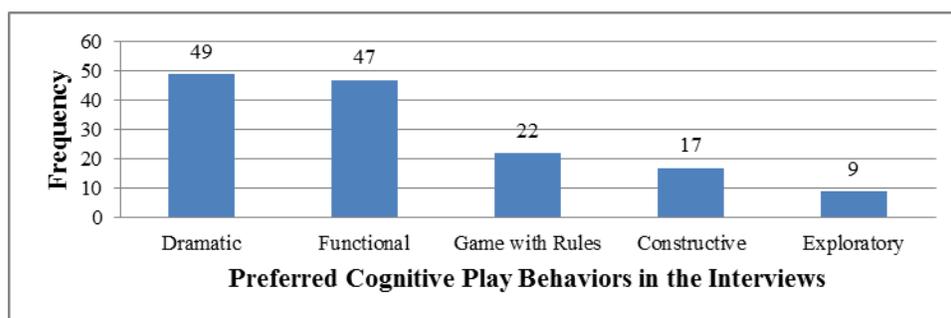


Figure 25. The frequency of preferred cognitive play behaviors in the interviews. (N=21; N of cognitive play =144)

#### 6.4.3 Correlational analysis of children's interviews.

This study intended to explore children's perception of the cognitive play behaviors that each behavior setting and element encouraged. The following sections evaluate children's preference for behavior settings and the elements corresponding to their cognitive play affordances.

##### 6.4.3.1 Favored behavior settings and cognitive play behaviors in the interviews.

The crosstab analysis explored how children perceive the cognitive play behaviors each behavior setting offered (Table 42). The "within behavior settings" row explains the percentage of cognitive play behavior types each setting offered. The "within cognitive" row compares each category of behavior setting for the cognitive play they afforded. Table 43 visually summarizes the correlational findings.

Table 42. Preferred cognitive play behaviors and category of behavior settings in the interview. (N=21; N of cognitive play =144)

Category of Elements		Cognitive Play Behaviors					SUM
		Functiona l	Constructive	Exploratory	Dramatic	Games with rules	
Manufactured	Count	10	5	1	8	7	31
	% within Elements	32.3	16.1	3.2	25.8	22.6	
	% within Cognitive	21.3	9.4	11.1	16.3	31.8	

Table 42. Continued.

<b>Mixed</b>	<b>Count</b>	16	8	1	29	4	58
	<b>% within Elements</b>	27.6	13.8	1.7	50	6.9	
<b>Natural</b>	<b>Count</b>	21	4	7	12	11	55
	<b>% within Elements</b>	38.2	7.3	12.7	218	20	
<b>Mixed</b>	<b>Count</b>	44.7	23.5	77.8	24.5	50	
	<b>% within Cognitive</b>						

Table 43. Preferred cognitive play behaviors and category of behavior settings in the interview.

	<b>Cognitive Play Behaviors</b>				
	<b>Functional</b>	<b>Constructive</b>	<b>Exploratory</b>	<b>Dramatic</b>	<b>Games with rules</b>
<b>Natural</b>	●×		×		×
<b>Mixed</b>		×		●×	
<b>Manufactured</b>	●				

● The highest percentage for a cognitive play regarding each category of behavior setting.

× The highest percentage of an afforded cognitive play type, comparing different category of behavior settings.

The results suggest that children mainly enjoyed the functional play opportunities that the natural and manufactured settings stimulated. Children also recognized mixed behavior settings for their dramatic play opportunities. Natural behavior settings set the stage for the functional, exploratory, and games with rules play behaviors in which children engaged. Children further favored mixed behavior for their constructive and dramatic play opportunities.

#### **6.4.3.2 Favored elements and cognitive play behaviors in the interviews.**

The crosstab analysis evaluated preferred elements and the associated cognitive play behaviors. Table 44 displays the results of this analysis. The “within elements” row explains the frequency each category of element offered each cognitive play behavior type. The “within cognitive” row assesses each category of elements for their particular cognitive play affordance. Table 45 visually summarizes these results.

Table 44. Preferred category of elements associated with their cognitive play affordances in the interviews. (N=21; N of cognitive play =144)

Category of Elements		Cognitive Play Behaviors					SUM
		Functional	Constructive	Exploratory	Dramatic	Games with rules	
<b>Manufactured Fixed</b>	<b>Count</b>	13	0	0	11	4	28
	<b>% within Elements</b>	46.4	0	0	39.3	14.3	
	<b>% within Cognitive</b>	27.7	0	0	22.4	18.2	
<b>Manufactured Loose</b>	<b>Count</b>	12	6	1	6	4	29
	<b>% within Elements</b>	41.4	20.7	3.4	20.7	13.8	
	<b>% within Cognitive</b>	25.5	35.3	11.1	12.2	18.2	
<b>Natural Fixed</b>	<b>Count</b>	4	4	3	3	6	20
	<b>% within Elements</b>	20	20	15	30	30	
	<b>% within Cognitive</b>	8.5	23.5	33.3	6.1	27.3	
<b>Natural Loose</b>	<b>Count</b>	7	6	5	18	4	40
	<b>% within Elements</b>	17.5	15	12.5	45	10	
	<b>% within Cognitive</b>	14.9	35.3	55.6	36.7	18.2	
<b>No Elements</b>	<b>Count</b>	11	1	0	11	4	27
	<b>% within Elements</b>	40.7	3.7	0	40.7	14.8	
	<b>% within Cognitive</b>	23.4	5.9	0	22.4	18.2	

Table 45. Preferred category of elements associated with their cognitive play affordances in the interviews.

	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
<b>Manufactured Fixed</b>	●×			●	
<b>Manufactured Loose</b>	●×	×			
<b>Natural Fixed</b>				●	●×
<b>Natural Loose</b>		×	×	●×	
<b>No Elements</b>	●×			●	

● The highest percentage for a cognitive play regarding each category of element.

× The highest percentage of an afforded cognitive play type, comparing different category of elements.

The results suggest that children perceived most categories of elements as offering functional and dramatic play opportunities. Children further appreciated natural fixed elements for their games with rules opportunities. Children enjoyed many functional play activities without recalling any elements; manufactured loose and manufactured fixed elements also proved ideal for functional play. Manufactured loose and natural loose elements offered constructive play, while natural loose elements lent themselves to exploratory and dramatic play behaviors. Natural fixed elements offered the most games with rules opportunities.

#### **6.4.4 Summary of the interview findings.**

Children chiefly mentioned the trees, sand, stone-lined swale, and hill as their favorite behavior settings. Of these, the sand and trees elements rated the highest preference. Similar to the photo preference, the interview results indicated dramatic and functional play as the most favored. Natural loose elements, natural, and mixed behavior settings proved to be the most preferred category of elements and behavior settings. Both genders appreciated natural settings, mixed settings, and natural loose elements. The following section explains the results from the teachers' interviews.

### **6.5 Structured Interviews with Teachers**

The researcher interviewed the four teachers who worked with the four-to-five-year-old children to understand the preschool and teachers' philosophy for children's play. This section explains the results of these interviews<sup>3</sup>. The researcher asked each teacher to describe their educational level experience with children in the early childhood category. Amy responded that she has a bachelor's degree in art education and 14 years of experience with young children. Judy holds a Bachelor of Science degree in birth to Kindergarten education with four years of experience in this preschool. Hannah, who has a Bachelor of Science degree, started working at the FEELC in 2007. She also stated that she has a child development background. Bob has Master's degree in human development and psychology and Bachelor's degree in human Development. He had been working at the early childhood center for about a year. The following sections explore the teachers' viewpoints toward outdoor learning experiences, how the children played, and to what extent the outdoors was part of the preschool's educational curriculum. The teachers also described their thoughts on adapting the outdoor environment.

#### **6.5.1 Analysis of teachers' interviews.**

Qualitative data is prone to describe the nature of specific events, associations, or spaces, enabling researchers to seek new insights towards a particular incident (Leedy & Ormrod, 2010). The teachers' interview results provided detailed insight into each teacher's attitude during the behavior mapping observation. These interviews provided a deeper interpretation of the school's curriculum and its stance on children's play. The researcher transcribed the teachers' responses and merged them into their associated themes. These themes

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<sup>3</sup> For improving the understanding of interviews, each teacher will be referred by a pseudonym.

described the teachers' views on the school's curriculum and the outdoor learning environment, the value of children's play, what children prefer and enjoy the most, and the cognitive play affordances each zone provided for children.

### **6.5.2 Children's educational experience within outdoor environments according to teachers.**

The researcher asked the teachers if they consider the outdoor space as a learning environment for children. The teachers were consistent in recognizing the preschool's outdoor space as a learning environment for children. Amy observed that each zone provided a unique educational experience for children and that teachers needed to guide children to ensure maximum interaction with the environment:

I think all three of them [zones] are even with the educational [experience]. I think the teachers' job is to seek out to be educational. Because if we are in the back woods building a fort and balancing with trial and error. In the bike playground we can put the hose up and do water and planting. Therefore, it is discovery or physical activity. It depends on what you look [at] as educational. We do a lot of chalk on the bikes, so we can do hop scotch and doing numbers, we can draw, we can add water to that playground with the access with the hose out there.

Amy explained how children discovered incidents in the outdoors without the need of toys by describing their learning experience in the natural zone:

Children are finding the bugs underneath the logs, climbing the trees, running around playing games and making up games with other friends.

Judy pointed out how learning how to jump, throw, catch, coordinate, and run in the outdoor environment developed children's gross motor skills. She also explained how children "appear to be more social outside" and "learning about nature and science, change of seasons, the weather and the bugs, and beyond that." Judy believed the natural zone and the garden area offered the most educational opportunities for children:

The woods provide a lot of educational experience because you see a lot of nature happening there. Also, I think the educational space is provided in the garden too. They learn about life cycles, insects, or nature, in terms of learning outside. In terms of gross motor [skills], it's kind of all over [the place]. You have got the swings, the bikes, the balls, and the hill where they can run up and down.

Hannah described how teachers use the outdoors as an extension of indoor classrooms:

We often times bring even whatever we are doing inside, outside. We use the space just as if it is an indoor space. Sometimes in the past, we used outdoor space and created centers outside, if we just we feel today is a good day. Sometimes we plan it; sometimes it is spontaneous; sometimes it goes along with what we are learning. We did all kinds of investigations. We have done airplane investigation, where we do part of the learning outside. We built an airplane, and let us go out and test it. We took a giant paper airplane outside and painted it. We made a runaway outside. We have done measuring inside where we done different type of investigations. We did this whole thing of measuring and we took it outside and started measuring outside, and started measuring from the ground up and all kinds of things outside. We did a bug investigation so that was obviously more outside learning. We use all kinds of different space outside to do that. Therefore, there is all kinds of different

projects that extend to the outdoors. Of course, first getting here you just have to learn the space and then it's totally open and almost as we consider it as equal to the indoors.

Like Judy, Hannah believed that the natural and mixed zones provided the most learning opportunities for children. She further explained that children learned about nature and life cycles in the natural zone, but the manufactured zone lacked such possibilities:

The garden has a lot of educational experience when the springtime and summer gets here. We focus on group or one for learning and focus on planting and taking care of plants and watching it grow from the seed to a giant plant, something that we are not eating at lunchtime. That is really a big educational experience there. Then we also got the woods [natural zone] and hills [mixed zone] that have more natural types of environments like animals and bugs.

Bob indicated that the outdoors promoted teamwork and social opportunities, particularly when children were in the natural zone:

They talk a lot, and they even say, 'We are in the same team' or 'Let's work together,' even [when they are] just picking up a stick, or building something that they all can use.

Bob noticed the natural zone had the most educational value because it provided exploratory, cooperative, and creative opportunities:

I think the back woods has the most educational experiences for them because it offers that natural environment for them to explore. They can cooperate in projects. They get to build things. It offers the most opportunities for creativity for them.

In contrast to the natural zone, Bob explained how children chiefly developed their gross motor skills in the manufactured zone "by riding with the bikes and playing with the sand, which is fun for them. But for them, they get to do the most experiments in the back woods."

Overall, the interview results indicate that teachers considered the outdoor environment as a complimentary learning space for the indoor activities. The following section explains the preschool's educational curriculum as viewed by the teachers.

### **6.5.3 Outdoor environment as an educational curriculum according to teachers.**

The study explored the teachers' opinion of the outdoor environment as part of the educational curriculum and found that they recognized the outdoor environment as an integral component of the "creative curriculum." Amy described the school's mission to "get the kids outside" every day. Judy recognized the outdoors' capability for developing children's gross motor skills, such as "throw and catch, bouncing, or jumping on with two feet." She indicated that teachers try to evaluate children's development by guiding the children toward specific goals, such as pedaling a bike:

There are three steps for pedaling a bike; for example, learning to pedal, then go fast, and go faster on corners. That is how they are all kind of set up so we have to observe outside too to see if they are achieving these milestones.

According to Hannah, the preschool's high quality outdoors motivates teachers to incorporate the indoor curriculum with the outdoors. Teachers often take children on exploratory tours of a nearby lake, which Hannah said is an indication of how teachers value the outdoor space for children's development:

I think teachers notice how imaginative kids can be and how much more the kids learn by their own by being in the outdoor space. As teachers, we have noticed how much they gain from those experiences that it almost allows us teachers to automatically integrate them to our lesson plans, and it's like a lot of schools incorporate field trips. Since we cannot, we use our outdoor spaces to incorporate that kind of experiences. We are asked to do gross motor activities. It is part of our curriculum to combine indoor with outdoor stuff. But we do kind of extend it beyond what they ask.

Every class incorporates the outdoor environment in their daily curriculum, as Bob explained:

It can definitely tie into many aspects of our curriculum, more creativity, social aspects; it gets the children to talk to each other a lot. It might not be direct but it has lots to offer.

He further described his enthusiasm for incorporating children's ideas and play suggestions for their daily activities:

I like to keep things interesting for children. Therefore, I don't like keeping it segmented. I like introducing new things to children and to keep their interest and they can give us ideas too. I mean if they get more in something, they can sometimes offer ideas, some things that we switch up.

The interview results highlight the teachers' belief in the value of outdoors for complementing the indoor curriculum. The teachers demonstrated awareness of the variety of experiences provided outdoors and concern to improve these interactions. The following section further explains the teachers' vision of the natural zone as an educational environment for children.

#### **6.5.4 Children's experience in the natural zone according to teachers.**

The researcher asked teachers if children occasionally play in the natural zone and the reasons they assign playtime in this area. The teachers said children use the natural zone once or twice per week. Some teachers explained how they wanted this experience to be "special," "exciting," "interesting," and not "boring" for children. Judy offered a description of children's interactive experiences in the natural zone:

When children play on playground structures, it is very much predictable. The steps are always a certain measure of height and the slide, and it's the same every time. But when they are in the woods, they climb up on the logs; and this log might be different from that log; and it might roll over; and it might crunch. They really learn their bodies out there. It's fun! They enjoy it. When you see kids, you worry that they might get hurt or they might fall down. But they really can control their bodies. A lot of kids fall down; they just hop back up and try again. They say, 'No, I don't want your help. I can do it myself.' They have that pride, and it's a more free space to be creative. Their imagination kind of sparks out there.

Hannah also offered an account of the experiences in the natural zone:

We don't typically bring materials out to that space, because it's a more creative space. They do more creative things out there [in the natural zone]. It is different since if you ought to do that in the playground, it is almost a very different atmosphere, even if you do not bring toys

outside versus toys outside in the woods. They just use that space more differently because there are so many places to hide and so many things to do out there with the natural environment that already creates that kind of situation.

We went out in the woods a couple of weeks ago and saw a dead animal out there. So just to be able to have that open times for the kids to explore and understand about nature and life cycles, and animals[in the natural zone], that we don't see that much often on a man-made playground. Whereas a lot of the playgrounds in these areas have the manmade playground, which is kind of like, I feel the bike the playground represents a man-made playground, versus the hills, woods or the garden.

Amy said each class takes turns using the natural zone. Parents gave consent for their child to use the natural zone as a "field trip" playtime. Judy offered that the preschool is learning from other countries how to promote less structured play outdoors; the natural zone is ideal for this purpose.

Bob indicated that the natural zone sees regular use when the weather is warmer. The natural zone was constantly changing and offered children exciting and exploratory chances, as Bob detailed:

Children spread out and can work together on things. As long as they stick to the trails, they can do their own exploring. There are things for them to have a look at in the woods. For example, they can even just roll over the bugs and look at bugs. In the woods [natural zone], we don't see any arguments and they can branch out and do their own thing. Considering the age of children, as they get older they kind of lose interest of the bike playground because the playground's structure is small; the sand kind of gets boring for them after a little bit. The one thing they do like there is the basketball. The hill, there is enough for them to do; we just have to keep introducing new loose parts and loose parts, kind of cycle things out of the shed that they can use. In the woods, it's somewhere that is constantly evolving".

Overall, teachers recognized the play value of the natural environment. They considered the natural zone to be exciting, evolving, exploratory, and fun. They also mentioned that the natural environment provided many learning opportunities that stimulated children's curiosity about life cycles. The following section explores teachers' observations of differences in children's play behavior.

#### **6.5.5 Children's difference during play according to teachers.**

The researcher asked the teachers if they recognize any differences among children during their play activity. This question sought to verify the value of diverse environments in stimulating children of different interests and skills. Teachers recognized the children's various play behaviors in the outdoor learning environment and further explained the distinct behaviors found in different zones. Amy noted how the natural zone stimulates children's creativity:

I can see some kids to be more outgoing in the woods, because once again we are not providing the toys for them; they are making up their own game. When the kids make up their own game, they are more willing to play and choose who to play with.

In addition, Hannah remarked that the behavior differences within the three zones related to the provided space and elements:

Just comparing the hill compared to the bikes, the hill is so much open, they have so much space to be imaginative. They often do that in the hill compared to the bikes. Also in the woods, versus the garden space out here, they don't have much space to run and be as imaginative and open as their play can be. Whereas, out in the hill we may not always provide them a lot of things but that space provide them so many opportunities to create whatever. Children are more limited when they are in the bike playground or garden space.

Teachers believed children varied in their play preference. Judy described how some children preferred dramatic play, some preferred to be physically active and engage in sports, and others preferred to sit and dig in the sand:

Outdoors is a space for children to run and be more physical and get their energy out, but some kids doesn't even want that. I do see a variety of kinds of play outside. We do have some children that are not clearly gross- motor advanced as others.

Bob noticed minor differences in children's play behavior. He recalled that children asked him or their friend's questions about new subjects or incidents, or even when they needed help. Overall, teachers believed that children enjoyed the variety of options in the outdoor play environment, but that each child enjoyed different activities. The next section explains the children's favorite zones, settings, or elements, according to their teachers.

#### **6.5.6 Children's favorite places according to teachers.**

The researcher solicited the teachers' opinion about children's favorite play environments and associated play behaviors. Teachers had mixed opinions on the places children enjoyed the most. Amy supposed the children's preference for the mixed zone (hills) because it incorporated a variety of behavior settings:

I think the hill is the best, and that's because there is a more variety of areas to play in. There is a flat grassy area, rock area, climbing feature, the swing, there is houses, and back woods in that area.

Judy guessed that children gave different answers when asked about their favorite places, compared to how they actually behave in the settings. She believed children enjoyed the swings, bikes, and dramatic playhouses more than other activities:

I think they get excited about the swings, and a lot of our kids know how to swing, and they do different things on swings: sometimes they stand on it; lay on it; or whatever. Same things happen on the bikes [zone]. They run out to get the bikes first, then they lose interest, and they go to the pretend place.

Hannah indicated that the natural and mixed zones were children's favorite play areas because they offered dramatic play behaviors for children, while the open and private spaces invited children's independency and playfulness:

The hill and the woods are their favorite, just because they can be more open and imaginative. If we let it up to them to choose everyday maybe one time out in the week, they choose the

bike; but the rest of the time will be the hill and the woods. Because we cannot always see wherever they go, and they can be rather hidden, or they can play hide and seek, and they can play all those games. Whereas, up here [manufactured zone] they are more noticeable and more seen, and it is almost as they can't get away with their play as they much as they can as it is so much more open out there. Therefore, it is almost like that they realize that there is a risk, and they know that the supervision for the woods and hill allows them to be more responsible. We never talked to them about that, but they can internalize that, and they realize that, 'You knows we are older now; we can take care of ourselves.' We talk about responsibility in the classroom, and it allows them to be more independent in setting boundaries and seeing what boundaries are good to test and which ones are not.

Conversely, Bill thought individual children prefer different zones: "Some kids like the bike playground because they can play basketball. There is sand in both. So that does not play too much of a factor." He noted how most of the children seemed to "like the back woods [natural zone] because they do something different. We don't go there every day, and they look forward to going back there. Sometimes I begin a project, they take over, and that rather takes them involved. The woods [zone] is always developing, so there is always introducing new things and trying new things so the kids like it back there."

In summary, teachers differed in their opinion of children's favorite places. Some believed the natural zone to be more interactive and motivating; others believed individual children respond differently within the three zones based on the child's skills and personalities. In general, the teachers thought children enjoyed places that are challenging, changing, exciting, and providing continuous activities.

#### **6.5.7 Summary of the teachers' interview findings.**

The teachers' interview results provided insight toward the preschool's policy and teachers' views of outdoor play. The interviews presented a window into how teachers perceive the children's daily experiences. Awareness of the educational benefit of the outdoor environment for young children proved common among the teachers. They believed the natural zone offered many constructive, exploratory, and imaginative play opportunities. In addition, they recognized the value of natural loose elements for inspiring play and creativity among children. The teachers further believed children enjoyed the natural and mixed zones, where they had a variety of challenging activities.

### **6.6 Conclusion**

Combining qualitative and quantitative data creates a comprehensive analysis of the research problem (Creswell, 2003). This chapter showed the results of the study's qualitative and quantitative methods. The multi-method approach assessed three environmental categories: zones, behavior settings, and elements. Further, the results evaluated the children's observed and perceived cognitive play behaviors. This chapter demonstrated how combining qualitative and quantitative methods helps in interpreting children's interaction within the outdoors. The quantitative data described how various cognitive play behaviors correlate with available behavior settings and elements. Table 46 summarizes the findings based on the behavior mapping results. The results indicate the value of natural and mixed settings for children's cognitive play behavior.

Consistent with Nicholson's (1971) theory of loose parts, the results signify the importance of natural loose and manufactured loose for stimulating cognitive play behaviors.

Table 46. Significant settings and elements that mainly afforded a cognitive play type regarding the behavior mapping results.

	<b>Cognitive Play Behaviors</b>				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
	<b>Category of Behavior Setting</b>				
<b>Natural</b>	•	•	•	•	•
<b>Mixed</b>	•				•
<b>Manufactured</b>					
	<b>Category of Elements</b>				
<b>Manufactured Fixed</b>					
<b>Manufactured Loose</b>	•				•
<b>Natural Fixed</b>					
<b>Natural Loose</b>		•	•	•	

Evaluating the qualitative data offered in-depth insight toward the observational data. Table 47 explains how the combined qualitative methods showed children's preference for natural and mixed zones; this proved consistent with the teachers' perception. The results also point to children's preference for manufactured fixed and natural loose elements.

Table 47. Children's preference for category of elements and behavior settings in qualitative methods.

	<b>Qualitative Methods</b>		
	<b>Photo Preference</b>	<b>Drawing</b>	<b>Interview</b>
	<b>Category of Behavior Settings</b>		
<b>Natural</b>			•
<b>Mixed</b>	•	•	•
<b>Manufactured</b>			
	<b>Category of Elements</b>		
<b>Manufactured Fixed</b>	•	•	
<b>Manufactured Loose</b>			
<b>Natural Fixed</b>			
<b>Natural Loose</b>		•	•

The results of this study highlight the importance of varied options for different children within the outdoor learning environment. This diversity and variety stimulated a host of cognitive play behaviors among children. The multi-methods research approached revealed the value of natural and mixed settings for young children's cognitive play behaviors (Table 48). The triangulation emphasizes the importance of manufactured loose and natural loose elements for cognitive play stimulation.

Table 48. Comparing the quantitative and qualitative results.

<b>Cognitive Play Behaviors</b>					
	Functional	Constructive	Exploratory	Dramatic	Games with rules
<b>Category of Behavior Setting</b>					
<b>Natural</b>	●■	●	●×■	●	●■
<b>Mixed</b>	●×	×■		×■	●×
<b>Manufactured</b>					
<b>Category of Elements</b>					
<b>Manufactured Fixed</b>	×■			×	×
<b>Manufactured Loose</b>	●■	■			●
<b>Natural Fixed</b>				×	
<b>Natural Loose</b>		●■	●■	●×■	■

- Behavior settings and elements that mainly afford a cognitive play type (N=6801)
- × Behavior settings and elements in the photo preference (N=24).
- Behavior settings and elements in the interview (N=21).

The quantitative results suggest that natural settings stimulated cognitive play behaviors for both genders (Table 49). Mixed settings were more stimulating for girls. Further, manufactured loose and natural loose elements stimulated the most diverse cognitive play behaviors for both genders.

Table 49. Comparing genders for their type of interaction with settings and elements during behavior mapping.

<b>Cognitive Play Behaviors</b>					
	Functional	Constructive	Exploratory	Dramatic	Games with rules
<b>Category of Behavior Setting</b>					
<b>Natural</b>	●	●	●×	●×	●
<b>Mixed</b>	●×	×		×	×
<b>Manufactured</b>					

Table 49. Continued.

Category of Elements			
<b>Manufactured Fixed</b>			
<b>Manufactured Loose</b>	●×	×	●×
<b>Natural Fixed</b>			
<b>Natural Loose</b>	●×	●×	●×

● Results regarding the boys (N=4172)

× Results regarding the girls (N=2629)

The qualitative methods revealed that both genders preferred mixed and natural settings, as well as manufactured fixed and natural loose elements (Table 50). Each gender's preference for mixed settings and natural loose elements proved consistent with the behavior mapping results.

Table 50. Gender's preference for category of elements and behavior settings in qualitative methods.

	Qualitative Methods		
	Photo Preference	Drawing	Interview
	Category of Behavior Settings		
Natural			●×
Mixed	●×	●×	●×
Manufactured			
Category of Elements			
Manufactured Fixed	×	●×	
Manufactured Loose	●		
Natural Fixed			
Natural Loose		●×	●×

● The results regarding the boys (N for Photo preference=11; N for Drawings=9, and N for Interviews=8)

× The results regarding the girls (N=13)

In summary, the results suggest the importance of diverse outdoor environments that integrate natural and mixed settings to stimulate cognitive play behaviors.

## CHAPTER 7: DISCUSSION

This study aimed to understand how the features of an existing physical environment stimulate children's cognitive play behaviors. Combining qualitative and quantitative methods is an effective approach in understanding children's opinion of their environment. The results can yield significant data for research or practice, helping researchers and practitioners alike recognize connections between setting and behavior (Cele, 2006; Clark, 2005; Einarsdottir, 2005). The behavior mapping results offer an objective measurement of children's interaction with zones, behavior settings, and elements.

While previous studies have mostly focused on adults' preferences, this study sought to explore children's favorite elements, behavior settings, and cognitive play behaviors. Many researchers documented children's cognitive play behavior through observation (Campbell & Frost, 1985; Henniger, 1985; Pack & Michael, 1995). However, few have examined children's opinions of an enjoyable experience within behavior setting or elements. The findings from this study stress the importance of combining qualitative data collection techniques and observational methods to understand children's perspective of play behaviors.

This study intended to explore the association between existing physical environment categories (zones, behavior settings, and elements) and children's cognitive play behaviors. In response to this purpose, the researcher amassed 6801 behavior mapping data points. In complement to the observational data, the researcher asked children to participate in photo preference, drawings, and interviews. The researcher interviewed teachers to obtain their opinions toward the culture of the early learning center and children's play opportunities. This section discusses how the results of this study respond to the research question. The chapter evaluates how different methods indicate the cognitive play behavior affordances of zones, behavior settings, and elements. This chapter also explains the results concerning gender differences and teacher's interaction and opinion of the outdoor learning environment.

### **7.1 Cognitive Play Affordances by Zones**

The first research question attempted to explore the connection between three different zones and children's cognitive play behaviors. Consistent with the behavior mapping results, the teachers believed the manufactured zone mostly afforded functional play. The behavior mapping results suggest that the manufactured zone offered 13% more opportunities for functional play than the natural zone. However, the behavior mapping rarely indicated constructive, exploratory, and games with rules behavior in this zone. The behavior mapping results further indicate the value of the mixed zone for functional play. Pursuant to previous literature (Barbour, 1999; Campbell & Frost, 1985; Frost & Klein, 1983; Moore, 1985; Sandseter, 2009; Woolley & Lowe, 2012), this result justifies recognizing that mixed and manufactured zones are comprised of elements, such as swings, climbing structure, swinging ropes, or rockers. According to the behavior mapping results, these elements mainly offered functional play. The existing hill, pathway, and available loose elements

in the mixed zone also contributed to children's engagement in functional and games with rules play. Supporting Hestenes et al.'s (2007) findings, the behavior mapping suggest the natural zone offered the least functional play.

Further to Hestenes et al.'s (2007) assumption, the results value the natural zone for children's engagement in constructive, exploratory, or dramatic play. In fact, the natural zone provided almost twice as much constructive play than the other zones, along with the most dramatic play opportunities. Accessible loose elements, seasonal variation, and continuity of experiences may explain these attributes (Cosco, 2007; Fjortoft, 2000; Henniger, 1985; Moore, 1985; Moore & Wong, 1997; Reifel & Yeatman, 1993; Tai, et al., 2006). Some teachers even pointed to the continuity of activities, evolving character, and unpredictable nature of the natural zone as contributing to its appeal. Previous studies also reveal the discovery and exploratory opportunities of natural zones (Fjortoft & Sageie, 2000; Lester & Maudsley, 2007; Bixler et al., 2002; Moore & Wong, 1997). This characteristic associates with the sense of surprise, novelty, and complexity that natural environments provide (Bradley, 1985).

Behavior mapping indicates that the natural and mixed zones mostly afforded exploratory play, despite the teachers' belief that only the natural zone offered such play. Teachers surmised that the variety of plants and creatures in the natural zones inspired children's sense of curiosity and imagination, when in fact, children's exploratory play within the mixed zone typically happened where the natural zone extended to the woods behavior setting. This highlights the value of natural behavior settings, such as the stone-lined swale or trees, in the mixed zones. These behavior settings inspired children's curiosity to explore worms, bugs, or plants. Thus, it is important to combine natural and manufactured elements to heighten children's explorative play.

According to Cosco (2006), the mixed zones combine the diverse quality of nature with the challenging characteristics of manufactured elements, thus stimulating various behaviors in children. Consistent with this statement, the observational results noted that more than half of the games with rules play behavior occurred in the mixed zone. This result stresses the importance of assembling various manufactured and natural features to encourage higher levels of cognitive play behavior.

The behavior mapping analysis suggested the natural zone had the lowest percentage of non-play behavior; more than half of this behavior happened in the manufactured zone. The teachers also recognized how the manufactured zone made children disinterested, disconnected, and unmotivated to play. Conversely, teachers noticed that the natural zone encouraged children to take part numerous based on their interests. These findings are congruent with previous studies comparing natural with manufactured zones. For instance, Lee (1999) found that natural play environments stimulate children, more so than traditional and contemporary playgrounds. Lee further found that traditional playgrounds offer the least challenging play opportunities and thus the most non-play behaviors. Extending on previous findings (Fjortoft, 2000; Moore & Wong, 1997), this study points to the natural zone as more challenging and exciting for children, compared to what they termed

the “boring” manufactured zone; the zone is boring because of its lack of variety and challenging experiences. Children craved the exciting, new discovery opportunities that natural zone provided.

Considering this study's focus on a single case, the comparisons of the three zones are too weak for generalizations (Groat & Wang, 2002; Leedy & Ormrod, 2010; Yin, 2009). The study addressed this drawback by collecting more than 2000 observational data points in each zone and considering the teachers and children's viewpoints. In conclusion, comparing zones for their cognitive play behavior affordances suggested the value of combining manufactured and natural features to promote children's cognitive play behavior. This study further indicates that natural zones afford the various explorative and constructive play opportunities necessary for children's development. The following section explains how the different behavior settings and elements within each zone offered unique cognitive play behavior opportunities.

## **7.2 Cognitive Play Affordances by Behavior Settings**

In this study, zones include different behavior settings. Employing the concept of associating behavior settings with cognitive play affordances, this study desired to interpret how design affects children's play behavior. Behavior settings are unit of analysis for dividing each part of the outdoor learning environment into its functional parts (Cosco, 2006; Moore & Cosco, 2010). This section evaluates how the behavior settings of the outdoor environment promoted various cognitive play behaviors. The sequence of the settings is the natural, mixed, and manufactured setting categories.

### **7.2.1 Natural settings and cognitive play behavior affordances.**

Natural settings develop children's imagination, while allowing them to experience all their senses and interpret the natural world (Moore & Wong, 1997). Previous studies report how natural settings afford discovery and dramatic play among children (Bixler et al., 2002; Fjortoft & Sageie, 2000; Heseltine & Holborn, 1988; Lester & Maudsley, 2007; Moore, 1986; Moore & Wong, 1997; NLI, 2007; Tai et al., 2006). For example, Woolley and Lowe (2012) found natural sites with extensive loose parts support children's functional and dramatic play behaviors. Consistent with these findings, the results determined natural settings to be the most supportive for functional, constructive, dramatic, and game with rules play behaviors. Children enjoyed the diversity of functional play behaviors that the natural settings offered, such as running, wandering around, swinging from or climbing trees, and balancing on rocks, tree trunks, or logs. In harmony with prior studies (Moore & Wong, 1997; Tranter & Malone, 2004), this study found that natural loose materials found in natural settings sparked a number of dramatic play behaviors. The flexibility of natural settings inspired children's sense of imagination and adaptability for different dramatic play themes. Natural settings proved substantially capable of affording dramatic play behaviors, compared to other settings.

Marcus (1998) explains how densely planted areas offer discovery and exploration opportunities. Similar to other studies (Fjortoft & Sageie, 2000; Moore, 1986; Moore & Wong, 1997; NLI, 2007), natural settings in this study afforded much exploratory play. Compared to manufactured and mixed settings, natural

settings offered about three quarters of the exploratory play behaviors. The results emphasize children's enthusiasm and eagerness for experiencing, learning, and watching natural transitions and cycles (Chawla, 1988; Kellert, 1996; Lye, 1994; Moore & Wong, 1997; Tranter & Malone, 2004). The creatures and ecosystems in the natural settings fascinated children, and they enjoyed watching natural features change over time. Confirming previous research (Frost, 1992; Parnell & Ketterson, 1980), the results of this study demonstrate how natural settings present complex and exciting interactions that other environments do not offer. In conclusion, natural settings afford diverse cognitive play opportunities for children, which is a critical factor in their development.

Confirming previous research (Frost, 1992; Parnell & Ketterson, 1980), the results of this study display the complex and exciting interactions present in natural settings, which promote higher levels of cognitive play behaviors. These characteristics of natural settings, such as topographic change, distinct and challenging features, and manipulative props, inspired children to develop their own games to evaluate and challenge themselves; this is likely why half of the games with rules instances occurred in that setting. Sandseter (2009) reports how children seek out the risky play of the natural environment. Children in this study competed with each other in climbing, jumping, and balancing on tree trunks, trees, logs, or rocks. The following sections evaluate children's cognitive behavior within each natural setting.

**1) Hill:** Previous studies note how topography variations offer opportunities for rolling, running down, or sliding (Marcus, 1998; Moore & Wong, 1997; Striniste & Moore, 1989; Woolley & Lowe, 2012). Fjortoft and Sageie (2000) found that natural features such as grass and hills positively associate with children's gross motor skill; slopes in particular afford sliding, running, role-play, and games with rules. Skanes (1997) explains how outdoor topographic variations form physical patterns that suggest a purposeful meaning.

Children identified the hill as one of their favorite settings. The topographic variation of the hill provided challenging opportunities, inspiring game play; "I play 'tag' over the hill," one child remarked. Consistent with previous studies (Ozdemir & Corakci, 2010; Ozdemir & Yilmaz, 2008), this study discovered that children enjoyed chasing and group play opportunities on the wide-open grassy hill. Moore and Wong's (1997) study of children's play indicates how topographic variations afford fantasy play, orientation skills, and games with rules, much like they did in this study. Further, Moore (1986) found that slopes allow children to slide, dance, cycle, and roll down the hill. Almost half of children's interaction with the hill behavior setting in this study demonstrated functional play behavior, such as running, walking, and rolling on the hill. Children also enjoyed chasing, playing Frisbee, and rolling tires or balls down the hill. Marcus (1998) believes a change in elevation can provide many play opportunities for children, including running, rolling, games, or role-play; thus, children's opinion of the play possibilities of the hill may associate with the hill's change of elevation.

**2) Camp:** Teachers and children developed a camping area in the natural zone over time. This behavior setting consisted of tree logs and trunks arranged in a circle, where children sat. Children and teachers

arranged branches and logs at the center of the circle. Children engaged in dramatic play during more than half of their time spent in this area. The available natural loose elements provoked children to imagine representations, such as “turning on the fire,” “putting poison sparkles,” or “burning the bad guys.” Children occasionally balanced on the rocks or logs, demonstrating functional play behavior. These findings emphasize the importance of a variety of natural loose elements to support cognitive play behaviors.

**3) Stone-lined swale:** The stone-lined swale behavior setting was located in the mixed zone, covered with rocks and dirt. The stone-lined swale separated into two sections: one section running along the sand behavior setting and the other section near the trees. Three bridges crossed the stone-lined swale surface, linking the two sides. Children enjoyed walking on the bridges, as well as balancing, running, or jumping on the rocks. Combining rocks, dirt, mud (after rain), and vegetation in this setting stimulated children’s explorative and imaginative play. Overall, the stone-lined swale afforded many exploratory play opportunities. Interestingly, children demonstrated fascination about bubbles or puddles within the stone-lined swale. For example, one child who pictured the stone-lined swale explained, “This is the river, where the bath bubble came up!” “Sometimes there is water when it rains, it makes puddles,” another child offered. These results indicate the importance of providing natural ecosystems within children’s outdoor learning environments. Children exhibited consciousness about small transformations, creatures, and novel experiences provided by the natural environments.

The stone-lined swale offered many games with rules affordances. Children created their own rules and enjoyed jumping or hopping on the rocks. One girl explained, “I jump on the rocks. It is called ‘Jumping house.’ We jump from one place and another friend jumps to another place, and the other friend jumps to the ‘two’ place. Then I jump, and other friend jumps to the ‘three’ place.” The tree in the swale provided climbing opportunities that encouraged challenging games for children. Another game children created was throwing toys inside the tree and trying to find or reclaim them. These instances demonstrate the correlation between various natural elements and higher ranges of cognitive play behaviors.

**4) Stick pile:** The natural zone offered abundant loose material that encouraged children’s constructive play. Compared to other settings, the stick pile afforded the most constructive play behavior. Children enjoyed collecting sticks and logs and stacking, indicative of their constructive play behavior. Teachers sometimes helped children in their construction. Consistent with Tranter and Malone’s (2004) observation, children enjoyed the ‘to-be continued’ activity of building a “fort” or a “house” over the course of several days. Providing children opportunities to build their own play environment can develop their environmental learning and sense of place (Cele, 2006; Herrington & Studtmann, 2004; Shaw, 1987; Tranter & Malone, 2004). Additionally, more than half of children’s interaction in this setting demonstrated dramatic play behavior. While setting up the stick-pile, children imagined they were “builders” or “decorating home.” This spontaneously created space allowed a child-sized place for children to hide from adult supervision and imagine being in a

“prison,” “haunted house,” or their “home.” Consistent with previous findings (Olds, 1989; Prescott, 1987; Sobel, 2001; Tail et al., 2006), children enjoyed relaxing and imagining in this hidden and private space.

**5) Trail:** The trail in the natural zone mostly afforded functional and dramatic play behaviors. Children enjoyed running along the trail, chasing each other, and jumping over the logs. Children occasionally stopped walking and explored plants, tree barks, and creatures. The surrounding trees also increased the sense of mystery and discovery, stimulating children to engage in dramatic play behaviors. Children explained they played “*Star Wars*,” chased “cheetahs,” or looked for “dinosaurs.” Consistent with previous studies (Cosco et al., 2010; Moore & Cosco, 2010), the trail in this study possessed a loop design, allowing a circular motion and enabling children to run without interference from one another.

The existing tree trunks, logs, and trees, combined with the ambiguity of the woods along the trail, provided challenging opportunities that children incorporated in their games. For example, one child explained how children race at the trails, jump over obstacles such as tree logs, and try to reach an end. Children enjoyed running along the pathway and crawling into elements such as the arch. They developed a game involving the trees called “climb-a-boo,” wherein they climb a tree and try to hold on to it as long as possible.

**6) Trees:** Loosely designed or unfurnished spaces kindle children’s imaginative and unstructured play (Johnson & Hurley, 2002). The trees in this study provided a varied and mysterious environment that stimulated children’s dramatic and functional play behaviors. Children enjoyed fantasizing about different heroic characters and chasing one another. The trees also provided additional dramatic play elements via loose play props including sticks, leaves, and fruits (Moore & Wong, 1997; Weinstein, 1987). The trees were ideal for attaching ropes and tents, which emerged as popular settings for functional play. Children enjoyed swinging on the ropes and climbing on the nets. They also enjoyed climbing and hanging from the trees, and some trees supported the stick piles children built. The trees stimulated many exploratory play opportunities through the existing creatures, branches, and trunks.

Children mentioned that natural settings offer enjoyable functional play. Children favored these elements for their risky and stimulating qualities (Francis, 1988). They explained how they like to “trip over the logs,” “move the rocks,” “balance over the rocks,” or “shake the trees.” One child explained, “I like to jump on to the swing from the logs and swing off of it and do a back flip.” Another other child described how he enjoyed the running and jumping affordances provided by the woods: “I like to run fast in the woods and jump.” In this instance, children ran along the trail and jumped over logs. The rocks joined the hill in providing ample balancing opportunities that children sought: “We like walking on the rocks because it is my favorite part of the woods. I like to walk on the rocks because I can balance on them.”

The natural settings of plants and trees inspired many exciting dramatic play opportunities. One child explained, “I play princess in the back woods, and I follow the trail in the back woods.” The trail in the back woods included many of these natural elements. Children explained, “I play running to find a baby cheetah,” or

“I like to pretend to be ‘panthers’ with my friends.” Trees also offered many loose elements, such as sticks, pine needles, or leaves, which children piled to create imaginary, dramatic play scenarios, such as houses: “We usually play in one of the wood houses [stick piles] and you think you are a ‘kiddy’ and you live in the house.” Another child offered this explanation:

These are the trees out in the woods with lots of branches, where monkeys mostly swing on. This is just the vines. The monkeys just pick on the leaves, and if it is a vine and they swing on it. But if it is a heavy branch and it has leaves on it, if they can’t go they just pick the leaves on it, if their just the bananas, they just pick the bananas and eat them. I try to swing on it with rope to imagine.

This anecdote suggests combining natural and manufactured features to inspire children’s functional play.

Environments that support hide-and-seek opportunities attract children (Moore & Cosco, 2010); this proved to be true in this study. For instance, Fjortoft and Sageie (2000) report that shrubs allow children to hide. The shelves, trees, music wall, and tire provided hiding places for the children of this study. One child stated, “I like to play hide-and-seek in the woods.”

The findings suggest children demonstrate gender role expectations during their games (Borman & Kurdek, 1987). For example, trees provided loose elements such as sticks that boys employed in games such as “climb it.” “*Star Wars*,” or “Ninjas.” Trees offered a sense of mystery, change, and ambiguity, which inspired such challenging and exciting games. Children further enjoyed collecting sticks to engage in a “stick fight,” during which time they imagined the sticks to be weapons. One boy explained, “We chase each other with sticks and pretend they are swords.” Children referred to the “snakes” games in which boys threw a snake toy toward a tall tree. The boys then tried to retrieve the toy by shaking or climbing the tree. Another game associated included trees and straw. “The other part in the back woods is the straw. We put straws in trees, so the trees become ‘strawy,’ so the straw will be all over the trees. I put them on trees. If you put the most straw on the tree you win!” one child explained. The following section explores how the combination of methods explained the cognitive play affordances of mixed zones.

### **7.2.2 Mixed settings and cognitive play behavior affordances.**

Numerous studies have explored the association between children’s play behaviors and mixed settings. For instance, Herington and Studtmann (1998) investigated how incorporating natural elements in traditional playgrounds encourage children’s play behavior. The results conclude that mixed settings afford higher levels of imaginative and social play behaviors compared to manufactured settings. A similar study by Cosco (2006) indicates that mixed settings offer diverse play behaviors and manipulation chances. Cosco further suggests that the challenge and control of manufactured materials combined with the variety of natural elements prompt children’s play behaviors.

In this study, mixed settings afforded high proportions of functional and dramatic play behaviors. Specifically, mixed settings such as the pathway, looped pathway, or sand, played host to about half of the functional play. As in previous studies (Cosco et al., 2010; Moore & Cosco, 2007), children enjoyed running, biking, chasing, and rolling tires over the paved pathways. They also enjoyed the climbing affordance provided by the sand-climber setting, which allowed them to look over the play environment. The rope swings proved to be another popular mixed setting. Children favored such functional play activities as holding, jumping, moving, and swinging on the rope swings.

The combination of loose and fixed elements in mixed settings prompted a variety of dramatic play behaviors. For instance, the green tube, sand-climber, and playhouse offered many hiding and climbing opportunities. In general, these child-sized offered protected enclosures that fostered children's need for retreat, solitude, and privacy. Children enjoyed collecting manufactured loose and natural loose elements and arranging them in these semi-enclosed, private spaces. The surrounding trees offered many natural props that children incorporated into their play, such as sticks, pine needles, and leaves. Mixed settings also provided more games with rules opportunities than manufactured settings. The merging of natural and manufactured elements in mixed settings triggered children's imagination and inspired them to develop games. The study results indicate the value of mixed settings for children's cognitive play behavior opportunities. The following paragraphs evaluate children's cognitive behavior within each mixed setting.

**1) Looped pathway:** Moore & Cosco (2010) found that looped pathways afforded running and riding activities in addition to their intended purpose of connecting children to other play settings. Similarly, Cosco and colleagues (2010) note that looped pathways attract children to play and increase their activity levels. Likewise, Cosco (2006) reported that children enjoyed riding on wheeled toys on hard, curvy pathways. Similarly, the results of this study suggest the looped pathway supported functional play behaviors including riding bikes and scooters, running, and walking. Consistent with previous studies (Cosco, 2006; Cosco et al., 2010) the circular design and the hard surface of the pathway in the manufactured zone stimulated continuous biking or chasing patterns.

**2) Pathway:** Researchers primarily evaluate pathways for their physical activity play value (Cosco, 2006; Cosco et al., 2010; Moore & Cosco, 2007). This study likewise explored the cognitive play behavior provided by pathways. Moore (1986) states that pathways or other smooth surfaces offer walking, biking, or riding opportunities. Consistent with previous findings (Cosco et al., 2010; Moore & Cosco, 2010; Potwarka et al., 2008), this study found that more than half of children's behavior in this setting demonstrated functional play. The pathway sometimes promoted games with rules activities, such as when children chased each other or rolled tires.

Based on children's descriptions, the hard, smooth surface of both the looped and straight pathways lent themselves to many functional behaviors such as cycling, running, kicking balls, or walking. Previous

studies have also regarded the value of pathways for functional play opportunities (Cosco et al., 2010; Moore & Cosco, 2007). Consistent with Striniste and Moore's (1989) statement, the pathways allowed the children to experience fast movement and challenging opportunities while riding bikes. One girl explained, "I like playing with the bikes mostly, and I just play with bikes, because sometimes I get to go really fast, even though if someone is on the bike with me I can go really fast, because I have really strong legs."

The pathways also offered chasing and running opportunities that children incorporated into their dramatic play and used to stimulate their games. Some children described how they play "pretend" activities on the pathway: "We usually play 'Star Wars' on the pathway." Another girl explained, "I like to run up and down it and have races. Sometimes I run on the pathway and pretend to be a snail, and I also pretend that I am a fast 'fairy' when I go over the concrete." Consistent with Moore and Cosco's (2010) findings, children explained how they enjoyed running and chasing along the pathway.

**3) Sand-Rope:** Considering the manipulative and shapeless characteristics of sand, researchers deem sand to be rich in constructive play opportunities (Moore & Wong, 1997; Woolley & Lowe, 2012). In the present study, one sand behavior setting included a plastic climber and the other featured a swinging rope. Consistent with previous studies (Fjortoft & Sageie, 2000; Moore, 1986) children enjoyed climbing on a pot and swinging on the rope in various directions, while the sand surface provided a safe surface for falling. The rope offered a change in levels and variety of experiences (Shaw, 1987), in addition to a challenging experience through which children could develop their abilities (Cele, 2006; Fjortoft & Sageie, 2000; Matthews, 1985). Dramatic play behaviors proved prevalent in the sand setting. Children combined sand with other loose elements to create symbolic representations, such as "ships," "boats," or "fish," largely made possible because sand can be shaped, poured, molded, and transferred into a desired purpose (Marcus, 1998). Overall, the combination of sand, tools, toys, rope, and pots enticed children to many dramatic and functional play behaviors.

**4) Sand-Climber:** The sand-climber behavior setting offered numerous functional and dramatic play behaviors. Previous studies report that children value places they can hide (Cele, 2006). The climber afforded refuge or hiding opportunities that encouraged children's dramatic play behaviors (Cele, 2006; Moore, 1986; Tai et al., 2006). Toys, sand, and the seats under the climber, as well as the child-friendly height of the climbers also encouraged dramatic play (Marcus, 1998). Research indicates that challenging experiences help children develop a sense of control and expertise necessary for their early cognitive development (Marcus, 1998; Moore, 1986; Yarrow et al., 1984). Similar to other manufactured fixed elements that afford functional play (Olds, 1987; Winter, 1985; Woolley & Lowe, 2012), the climber enticed children to climb, jump, or balance. Woolley and Lowe (2012) recognize this climbing opportunity as a means of increasing the challenge of an environment. This study's findings confirmed Hart's (1979) notion that children enjoy the climber's hiding and lookout opportunities.

**5) Ropes:** Children develop their cognitive abilities via the loose elements in play environments (Moore, 1985; Myers, 1985). Ropes tied to the trees became behavior settings that challenged children to balance, walk, climb, jump, and swing. Consistent to Moore's (1986) findings, the swinging opportunity in this behavior setting inspired children to be active. The study also indicated that functional play made up more than half of children's interaction in this setting. The ropes tied to multiple trees occasionally created a semi-circular boundary. Children held the trees and climbed on the rope, trying to balance or walk on the rope. This challenging arrangement stimulated children's games with rules. In contrast to this particular rope arrangement, the swinging rope only allowed one child to use the rope at a time. Children lined up to have a turn at swinging on the rope, thus increasing their non-cognitive play behavior. As previous studies suggest (Hart, 1979; Moore, 1986; Prescott, 1987), children enjoyed the lookout opportunities associated with the change of level that rope swinging provided.

Fjortoft and Sageie (2000) state that children use ropes for climbing and looking over the adjacent space. Shaw (1987) also recognizes rope for its change of level affordance. Moore (1986) notes children's use of ropes for swinging. Consistent with these studies, the children of this study described how elements such as bikes, balls, or rope swings offered functional play opportunities. Many children also expressed interest in climbing and swinging on the rope swings. The rope swings proved to be one of the popular behavior settings in the natural zone. One of the girls explained how she enjoyed the rope swing in the manufactured zone: "You stand on the bucket, and you swing. I like that because it's so fun on it and I like to dance on it."

**6) Green tube:** The green tube behavior setting afforded the most dramatic play opportunities. As previously described, the tube's hiding and lookout opportunities enthused children. In addition, the existing natural loose props surrounding the tube developed children's sense of imagination and creativity. Similar to the tires (Weinstein & Pinciotti, 1988), the interior space of the green tube provided a popular, protected, and safe boundary in which children retreated, socialized, and explored their surroundings.

Children created imaginative characters in the green tube, such as "*Star Wars*," "cheetahs," or "dinosaurs." The hiding-climbing affordance of the green tube intrigued children's dramatic play behavior. Hiding provides restorative or privacy opportunities children value (Hart, 1979; Sobel, 1990; Tai et al., 2006). Opportunities for climbing satisfy children's need for exploring and understanding their surroundings (Cele, 2006; Moore & Wong, 1997). Children's explanations reflect their desire for hiding and climbing opportunities. For instance, one of the girls explained, "I like the green tube because you can get in it and on the top. Sometimes we play 'dinosaurs.' Sometimes I'm the baby dinosaur; sometimes I am the baby coyote."

**7) Play houses:** Many designers recommend incorporating playhouses to support young children's dramatic play opportunities (Frost & Klein, 1979; Frost & Strickland, 1985; Moore & Marcus, 2008; Monore, 1985; Moore & Marcus, 2008; Moore & Wong, 1997). In this study, the outdoor learning environment incorporated three house behavior settings: two in the mixed zone and one in the manufactured zone.

Supporting previous studies, the findings of this study showed more than three quarters of children's interaction with playhouses in both zones demonstrated dramatic play. This high quantity of dramatic play may associate with how spaces with boundary, especially roofs, inspire a feeling of home (Olds, 1987; Sobel, 2001) or shelter (Striniste & Moore, 1989). During many observation sessions, children role-played activities associated with a house theme, such as cooking, cleaning, playing family roles, or repairing the roof. Far from adult supervision, children enjoyed the sense of privacy and refuge afforded by the houses. Children assembled and decided about their imaginary plots in these hiding spaces.

Much like prior studies (Moore, 1985), children favored the playhouses the most for their dramatic play affordances. They enjoyed these spatially defined, child-scaled elements. In fact, Marcus (1998) recommends considering children's height and scale for dramatic play structures. These small-scaled spaces create "nooks and crannies" that develop a sense of belonging (Moore & Wong, 1997). The sense of enclosure and safety of the playhouses provided spaces for socializing and retreat (Weinstein & Pinciotti, 1988), which developed children's sense of imagination.

Near the tables, the house in the manufactured zone inspired "home" dramatic play themes. Children described their game as "house," practicing their roles as "mothers," "children," or "shopkeepers," among other roles. Relating to these interpretations, one child explained, "I really like them [the play houses]. I play 'Kitty' and 'Baby and Mommy.'" Another child offered, "We pretend to have a house and make food on the table." One girl stated how children organize food and pretend the house is a store with shelves: "We pretend it to be an ice cream store." Some boys remarked how they hide and pretend to be characters such as "Iron Man" in the playhouses. These examples illustrate the importance of such settings for inciting children's sense of imagination and role play.

The playhouse in the mixed zone also proved popular behavior for games with rules activities, due in large part to the playhouse's child-scaled, concealing qualities. Confirming previous studies (Fjortoft & Sageie, 2000; Moore & Cosco, 2010), children enjoyed the hiding affordance of the playhouse. One child explained, "We hide in the house and try to kill the enemy."

**8) Green patches:** The green patches in the mixed and manufactured zone incorporated many natural and manufactured loose features. The green patches often served as a link between other settings. The green patches behavior settings afforded many imaginary play behaviors. This setting included the tires, which are associated with children's dramatic play (Weinstein & Pinciotti, 1988). Similar to Weinstein and Pinciotti's (1988) study, children collected loose props in the enclosed, private space of the tires, where they imagined to be "warriors," or "cats." The tire represented "home," a "ship," and a place of refuge. Sometimes, children transferred chairs, tables, or logs to the tires and prepared imaginary "food" that they would "cook" and serve at their "home." Other times, children jumped and balanced on the tires. The green areas also afforded many functional play behaviors through providing running and walking opportunities.

Consistent with the quantitative findings, children mentioned how the green patches in the manufactured and mixed zones offered dramatic play. The grass, bushes, and trees lent themselves to dramatic play as well as linking multiple behavior settings. One girl stated, “I like playing princess in the grass. We pretend to have a fancy dress.” The following section explores how the combination of study methods explained the cognitive play affordances in manufactured zones.

### **7.2.3 Manufactured settings and cognitive play behavior affordances.**

Manufactured settings mostly provide functional and challenging opportunities for children (Moore & Wong, 1997). The main purpose of manufactured settings is to support children’s gross motor development (Barbour, 1999; Moore & Wong, 1997). Accordingly, Moore and Marcus (2008) believe some manufactured settings have significant play value for children. Consistent with the previous studies, the results in this instance indicate that manufactured settings mostly afford functional play behaviors. Compared to other settings, manufactured settings rarely offered high ranges of cognitive play behavior and fewer opportunities for dramatic play, even though 40% of the play in this setting could be classified as dramatic. While dramatic play was more prevalent in other settings, the complex quality of the manufactured setting, coupled with the available natural loose and manufactured loose elements, promoted dramatic play in the manufactured setting. These findings stress the importance of loose elements within play environments to encourage higher levels of cognitive play. The following paragraphs evaluate children’s cognitive behavior within each manufactured setting.

**1) Tables:** Tables and seating settings are important spaces to stimulate different behaviors in children (Ozdemir & Yilmaz, 2008). Woolley and Lowe (2012) recognize the potential of seating and table behavior settings for making an environment more enticing. The tables in the manufactured zone were adjacent to the playhouse, prompting children’s imaginative play behavior. Children usually combined the available sand and mulch in plates and utensils, and organized them on the tables during their dramatic play. When asked, children described their actions as “cleaning the tables,” “making ice cream,” or playing “house.”

**2) Swing:** Swings provide challenging opportunities for children (Marcus, 1998; Woolley & Lowe, 2012). Similar to the swing elements, the swing behavior setting afforded the highest quantity of functional play behavior compared to other settings. This result implies the one-dimensional element of this behavior setting (Marcus, 1998) and its inability to afford higher levels of cognitive play behaviors.

**3) Rockers:** The rockers behavior setting mostly provided functional play behaviors associated with the existing rocking apparatus. Children enjoyed rocking, swinging, and balancing on the rocking equipment, all of which demonstrated a high ratio of functional play. In addition, this setting also offered numerous opportunities for dramatic play due to its child-scaled, sheltered, and circular design features. As previously described, the mulch surrounding the rockers supported dramatic play. Consequently, children enjoyed collecting mulch and engaging in dramatic behaviors it.

**4) Music wall:** Ideal playgrounds stimulate all senses (Olds, 1987), creating children's memory of a place (Cele, 2006). Opportunities to create music, perform, or dance can develop children's social-cognitive development (Moore, et al. 1979). Sounds can affect how children perceive and experience the environment (Perrine, Arp, & Johnson, 1993; Serafin & Serafin, 2004). Sanoff and Sanoff (1981) consider opportunities for creating music as a means to express musical ideas, extend sensory keenness, and develop social and emotional skills.

Consistent with the observational results, children explained how the music wall offered constructive and exploratory play behavior. In fact, this setting offered some of the most constructive play opportunities. Children engaged in constructive play by creating music with loose elements and attaching equipment to the panel, including hanging buckets. Children filled the buckets with mud, water, or dirt and explored creatures such as worms or bugs. This characteristic inspired many exploratory play behaviors. The wooden stage in this behavior setting afforded dancing, sitting, and gathering. As in previous studies, children favored creating music with the instruments attached to the music wall. Children explained how they sang in groups or individually. For example, one of the boys described, "I like to make noises on the stage. I like the music parts, and I sit where the music is."

**5) Gazebo:** Previous studies consider gazebos to be structures that afford social gatherings for children and adults (Moore & Cosco, 2007; Moore & Wong, 1997). This study explored how the gazebo can afford cognitive play behaviors for young children. The gazebo situated at the top of the hill provided many lookout opportunities. In addition, the behavior setting included a shelf. Although children did not use this behavior setting much, the few activities that occurred there suggest its effectiveness for affording dramatic play behaviors. Children used the shelves as hiding spaces during dramatic play, such as pretending to be animals or sleeping. The wooden surface of the gazebo encouraged children to sit, crawl, and mix loose elements to represent symbolic objects. The wooden surface encouraged rope games such as jumping, as well as singing. The findings recommend the importance of sheltered, soft-surfaced, and semi-enclosed spaces for children's play.

Dramatic play develops through moving beyond the discovery of objects to use them based on preexisting information (Belsky & Most, 1981). Confirming the observational findings, children described how they enjoy dramatic in the gazebo behavior setting. One of the children explained, "We usually hide in the shelves and make cat sounds." Children imagined themselves as other animals such as a giraffe and poodle, or they played as "Super heroes." This dramatic play stimulation may have been associated with the enclosed and defined space of the gazebo that also enabled children to look over the entire site. True to their need for hiding (Herrington & Studtmann, 2004; Moore & Wong, 1997; Sobel, 1990; Tai et al., 2006), children enjoyed the hiding in the small spaces the shelves provided.

**6) Play structure:** Settings that incorporate play structures develop children's motor activities (Herrington & Studtmann, 2004; Pack & Michael, 1995; Moore & Wong, 1997). Boldermann and colleagues (2006) recommend integrating play structures with natural features to increase children's play opportunities. Mulch covered this play structure behavior setting. Consistent with prior studies, the play structure mainly provided functional play behavior. Children mostly climbed, balanced, and jumped from the play structure. Children enjoyed climbing on the slide and the tires. The complexity of the compound play structure also granted many opportunities for hiding and pretending. The natural loose and manufactured loose elements around the play structure further encouraged children's dramatic play. Children pretended the mulch was "lava" as they jumped from the play structure to the tire. Some children jumped on the mulch pretending to be "football players." Combining manufactured fixed elements with natural loose elements increases the range of children's cognitive play behaviors children.

Children mostly recognized the play structure for its functional affordances. Further, they described how the play structure inspired some games: "We all slide; sometimes people hold on to each other and chain down the slide and say 'Whee!'. They slide in the air before they run." The results indicate that manufactured fixed elements should be complex and include various units to encourage a variety of play.

**7) Storage:** Many design guidelines for children's outdoor environment mention the need for storage spaces for keeping loose props (e.g. Marcus, 1998; Moore & Wong, 1997; Striniste & Moore, 1989; Winter, 1985). In this instance, the storage space also offered functional play opportunities. Children enjoyed climbing the shelves or the fence surrounding the storage area. The loose materials in storage, such as the baskets, enticed children to hide and develop dramatic play. Children sometimes continued their biking inside the storage area. These private spaces allowed children to explore their feelings without adult supervision (Olds, 1987; Sobel, 1990, 2001). The storage provided a private, enclosed space that may encourage children to develop a sense of belonging and engage in intimate play between peers (Moore & Wong, 1997; Prescott, 1987).

**8) Platform:** Few studies appreciate the dramatic play value of platforms in play environments. Located within the trees, the platform inspired children to create imaginary play. The mixed zone included three raised wooden platforms that children termed the "stage." Platform locations included one in front of the music wall and two within the trees in the mixed zone. Design guidelines for creating children's outdoor play environments suggest including platforms to encourage children's dramatic play opportunities (Sanoff & Sanoff, 1981) or visual exposure (Olds, 1987; Prescott, 1987; Shaw, 1987; Striniste & Moore, 1989). Observational research also suggests the dramatic play affordance of platforms for children (Frost & Campbell, 1985; Frost & Strickland, 1978; Myers, 1985). Moore and Wong (1997) consider platforms as multi-purpose game settings. The behavior mapping results proved consistent with these theories, suggesting the platforms' use in dramatic play. The children imagined the platform to represent a "ship" or a "performance stage." Children employed the defined perimeter of this behavior as a landmark in their games. The wooden stage

allowed children to sit, gather, and discuss their play strategies. The platforms further provided a hard, smooth, warm-textured surface for children's constructive play behavior. "We build on it," one child stated of her play habits on the platforms. Children usually scattered their loose play elements on the platforms and tried to build what they had imagined.

During the qualitative portion of the study, children described what the platforms represented in their imaginary play activities. The hard, smooth surface of the platform enabled children to sit, organize their play props, and imagine their characters. Children recognized that the platform was a different setting than its surrounding. "I like playing pirate ships at the stage in the woods," one child explained. Indeed, the available loose elements inspired children to use the platform for their dramatic play purposes. For instance, children employed a steering wheel toy and imagined the deck to be a 'boat.' The following section explores how the combination of methods explained the cognitive play affordances of various elements.

### **7.3 Cognitive Play Affordances by Elements**

To provide a broader understanding about how the elements offered cognitive play behaviors, this section assembles the elements into categories. The following paragraphs explain how manufactured fixed, manufactured loose, natural fixed, and natural loose elements afforded cognitive play behaviors based on the multi-method findings.

#### **7.3.1 Manufactured fixed elements and cognitive play behavior affordances.**

Previous studies suggest that manufactured fixed elements are one-dimensional and mostly afford functional play behaviors (Frost, 1985; Frost & Klein, 1983; Frost & Campbell, 1985; Moore & Wong, 1997; Lee, 1999). In a study by Naylor (1985), fixed manufactured equipment demonstrated low attendance and offered limited play type. Moore and Wong (1997) conclude that manufactured fixed equipment supports children's creativity and social interaction through challenging experiences. Supporting previous studies, the results suggest that manufactured fixed elements predominantly allowed functional or dramatic play. The objects' complexity of form, variety of heights, and places to hide stimulated dramatic play behavior. Mirroring previous studies, this study noted functional play occurring on elements such as swings, or rockers. The following paragraphs evaluate children's cognitive play that each manufactured fixed element stimulated.

**1) Play Structure:** Previous studies note children's interest for compound play structures that include diverse play opportunities (Prescott, 1987; Monore, 1985; Moore, 1985). The play structure in the manufactured zone incorporated a slide, a connecting platform, and two different stair types. Similar to most studies (Campbell & Frost, 1985; Frost, 1985; Pack & Michael, 1995), the findings indicate that functional play defined half of children's interactions with the play structure. The complexity of the play structure's units provided opportunities for climbing, sliding, hanging down, jumping, balancing, running, and balancing. Consistent with Korpela et al. (2002), the results link children's place preference and functional affordance. This preference may associate with how satisfying an action feels (Kytta, 2003). Children prefer challenging, and exciting

opportunities (Francis, 1988; Lee, 1999). The children often described how they enjoyed going down the slide, rocking, or swinging because it is “fun.”

Previous research also recognizes slides to be one of the most popular elements for preschool children (Frost & Strickland, 1985). Shaw (1987) explains that the top of slide can afford a gathering and lookout space for children, while the space underneath can serve as an enclosed space for gathering. Consistent with this observation, children used the structure slide as a place to gather, decide on the rules of their play, or watch other children. Sometimes, the void space under the slide encouraged hide-and-seek or a private area for dramatic play activities. This result is consistent with previous design suggestions or studies that report children’s fascination for places affording privacy or hiding opportunities (Cele, 2006; Golicnik & Thompson, 2010; Marcus, 1998; Shaw, 1987; Moore & Cosco, 2010; Shaw, 1987; Sobel 1990).

Children also enjoy climbing objects to look down from above and feel powerful (Cele, 2006; Marcus, 1998; Moore, 1986, Olds, 1987; Tai et al., 2006). Sliding is attractive for children as it offers movement, change of speed, and experience of gravity (Heseltine & Holborn, 1987; Moore & Wong, 1997). Children often climbed the stairs to reach a higher perspective level before finally sliding down. In this study, children illustrated or mentioned the slide attached to the play structure many times as their favorite element. For instance, one girl explained, “I climb it up sometime and I slide back down!” Children enjoyed standing on the stairs or the top of structure to watch others; the researcher coded this activity as exploratory play. One child explained, “I like going up the structure and looking around.” This lookout opportunity also allowed dramatic play opportunities for children. Based on the observations, the attached slide afforded various play activities. The structure occasionally stimulated games with rules when children attempted to climb the slide without falling into the mulch. Children also engaged in dramatic play with the slide and occasionally just enjoyed sliding down. In summary, the behavior mapping results illustrate how a compound structure can afford different cognitive play behavior affordances. The results were congruent with other research regarding children’s preference for compound play structures (Moore, 1985). One of the children explained her preference for the climbing-sliding affordance of the structure: “I like to swing from here and then slide all the way down. I like to go all the way up...I climb it [the structure] up sometime and I slide back down!”

Dramatic play links children’s imagination with the outside reality, enabling children to learn and manage new experiences (Golinkoff et al., 2006). One of the children explained how the play structure provided this opportunity for her: “We play “people” on the top, and princess over.” Another child stated, “I like hiding in the structure and pretend to be fighters.” Moore and Cosco (2010) assert that play settings with hiding opportunities are attractive for children. Indeed, the hiding and climbing opportunities of the play structure intrigued children’s sense of imagination.

**2) Green Tube:** Tai, et al. (2006) theorize children’s need for private spaces to relax and escape. They further explain how enclosures provide one type of retreat, where children can play and think privately while

being free from adult supervision. These spaces develop a sense of autonomy and promote creative play. In this study, the green tube in the natural zone primarily afforded dramatic play behaviors by offering a sense of enclosure and privacy, and children desired going inside the tube. “I try to go inside and run away so they wouldn’t get me. I play ‘princess’ and ‘mommy’ there,” one child said of her play preferences. Compared to other elements, the tube demonstrated the highest potential in affording dramatic play behavior. Children mentioned many pretend themes they play in the tube, such “sharks,” “dinosaurs,” “mommy,” or “*Star Wars*.”

Hart (1979) explains that hiding and look out places are two environmental qualities that children value. This manufactured play element consisted of a number of stairs for children to climb and observe and a short tunnel for them to hide and relax. Consistent with Hart’s finding, children used the stairs to climb the play equipment, observe the surroundings, or “hold trees.” The “overlook” quality of the tube afforded many dramatic play opportunities for children. In some instances, children used the tunnel as a place to collect loose natural pieces. Consistent with previous research (Moore, 1986; Shaw, 1987), the tunnel in this study afforded adventurous, imaginative, hiding, and refuge opportunities.

The qualitative results confirmed the role the tube’s hiding and climbing affordances played in inspiring children’s games. For instance, one child detailed the game children play with the green tube: “I climb up on it and I like to hang from the tree. There is a bar tree that I hang on. You climb a tree and try to hold on to it for three hours.” Comments such as this underscore the importance of interviews for understanding children’s play behavior.

**3) Swing:** Greenman (1988) argues that swinging is a necessary outdoor play opportunity for preschool children. Marcus (1998) explains how swings provide challenging experiences for children. Prescott (1987) classifies swings as play units with an obvious use, does not suggest any other roles, and possesses a risk and daring quality. Compatible with this statement, the swings in this study mostly offered functional play behavior opportunities and led all other elements in the amount of functional possibilities. Many children recalled swings as an enjoyable element despite their having only one function.

Swings are action-oriented and among the most popular playground equipment for children (Frost & Campbell, 1985; Loukaitou-Sideris & Sideris, 2010). The swinging structures granted many challenging experiences that inspired children to recognize it as one of their favorite elements. Children described the stimulating and exciting encounters the swings afforded, such as a sense of “flying.” A child described, “I like swinging because I like swinging back and forth and getting higher.” Although children frequently used swings to move backward and forward, some explained how they integrate other challenging motions, such as jumping or doing back flips.

**4) Seating:** In this study, fixed benches and movable plastic chairs provided primary seating opportunities. While literature values seating and tables for their social play value (Malone & Tranter, 2003; Moore & Cosco, 2007; Moore & Wong, 1997; Woolley & Lowe, 2012), the behavior mapping results suggest

they also support dramatic play opportunities. Children used these elements to organize their toys, climb, imagine, and communicate with peers. Supporting Moore and Wong's (1997) design suggestions, children also used chairs or tables for restorative or lingering purposes. The results demonstrate that seating opportunities can also afford dramatic play opportunities parallel to social play.

**5) Climbing structure:** Greenman (1988) regards climbing as one of the essential opportunities for preschool-aged children. Woolley and Lowe (2012) view opportunities for climbing as characteristics of a challenging environment. The climbing structure in the sand behavior setting mostly offered dramatic, then functional play behaviors. As previously described, the play structure incorporated hiding and lookout qualities that children sought (Cele, 2006; Hart, 1979; Heft, 1988; Kytta, 2002). The void area created by the arched structure of the climbing structure formed a tunnel, inviting children to hide, gather, and fantasize. As one child described her hiding experience, "I hide in the sand structure and we play 'snowy wolves' where we hide." The observation results joined previous studies in explaining how the climbing structure encouraged functional play behaviors. Indeed, children enjoyed the climbing challenge provided by the structure; one child noted, "I climb on the little sculpture thing and it is so fun getting down." Consistent with previous research (Cele, 2006; Kytta, 2003; Rasmussen, 2004; Shaw, 1987; Tai et al., 2006), the climbable structures offered challenging experiences that appealed to children.

**6) Rockers:** Prescott (1987) recognizes rocking equipment as a play apparatus with an obvious one-functional use. Woolley and Lowe (2012) classify the existence of rocking equipment as a sign of a challenging outdoor environment. More than half of the interaction with the rocking equipment demonstrated functional play behavior. Similar to swings, children enjoyed the swinging and rocking movement: "I like playing there because we get to rock." The observational results suggested about 36% of children's interaction with rockers included dramatic play, such as riding a "horse" or "super heroes." During interviews, one girl explained, "I like to play 'sick fairy' [at the rockers]. Someone has to be the good fairy and the other one gets sick." This dramatic play activity may result from the circular arrangement of the rockers, which encouraged both private and group activities. The following section explains how manufactured loose elements offered cognitive play for young children.

### **7.3.2 Manufactured loose elements and cognitive play behavior affordances.**

Nicholson (1971) developed the theory of loose parts, which asserts that loose parts in the environment offer many play chances and stimulate creativity that is unlikely found in settings with fixed elements. He believed that richer environments possess more diverse ranges of loose elements. Moore (1985) believed that play spaces with ample loose parts promote children's cognitive, social-cognitive, and cognitive-motor play behaviors. Similarly, Marcus (1998) points out the value of loose elements in supporting children's imagination, creativity, and constructive play. A study by NLI (2007) suggests that manufactured loose elements support promoting children's sense of marvel and research, and as a result, prompt dramatic play. These interactions

with the environment enhance children's science learning behavior. Striniste and Moore (1989) emphasize the importance of manufactured loose elements for children's creative behaviors within the outdoors. Consistent with other findings, this study found that manufactured loose elements mainly support children's functional and dramatic play behaviors. Wheeled toys particularly afforded functional play behaviors. Other tools and toys contributed to children's dramatic play. Manufactured loose elements also served as the main supportive element for games with rules play, due in large part to the portability of loose elements; for example, children chased one another while carrying balls. The following paragraphs evaluate the cognitive play that each manufactured loose element stimulated.

**1) Tire:** Striniste and Moore (1989) describe tires as transportable objects that encourage children to stand, pull, or cruise. Shaw (1987) recognizes the change of levels that tires offer for rich and varied play. Few studies have explored the value of tires for children's cognitive play behavior opportunities. Consistent with Weinstein and Pinciotti's (1988) findings, almost half of the children's interaction with tires was dramatic play. The inside space of tires offered popular, guarded spaces wherein children could play without the need to be active. Tires offered hiding spaces for retreat and solitude (Cele, 2006; Hart, 1979; Heft, 1988; Kytta, 2002; Weinstein & Pinciotti, 1988). One child explained, "I go in it [the tire], or around it and sing. I also go inside and hide."

Children enjoyed the combined challenge of climbing and dramatic play opportunities the tires offered. Occasionally, children engaged in games with rules or functional play that included jumping off a tire, rolling tires down the hill, or hopping from one tire to another. Compared to other elements, tires offered the most possibilities for games with rules behavior. The observational results indicate the value of this manufactured loose element for children's play.

Previous studies show the popularity of elements such as tires (Frost & Strickland, 1985; Marcus, 1998; Weinstein & Pinciotti, 1988). Children mentioned their preference for tires and their dramatic play affordances. Children imagined playing "ducks," "Transformers," "unicorns," "shooting," "house," "pool," "animals," "princess," or "jail" in the tire. One of the respondents explained, "I go inside it, pretend to be the 'kitties' in the tire, and the tire is our home, and we move in the playground." Other children explained how they imagined the tire to be an island and ran around them. Weinstein and Pinciotti (1988) further note how tires provide enclosed spaces that promote a sense of retreat and imaginative play, and that children need elements that offer different heights, which tires offered. Children also appreciated how they could climb and jump from the tire, pretending to be "sky landers." They also enjoyed how they could hide in a child scaled element, collect loose elements, and pretend to have a spatial boundary.

Based on the children's descriptions, the tire provided hiding opportunities that inspired children's games. One girl described how she enjoyed the hiding affordance provided by the tire:

I love the tire. I get in it and I hide under it, when my daddy comes. Do you know what he says? 'Where is X [the child's name]? She is not here. I guess her mommy already picked her up.' Do you know what else I do? I surprise them! I also like to play jump over where I have to jump over it, it is a little hard.

Tires also occasionally provided a challenging surface for children to balance, further inspiring their games.

**2) Rope:** Matthews (1985) considers swinging ropes as elements for inciting adventurous play. In the study by Fjortoft and Sageie (2000), ropes and ladders provide climbing opportunities for children. Moore's (1986) observations indicate that ropes tied to tree branches afford swinging behaviors. Consistent with these findings, this study found that ropes tied to trees or the shading structure mostly afforded functional play. Children sought after the challenging experience of climbing and balancing on the buckets or tree logs, holding to the ropes, and swinging, "You stand on the bucket and you swing. I like that because it's so fun on it and I like to dance on it!" one child stated. Children found pleasure in the rhythmic movements of the rope swings: "I like the ropes. I swing a lot and play there all day long!" Children also enjoyed their motion through space; as a boy described, "I move my legs while I am swinging."

The challenging movements provided by the ropes inspired children's minds. About one quarter of children's interaction with ropes consisted of dramatic play. Children imagined themselves as swinging monkeys, jumping off a pretended volcano, or flying through the air as "hungry birds. A boy explained how he enjoyed the swings: "I just like to do monkey tricks. You just have to climb up and hang upside down from the rope." Children employed the non-attached ropes as loose materials in dramatic play. In one game, two children held on to the rope imagining being "owner and kitty."

**3) Bikes:** Kytta (2003) considers cycling a challenging and motivating activity that excites children. Marcus (1998) suggests providing hard surfaces in outdoor preschool settings so children can play with cycling equipment. Consistent with this idea, previous studies (Cosco, 2006; Cosco et al., 2010; Moore, 1986; Moore, Cohen, Oertel, & van Ryzin, 1979; Tonyan & Howes, 2003) indicate the importance of hard and smooth pathways for skating, bicycling, or riding. However, there is inadequate empirical research on the cognitive play behaviors opportunities the bikes offer. The observational results suggest cycling equipment as one of the commonly used elements and among those providing functional play.

Children recognized these functional play affordances. They explained how they enjoy "driving" the bikes or scooters because "they go super fast!" One child explained how biking associates with her physical skills. "I just play with bikes, because sometimes I get to go fast, even though if someone is on the bike with me. I can go really fast, because I have really strong legs." More than three quarters of children's interaction with bikes demonstrated functional play behaviors, the bikes also encouraged dramatic and exploratory play. Moore and Marcus (2008) also comment that wheeled toys offer dramatic play opportunities. There were many instances in which children enjoyed sitting behind the bike his or her friend rode, exploring the movement

experience. In some observations, the researcher noticed how children turned the bikes upside down and imagined “driving a car.”

**4) Tools or toys:** Many studies (Bradley, 1985; Moore & Wong, 1997; Sanoff & Sanoff, 1981) identify toys and play props for their dramatic play value. The observational research by NLI (2007) recommend toys for promoting children’s dramatic play. Considered as one of the popular elements, tools or toys provided a host of dramatic play behaviors. In addition, children employed toys in their constructive and exploratory play when digging or creating music. Toys, such as balls or Frisbee, stimulated children’s functional or games with rules play behavior. In summary, the results imply the value of manufactured loose elements such as toys for promoting different cognitive play behavior types. The following section explains how natural fixed elements offered cognitive play for young children.

### **7.3.3 Natural fixed elements and cognitive play behavior affordances.**

Natural fixed elements have a moderately strong positive correlation with children’s play (NLI, 2007). However, few studies have explored the cognitive play behavior affordances of these elements for young children. The study by NLI (2007) associate these elements with exploring and experimenting behaviors. It is worth mentioning that the results of this study suggest that natural fixed elements mainly offered functional play behaviors due to the element’s quality of representing strong structural units. These supporting units supported children’s weights for functional play purposes, such as climbing, or swinging. Consistent with previous research (Moore & Wong, 1997; NLI, 2007), about a quarter of children’s interaction with natural fixed elements demonstrated dramatic and explorative play behaviors. The following paragraphs evaluate the cognitive play that each natural fixed element stimulated.

**1) Tree:** While trees can afford many play opportunities for young children, policy makers and designers usually neglect their cognitive play affordances. Some studies explored the physical activity value of trees for children’s health. Boldermann and colleagues (2006) examined the connection between the physical environment, children’s Ultra Violet (UV) exposure, and physical activity and suggest that environments with trees and vegetation increase children’s physical activity level while protecting them from UV rays. Fjortoft and Sageie (2000) indicate that natural features such as trees have a positive correlation with children’s gross motor activities. However, few studies may have explored the cognitive play behavior affordances for young children that trees provide.

The trees in the natural zone offered many dramatic play activities, where children imagined being in a forest, chasing animals, or playing “*Star Wars*.” The trees afforded games with rules activities such as hide-and-seek. The tree bark also stimulated children’s curiosity and sense of wonder, affording exploratory play behaviors. Nevertheless, about 40% of children’s interaction with trees demonstrated functional play due largely to the ropes tied to the trees that offered swinging, climbing, and balancing activities. The weight-bearing quality of trees actualized these functional affordances. Depending on their physical characteristics,

trees offer climbing affordances (Heft, 1988; Herrington & Studtmann, 2004; Moore, 1986; Moore & Wong, 1997). Confirming these findings, the study discovered young children's interest for climbing low height trees. One child explained, "I like to play 'climb it,' and then you have to climb a tree." Similarly, in Cele's (2006) study, children also enjoyed climbing shorter trees. Cele further explains climbing's importance as a both a mentally and physically challenging activity.

The loose nature of the tree bark provided constructive play opportunities. One of the children said, "I love to take the bark off the trees. Because sometimes we use the bark to make something, and we crack the bark on the soft place and we pull it off." Trees provided many challenging activities while increasing children's play alternatives.

**2) Rocks and boulders:** Literature recognizes rocks for their dramatic (Tai et al. 2006; Woolley & Lowe, 2012) and functional (Moore, 1986; Woolley & Lowe, 2012) play opportunities. Moore and Wong (1997) classify rocks in the "play props" category, in which children can transform and manipulate them into what they imagine. In this study, children accessed rocks at the stone-lined swale and within the natural zone. The rocks, soil, and water supported the existence of many creatures such as worms. Children moved the rocks to "see what is underneath." One child offered, "I like playing in the rock area when there is water. We find worms." These worms stimulated children's curiosity, suggesting the high potential of rocks for exploratory play.

Children enjoyed dramatic play when exploring under the rocks, such as seeking "dinosaur bones" or "finding the worm's mommy." Climbing the boulders or the surface of rocks also encouraged children's functional play. Children enjoyed climbing, jumping, and balancing challenge of rocks because of their irregular size. One child explained, "I like to walk on the rocks because I can balance on them." Many children described their self-developed games over the rocks, but the observational results did not record any game with rules activities in the natural area.

The rocks in the stone-lined swale area, however, inspired many games with rules. One girl explained how she plays hop scotch, while another girl described, "I jump on the rocks. It is called 'Jumping house.' We jump from one place and another friend jumps to another place, and the other friend jumps to the 'two' place. Then I jump, and other friend jumps to the 'three' place." Another girl detailed the rules of another game with rocks:

I like to play, jump over the rocks. It's where you jump on to rocks and try to miss a few of them. You actually try to jump from this and to all the way to a different one without touching that one, and then you jump over that one, trying to land on that one. I actually pick them up sometimes and I flip them over. You have to keep flipping it and see how much times you do it. If you get a really high one you win!

**3) Tree trunk:** Almost half of children's interactions with tree trunks involved exploratory play behavior. Compared to other elements, trunks represented one of the most effective features for stimulating

exploratory play. This exploration originated from children's curiosity to find bugs or creatures in the trunk. One of the children explained about his sense of curiosity: "I like to feel [touch] the trees. The bugs fell down and we pretended they spread." Children combined the tree trunks to build their pretend "houses" in the natural zone. Challenging children to jump, balance, or crawl over them, some tree trunks along the trail offered functional play opportunities.

**4) Bushes and vegetation:** Bushes and vegetation provide aesthetical and learning qualities to outdoor environments (Woolley & Lowe, 2012). Vegetation can also increase the duration and diversity of outdoor play (Grahn, Martensson, Lindbald, Nilsson, & Ekman, 1997). Some studies have explored the cognitive play behavior opportunities that vegetation or bushes offer for young children. In the research presented by Fjortoft and Sageie (2000), the diversity and appearance of vegetation associated with varied play opportunities. They also found that scattered deciduous and mixed shrubs afford symbolic and constructive play mainly because they offer places to hide, imagine, or build shelters. Chawala (2003) further observed that the most dramatic play occurs near bushes in schoolyards with natural and built elements.

Moore and Wong (1997) report vegetation and shrubs promote discovery, exploratory, and dramatic play. They also point out that bushes offer hide-and-seek and games with rules play. Further, Moore (1986) values bushes for climbing, exploring, fantasizing, hiding opportunities as well as the microclimate they create, offering shelter and privacy and allowing children to look out without adults noticing them. Marcus (1998) describes bushes as elements in which children can hide and explore. Reinforcing previous research, the results describe dramatic and exploratory play as the behaviors of choice during much of children's interactions with bushes. Children enjoyed examining the bushes for creatures, such as bees, bugs, or worms. Bushes also created boundaries for imaginary territories and private spaces for children's dramatic play. Children used bushes for their hiding affordance during games with rules play. The following section explains how natural loose elements offered cognitive play for young children.

#### **7.3.4 Natural loose elements and cognitive play behavior affordances.**

Natural environments provide various loose elements such as dirt, sand, sticks, or logs. These elements stimulate children to manipulate their surroundings and develop their creative, dramatic, and constructive abilities (Moore, 1985; Moore and Wong, 1997; Fjortoft and Sageie, 2000; Tai et al., 2006). Cosco (2007) explains how loose elements, especially natural ones, can afford diverse play opportunities for young children. Fjortoft and Sageie (2000) report how natural environments provide many natural loose elements that stimulate dramatic play. Like the previous studies and Nicholson's (1971) theory of loose parts, the results imply that natural loose elements support constructive, exploratory, and dramatic play behaviors. In fact, almost half of children's interactions with natural loose elements consisted of dramatic play. Natural loose elements also offered similar exploratory and constructive play opportunities. These findings underscore the variety of cognitive play behaviors that natural loose elements provide. This variety is due to their manipulative,

shapeless, transportable, evolving, and complex qualities. These characteristics allowed children to move these elements within various settings, thus increasing their play engagement levels. The following paragraphs evaluate children's cognitive play associated with each natural loose element.

**1) Creatures:** According to Moore and Wong (1997), small animals and creatures can stimulate children's exploration and learning. They further explain how these creatures provide natural lessons for children, while enhancing the attractiveness of the outdoor learning environment. The observational result analyses provides further evidence for this growing body of research suggesting children's interaction with creatures to mostly afford exploratory play. Interestingly, compared to other elements, creatures represented the highest potential for exploratory play. The observational research further indicates children's excitement for investigating how creatures such as worms, ants, or bugs reside or transform.

The identifiable traits of natural elements, such as water or sand, helps explain children's preference for them (Kytta, 2003). Children described their fascinating encounters with creatures, such as bugs, or spiders, that they found in the woods. This study offers further evidence that children's preferences for behavior settings may associate with their functional characteristics (Fjortoft & Sageie, 2000). Further, features that prompt a sense of curiosity and confusion evoke children's sense of wonder (Cecil, Gray, Thornburg, & ISPA, 1985; Gottfried, 1984; Prentice, 2000). The combination of water, dirt, rocks, and creatures enticed children's exploratory play. One child explained, "Sometimes we scoop the water in it. But yesterday it rained and when we went outside and there was a lot of water. So we scooped them in to the bucket and put worms in it. But I didn't touch it because I don't like touching the worms. Then we dumped them out so we could see if they would die."

Environmental stimuli that arouses a sense of surprise, novelty, and complexity induces exploratory play behavior. These situations and objects prompt the individual to seek data to reduce the sense of confusion (Bradley, 1985). Consistent with Moore and Wong's (1997) results, children expressed a sense of surprise and curiosity toward the natural environment. One boy explained how the puddle in the stone-lined swale creates exploratory play opportunities that he enjoys:

I like playing in the rock area when there is water, and when I have boots on. We find worms and we put them in the water and that means that dig and die or live. If they let them be there for a long time, they would die. We just filled up water and then we brought all of them on the sidewalk ... to see if the worms are alive. If they wiggle a bit they are alive.

**2) Sand:** Considered as a favored material for outdoor preschool settings, sand affords a soft and safe surface, as well as a manipulative play material for children (Marcus, 1998; Moore & Wong, 1997; Striniste & Moore, 1989; Woolley & Lowe, 2012). Prescott (1987) regards sand as a complex element that affords manipulation and change. Olds (1987) recognizes the manipulative quality of sand that enables children to experience and discover qualities of basic materials. Sand can mix with liquids and be shaped, poured, molded, or moved with play toys (Marcus, 1998; Striniste & Moore, 1989; Moore & Wong, 1997).

Weinstein (1987) identifies materials such as sand or dirt as stimulating touch through their soft quality, which contributes to a less stressful and more comfortable environment. He further explains how manipulative elements such as sand can promote children's dramatic play. Consistent with these findings, the results indicate sand as one of the most popular elements with which children engaged during play. The findings also marked that more than half of children's interaction with sand were dramatic play. Because of its manipulative quality, children transferred sand with their hands or containers to create pretend play materials such as a "castle," "poison," or "soup." Children manipulated sand during while playing pretend: "We play 'forts' or 'mermaids.'" Children enjoyed the diverse opportunities sand offered for shaping and creating representative objects. One child explained, "What I like about it is because you get to do whatever you want." Further, sand's soft and manipulative quality inspired about a quarter of children's interaction with the element to be constructive play, including digging in the sand.

Researchers recognize the value of sand for its ability to provide a variety of play opportunities (Moore & Wong, 1997) and increase the complexity and diversity of play environments (Moore & Wong, 1997; Prescott, 1987). Many children indicated how sand promoted their imaginary play. One child explained, "I like playing in the sand box. Sometimes I make stuff with things, like build sand castles." Another child stated, "I like to dig holes and find golden rocks. I also like to build houses for the dashes. We make hop holes; we dig up and make mountains." From another child: "My friends and I collect sand and pretend it is pixy dust; some type of sprinkles that you think it is sprinkles that you use to make cake or cup cake." Other children noted that they pretend to make "fire," "poison," "volcanoes," "sand castles," "ships," or "food" with the sand. These findings indicate the value of manipulative, soft, accessible elements such as sand for inspiring children's imagination.

**3) Log:** Tree logs spread over the behavior setting in the natural zone. More than half of children's interaction with tree logs included dramatic play. Children collected tree logs to build imaginary houses or forts. In some cases, children moved and carried or balanced on the logs, demonstrating challenging functional play behavior. Children also used logs to define boundaries in their games or as a challenging surface to balance or jump.

**4) Sticks:** Cele (2006) explains how children can create special or secret places with manipulative elements such as sticks, promoting a sense of attachment. Moore and Wong (1997) explain the importance of natural loose elements, including sticks, for children to create pretend places and stories. The observational results confirm these statements. More than half of children's interactions with sticks included dramatic play. Children created special places within the natural zone by collecting sticks, leaves, and logs. They also collected sticks to create or spread pretend fire in the camping areas. Sticks proved among boys, as they employed them in their games as "guns" or "swords." As one child explained, "We chase each other with sticks and pretend they are swords." Children also used sticks to dig holes in the tree trunks or the soil, to find ants, or bugs. Children recognized the variety of affordances that sticks provided. "I like to pick up sticks and play with them.

I throw them and sometimes I scrape shells with them. We pretend fire with sticks,” one child offered. In general, sticks afforded various cognitive play opportunities for children. Children explained how they enjoy digging sand with sticks or breaking the branches and sticks they used in other games. They also expressed pleasure toward collecting sticks to build the stick-pile during their constructive play.

Loose elements inspire children’s dramatic play behavior (Moore & Cosco, 2010; Weinstein & Pinciotti, 1988). In this study, children explained that manufactured loose and natural loose elements, such as sand or tires, offered dramatic play opportunities. They gathered loose elements and incorporated them into their play. One girl explained how they imagine selling things with natural loose elements and logs, “Some people we say, ‘Who’s next?’ and someone comes up, and doesn’t have to come up, but sometimes comes up and says, ‘I like this.’ But we say, ‘Do you have something to trade with?’ They say, ‘no’ or ‘yes.’ If they do have sticks they can get one and if they don’t they cannot have one.” Indeed, loose elements such as sticks stimulated children’s imagination through their manipulative quality.

**5) Mulch:** Moore and Cosco (2010) describe mulch as a safe surface for use in outdoor preschool settings. However, designers neglect the value of this natural loose element for children’s cognitive play behavior opportunities. This study notes mulch’s potential in affording dramatic play. Compared to other elements, mulch provided a high amount of dramatic play opportunities because it could be gathered with other loose materials for use in such play.

Children repeatedly favored natural loose elements such as mulch for their games with rules affordance. For example, one of the children explained how they play “Mulch fight”: “You throw mulch at others and try not to get mulch on their eyes.” Children mentioned another example as “Catch the Mulch”: “It’s where you get a certain amount of mulch and see who has got the most.” The manipulative and transformable quality of mulch inspired children to employ it during games.

**6) Dirt:** Natural loose elements such as dirt develop children’s building and dramatic skills (Tai et al., 2006). Similar to sand, researchers recognize dirt for its soft, manipulative quality that promotes a sense of peace, safe surface, and concrete experience (Moore & Wong, 1997; Striniste & Moore, 1989; Weinstein, 1987). Prescott (1987) considers dirt a complex element that affords diverse play opportunities. The design guidelines Marcus (1998) proposes for children’s outdoor environment suggests providing opportunities for interacting with dirt to explore plants and fantasize. Likewise, the softness and manipulative quality of the dirt in this study enabled children to explore it for creatures. The natural ecosystem fascinated children and their sense of curiosity. In fact, about half of children’s interaction with dirt included exploratory play behavior. Another quarter of children’s interaction with dirt involved dramatic play opportunities, as they pretended dirt to be “poison,” “food,” or “powder.” A girl explained, “When we mix the dirt, we pretend to make food.”

**7) Leaves and flowers:** Small bushes, trees, and shrubs supply props and loose elements such as flowers or leaves. These play props promote the complexity of the site and encourage diverse play opportunities

(Moore & Wong, 1997; Weinstein, 1987). Previous studies indicate that leaves and flowers stimulate children's dramatic (Fjortoft & Sageie, 2000; Moore & Wong, 1997), explorative (Marcus, 1998), and constructive play (Tai et al., 2006). These natural loose elements can arouse children's senses and increase the aesthetic quality of the environment (Cele, 2006; Olds, 1987). The results show more than half of children's interaction with leaves and flowers associated with their dramatic play behavior. Children enjoyed collecting, mixing, and arranging leaves and flowers for dramatic play means. Some children employed leaves and flowers for constructive and exploratory purposes. They explored leaves to discover how other creatures existed on them. Flowers had one of the highest scores in affording constructive play, compared to other elements. In these instances, children just enjoyed picking up flowers without any dramatic play purpose.

In conclusion, these results highlight the value of natural loose elements for motivating children's cognitive play. The following section compares genders for their preference of settings and elements based on the multi-method results.

#### **7.4 Behaviors and Preferences by Gender**

Children's play preferences provide valuable information to create rich outdoor preschool settings (Winter, 1985). In addition to understanding children's preference for elements and behavior settings, this study explored how genders differed in these choices. Gender difference can associate with how children spend time in, experience, use, and interact with an environment (Cele, 2006; Kontos et al., 2002; Tonyan & Howes, 2003). This study employed a combination of quantitative and qualitative methods to understand how both genders play outdoors and their preference for elements and settings.

Consistent with Parnell and Ketterson's (1980) findings, both genders mentioned their preference for a diverse range of elements and settings. This result implies the necessity of providing a wide range of opportunities in the outdoor play environment. Moore and Wong (1997) associate this diversity with an increase in learning and development opportunities for children. Boys and girls both preferred mixed settings, which proved consistent with the observational findings. These mixed settings stimulated functional play for both genders. In addition, girls enjoyed the mixed settings for their constructive, dramatic, and games with rules opportunities. These settings mostly included manufactured fixed elements within a natural context. Cosco (2006) explains how mixed settings provide challenging, motivating, and variety of materials that children enjoy. Indeed, the mixed settings provided natural loose and manufactured loose elements that children combined in different cognitive play behaviors.

Previous studies note children's preference for complex and compound manufactured fixed elements (Frost & Strickland, 1985). The photo preference and drawings results implied girls preferred manufactured fixed elements. Based on the observational results, manufactured fixed elements mainly stimulated the dramatic play affordances girls preferred. Previous studies also report girls' preference for dramatic play and socializing with friends (Campbell & Frost, 1985; Gershner, 1985; Matthews, 1977; Spiller & Williams, 1985; Throne,

1993 Weinstein, 1987). Conversely, boys preferred manufactured loose elements that mainly offered functional and game with rules opportunities. For instance, boys used the tires as a challenging surface to balance and evaluate their abilities with peers. Previous research also suggests boys' preference for competitive and active play opportunities (Ozdemir & Yilmaz, 2008; Throne, 1993). These findings indicate that children's preferences for elements associated with their afforded play opportunities (Kytta, 2003).

The observational results showed that natural settings stimulated different cognitive play in boys and girls. These natural settings stimulated exploratory and dramatic play for girls. However, natural settings held the most potential in stimulating all cognitive play types for boys. The findings are consistent with those of previous studies (Fjortoft & Sageie, 2000; Johnson and Hurley, 2002; Moore & Wong, 1997), suggesting the complexity of the site and features within natural environments can create spatial and experimental qualities that develop a sense of wonder in children. This observation results agree with children's interview results, indicating their preference for natural settings. As in previous findings (Fjortoft & Sageie, 2000; Malone & Tranter, 2002), the natural settings provided natural loose elements that children favored during their drawings and interviews. These natural loose elements stimulated constructive, exploratory, and dramatic play for both genders. This finding verifies Nicholson's (1971) theory of loose parts that stresses the importance of manipulative and loose elements for children's diverse play chances. The findings emphasize the value of natural settings in affording these elements for children's cognitive play stimulation. Like Moore and Cosco (2007), the researcher discovered the diversity of opportunities within the natural settings stimulated children's need for exploring the environment.

Additionally, children's preference for natural loose elements associates with the exploring, experimenting, and shaping opportunities they offer (NLI, 2007). Adults referring their favorite childhood place typically outdoor environments wherein they played with natural loose elements (Cobb, 1977; Marcus, 1978; Louv, 2005). A survey of the three qualitative methods shows that both genders favored manufactured fixed and natural loose elements. In comparing the preference for category of behavior settings, the photo preference, drawings, and interview results all implied both genders favored mixed the behavior setting. Mixed behavior settings, in turn, provided the natural loose and manufactured fixed elements that children employed in play. These behavior settings stimulated children's curiosity, imagination, and excitement.

Unfortunately, few studies shed light on four-to-five-year-old children's cognitive play behavior preferences. The results of this study extend current knowledge by considering children's self-reports as a means to understand the preferred cognitive play. According to the results of the interviews and photo preference, both genders favored functional and dramatic play behaviors. This finding was consistent with the observational results. Children enjoyed being active and interacting with various elements. Functional play offered children exciting, challenging, and stimulating experiences with the outdoor environment. Children's preference for functional play may associate with the available play structures that afford this behavior (Pack &

Michael, 1995). Another reason may be that manufactured fixed elements require less effort for children, as they are more noticeable. Based on the data, children perceived mixed settings as offering the most functional play, where they enjoyed activities such as running, jumping, or balancing.

Throughout dramatic play, children attach meanings to objects, developing their abstract thinking (Johnson et al., 1999). Studies report how goal-oriented, complex dramatic behavior increases children's attention span (Berk, et al., 2006). Both genders enjoyed practicing gender-related roles, thus learning to cooperate, developing social skills, and stimulating their imaginative skills, (Chia, 1985; Tai et al., 2006). They also developed their creativity through transforming objects and actions (Weinstein, 1987). In conclusion, these findings imply the value of environments that stimulate and support children's dramatic play. Most of these environments offer a variety of loose elements that also stimulate dramatic play (Frost, 1985; Marcus, 1998; Moore & Wong, 1997; NLI, 2007). This research studies how genders differ in their preference for elements or behavior settings. It also explored teachers' opinion and behavior as a moderator variable that may change children's behavior. The next section discusses these results.

### **7.5 Teachers' Perceptions and Interactions toward Children's Outdoor Play**

The interactions between the child and context develop and shape patterns and relationships over time that associates with their development (Rimm-Kaufman & Pianta, 2000). Ecological theories explain that, apart from children's characteristics, teacher and child interactions affect children's development (Bronfenbrenner & Morris, 1998). Research believes family and school environments have a higher influence on children's development than their socioeconomic status or ethnicity (Bronfenbrenner, 1997). The results of this study contributes to a growing body of research suggesting the value of child-teacher interaction, teachers' knowledge and experience, and early learning centers' curriculum for children's play experience. This research evaluated teachers' opinion towards children's play and development during outdoor play through observation and interview data.

In this study, the teachers associated with the four-to-five-year-old children described themselves as highly educated and experienced with young children. According to previous studies, trained teachers are more responsive toward children's development and daily experiences within childcare settings (Kontos, et al., 2002). Supporting this finding, the teachers expressed and recognized the significance of outdoor environments for young children's educational experiences. Integrating the indoor curriculum with the outdoors, teachers believed in providing and stimulating educational and learning experiences through the outdoor learning environment. They explained how they combined the curriculum with outdoor play to increase children's learning. They also expressed how this opportunity mostly associated with the physical qualities and affordances of the preschool's outdoor environment.

Researchers believe that culturally, teachers train to be influential on children's development (Tonyan & Howes, 2003; Kontos, et al., 2002). Consistent with this viewpoint, some teachers insisted on providing an

interchangeable environment and interesting opportunities for children to stimulate their play. For instance, they explained how they incorporate field trips to encourage children's learning and dramatic play behaviors. The teachers tried offering satisfactory play props for children to develop their creativity and imagination. Occasionally, the teachers set up play themes to prompt group play. The results of this study support the value of child-teacher interaction and teachers' beliefs in children's development. The following sections explore how teachers' behavior during children's outdoor play associated with children's cognitive play behaviors. Further, the section explains teachers' insight toward different play zones

#### **7.5.1 Child-teacher interaction and cognitive play behaviors.**

Children's informal learning is the intrinsically evolved understanding of social interaction between peers that occurs without communicating with teachers (Dyment, 2005; Titman, 1994). Moreover, this interaction among children develops children's social and cognitive skills (Malone & Tranter, 2003). During the preschool period, the child-teacher relationship is a critical experience for children that predict their cognitive skills (Burchinal et al., 2002; Hamre & Pianta, 2000). Grounded in a child-centered philosophy, teachers may believe children's right to play freely and make their own choices has optimum play benefits (Bennett, Wood, & Rogers, 1997).

Considered as an important part of the preschool Microsystem, some studies examined the association between teachers' non-involvement and children's play behavior. For example, Tonyan and Howes (2003) suggest the teacher's presence in children's group play is associated with reduced levels of complex play with objects. However, the teacher's presence did not influence the behavior of children who were playing alone. Kontos and colleagues (2002) conducted a similar study, wherein children received high amount of teacher-free involvement. The findings signaled that no teacher involvement triggered children's complex play that involved interacting with peers and objects. Consistent with these findings, most of the observation data in this study indicates children's increased engagement in various cognitive play behaviors when teachers did not interfere with their play. The results express the significance of free play for children's play stimulation to develop their insight toward the environment.

During teachers' custodial behavior, most children did not engage in any cognitive play behaviors. Additionally, the findings indicate that teachers' custodial behavior toward children during outdoor play negatively associated with children's functional play. In a similar study by Campbell and Frost (1985), the findings imply that children's non-engagement in play associated with the teacher's involvement. During non-play engagement, children behaved passive or isolated, which resulted in their low participation behaviors.

Johnson and colleagues (1999) suggest that teachers' positive behavior toward children's play associates with children's social or cognitive development. Consistent with this interpretation, when teachers behaved neutral or positive towards children's play, about half of the children engaged in functional play. In addition, research by Gooncu and Weber (2000) explains that children tend to involve themselves with adults

more when they are concentrating on goal-oriented problem solving, than open-ended play (Goncu & Weber, 2000). Johnson and colleagues (1999) observed that teachers mostly directed children's constructive play. The results of this study also suggested that teachers' neutral or positive reaction during children's play increased the odds of children's constructive or games with rules play. For instance, when teachers engaged in neutral behavior, children were three times more likely to involve in constructive play. This positive association may result from teachers directing or supporting children during constructive play.

The observation data in this study suggested that teachers promoted children's games with rules through their own direct participation in the game. Supporting this finding, research considers an association between an adult's receptive engagement and children's development (Forman, 1993; Howes & Smith, 1995; Kontos, et al., 2002). A study conducted by Sylva et al. (1980) shows that children's play duration doubled when they played with teachers compared to when they played with peers. In fact, teachers can increase the level of play through receptive involvement during children's play behavior (Kontos & Wilcox-Herzog, 1997). Conversely, extreme play intervention can negatively affect children's play behavior (Johnson et al., 1999). Teachers require extra training to understand when to be responsive and when intrusive during children's play (File & Kontos, 1993). In conjunction with these findings, this study offers that teacher's positive behavior decreases the odds of children's participation in dramatic play. In general, the behavior mapping findings suggest different child-teacher interactions associates with different cognitive play behaviors. Teachers' non-involvement often inspired children's cognitive play. Nevertheless, the teachers' positive interactions increased children's cognitive play behavior. The following section explains the teachers' opinion about the play opportunities the outdoor learning environment offered for young children.

#### **7.5.2 Teachers' perception of the play opportunities of the outdoor environment.**

Children's experience in childcare centers associates with the quality of these learning environments and how it affect children's skills and development (Peisner-Feinberg et al., 2001). In this study, teachers explained how different attributes of the outdoor learning environment promote or hinder children's play. The teachers believed each zone supported a certain area of development necessary for children's health and well-being. They explained how the natural environment provided many learning opportunities for children. The teachers perceived the natural zone as unpredictable, exciting, and providing different experiences in each play session. They expressed how this environment enabled children to be independent, while providing them many personal nooks and child-scaled spaces.

Teachers believed the children to be more cooperative within the natural zone. They explained how the plentiful natural loose elements offered various exciting play opportunities for young children. Consistent with children's explanations, teachers expressed how children enjoyed creating imaginary objects with loose elements. They also believed that loose elements increased children's play duration. Also consistent with the observation results, teachers believed the mixed zone provided play by combining natural features. Confirming

the behavior mapping findings, teachers expressed the value of the mixed zone for children's natural learning opportunities and challenging activities. Teachers further sensed the manufactured zone was mono-functional compared to the other zones. They also expressed children's decreased interest level and lack of motivating play opportunities in this zone, and that the zone mostly offered functional play behavior. Similar to the observational findings, teachers mentioned the sand area in the manufactured zone as a place in which children engage in constructive play behavior.

Combining natural environments with trained teachers originates spaces that support children's development and learning (Wechsler et al 2001; Moore & Wong 1997; Zask, van Beurden, Barnett, Brooks, & Dietrich, 2001). In the natural outdoor learning environment, such as the Washington Environmental Yard, children with various learning styles gained knowledge through various hands-on learning opportunities. These experiences stimulate a sense of excitement and establish a base for future educational experiences (Moore & Marcus, 2008). Consistent with this perception, the trained teachers in this study believed the natural outdoor environment offered richer and more diverse learning experience compared to the manufactured zone. They expressed how the seasonal change, variety of creatures, and natural elements promote children's curiosity and sense of wonder. The teachers explained that the natural environment stimulated children's teamwork, imagination, social interaction, sense of responsibility, and competence. Consistent with the observational results, teachers believed natural features offered children personal territory and hiding possibilities.

In summary, this study aimed to recognize how teachers' behavior and opinions associates with children's cognitive play behavior. In addition, the study sought teachers' perspective of the outdoor environment and compared them with the observational data. Based on the teachers' interviews, the result of this study highlight the value of natural and mixed outdoor play environments for children's development. The teachers recognized these spaces to be engaging, interesting, and supportive for children's play. These environments provided various play opportunities for different interests and abilities. The teachers' opinions supported the observational data, which suggested the importance of natural elements and natural settings for children's cognitive play behaviors. The following chapter explains the conclusions of this multi-method study. The conclusions offer suggestions for future design of outdoor preschool environment. Additionally, the chapter explains the study's strengths and limitations.

## CHAPTER 8: CONCLUSION

Diverse outdoor environments provide children opportunities for exploration, wonder, and learning (Collard, 1971; Freuder, 2006; Moore & Wong, 1997). The results of this study suggest diverse outdoor play environments inspire different cognitive play behaviors for different children. Limited literature thoroughly explores zones, behavior settings, or elements that inspire children's cognitive play behaviors. This chapter describes the main conclusions of this study. It also explains how future policy makers and designers can employ these results in their design decisions. Further, the chapter explains the limitations and strengths of this study and directions for future research.

### 8.1 Main Conclusions of the Multi-Method Study

Employing multiple sources of information, this study aimed to explore various facets of the outdoor environment for children's cognitive play, leading to the following conclusions.

#### **8.1.1 The value of natural and mixed natural and manufactured outdoor environmental zones for cognitive play.**

Manufactured and mixed natural and manufactured outdoor environmental zones are associated with children's functional play more than any other cognitive play types. In contrast, natural environments support more constructive, exploratory, and dramatic play, compared to manufactured and mixed zones. Mixed zones are associated with games with rules and exploratory play. In general, the findings stress the importance of natural and mixed zones for stimulating young children's cognitive play behavior.

#### **8.1.2 The value of natural and mixed natural and manufactured behavior settings for cognitive play.**

Natural and mixed natural and manufactured settings appear to stimulate various cognitive play opportunities through their variety, complexity, and unpredictability. Such settings challenge children with different abilities to engage in different functional play behaviors. Findings show that natural settings offer many constructive, exploratory, and dramatic play opportunities through natural loose materials, such as sticks or fallen leaves. Mixed settings provide the complexity and challenge of manufactured fixed equipment combined with manufactured loose and natural loose elements. This combination stimulates functional, constructive, dramatic, and games with rules play. Results underscore the importance of wide, topographic, open spaces provided through natural and mixed settings for children's games with rules behavior. In addition, the results indicate the importance of environments that provide natural loose elements for stimulating games. Natural and mixed settings appear to support various cognitive play behavior opportunities.

#### **8.1.3 The value of natural loose and manufactured loose for cognitive play.**

Results suggest that children mainly prefer manufactured fixed and natural loose elements. Manufactured fixed elements appear to encourage mostly functional play. Further, children enjoy manufactured

fixed elements that offer hiding and climbing opportunities. Natural loose elements intrigue constructive, exploratory, and game with rules play. Natural fixed elements support the existence of small creatures such as worms or bugs that inspire many exploratory play behaviors. Manufactured loose elements appear to be supportive for functional, constructive, and game with rules behavior.

#### **8.1.4 Implications of teacher-child interactions during outdoor play**

Trained, educated teachers recognize the learning value of outdoor play environments and integrate their educational programs with various outdoor opportunities. These teachers understand the play value of natural environments for variable, challenging, exciting opportunities. Trained teachers recognize the value of manufactured and natural loose elements for children's play experience. Teacher's non-intervention during children's play may encourage higher levels of cognitive play. Further, teacher's encouragement and positive interaction with children during free play may increase children's chance of functional, constructive, and games with rules play. In conclusion, the teacher's behavior and opinion is valuable to children's experience within outdoor learning environments. The following section describes how these conclusions can aid future design and policy in increasing the probability of cognitive play.

### **8.2 Implication for Future Policy and Design**

Given the increasing use of childcare centers in the United States, young children's experiences in these spaces have become a major consideration for public policy (Peisner-Feinberg et al., 2001). Literature associates children's experience in childcare centers with their developmental behaviors (Cosco, 2006; NLI, 2007; Moore & Cosco, 2010). As policy makers aim for high-quality childcare, the current study intended to propose design guidelines that increase children's opportunities for cognitive play while creating an enjoyable outdoor learning environment for children. These design suggestions may assist in the renovation and building of existing outdoor preschool environments.

**1) Incorporating natural and mixed natural and manufactured environments in outdoor preschool environments:** Natural environments stimulate diverse cognitive play opportunities for children. In the urbanized setting, outdoor preschool environments can increase the opportunity for cognitive play by adding natural features to existing sites. This transaction provides many cognitive play opportunities through diverse and challenging settings and elements.

**2) Incorporating natural settings in children's outdoor play environments:** Natural environments have challenging, interactive, varied, and changing qualities. Natural settings include natural fixed elements such as trees that offer natural loose elements for inspiring enjoyable cognitive play. Natural settings support ecosystems and creatures that intrigue children's exploratory play.

**3) Including mixed natural and manufactured settings in children's outdoor play environments:** Mixed settings stimulate different cognitive play behaviors through the challenging quality of manufactured

fixed elements. These settings also inspire exploratory, dramatic, and game with rules play through natural loose, natural fixed, and manufactured loose elements

**4) Providing diverse manufactured loose and natural loose elements in children's outdoor play environments:** Manufactured loose elements stimulate functional, constructive, and games with rules play. Further, natural loose elements are valuable for constructive, exploratory, dramatic, and games with rules play. Outdoor play environments with diverse loose elements can encourage diverse cognitive play behaviors and enhance children's learning. The following sub-chapter explains the limitations of this study.

### 8.3 Study Strengths

This study assists in understanding how young children interact with the outdoor physical environment as follows:

**1) Extending research on outdoor preschool physical environments and children's cognitive play behaviors:** Through combining multiple methods, this study offers a perspective toward how specific zones, behavior settings, and elements inspire diverse cognitive play behaviors for children. Limited studies explored the design characteristics of outdoor preschool environments and children's development.

**2) Recognizing young children's right to express their concerns on an enjoyable outdoor play environment:** This study employed three qualitative methods to explore four-to-five-year-old children's perceptions and preferences of outdoor play opportunities. Supporting the UNCRC, this approach recognizes children's right to express their views (Clark, 2005). Limited research considered preschool-aged children's opinions about how they enjoy their outdoor preschool environment.

**3) Combining quantitative and qualitative findings to increase internal validity:** This study employed multiple sources of evidence to assess how the outdoor physical environment affords cognitive play opportunities for young children. Considering the cross-sectional quality of this study, the combination of multiple methods increased internal validity (Groat & Wong, 2002). The behavior mapping provided an objective insight about this affordance and how various zones, settings, and elements stimulated cognitive play. The qualitative methods contributed to understanding and interpreting children's behavior and preferences.

**4) Extending research on mixed and natural zones of outdoor preschool environments:** Controlling for children's variability, this study explored the value of natural and mixed zones for inspiring different cognitive play behaviors for young children. Few studies have compared natural, mixed, and manufactured zones that contain diverse behavior settings and elements in outdoor preschool environments.

**5) Considering behavior setting as a unit of analysis to increase external validity:** This study separated the three zones into associated behavior settings. Indeed, the behavior settings functioned as multiple sub-units of the outdoor environment, allowing comparisons of their cognitive play behavior affordances. Regarding the characteristics of the behavior settings, many of them prove comparable with global instances, such as the trees, hills, or pathway. This quality increased the external validity of the study.

**6) Extending research on the value of natural and mixed settings within outdoor preschool settings for children's cognitive development:** The results of this study accentuate the importance of natural and mixed settings for children's cognitive play encouragement. Regarding the complexity and variety of natural and mixed settings, few studies explored their cognitive play value for children.

**7) Understanding the cognitive play affordances of natural elements for preschool children to increase external validity:** By employing elements as a unit of analysis, this study explored the cognitive play affordances of natural elements. Considering the global similarities of natural elements, the results of this unique site may correspond to the cognitive play affordances of similar elements.

**8) Complementing research on the value of natural and manufactured loose elements for preschool aged children:** This study complements Nicholson's (1971) the theory of loose elements and emphasizes the cognitive play value of natural and manufactured loose elements for diverse play motivation.

**9) Extending methodological approaches for communicating with preschool children:** This study investigated how different visual and verbal tools can improve young children's way of communication. Further, the results suggest the value of visual tools for sharpening children's memory.

**10) Extending the methodological approaches for recording cognitive play behaviors:** This study extends Pack and Michael's (1995) research by employing a combination of observation and interview methods for deciding the cognitive play behavior codes.

**11) Extending research on the value of teachers' understanding and education and young children's cognitive play opportunities:** This study considers teachers' interaction and beliefs as a significant Microsystem that associates with children's cognitive play. It also recognizes the importance of teachers' positive interaction with children in supporting their play behaviors.

**12) Controlling for children's characteristics:** Most participants of this study were from high socio-economic and Caucasian backgrounds. This quality enabled controlling for ethnicity and socio-economic status. The researcher coded the behaviors of the same children on different days, and the same observed children participated in the qualitative evaluation. This combination intensifies the internal validity of the findings.

#### **8.4 Study Limitations**

Like any research study, this study had various drawbacks ranging from sampling and data collection methods to generalizing the findings. The following paragraphs address the limitations of this study.

**1) Lacking measurement of children's cognitive development:** Research suggests that children with cognitive delays are less likely to engage in complex cognitive play behaviors, such as dramatic or games with rules play (Farmer-Dougan & Kaszuba, 1999; Johnson & Ershler, 1985; Kelly-Vance, Ryalls, & Glover, 2002). This study recognizes how this fact may affect children's play behavior. However, time and budget limits prevented measuring children's cognitive level.

**2) Challenges of coding cognitive play behaviors:** Prior studies report the difficulties with coding and subjective interpretation of children's cognitive play behaviors (Bloom & Fischer, 1982; Cornett, 1998, Pack & Michael, 1995). Researchers remark about weaknesses of behavioral observation, such as inaccurate recordings, altering observation standards through time, and reduced reliability because of the complexity of ratings (Doll & Elliott, 1994). Based on the pilot study, these limitations also manifested themselves in this study. To increase the validity of the codes, Pack and Michael's (1995) approach served as the basis of this study, combining the observation and interview approach during coding for children's cognitive play behaviors. This approach made coding more accurate and not based on personal assumptions. Interruptions may affect a child's behavior, which is not acceptable in many observational studies. Throughout the observations, the researcher aimed for the minimum amount of interruption.

**3) Small sample size for quantitative findings:** The behavior mapping included 36 children, consisting of 15 girls, and 21 boys. This sample size is inadequate for statistical generalization purposes. Through combining qualitative methods, this study aimed to overcome this limitation.

**4) Young children are not always reliable respondents:** Considering the qualitative data, the four-to-five-year-olds did not always prove reliable in their explanations. Verbal communication with children sometimes presented problems. Children's explanations possessed some inadequacies for coding purposes. Consistent with previous studies (Wesson & Salmon, 2001), the variability in children's drawings became apparent as each child differed in drawing skills. In fact, girls communicated more through drawings. This difference affected children's desire to engage in a certain data collection method.

**5) Short memory spans of young children in qualitative methods:** Some children had shorter memory spans during qualitative data collection. This problem created difficulties for them to recall elements, behavior settings, or their play type. It became necessary to apply the photo preference and drawings to promote children's memory retrieval. Nevertheless, this approach required more time and concentration, which exhausted some children.

**6) Different proportion of genders in qualitative methods:** One other problem that arose during qualitative data collection associated with gender difference. In general, girls were more willing to participate and explain their thoughts and memories compared to boys. Hence, the qualitative data may not offer a robust insight toward the preferences of the genders.

**7) The cross-sectional quality of the study:** The study results focus on a snapshot of a group of children at a certain time. Causality is often unclear in this type of study. Further, this cross-sectional study excludes children's previous experiences within the outdoor environment that may associate with their current behavior. Thus, the results may change through different weather conditions.

**8) Assessment of a single preschool outdoor space:** This study compared three zones of a single outdoor environment. This situation weakens the how well the results can be generalized (Yin, 2009). Apart from these limitations, this study had many strong qualities that the following section addresses.

### 8.5 Suggestions for Future Studies

Recognizing the findings and limitations, future research suggestions include:

**1) Exploring children with different socio-economic characteristics:** This study mostly explored Caucasians with high socio-economic backgrounds. To fulfill the gap of knowledge, future research should explore how young children from different ages, ethnicities, cultures, family background, parent education, and economic level display or prefer various cognitive play behaviors.

**2) Comparing the cognitive play behavior between genders:** Within this study, gender proportions in observations and qualitative methods were not equal. Future studies may explore similar proportions of boys and girls behavior in different outdoor physical environments.

**3) Extend methodological approaches that increase the reliability of young children's responses:** This study employed visual and verbal tools to increase the reliability of children's responses. Future research is required to extend the effectiveness of combined interview and visual tools for different age groups.

**4) Employing longitudinal research to understand children's cognitive play behaviors in preschool outdoor environments:** The results of the current research are based on a cross-sectional design. Future longitudinal research can compare children's different preferences and interactions over longer time spans and seasonal variations. The longitudinal studies can explore if young children who interact in natural outdoor learning environments develop a sense of stewardship and love toward natural environments.

**5) Extending research on the cognitive play behaviors of different preschool outdoor environments:** Controlling for children's cognitive development levels, future studies may compare different outdoor learning environments with various physical environment attributes. These studies should address how different elements and behavior settings offer different cognitive play behavior opportunities for young children.

**6) Recoding for physical, social, and cognitive play behavior and the outdoor play affordances:** This study suggests future research to record for children's play duration, social interaction, and physical activity levels. This understanding proposes a more comprehensive understanding of children's environment and behavior interactions. In this approach, researchers recognize elements and behavior settings that have different play values and extend children's engagement with the environment.

**7) Extending on the importance of teachers' training and education for children's cognitive play chances:** This study involved educated, trained teachers who were concerned about the play value of the outdoor environment. Future studies should extend knowledge on how teachers from various ethnicities, educational levels, and experience hinder or develop children's cognitive play behaviors in outdoor

environments. Through this comparison, educational policies recognize the value of trained and experienced teachers for children's experience and development.

In conclusion, this study suggests the value of diverse natural and mixed settings for supporting children's cognitive play behaviors.

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**APPENDICES**

## **Appendix A: The Pilot Study**

Pilot studies are mini-versions of a full-scale study, pre-testing a particular research (Polit, Beck, & Hungler, 2001; Van Teijlingen & Hundley, 2001). Reporting the success or failure of a pilot study helps future studies employing the same instruments or methods (Mason & Zuercher, 1995). To justify and conduct proper adjustments to the methods, the researcher conducted some pilot studies. The pilot studies managed and evaluated small samples of data before the main data collection. The pilot studies revealed shortages in the design of proposed methods or addressed procedures. Understanding these weaknesses saved time and resources for the final data gathering. The following sections explain the pilot study procedures and results. In addition, the sections explain how the pilot results altered the methodological procedures and protocols.

### **A.1. The Pilot Study for the Behavior Mapping**

Observation is a significant approach for listening to children, especially younger or less expressive children (Clark & Statham, 2005). The behavior mapping data collection finds its foundation on the behavior settings and affordance theories (Cosco et al., 2010). The researcher conducted two pilot studies to understand and improve data content and collection procedure during behavior mapping. The pilot studies developed relevant questions and conceptual clarification of research design (Yin, 2009).

For the pilot study, the researcher intentionally selected two preschool settings. Purposive sampling selects individuals or cases that satisfactory information to answer the research questions (Patton, 1980; Sommer & Sommer, 2002). This selection associated with the complexity and variety of elements and behavior settings in both outdoor learning environments. The NLI team had designed both outdoor learning environments to strengthen children's contact with nature.

The first preschool, Bright Horizons Family Solutions at Harrison Park (BHFSHP), is in Cary, NC. The outdoor learning environment included natural and mixed zones with various natural, mixed, and manufactured behavior settings. The recess hours contained two sections for each age group of children. The manufactured zone included two jungle gyms, a wide area of sand around the gyms, and one spring bouncer, while at the left side was a bench and table under a shelter. The mixed zone incorporated plenty of climbing or fruit trees; bushes; a pergola; a wooden platform; movable boxes; a graded garden plot; a bicycle track around the grass; and a storage area for bicycles. Based on staff reports, 75% of the teachers had a bachelor's degrees in Early Childhood Education (ECE) or a related field. The teachers had at least two years of experience working with young children. Information on the center's demographics was unavailable.

The second site for the pilot study was the FEELC, described in the prior chapters. Based on staff report, the center had 200 children who ranged in age from 6 weeks to 5 years, belonging to the upper middle class socio-economic group, and above average cognitively. At the time of study, the teachers involved with 4-to-5-year-olds, were four females, ages ranging between 20-30 years. The teachers all had bachelors' degree,

three in ECE and one in art education. Three of the four teachers completed outdoor training sessions that supported children's play within nature.

The pilot study focused on four-to-five-year-old children. The researcher observed 42 children within the FEELC during behavior mapping. The study involved 28 boys and 14 girls, with a diverse ethnic representation of 31 Caucasian, 1 African American, and 10 Asian children. The researcher noted 38 children within the BHFSHP. The children consisted of 18 boys and 20 girls, with 29 Caucasian, 4 African American, and 5 Asian children.

#### **A.1.1 Procedure and protocols for behavior mapping pilot.**

The study systematically observed children during September 2011. The observation session occurred during morning outdoor playtime (center 1 session = 50 minutes, center 2= 60 minutes). Consequently, a least possible time or weather difference existed between the two sites. Behavior mapping sessions occurred during mild climate days (center 1= 62°F, center 2=65°F). The observation included a systematic circulation through behavior settings based on pre-defined zones.

For both preschool settings, the researcher completed one observation session, with 11 rounds in SAS, and nine rounds in Bright Horizons. Each observation consisted of a 30-second period. The researcher watched the children within the first 15 seconds and coded for their gender, cognitive play behaviors, and the elements they interacted during the next 15 seconds. The researcher positioned herself in predefined observational zones and coded play behaviors. When one round finished, the observer was in her first observational zone. During behavior mapping, the observer avoided communicating with the children. However, the observer sometimes needed to draw close to identify children's cognitive play behaviors. After finishing the behavior mapping, the researcher imported the observation data to the GIS. The GIS program simplified placing the data points with their assigned information.

The observer coded for children's location and associated information on a paper map. An audio recorder with a beep sound identified the observation period. Based on the research intent, the POS scale (Rubin, 2001) seemed the most suitable scale to identify children's cognitive play behaviors. During observation, the researcher recorded each element that stimulated cognitive play. Afterwards, based on Cosco's (2006) hierarchy, these elements organized into five groups: manufactured fixed, natural fixed, natural loose, toys, and wheel.

#### **A.1.2 Analysis and results of the behavior mapping pilot.**

After completing the behavior mapping, the study imported the data to the GIS program. The researcher created attribute tables for children's elements and cognitive play behaviors. The analysis accumulated the results of the two preschool settings to have a general scope of the cognitive play behavior affordances. The data evaluated elements as independent variables, children's cognitive play behaviors as dependent variables, and gender as a moderator variable

Overall, the behavior mapping presented 471 data points (SAS=234, and FEELC=237). Figures A.1. and A.2. show the distribution of the collected data points for each preschool site. Figure A.3. displays the cognitive play behavior affordance associating with each element. The results pointed out that boxes, pathways, strollers, trees, grass or dirt, and woodchips support functional play ( $p<0.01$ ,  $df=33$ ). Sand had the highest constructive play affordance ( $p<0.01$ ,  $df=33$ ). Additionally, adjustable pipes offered a high amount of constructive and exploratory play. Toys and fabrics mostly supported granted dramatic play. Tire tubes afforded games with rules more than other cognitive play behavior types.

The pathway provided the most opportunities for functional play. Grass or dirt had a high potential for offering dramatic and games with rules play. In addition, adjustable pipes provided the most exploratory play affordances. Grass or soil, pathway, and sand substantially offered more cognitive play behavior opportunities than other elements. The results suggested that functional play behavior was the most typical play behavior. However, children in both sites least engaged in exploratory play.

Figure A.4. compares each category of elements for their cognitive play behavior affordances. Fixed elements provided the least exploratory and constructive play. However, fixed elements offered the most functional cognitive play behavior. In addition, fixed elements were the most capable in affording non-play behaviors ( $p<0.0001$ ,  $df=5$ ). Natural fixed elements afforded the least constructive and games with rules cognitive play behavior. However, they significantly scored low in not affording any cognitive play behavior. Moreover, the results implied these elements were supportive in affording functional play behavior ( $p<0.01$ ,  $df=5$ ). On the other hand, natural loose elements significantly afforded constructive play behavior more than other elements. Natural loose elements provided constructive and functional play opportunities, more than other cognitive play behaviors ( $p<0.001$ ,  $df=5$ ).

Fixed elements significantly offered the most functional play ( $p<0.001$ ,  $df=4$ ). Natural loose elements substantially afforded constructive play ( $p<0.001$ ,  $df=4$ ). Natural loose and toys mainly afforded exploratory play behavior. Subsequently, toys, natural loose, and natural fixed elements chiefly afforded imaginative play behavior ( $p<0.001$ ,  $df=4$ ). By granting hard surfaces (exp. pathways) as fixed elements, manufactured fixed and natural loose elements afforded the most games with rules ( $p<0.001$ ,  $df=4$ ).

The study suggested that females engaged more in functional play behavior and least with exploratory and games with rules play ( $p<0.0001$ ,  $df=5$ ). Figure A.5. displays gender difference related to cognitive play behaviors. The findings suggest that boys were significantly more engaged in functional play behavior than girls. Comparing female and male children, the results suggested that girls were 8% more engaged in dramatic play than boys ( $z=2.77$ ,  $p<0.05$ ). However, boys engaged 7% more in games with rules play behavior compared to girls ( $z=2.42$ ,  $p<0.05$ ). Compared to girls, boys were 8% significantly more involved in non-cognitive play behavior ( $z=2.12$ ,  $p<0.05$ ). The results marked boys to be 13% more involved in cognitive play behaviors than girls ( $z=3.975$ ,  $p<0.0002$ ).

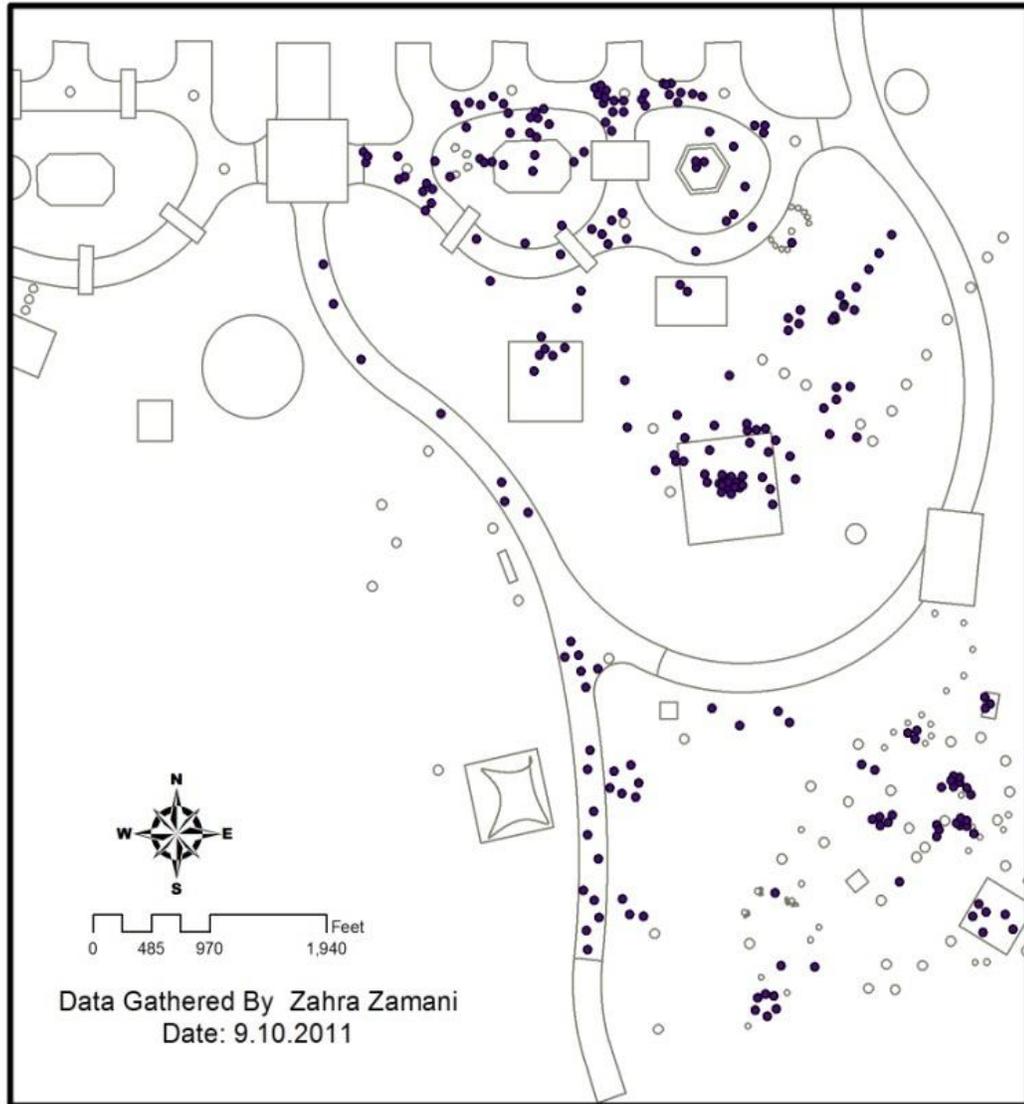


Figure A.1. FEELC's pilot study behavior mapping result.



Figure A.2. Bright Horizons at Harrison Park's behavior mapping results.

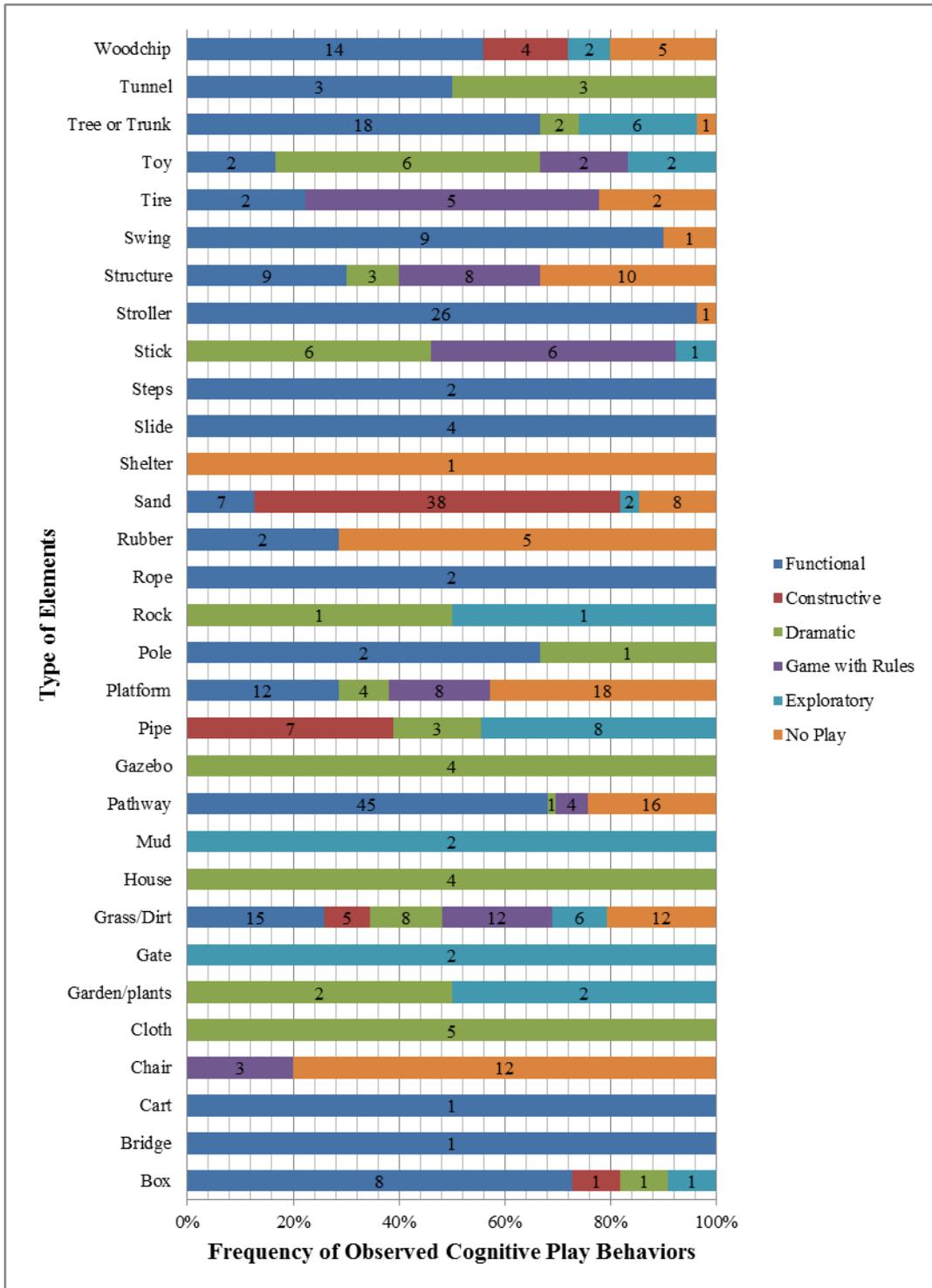


Figure A.3. Cognitive play behavior affordances of elements. (N=471)

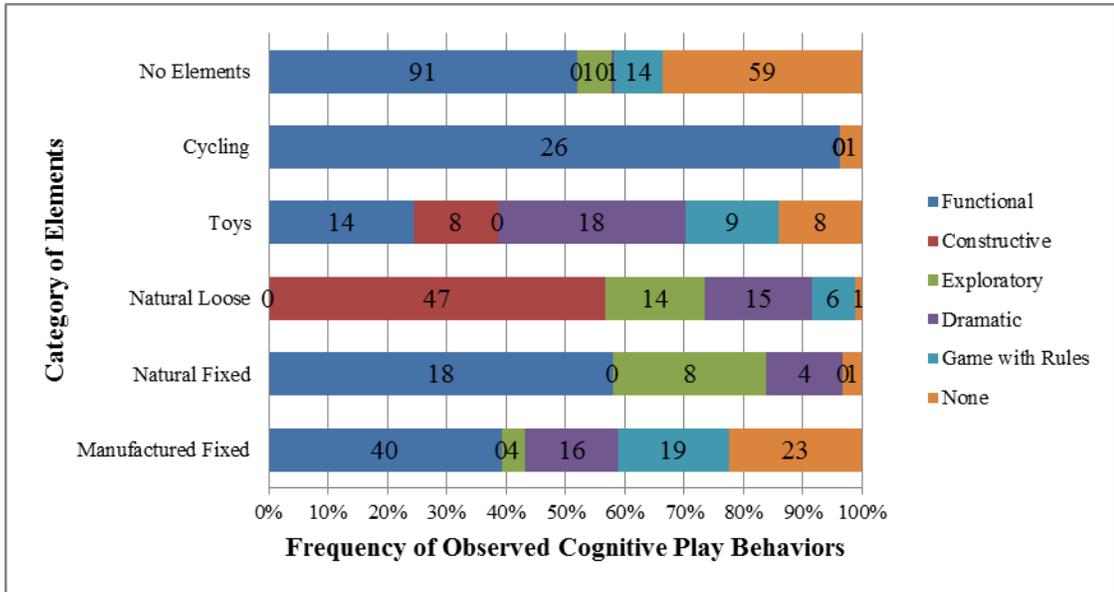


Figure A.4. Cognitive play behavior affordance provided by category of elements. (N=471)

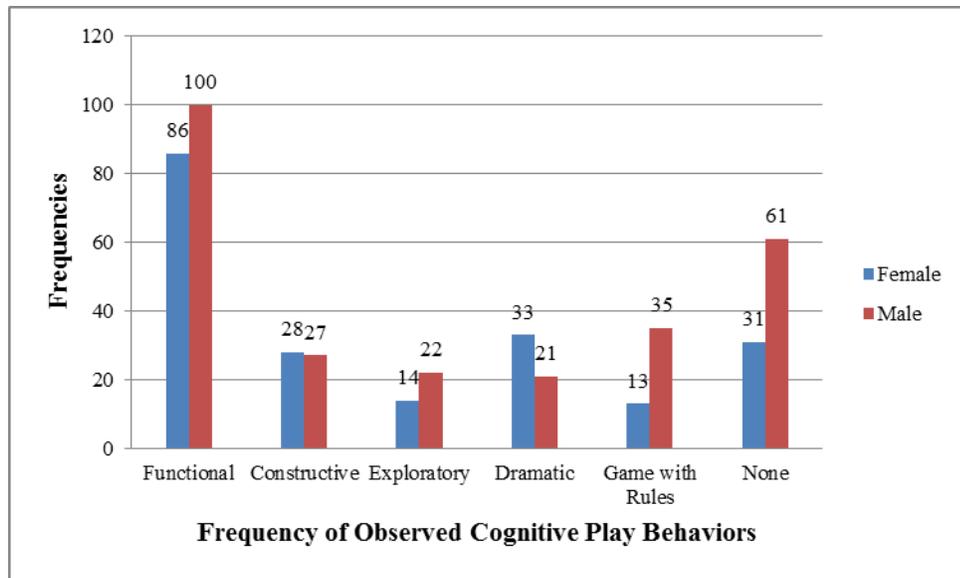


Figure A.5. Observed cognitive play behaviors of genders. (Females=205, and Males=266)

**A.1.3 The behavior mappings’ pilot study implications.**

The pilot results adjusted some data evaluation or behavioral observation procedures in the following paragraphs.

1) At first, the researcher did not consider coding exploratory play behavior in the pilot study, following Smilansky's coding. However, observing children's play hinted at the necessity for exploratory play. Subsequently, the researcher employed the POS tool (Rubin, 2001), which considers exploratory play as one of the cognitive play behaviors.

2) The researcher merged cycling and toys class into manufactured loose elements because of an inadequate number of data points.

3) During behavior mapping, the protocol for coding elements confused the researcher. For instance, when the child was not interacting with a specific element, the researcher decided to code this behavior as "no elements." Moreover, when a child interacted with multiple elements, the coding was intricate. Hence, the researcher decided to open-code the elements with which the children engaged. In this way, the results can evaluate how a group of elements may be supportive in affording certain cognitive play behaviors for young children.

4) During behavior mapping, the researcher struggled to distinguish between some categories, for instance between constructive and functional play. Rubin (2001) distinguishes between constructive and functional play through the child's goal during play. The researcher also confused constructive play with dramatic play even from cues.

To relieve this drawback, the researcher employed Pack and Michael's (1995) suggestion. Pack and Michael compared two observational protocols: one merely observational technique, the other combining observational technique combined with an interview with children. The observation-interview results proved effective in recognizing higher levels of cognitive play. For instance, findings suggested a higher degree of dramatic play based on the observation-interview technique. To increase the validity, when play behavior types were confusing, the researcher asked the child about the play.

## **A.2 The Pilot Study for the Photo Preference Method**

Studies explain that although quantitative methods, such as survey, or behavior mapping, are necessary for environment and behavior research, but not enough for evaluating children's experiences (Clark & Statham, 2005; Darbyshire et al., 2005; Einarsdottir, 2005). The study applied the photo preference technique as a visual tool for children to describe their experiences and preferred behavior settings. The pilot study aimed to understand if the photos were understandable for children and helped their communication.

The researcher took some photos of children playing in the FEELC outdoor learning environment. Afterwards, the researcher selected 26 photos that represented behavior settings and significant elements. A landscape architecture Ph.D. student colleague that had visited the site reviewed the appropriateness of these photos. The researcher printed and cut each photo into a 5 × 6 inch scale. The study evaluated the aptness of photographs for stimulating children's responses and restoring their memory. Additionally, the pilot study explored the interview lengths and children's understanding of the photos.

First, the researcher randomly selected five participating children. The pretest involved 26 photos. The researcher asked the children if they knew the locations of all the photos. The purpose was recognizing how well the children understood the photos. In this way, the researcher discovered how children named certain areas of the outdoor environment.

The researcher asked the child, “Can you select two of your favorite places in your outdoor space?” Children understood the question and explored the photos, returning two photos to the researcher. To evaluate children’s awareness of the photos, the researcher asked, “Do you know where is here?” Subsequent questions included, “Can you explain to me why you have chosen this place as your favorite outdoor play area?” Children named the place of the photo and explained their preferences. For instance, one child said, “I like digging in the sandbox. I like playing and running in the woods, and splashing the puddles.” Exploring the photos, one child asked about the basketball net, not included in the pictures. In addition, the result suggested children’s preference of choosing behavior settings, compared to elements. Table A.1. explains examples of interview codes for the interviews based on elements, behavior settings, and cognitive play behaviors.

Table A.1. Examples of coding for children’s photo preference responses.

<b>Element</b>	<b>Behavior Settings</b>	<b>Cognitive Play Behaviors</b>
Sand	Sand	Constructive
Tree	Trees	Functional
Water	Tree	Functional

### **A.2.1 The photo preferences’ pilot study implications.**

The pilot study results signaled the possibility of evaluating children’s responses to grasp how behavior settings or elements provided cognitive play behaviors. The pilot study suggested children’s interest in pictures with broader perspective angles hinting at the place of the settings. Hence, the picture quantity reduced to 22 and removed focused angled pictures. The pilot study implied the need for the interview following the photo selection to glean children’s opinions. For instance, a child picked a photo for the pathway behavior setting, while the researcher recognized it for the ‘music wall’ behavior setting. Based on the pilot study, the researcher added the basketball picture that one child mentioned. The study ascertained children’s interest in choosing more than two photos of the outdoor environment. This resulted in a decision to increase the number of selected photos for the main data collection.

### **A.3 The Pilot Study for the Drawing Method**

Through drawings, children can document information about their opinions, feelings, and knowledge of the environment (Clark & Statham, 2005). Drawings are child-friendly methods reliant on children’s

participation, needs, and skills (Cele, 2006; Clark & Statham, 2005; Powell et al. 2002; Punch, 2002). Children consider drawing as a natural representation of self-expression (Hawkins, 2002; Malchiodi, 2012). Applying methods based on children's interest and talents helps them to feel more engaged and comfortable with the adult researcher (Mahon et al. 1996). Conducting drawings focuses on the intent to help children to communicate and hear their opinions. The pilot study aimed to explore if children realized the questions and can depict preferred behavior settings and elements. The pilot study explored the efficiency of conducting drawings after photo preference. The researcher also sought the possibility of drawing analysis.

The pilot study for the drawing involved two phases. For the first pilot study, 20 children took part in picturing their favorite play areas. After the child sat, the researcher explained the interest to know children's outdoor play and favorite places in their outdoor learning environment. Then the researcher asked, "Can you draw me your favorite places you play within the outdoor environment?"

Sometimes children drew alone or with peers because of time and place limits. Most drawings were perspectives of one particular space that a child liked. Occasionally, children drew objects or individuals not related to the outdoor play environment, such as their mothers or flowerbeds. It seemed the children had difficulty recalling their outdoor environment behavior settings. After the child had finished the drawing, the researcher asked about what his or her drawing represented. Afterwards the researcher documented children's explanations of their drawings. A child explained of his drawing, "I like running, climbing the structure, and playing on the swings." Another child stated, "I like to run with my friends in the sidewalks. I also like climbing the structure and playing in the sand box."

The results of this pilot study pointed out the appropriateness of the drawing method for this age group. Children explained their drawings and referred how and where they played during outdoor play. In this pilot study, the researcher did not employ a digital audio recorder. Considering young children's impatience, this made writing children's drawing descriptions time-consuming.

The second pilot study involved 10 children who engaged in the photo preference. After children had completed their explanation about the photo preference, the researcher asked, "Can you draw me your favorite places you play within the outdoor environment? You can recall them by looking at the photos on the table." Some children used the photos to recall spaces. Based on the photo interviews, other children were already alert to their favorite areas. The researcher also explored the aptitude of coding drawing-interview responses for cognitive play behavior affordances. Table A.2. displays an example of this analysis:

Table A.2. Coding example for the drawing- interview pilot study.

Independent Variables	Cognitive Play Behaviors				
	Functional	Constructive	Exploratory	Dramatic	Games with rules
Elements	Rope, grass, swing, tire, scooter			Green tube, climbing structure, shelves, tire	
Behavior settings	Rope, hill, swing, tire, pathway			Green tube, sand, gazebo, tire	

### A.3.1 The drawings' pilot study implications.

Based on children's drawings and explanation in the pilot study, children understood the research question. The drawings showed children's ability to express small details and the play opportunities afforded in the outdoor learning environment. Given that several children were not skilled enough to draw their opinions, interviews seemed necessary for obtaining their viewpoint. The strengths of this procedure was that it provided an insight into which features of the outdoor learning environment children mostly prefer, where they play and what play they enjoy doing. Based on the pilot study the researcher decided to conduct the drawing data collection immediately after the photo preference, with the photos within reach of children to remind them of the outdoor play environment. This allowed some children to recall behavior settings or elements they enjoyed the most. Additionally, the researcher decided to write and record children's clarification of drawings.

### A.4 Conclusions from Pilot Studies.

This chapter reviewed the procedures, results, and implications of pilot studies conducted before the main data collection. The pilot studies identified potential drawbacks in following the data collection procedures. The researcher changed the steps of data collection and assessed whether each question was meaningful for children.

Based on the behavior mapping pilot study, the researcher combined toys and cycling codes into manufactured loose elements. The researcher decided to code for no elements when the child was not using any element during play. To increase understanding toward affordances, the pilot study called for open coding of all the elements with which a child interacted. Following Pack and Michael's (1995) approach, the researcher adapted the behavior mapping protocol, employing occasional short interviews during observation.

The photo preference pilot expressed the importance of combined interviews to understand children's viewpoints. In addition, the drawing pilot study suggested the importance of photo preference as stimuli before the drawings. Through this procedure, children's drawings more related to the question topic. Moreover, the photos performed as visual tools for sharpening children's memories.

## Appendix B: IRB Forms/Approval Letter

North Carolina State University is a land-grant university and a constituent institution of the University of North Carolina

Office of Research and Innovation  
Division of Research Administration

**NC STATE UNIVERSITY**

Campus Box 7514  
Raleigh, North Carolina 27695-7514

919.515.2444 (phone)  
919.515.7721 (fax)

From: Deb Paxton, IRB Administrator  
North Carolina State University  
Institutional Review Board

Date: December 14, 2012

Title: Cognitive Play Behavior Affordances of Outdoor Preschool Environments: Exploring the Affordances of Behavior Settings and Elements

IRB#: 2965

Dear Zahra Zamani

The project listed above has been reviewed by the NC State Institutional Review Board for the Use of Human Subjects in Research, and is approved for one year. **This protocol will expire on December 13, 2013 and will need continuing review before that date.**

NOTE:

1. You must use the attached consent forms which have the approval and expiration dates of your study.
2. This board complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU the Assurance Number is: FWA00003429.
3. Any changes to the protocol and supporting documents must be submitted and approved by the IRB prior to implementation.
4. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days by completing and submitting the unanticipated problem form on the IRB website.
5. Your approval for this study lasts for one year from the review date. If your study extends beyond that time, including data analysis, you must obtain continuing review from the IRB.

Sincerely,

Deb Paxton  
NC State IRB

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university and a constituent institution of the  
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Office of Research and Innovation  
Division of Research Administration

**NC STATE UNIVERSITY**

Campus Box 7514  
Raleigh, North Carolina 27695-7514

919.515.2444 (phone)  
919.515.7721 (fax)

From: Deb Paxton, IRB Administrator  
North Carolina State University  
Institutional Review Board

Date: March 15, 2013

Title: Cognitive Play Behavior Affordances of Outdoor Preschool Environments:  
Exploring the Affordances of Behavior Settings and Elements

IRB#: 2965

Dear Zahra,

Your addendum to the study named above has been reviewed by the IRB office, and has been approved. PI wants to use unobtrusive observable data by coding behaviors of children that did not return consent forms as they interact with play environments. This data will be coded without identifiers linked to children without consent forms. This approval does not change the original IRB approval expiration of the project.

If you have any questions please do not hesitate to contact the IRB office at 919.515.4514.

Sincerely,



Deb Paxton  
NC State IRB

North Carolina State University  
 Institutional Review Board for the Use of Human Subjects in Research  
 SUBMISSION FOR NEW STUDIES

**GENERAL INFORMATION**

1. <b>Date Submitted:</b> <u>11.30.2012</u>
1a. <b>Revised Date:</b> _____
2. <b>Title of Project:</b> <u>Cognitive Play Behavior Affordances of Outdoor Preschool Environments: Exploring the affordances of behavior settings and elements</u>
3. <b>Principal Investigator:</b> <u>Zahra Zamani</u>
4. <b>Department:</b> <u>College of Design</u>
5. <b>Campus Box Number:</b> <u>7710</u>
6. <b>Email:</b> <u>zzamani@ncsu.edu</u>
7. <b>Phone Number:</b> <u>919-633-3877</u>
8. <b>Fax Number:</b> _____
9. <b>Faculty Sponsor Name and Email Address if Student Submission:</b> <u>Robin Moore robin_moore@ncsu.edu</u>
10. <b>Source of Funding? (required information):</b> <u>none</u>
11. <b>Is this research receiving federal funding?:</b> <u>No</u>
12. <b>If Externally funded, include sponsor name and university account number:</b> <u>none</u>
13. <b>RANK:</b> <input type="checkbox"/> Faculty <input checked="" type="checkbox"/> Student: <input type="checkbox"/> Undergraduate; <input type="checkbox"/> Masters; or <input checked="" type="checkbox"/> PhD <input type="checkbox"/> Other (specify): _____

*As the principal investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Subjects in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of an amendment for its approval prior to implementation.*

**Principal Investigator:**

Zahra Zamani \_\_\_\_\_ \* \_\_\_\_\_  
 (typed/printed name) (signature) (date)

*As the faculty sponsor, my signature testifies that I have reviewed this application thoroughly and will oversee the research in its entirety. I hereby acknowledge my role as the **principal investigator of record**.*

**Faculty Sponsor:**

Robin Moore \_\_\_\_\_ \* \_\_\_\_\_  
 (typed/printed name) (signature) (date)

**\*Electronic submissions to the IRB are considered signed via an electronic signature. For student submissions this means that the faculty sponsor has reviewed the proposal prior to it being submitted and is copied on the submission.**

Please complete this application and email as an attachment to: [debra\\_paxton@ncsu.edu](mailto:debra_paxton@ncsu.edu) or send by mail to: Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III). **Please include consent forms and other study documents with your application and submit as one document.**

*For SPARCS office use only*

**Reviewer Decision** (Expedited or Exempt Review)

Exempt  Approved  Approved pending modifications  Table

Expedited Review Category:  1  2  3  4  5  6  7  8a  8b  8c  9

\_\_\_\_\_  
 Reviewer Name Signature Date

North Carolina State University  
 Institutional Review Board for the Use of Human Subjects in Research  
 GUIDELINES FOR A PROPOSAL NARRATIVE

In your narrative, address each of the topics outlined below. Every application for IRB review must contain a proposal narrative, and failure to follow these directions will result in delays in reviewing/processing the protocol.

**A. INTRODUCTION**

1. Briefly describe in lay language the purpose of the proposed research and why it is important.

The purpose of this multi method research is to complement existing evidence based research on preschool outdoor learning environments. Complementing existing evidence-based research, this study will focus on how the physical environment attributes of preschool outdoor settings composed of natural, mixed and manufactured zones stimulates children's cognitive play behavior. The empirical data of this multi method study can complement environmental – behavior research, in terms of the relationship between outdoor physical environment attributes and children's cognitive play behavior in outdoor preschool settings. This study would be of interest to landscape and industrial designers focused on outdoor learning environments settings. It can also be significant for policy makers for educational environments and researches focusing on children's development and play.

2. If student research, indicate whether for a course, thesis, dissertation, or independent research.

This study is a dissertation research

**B. SUBJECT POPULATION**

1. How many subjects will be involved in the research?  
 Estimates or ranges are acceptable. Please be aware that if you recruit over 10% more participants than originally requested, you will need to submit a request to modify your recruitment numbers.

The 4-5 year-old children will be around 45, and teachers and administrative around 6 people.

2. Describe how subjects will be recruited. Please provide the IRB with any recruitment materials that will be used.

After explaining the research purpose to the teachers, all parents of 4-5-year-old children in the First Environment Preschool (Case study) will be informed of the research procedure and purpose. The parents will be asked to sign the consent forms. Subsequently, the parents and children that are willing to participate will be considered as subjects. The teachers and administrative will be asked to participate in the research through an open ended interview conversation.

3. List specific eligibility requirements for subjects (or describe screening procedures), including those criteria that would exclude otherwise acceptable subjects.

Children subjects will be selected in the age range of 4-5 year olds. Since the study adopts a convenient and snowball sampling strategy, there will be no exclusive procedures for the selection of children. There is no criteria for teacher selection.

4. Explain any sampling procedure that might exclude specific populations.

There will be no exclusionary procedures.

5. Disclose any relationship between researcher and subjects - such as, teacher/student; employer/employee.

No relationship

6. Check any vulnerable populations included in study:

- minors (under age 18) - if so, have you included a line on the consent form for the parent/guardian signature
- fetuses
- pregnant women
- persons with mental, psychiatric or emotional disabilities
- persons with physical disabilities
- economically or educationally disadvantaged
- prisoners
- elderly
- students from a class taught by principal investigator
- other vulnerable population.

7. If any of the above are used, state the necessity for doing so. Please indicate the approximate age range of the minors to be involved.

The purpose of this study is to investigate how outdoor preschool environments afford cognitive play behaviors for 4-5 year old children.

### C. PROCEDURES TO BE FOLLOWED

1. In lay language, describe completely all procedures to be followed during the course of the experimentation. Provide sufficient detail so that the Committee is able to assess potential risks to human subjects. In order for the IRB to completely understand the experience of the subjects in your project, please provide a detailed outline of everything subjects will experience as a result of participating in your project. Please be specific and include information on all aspects of the research, through subject recruitment and ending when the subject's role in the project is complete. All descriptions should include the informed consent process, interactions between the subjects and the researcher, and any tasks, tests, etc. that involve subjects. If the project involves more than one group of subjects (e.g. teachers and students, employees and supervisors), please make sure to provide descriptions for each subject group.

#### **Method 1: Behavior mapping**

Prior to the actual behavior mapping, the researcher will observe the site to interpret children's play behaviors and how it is affected by different settings or teacher's behavior. Observations will be conducted through high use periods (recess hours) to collect the necessary data (Moore and Cosco, 2010). The researcher will visually scan a predefined space and code for the location and specific behaviors of the users on a clipboard. The coded behaviors will be imported to GIS, to assess environmental attributes (behavior setting size, pattern of use, loading of setting, etc.) (Cosco, 2006). The boundaries will be defined by children's accessibility to those locations and through clusters of actual behavior before the actual behavior mapping data gathering (Moore and Cosco, 2010). To increase the validity of the study the temperature condition during observation will be recorded. The schedule for collecting data is displayed at table 3 based on the current program of First Environments. Each recess is a one hour session. Within each of two recess sessions, each class will be cycling within two zones after 30 minutes. To collect adequate data from each class the observation for each class will be a 15 minute interval. Tuesdays and Fridays will be the main days of data collection. Wednesdays will be an alternative for Tuesday data collection if observation is not conducted for any reason (programs, weather, etc.). The reason for selecting Fridays is that it is the only day children use the natural zone of the outdoor learning

environment. The data will be collected in overall 6 weeks, while observation will be conducted in two days in each week. Additionally, to increase the internal validity of the results in relation to socio-economic, and ethnicity information, and correlating the observation results to the interview, each child will be assigned an ID number. The ID will be attached to the child during observation.

Materials utilized for behavior mapping are: 1- Paper based map, 2- clip boards to hold the paper, 3- Red pens to record observation, 4- Paper with the categorized codes, 5- Card with child's ID for coding 5- Digital camera. Photographs or video clips will be generated to have a deeper understanding of children's behavior in case of time limitation or doubt in a special behavior. When coding for children's behavior only one behavior can be coded for each child within a 15 second interval. However, if more than one behavior is observed during the 10 second interval, the one that has occupied the most of time will be coded. Fifteen second duration for transcribing the observed behavior on the map and coding sheet will be allocated. The observer will have a recorded beep sound in ear to measure the intervals precisely. Additionally, based on the play behavior scale if behaviors occur with the same duration, the 'codes up' technique is applied. This indicates that games-with rules precedes dramatic play, and dramatic is prior to construction. Additionally, constructive play precedes exploratory play, and exploration is prior to coding functional play behavior (Rubin, 2001).

#### **6-4-2-Method 2 and 3: Open ended interviews and drawing**

Provided by permission, the 40 children with pre-assigned ID numbers from both classrooms will be asked to draw and explain the type of play they are usually engaged in. The application of drawing method can contribute the children to retrieve information and focus on their memories. Additionally, based on the pilot study experience, most children were capable of conveying their interpretations through a combination of drawing and interview. Since the preschool has two 4 – 5 year old classrooms, accompanied by parental permission, all the students eager to participate in the research will be accounted to take part in the drawing and interview (about 2 × 20). To allow the interview to be taken place subsequent to the drawing at least 10 children will participate at one time. Children would be asked to draw their favorite place for playing in the outdoor learning environment within the class environment. Materials for this method will be plenty of drawing paper and colored pencils for children to draw. The children will be asked the following questions:

“Can you draw me what you usually play in the school's playground?”

“Can you draw me your school's playground?”

After the drawings have been done, each child will be asked to explain his or her drawing while notes will be written with pencil on their drawing. This can contribute to the precision of the coding procedure.

While the child has retrieved information during drawing, s/he will be interviewed for about 10 minutes in relation to the drawing. The children will be asked the following questions: “Can you explain your drawing to me? What do you usually play in your playground? What is your favorite place to play? What do you like playing most?”. The materials for the interview would be voice recorder device and papers to write notes (Creswell, 2009). Children's answers will be recorded in company with the attributed ID. The length of the interview will be based on how much the respondent wants to talk. The interview from children will be conducted twice from after one week to calculate the reliability of children's answers.

2. How much time will be required of each subject?

For interview and drawing section from children about 20 minutes is required. In terms of teachers, the open ended

interview will be around 30 minutes.

#### D. POTENTIAL RISKS

1. State the potential risks (psychological, social, physical, financial, legal or other) connected with the proposed procedures and explain the steps taken to minimize these risks.

No potential risks are foreseen. Children will perform daily play activities as they are accustomed to in the outdoor preschool environment.

2. Will there be a request for information that subjects might consider to be personal or sensitive (e.g. private behavior, economic status, sexual issues, religious beliefs, or other matters that if made public might impair their self-esteem or reputation or could reasonably place the subjects at risk of criminal or civil liability)?

Socio-economic status, cognitive development level of children, and ethnicity of children

- a. If yes, please describe and explain the steps taken to minimize these risks.

The private information will be recruited after parent permission. Afterwards, the information of each child will be recorded based on the associated ID. The purpose for collecting these information is to have more control and validity of the result.

3. Could any of the study procedures produce stress or anxiety, or be considered offensive, threatening, or degrading? If yes, please describe why they are important and what arrangements have been made for handling an emotional reaction from the subject.

No. children will be invited to play outdoors as they normally do.

4. How will data be recorded and stored?

A subject list will be created with contact information for the practical purposes of carrying out the field work. To preserve confidentiality, only ID numbers (initials/date of birth) will be used during the data collection and analysis phases. Information will be kept confidential in a password-protected computer. At the conclusion of the study, the sample list and original field records will be shredded.

- a. How will identifiers be used in study notes and other materials?

Only ID numbers (initials/date of birth) will be used during the data collection and analysis phases.

- b. How will reports will be written, in aggregate terms, or will individual responses be described?

All data will be aggregated (children's age, gender and behavior observations). Individual data will not be displayed.

5. If audio or video recordings are collected, will you retain or destroy the recordings? How will recordings be stored during the project and after, as per your destruction/retention plans?

At the conclusion of the study, the sample list and original field records will be shredded.

6. Is there any deception of the human subjects involved in this study? If yes, please describe why it is necessary and describe the debriefing procedures that have been arranged.

No

#### E. POTENTIAL BENEFITS

*This does not include any form of compensation for participation.*

1. What, if any, direct benefit is to be gained by the subject? If no direct benefit is expected, but indirect benefit may be expected (knowledge may be gained that could help others), please explain.

There is the likelihood that parents will benefit indirectly from the information imparted about the importance of children's daily contact with nature to promote their cognitive play behaviors  
The results of the study can be an advertisement for First Environments preschool in terms of the many cognitive play behavior opportunities provided through natural environments.

#### F. COMPENSATION

*Please keep in mind that the logistics of providing compensation to your subjects (e.g., if your business office requires names of subjects who received compensation) may compromise anonymity or complicate confidentiality protections. If, while arranging for subject compensation, you must make changes to the anonymity or confidentiality provisions for your research, you must contact the IRB office prior to implementing those changes.*

1. Describe compensation

Participants will not receive compensation for their involvement in the study. Water and a light snack will be provided.

2. Explain compensation provisions if the subject withdraws prior to completion of the study.

If the child withdraws during the drawing and interview, they will be asked to draw in another time

3. If class credit will be given, list the amount and alternative ways to earn the same amount of credit.

This research is associated with Zahra Zamani's Thesis

#### G. COLLABORATORS

1. If you anticipate that additional investigators (other than those named on **Cover Page**) may be involved in this research, list them here indicating their institution, department and phone number.

2. Will anyone besides the PI or the research team have access to the data (including completed surveys) from the moment they are collected until they are destroyed.

No

#### H. CONFLICT OF INTEREST

1. Do you have a significant financial interest or other conflict of interest in the sponsor of this project? No
2. Does your current conflicts of interest management plan include this relationship and is it being properly followed? No

#### I. ADDITIONAL INFORMATION

1. If a questionnaire, survey or interview instrument is to be used, attach a copy to this proposal.
2. Attach a copy of the informed consent form to this proposal.
3. Please provide any additional materials that may aid the IRB in making its decision.

#### J. HUMAN SUBJECT ETHICS TRAINING

\*Please consider taking the [Collaborative Institutional Training Initiative](#) (CITI), a free, comprehensive ethics training program for researchers conducting research with human subjects. Just click on the underlined link.

**North Carolina State University  
INFORMED CONSENT FORM for RESEARCH  
This form is valid from 12/13/12 through 12/13/13**

Title of Study: Children's cognitive play behavior in outdoor preschool settings

Principal Investigator: Zahra Zamani

Faculty Sponsor (if applicable): Robin Moore

**What are some general things you should know about research studies?**

You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. The purpose of this study is to evaluate the preschool's outdoor play areas in terms of children's learning. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

**What is the purpose of this study?**

The purpose of this research is to examine the outdoor play areas and learning environments at your child's school. Through understanding the significance of natural elements and play opportunities for children, we can modify your child's outdoor play area to better integrate natural features. This study will be helpful for landscape and industrial designers as they create play areas and it can help policy makers when making decisions about your child's educational environment.

**What will happen if you take part in the study?**

If you choose to allow your child to participate in this study, then your child will be observed during recess, asked to draw a picture of the areas they like to play in the most, and they will be asked questions about their drawings.

While your child is being observed during recess we would like your permission to take pictures of them while at play. During the interview we will audio record your child's answers. We also ask that you provide permission for our research team to have access to information from the school about your child's socio-economic status, development level, and ethnicity.

**Risks**

There should be no risks associated with your child's participation in this research as your child will perform daily play activities as they are accustomed.

**Benefits**

There are no direct benefits to you or your child for allowing them to participate in this study. However, the information from this study will help policy makers and landscape designers make more informed choices regarding your child's play area.

**Confidentiality**

The information in the study records will be kept confidential to the full extent allowed by law. Data will be stored securely in password protected computer and in a locked filing cabinet in the researcher's office. No reference will be made in oral or written reports which could link your child to the study. Your child will NOT be asked to write their name on any study materials.

At the conclusion of the study, the sample list and original field records will be shredded. All pictures taken will be used data analysis only and will not be used in publication, unless the child's face is not shown.

**Compensation**

You or your child will not receive compensation for your involvement in the study.

**What if you have questions about this study?**

If you have questions at any time about the study or the procedures, you may contact the researchers as followed:  
Zahra Zamani, Research Assistant, NCSU, College of Design, 919-633-3877, zzamani@ncsu.edu

**What if you have questions about your rights as a research participant?**

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

**Consent To Participate**

"I have read and understand the above information. I have received a copy of this form. I agree that my child may participate in this study with the understanding that he/she may choose not to participate or to stop participating at any time without penalty or loss of benefits to which he/she is otherwise entitled. I also give permission for my child to be photographed and for those photographs to be used in data analysis. Any photographs where my child is not identifiable may be used for publications and presentations"

**Subject's signature** \_\_\_\_\_ **Date** \_\_\_\_\_

**Student's Name** \_\_\_\_\_

**Investigator's signature** \_\_\_\_\_ **Date** \_\_\_\_\_

**North Carolina State University**  
**INFORMED CONSENT FORM for RESEARCH**  
**This form is valid from 12/13/12 through 12/13/13**

Title of Study: Children's cognitive play behavior in outdoor preschool settings

Principal Investigator: Zahra Zamani

Faculty Sponsor (if applicable): Robin Moore

**What are some general things you should know about research studies?**

You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. The purpose of this study is to evaluate the preschool's outdoor play areas in terms of children's learning. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

**What is the purpose of this study?**

The purpose of this research is to examine the outdoor play areas and learning environments of children. Through understanding the significance of natural elements and play opportunities for children, children's outdoor play areas can be integrated with natural features. This study will be helpful for landscape and industrial designers as they create play areas and policy makers to formulate decisions about children's educational environments.

**What will happen if you take part in the study?**

If you choose to participate in this study, then you will be asked about your ideas in terms of children's outdoor play.

**Risks**

There should be no risks associated with your participation in this research.

**Benefits**

There are no direct benefits to you for participating in this study. However, the information from this study will help policy makers and landscape designers make more informed choices regarding children's play area.

**Confidentiality**

The information in the study records will be kept confidential to the full extent allowed by law. Data will be stored securely in password protected computer and in a locked filing cabinet in the researcher's office.

**Compensation**

You will not receive compensation for your involvement in the study.

**What if you have questions about this study?**

If you have questions at any time about the study or the procedures, you may contact the researchers as followed: Zahra Zamani, Research Assistant, NCSU, College of Design, 919-633-3877, zzamani@ncsu.edu

**What if you have questions about your rights as a research participant?**

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

**Consent To Participate**

"I have read and understand the above information. I have received a copy of this form. I agree to participate in this study."

Subject's signature \_\_\_\_\_

Date \_\_\_\_\_

Investigator's signature \_\_\_\_\_

Date \_\_\_\_\_

### Appendix C: Examples of Photos Employed in the Photo Preference



Figure C.1. Children playing in the tire over the hill setting in the mixed zone.



Figure C.2. Children playing on the swing behavior settings. The images shows how some children combined other movements on the swings.



Figure C.3. The playhouses within the tree settings over at the mixed zone inspired children's dramatic play.



Figure C.4. Children enjoyed climbing and looking over the surrounding space in the green tube within the natural zone.



Figure C.5. The gazebo at the mixed zone inspired children's dramatic play.



Figure C.6. The stone-lined swale included various stone surfaces that challenged children to balance or jump, inspiring their games.



Figure C.7. Children enjoyed collecting natural loose materials and incorporating them within their dramatic plays.



Figure C.8. Children playing at the sand-climber setting. Further, the image shows the trees and playhouses at the back of the mixed zone.

Appendix D: Gender Difference Distribution in Various Behavior Settings

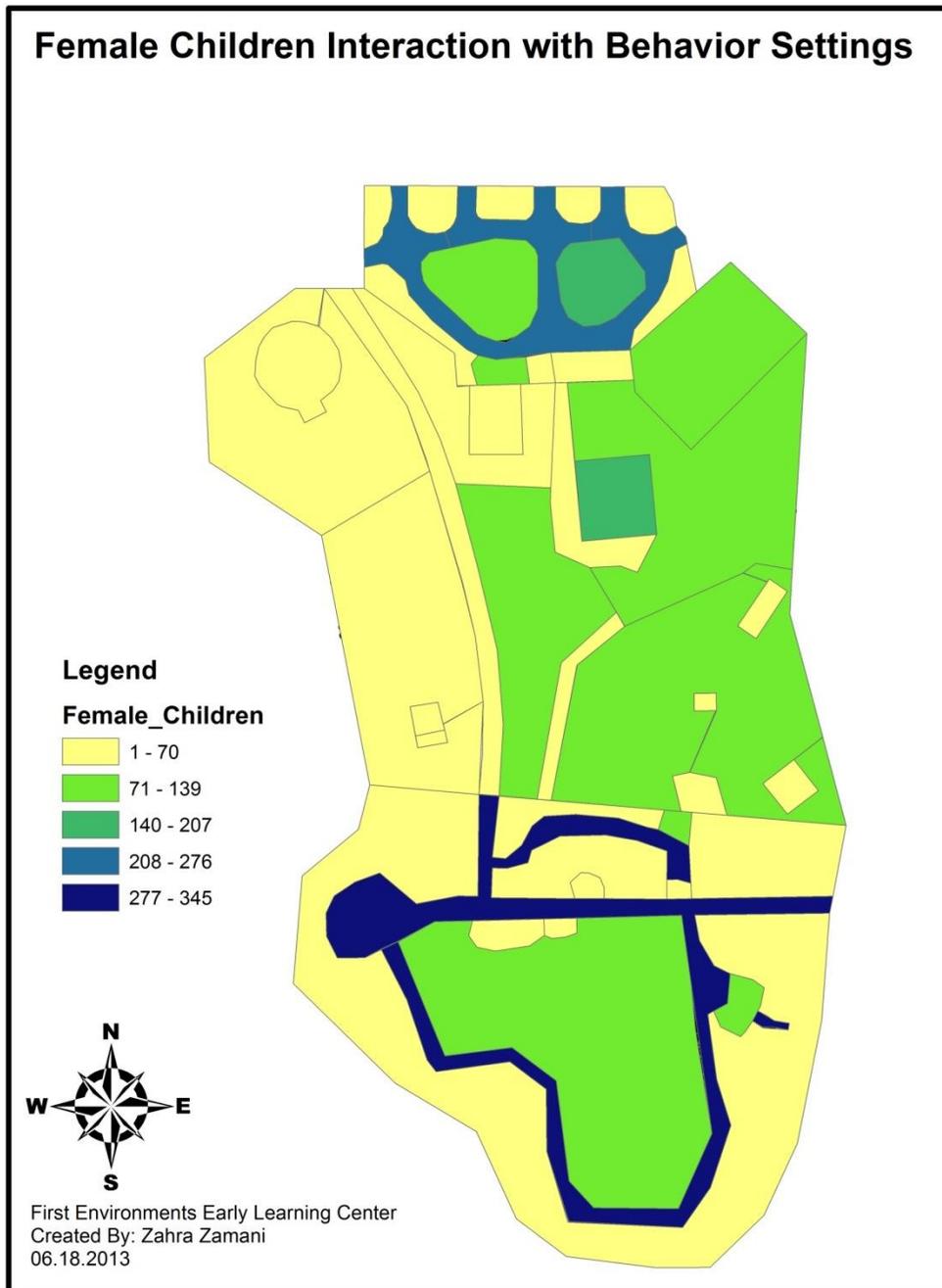


Figure D.1. Female children in various behavior settings based on quantile data classification.

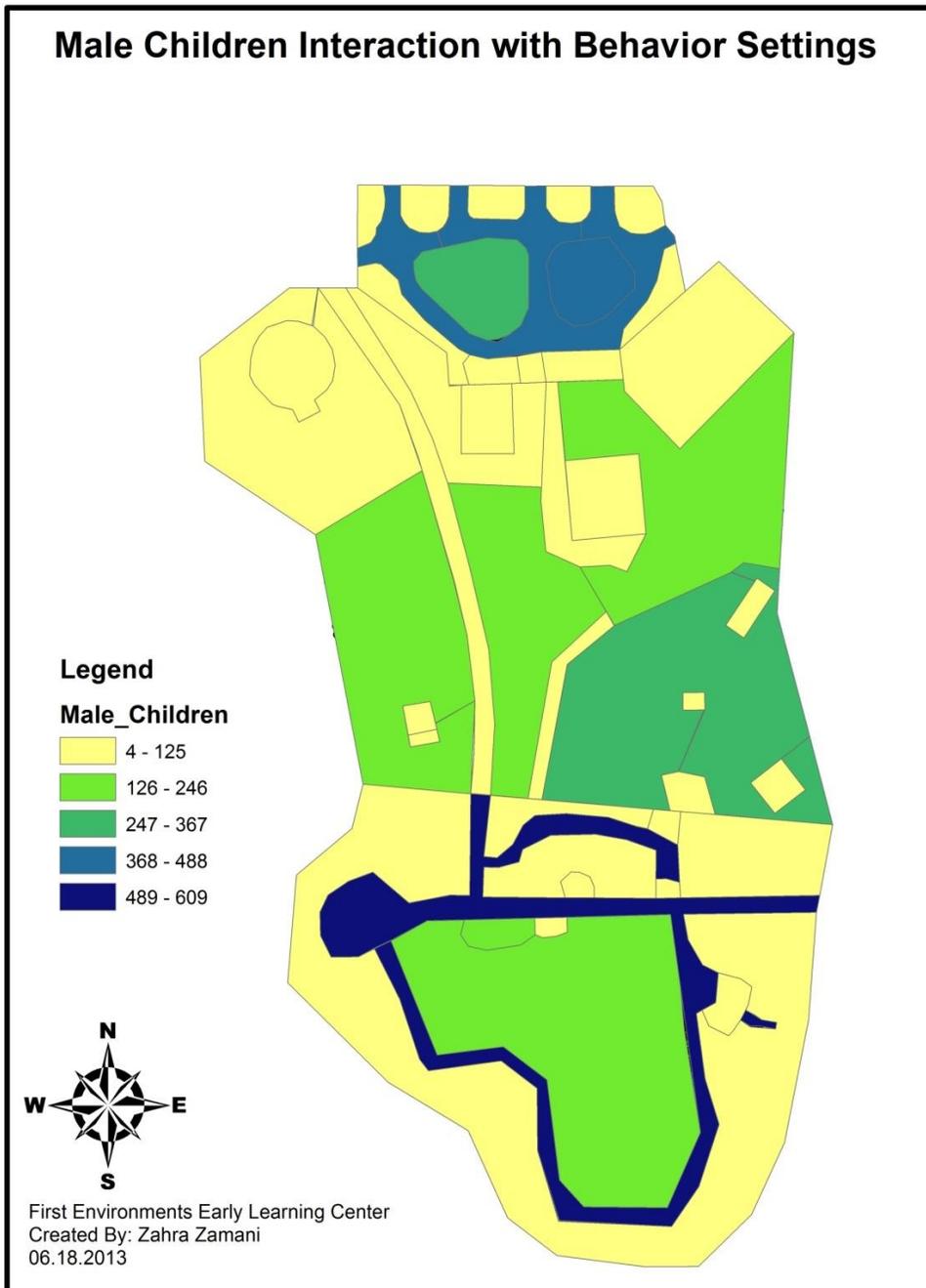


Figure D.2. Male children in various behavior settings based on quantile data classification.

Appendix E: Category of Elements and Afforded Cognitive Play Behaviors

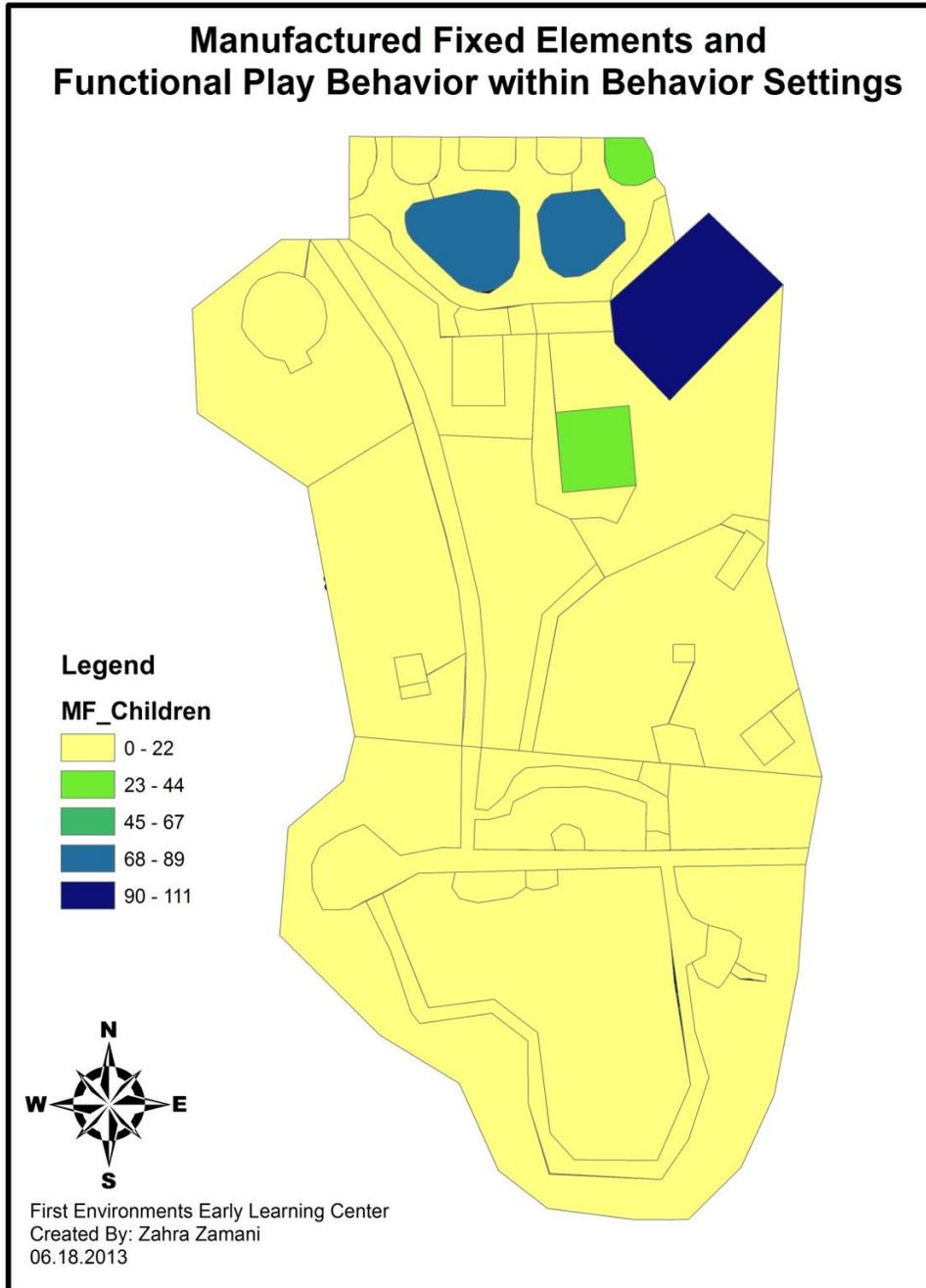


Figure E.1. Manufactured fixed elements and functional play behaviors.

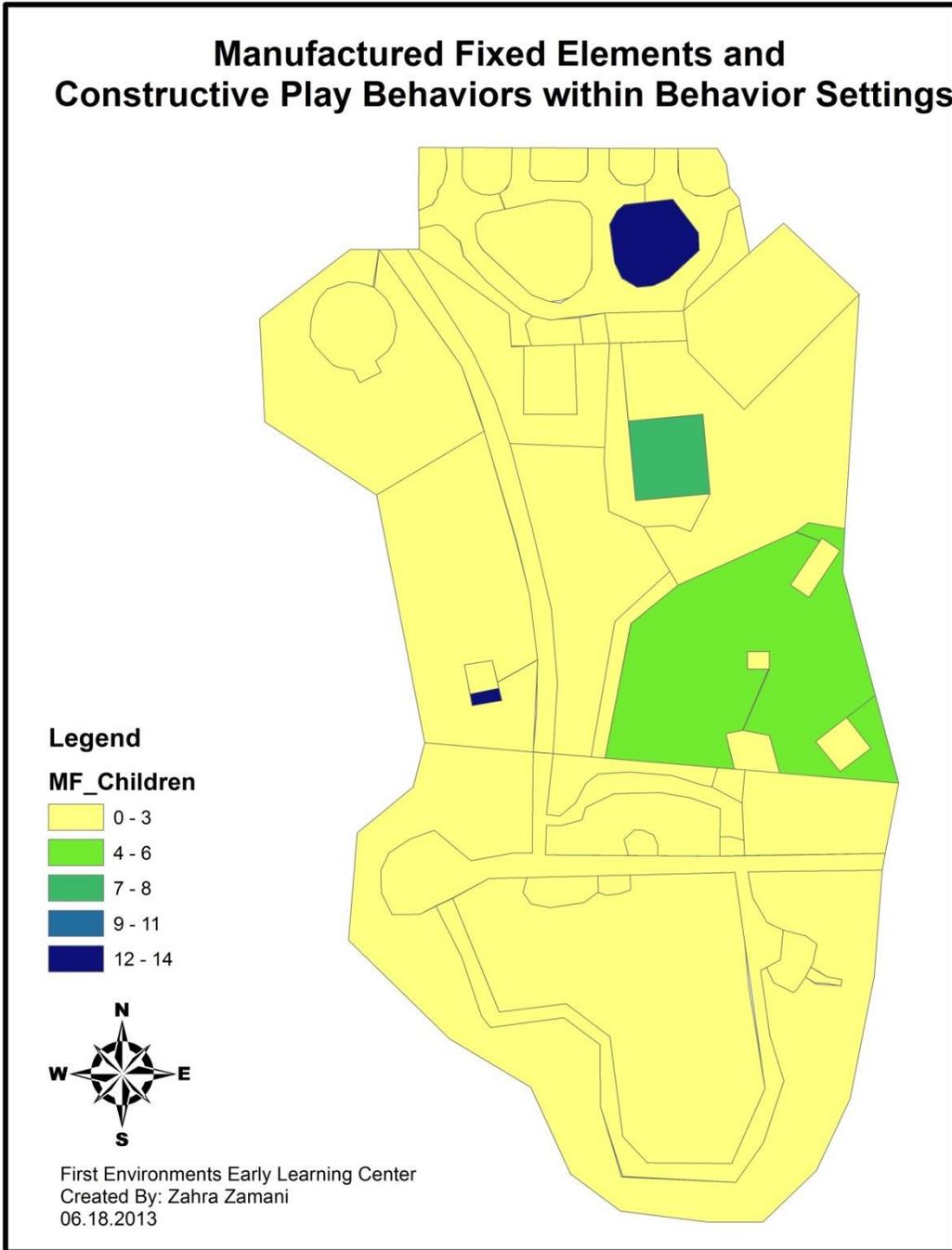


Figure E.2. Manufactured fixed elements and constructive play behaviors.

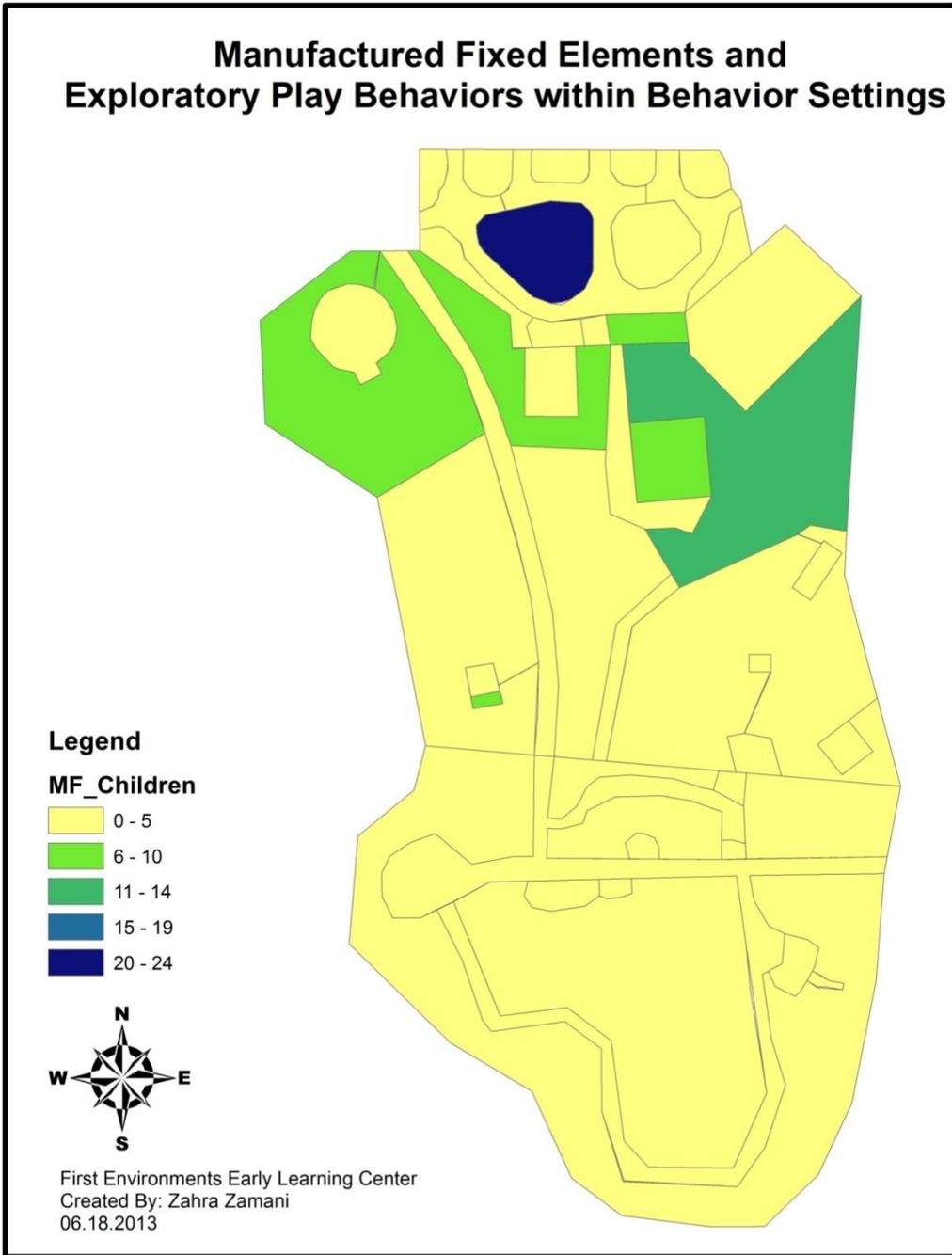


Figure E.3. Manufactured fixed elements and exploratory play behaviors.

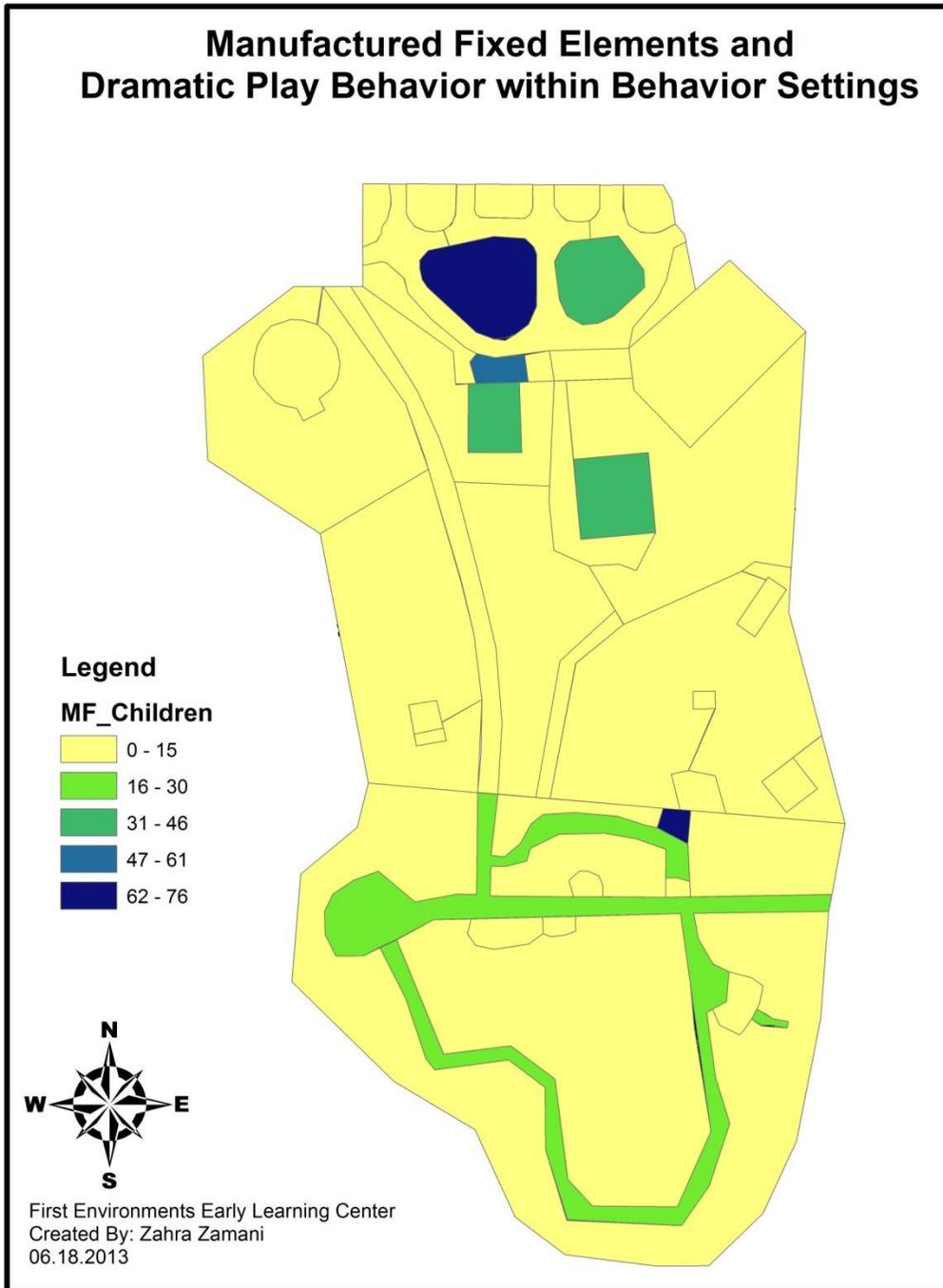


Figure E.4. Manufactured fixed elements and dramatic play behaviors.

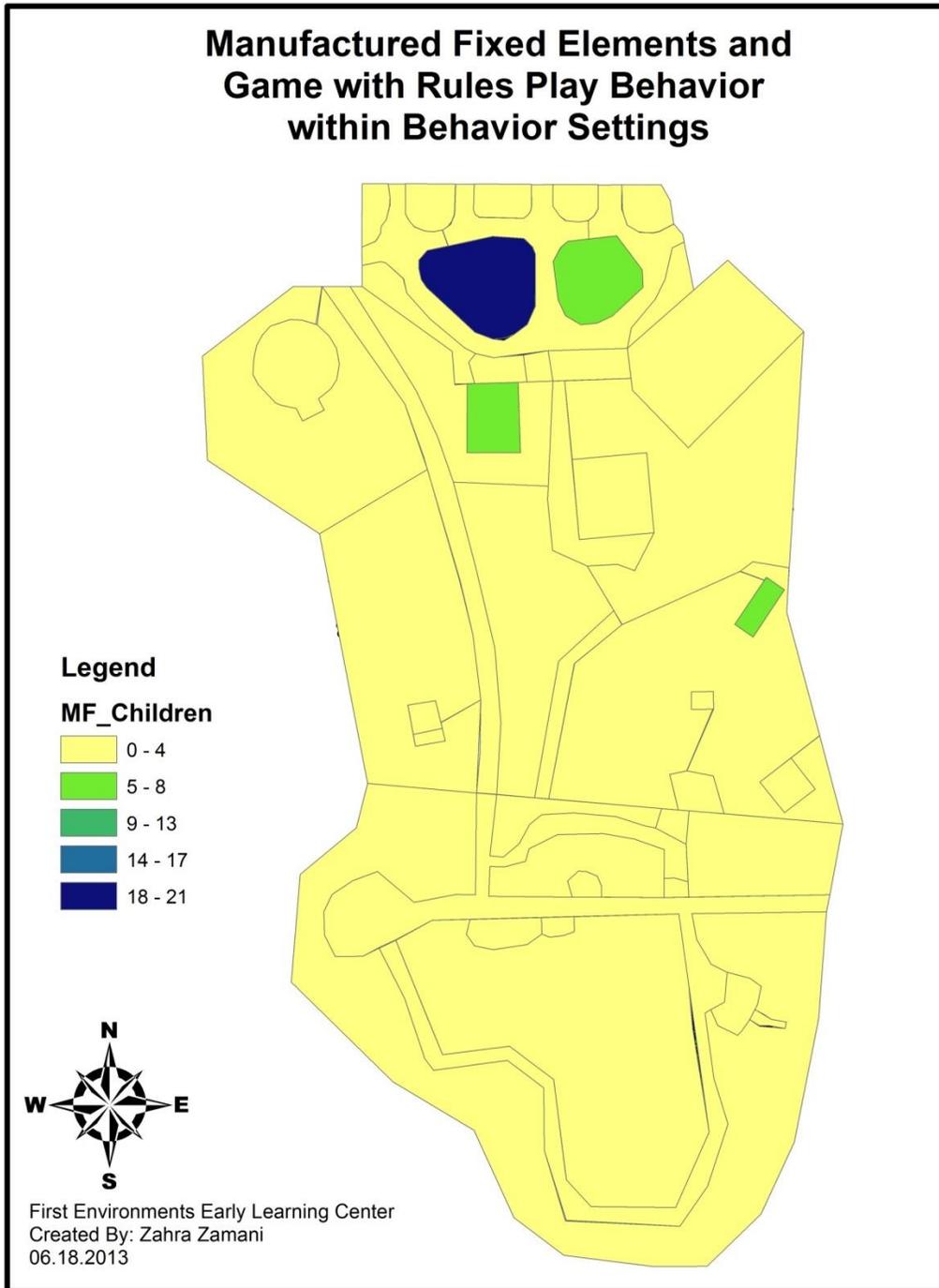


Figure E.5. Manufactured fixed elements and game with rules play behaviors.

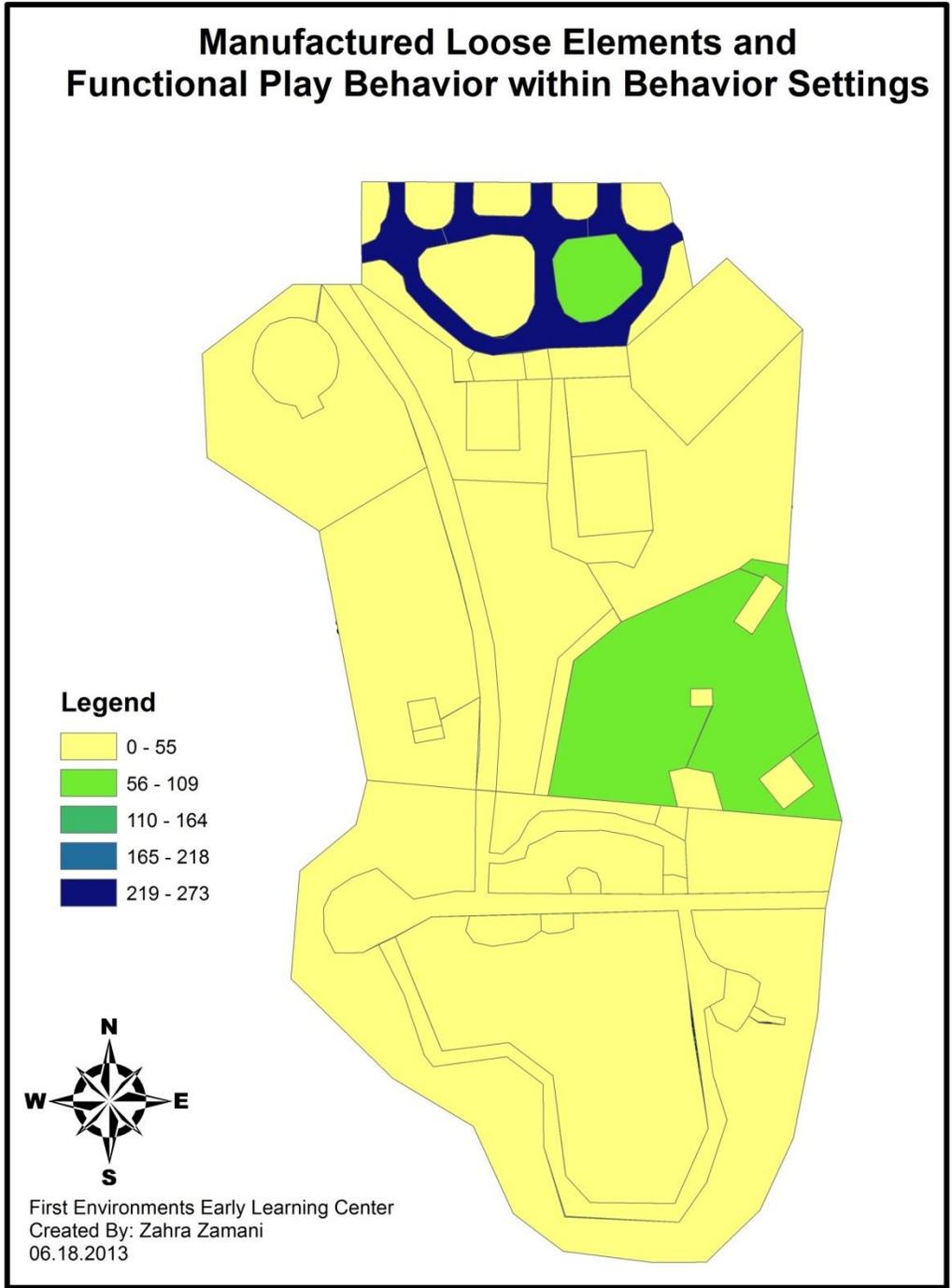


Figure E.6. Manufactured loose elements and functional play behaviors.

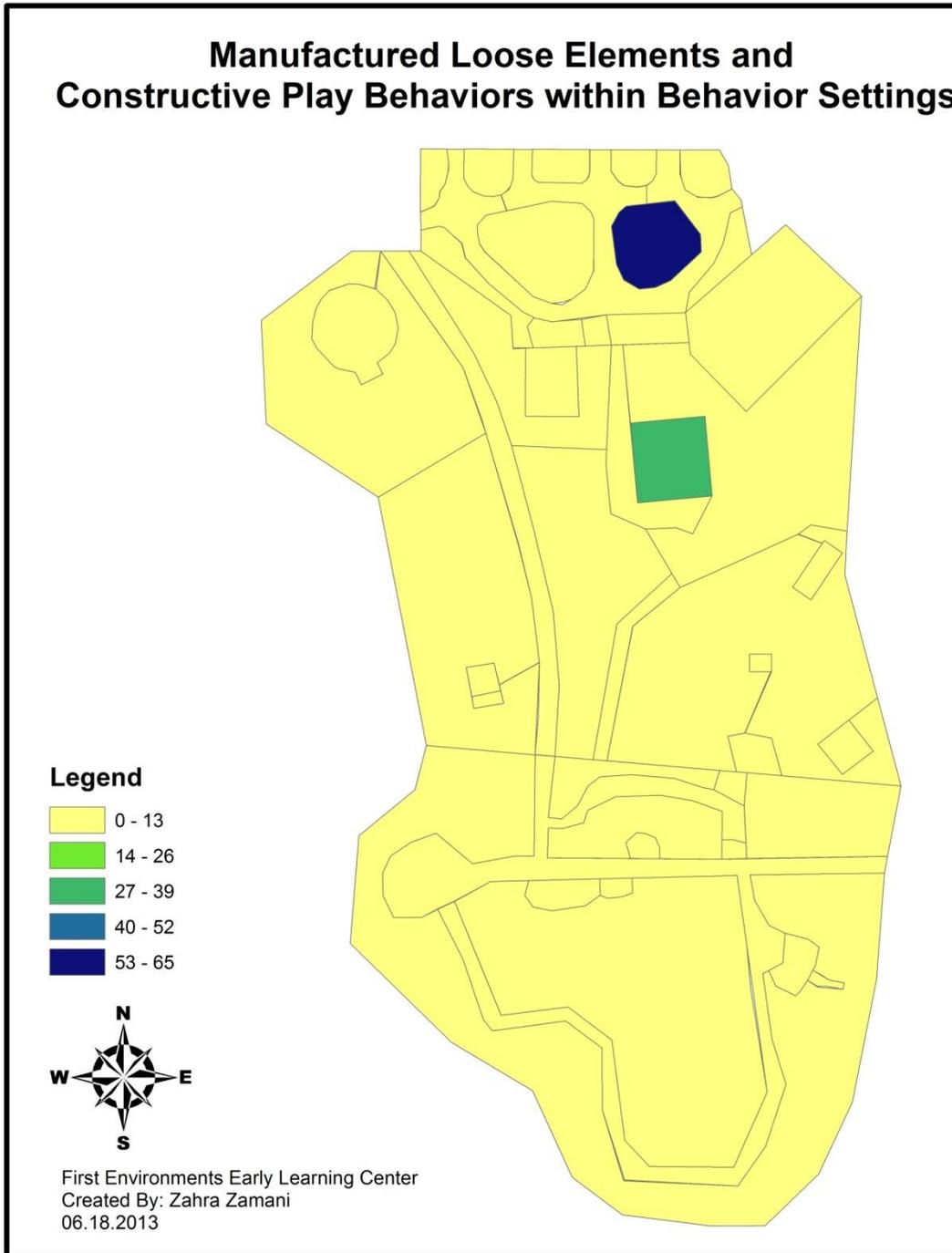


Figure E.7. Manufactured loose elements and constructive play behaviors.

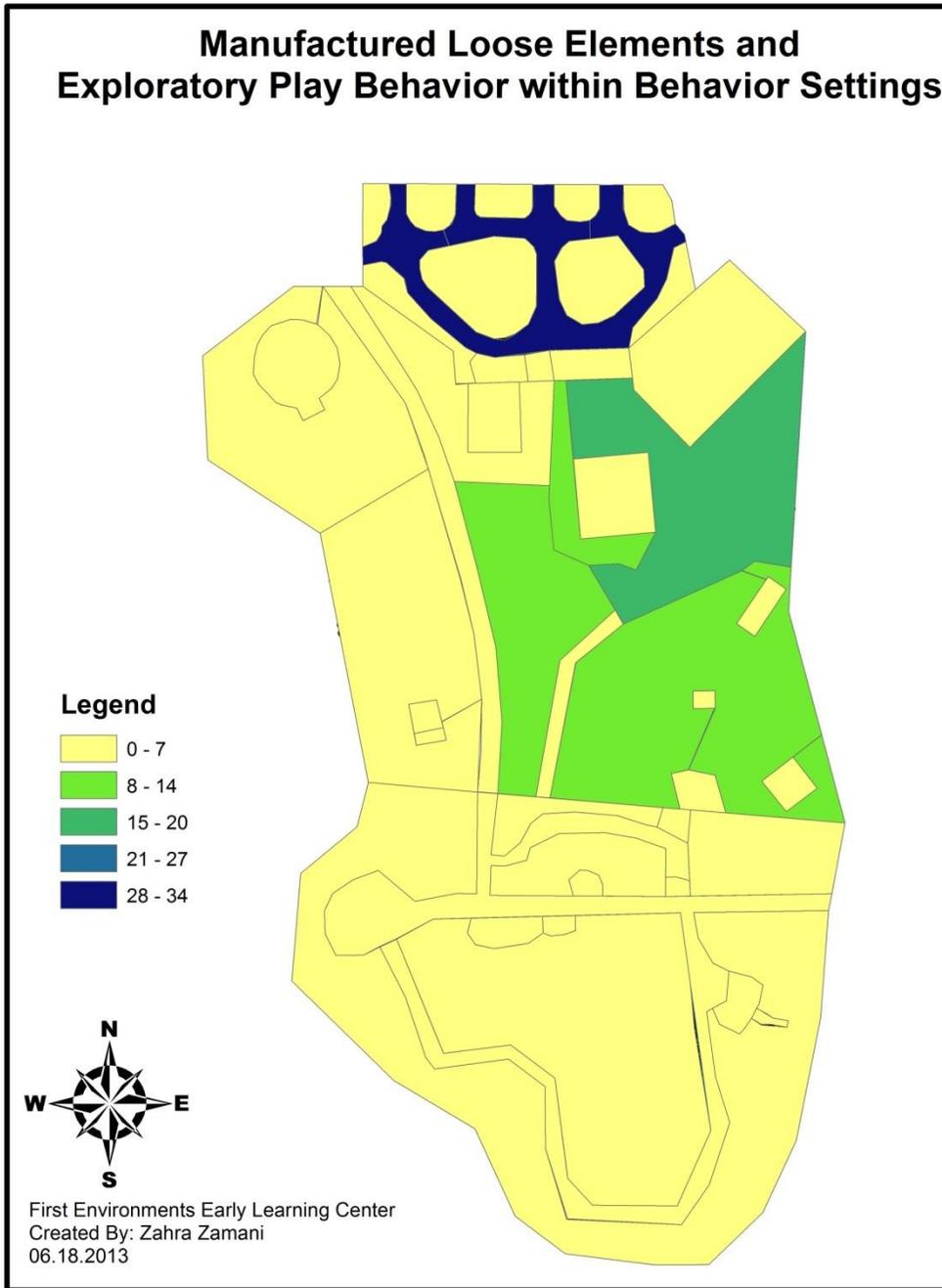


Figure E.8. Manufactured loose elements and exploratory play behaviors.

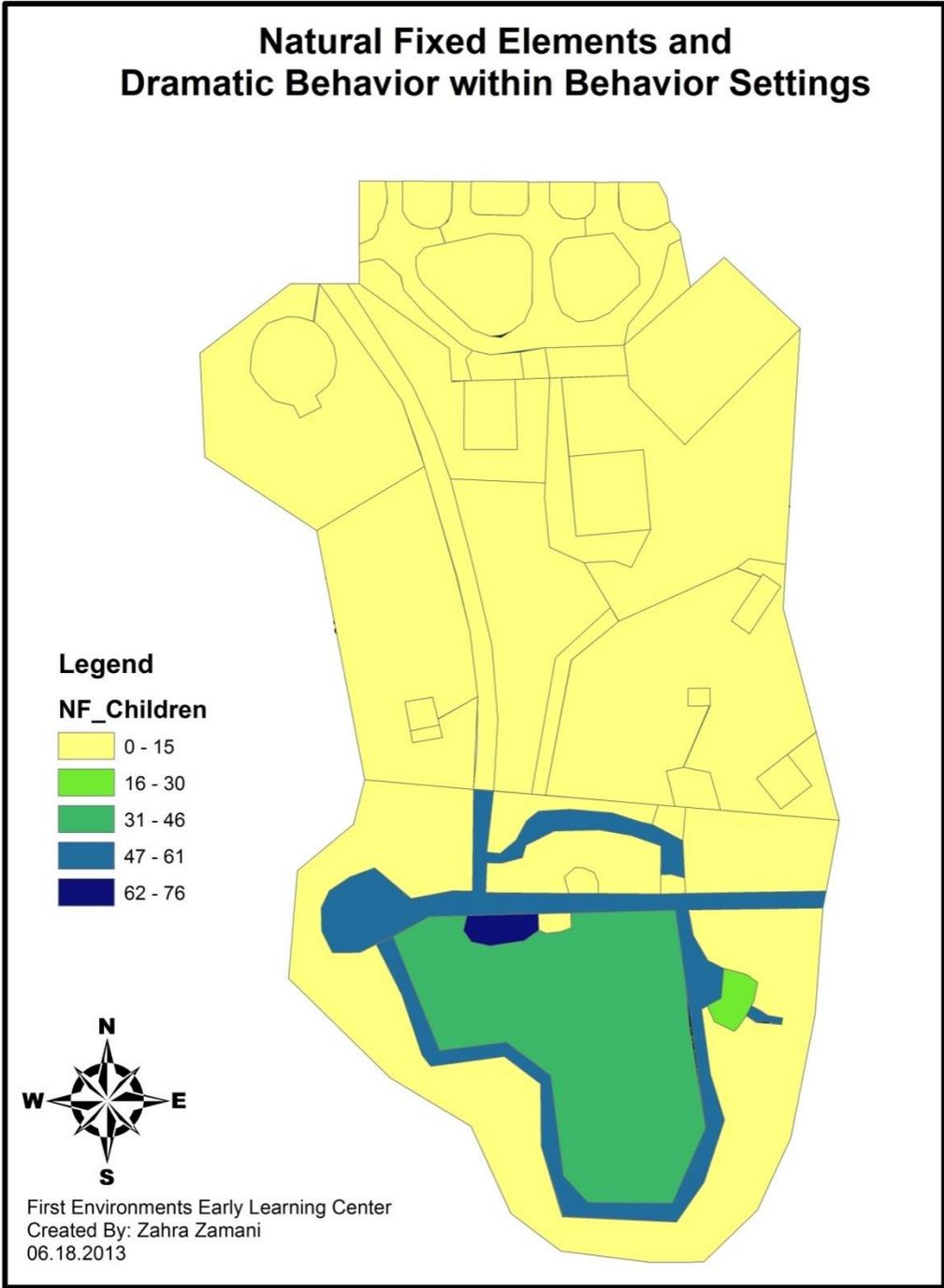


Figure E.9. Manufactured loose elements and dramatic play behaviors.

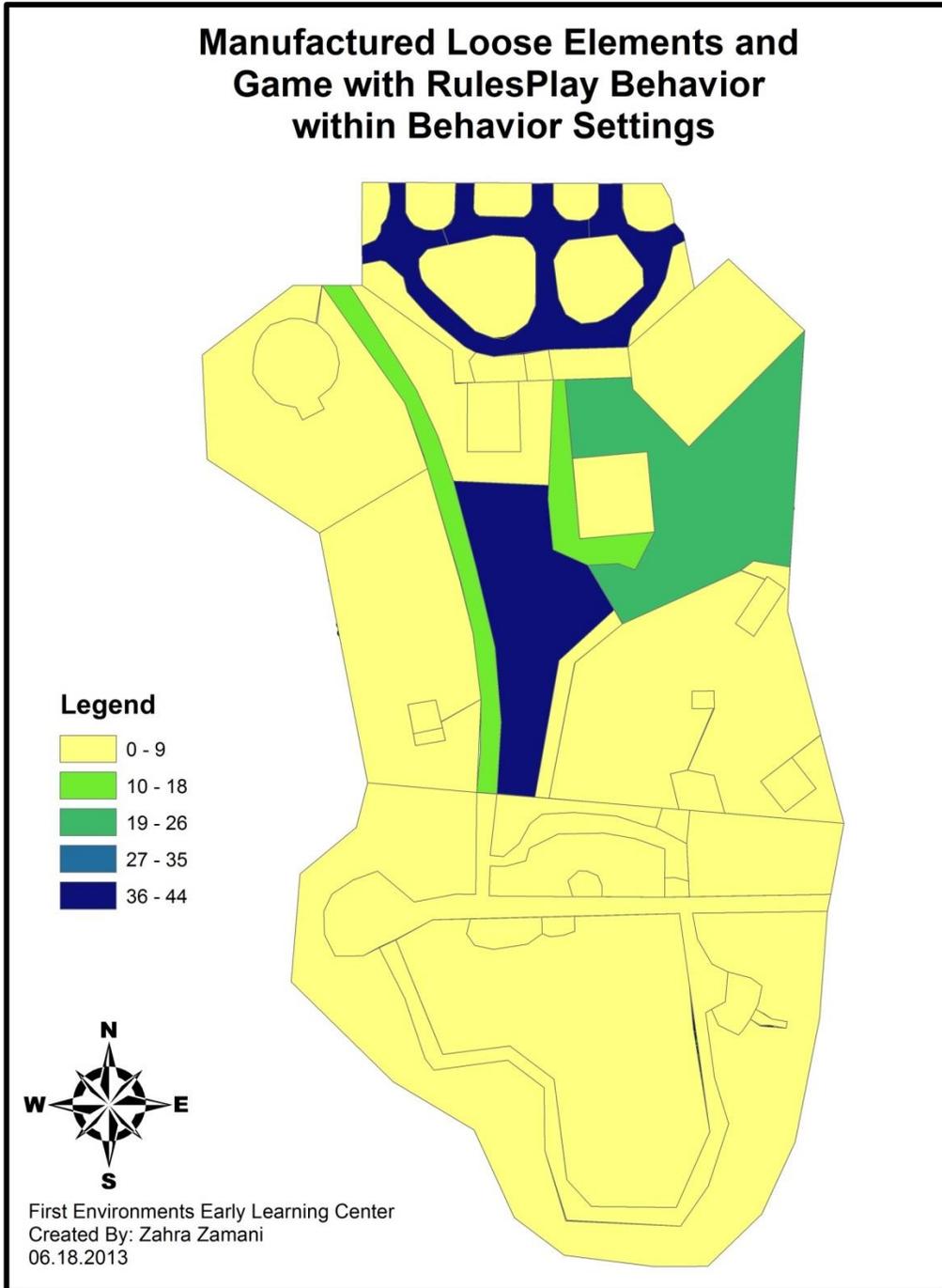


Figure E.10. Manufactured loose elements and game with rules play behaviors.

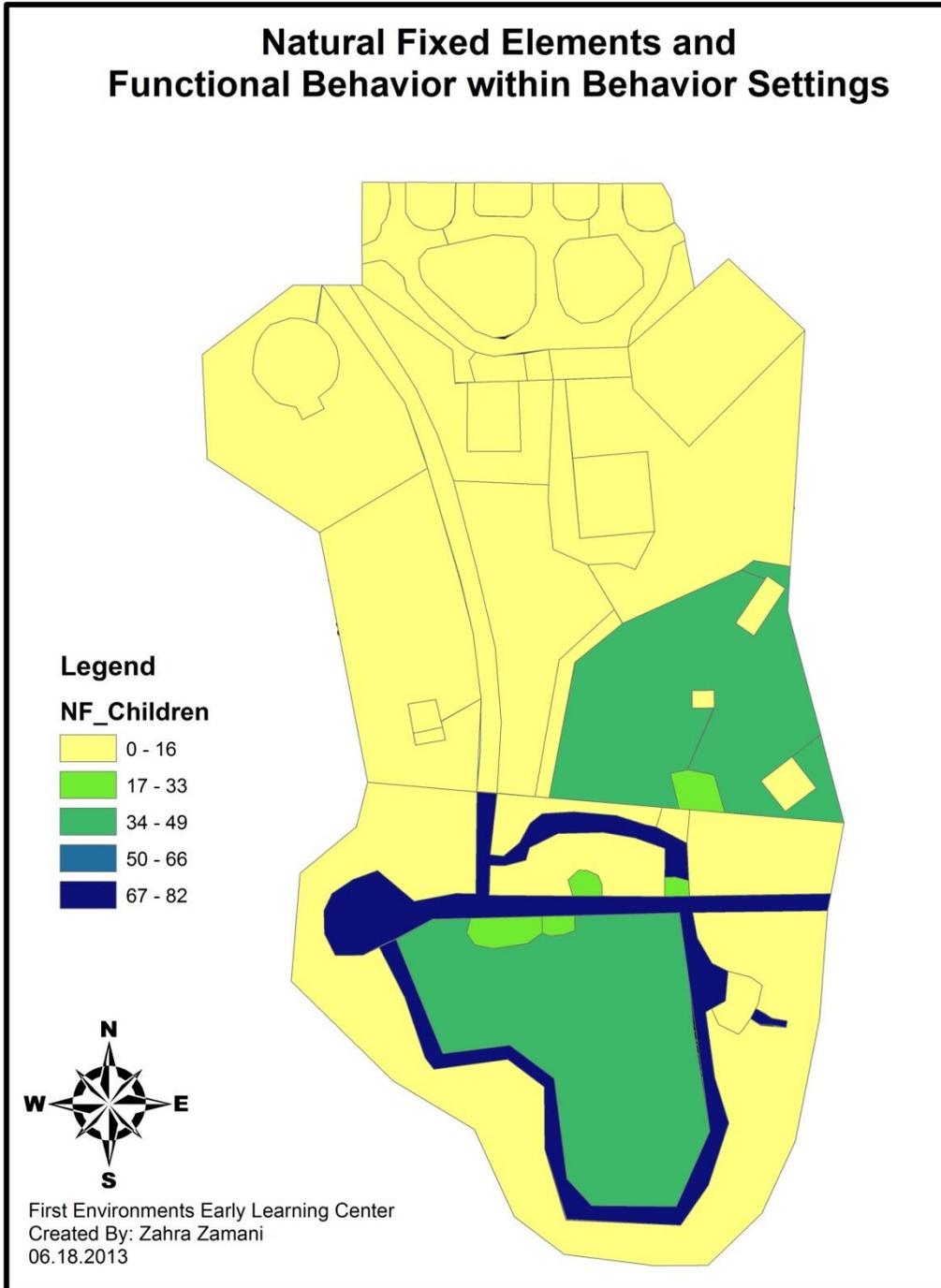


Figure E.11. Natural fixed elements and functional play behaviors.

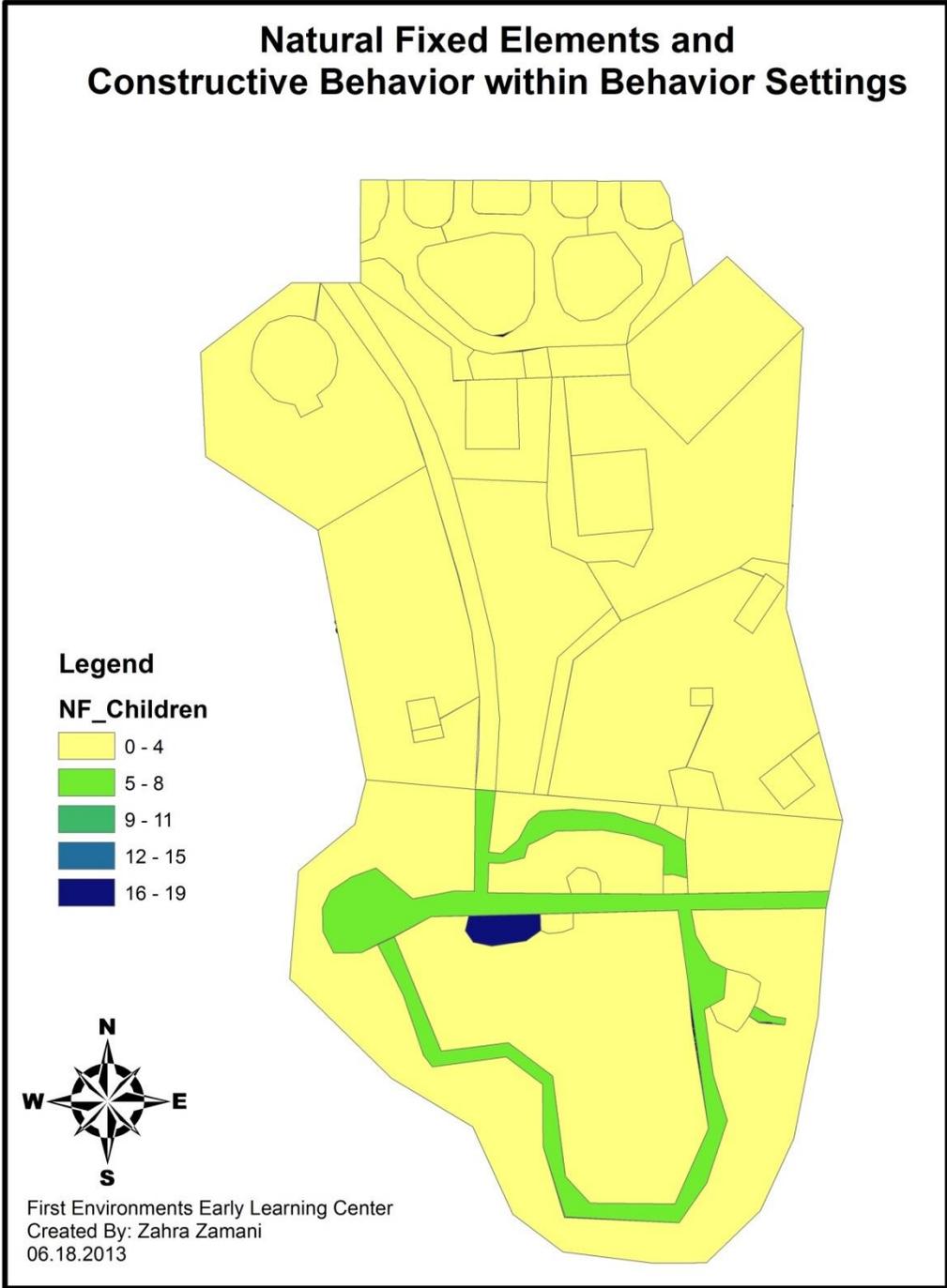


Figure E.12. Natural fixed elements and constructive play behaviors.

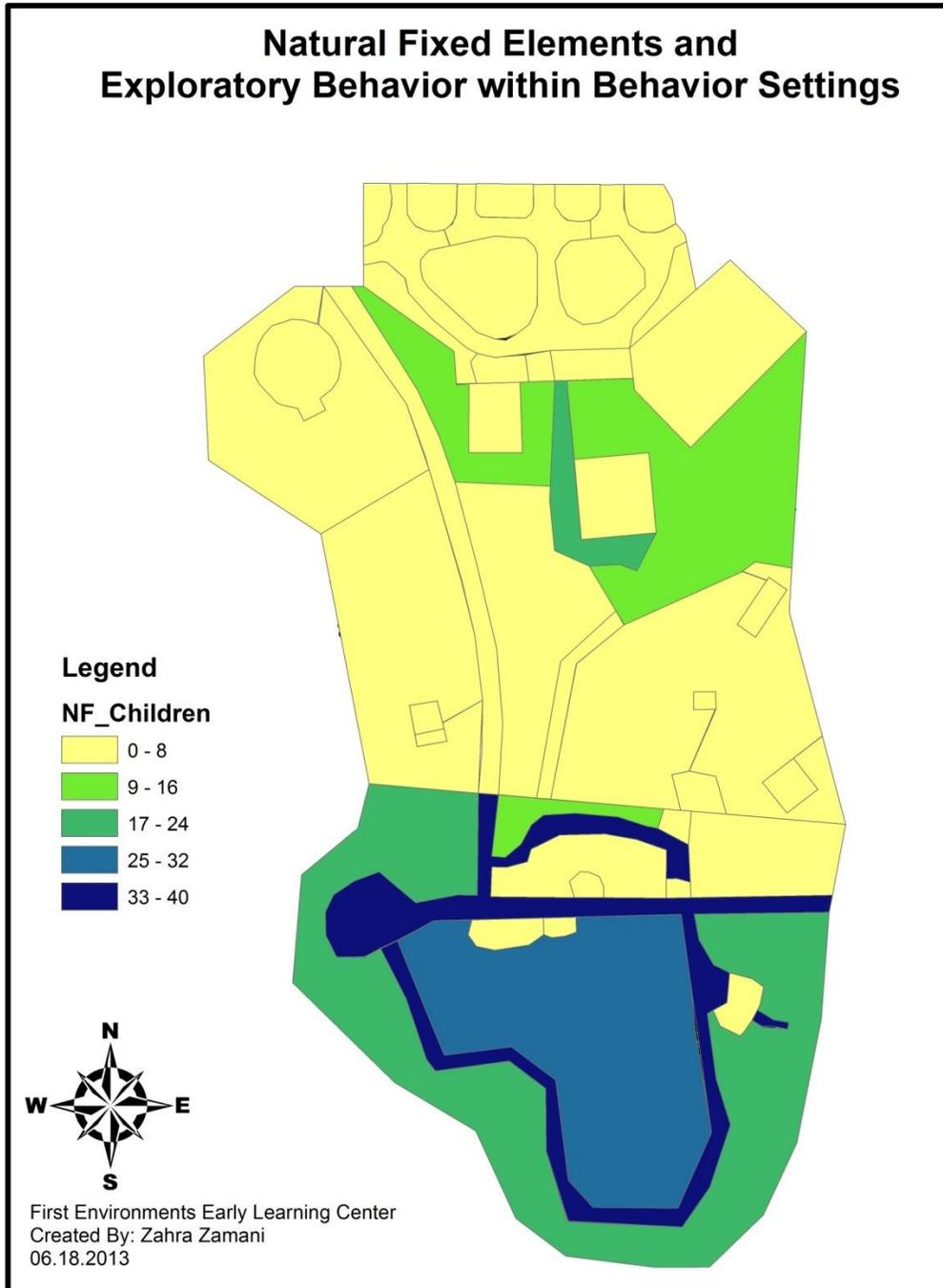


Figure E.13. Natural fixed elements and exploratory play behaviors.

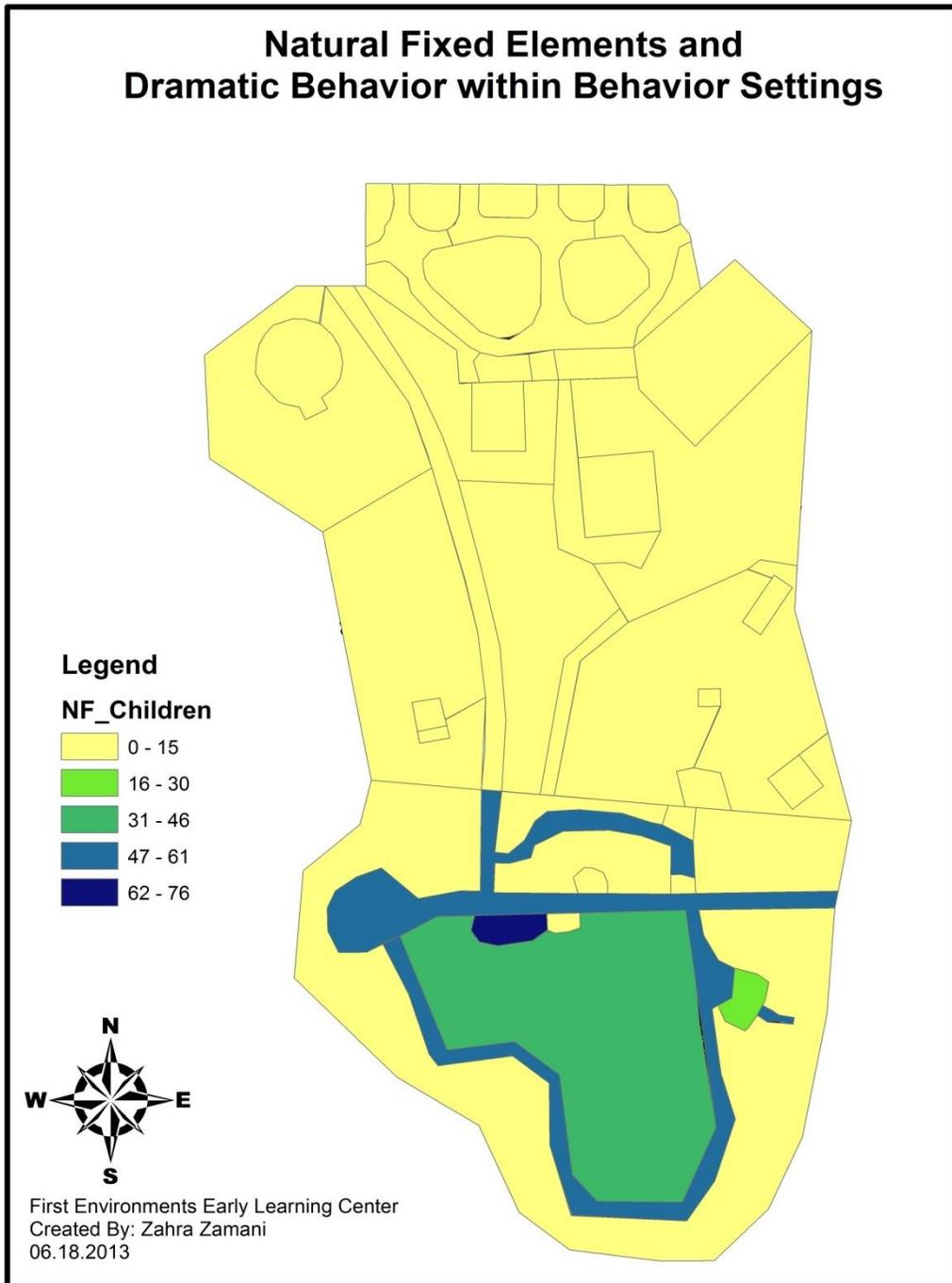


Figure E.14. Natural fixed elements and dramatic play behaviors.

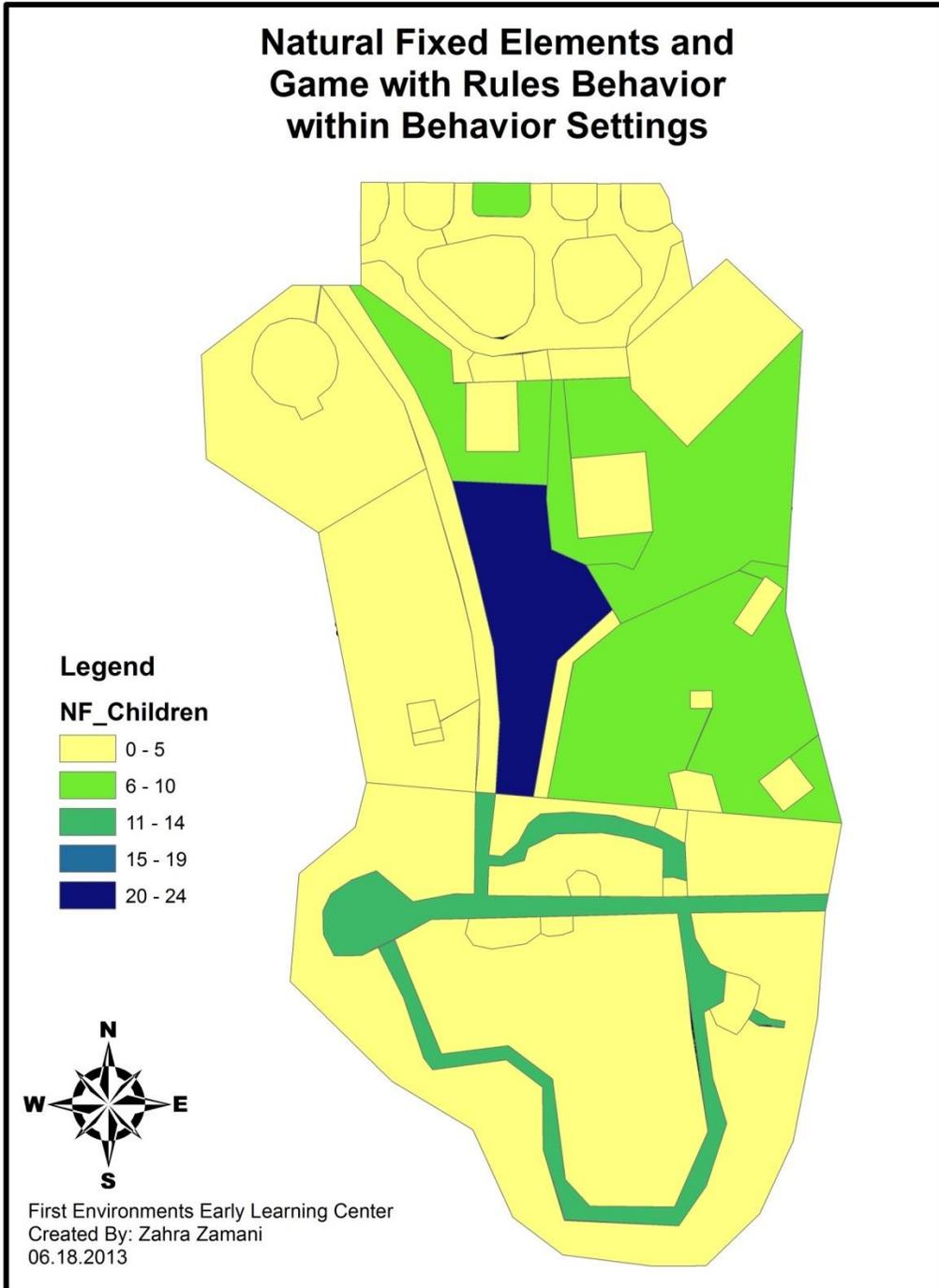


Figure E.15. Natural fixed elements and game with rules play behaviors.

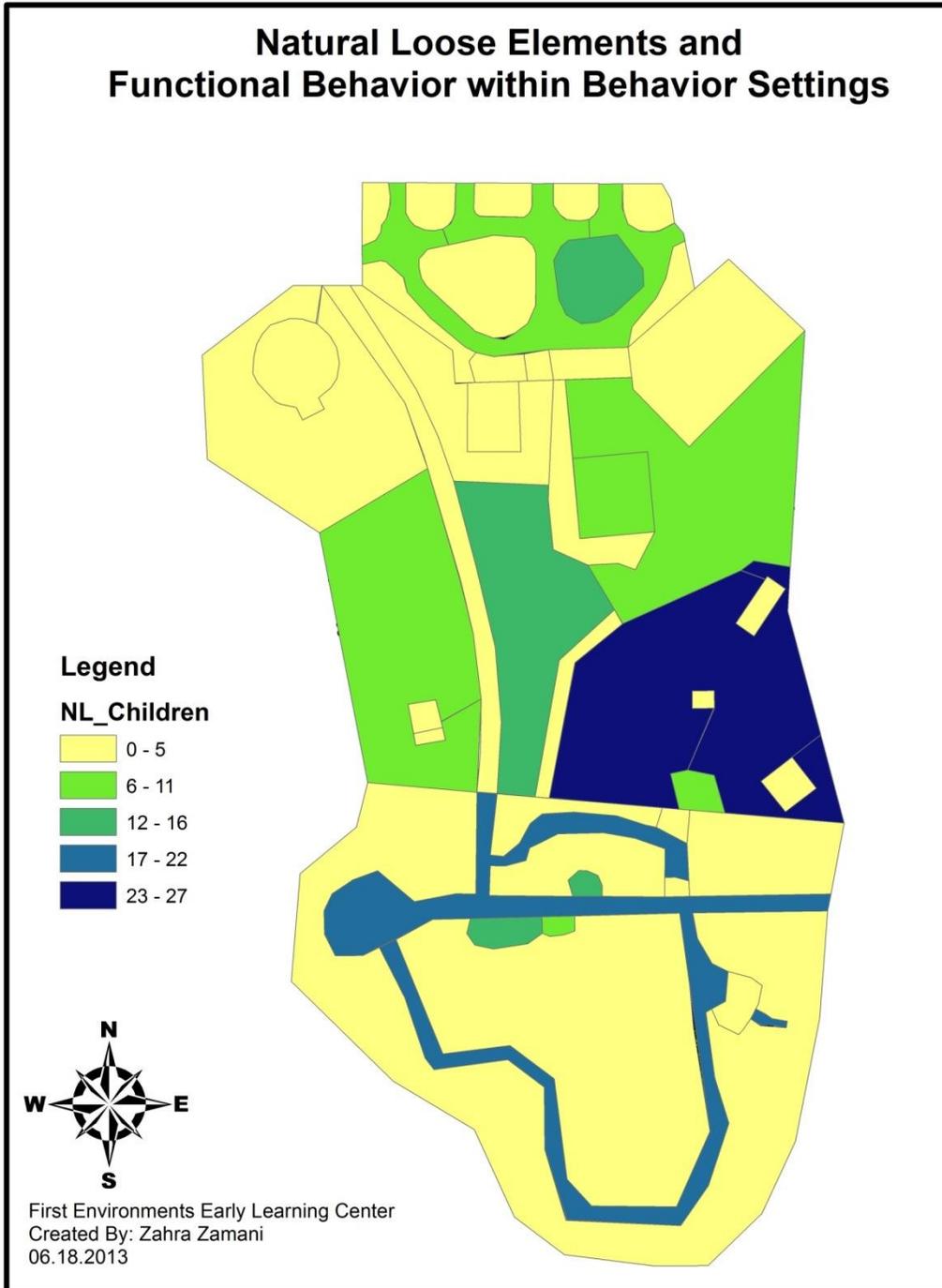


Figure E.16. Natural loose elements and functional play behaviors.

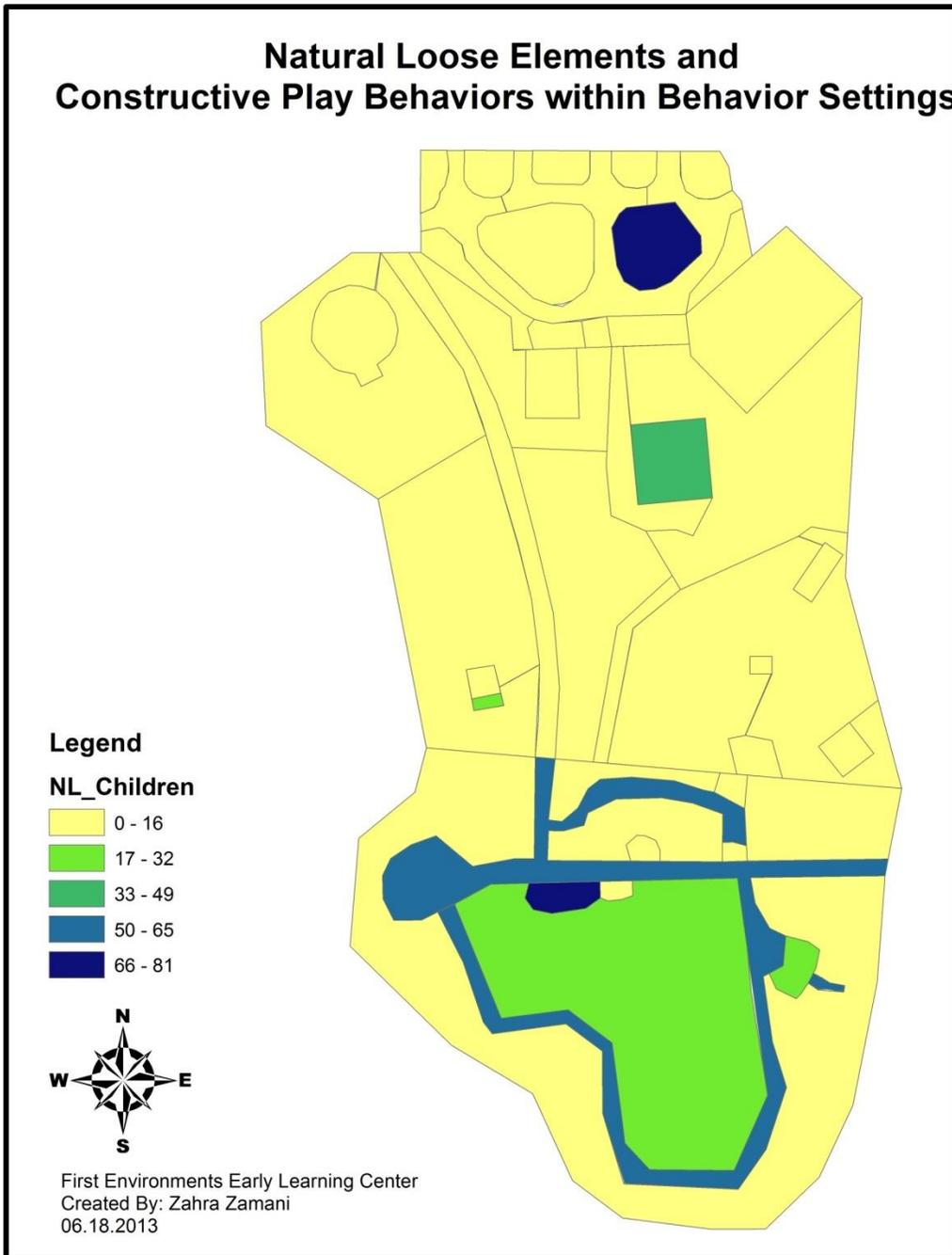


Figure E.17. Natural loose elements and constructive play behaviors.

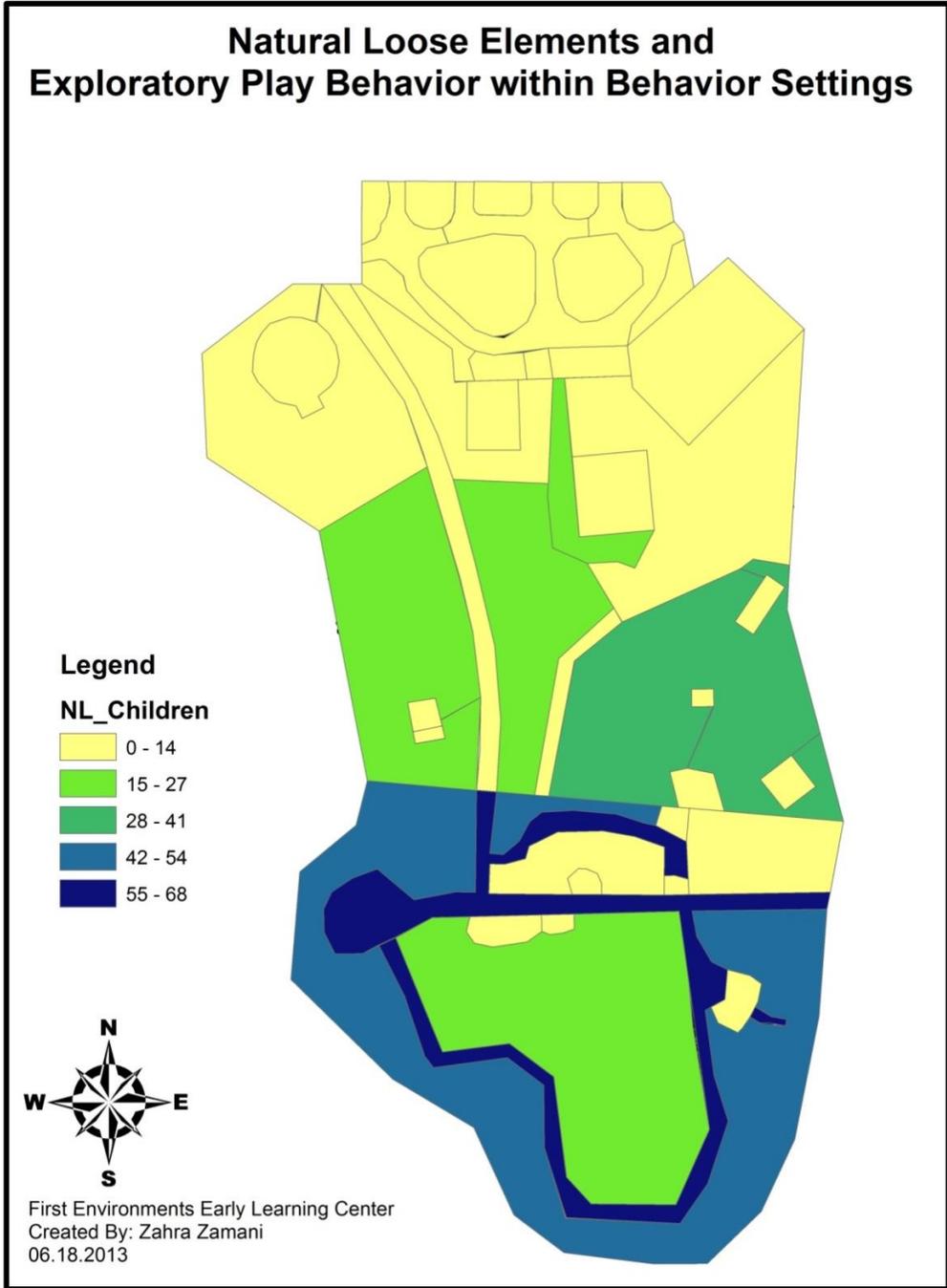


Figure E.18. Natural loose elements and exploratory play behaviors.

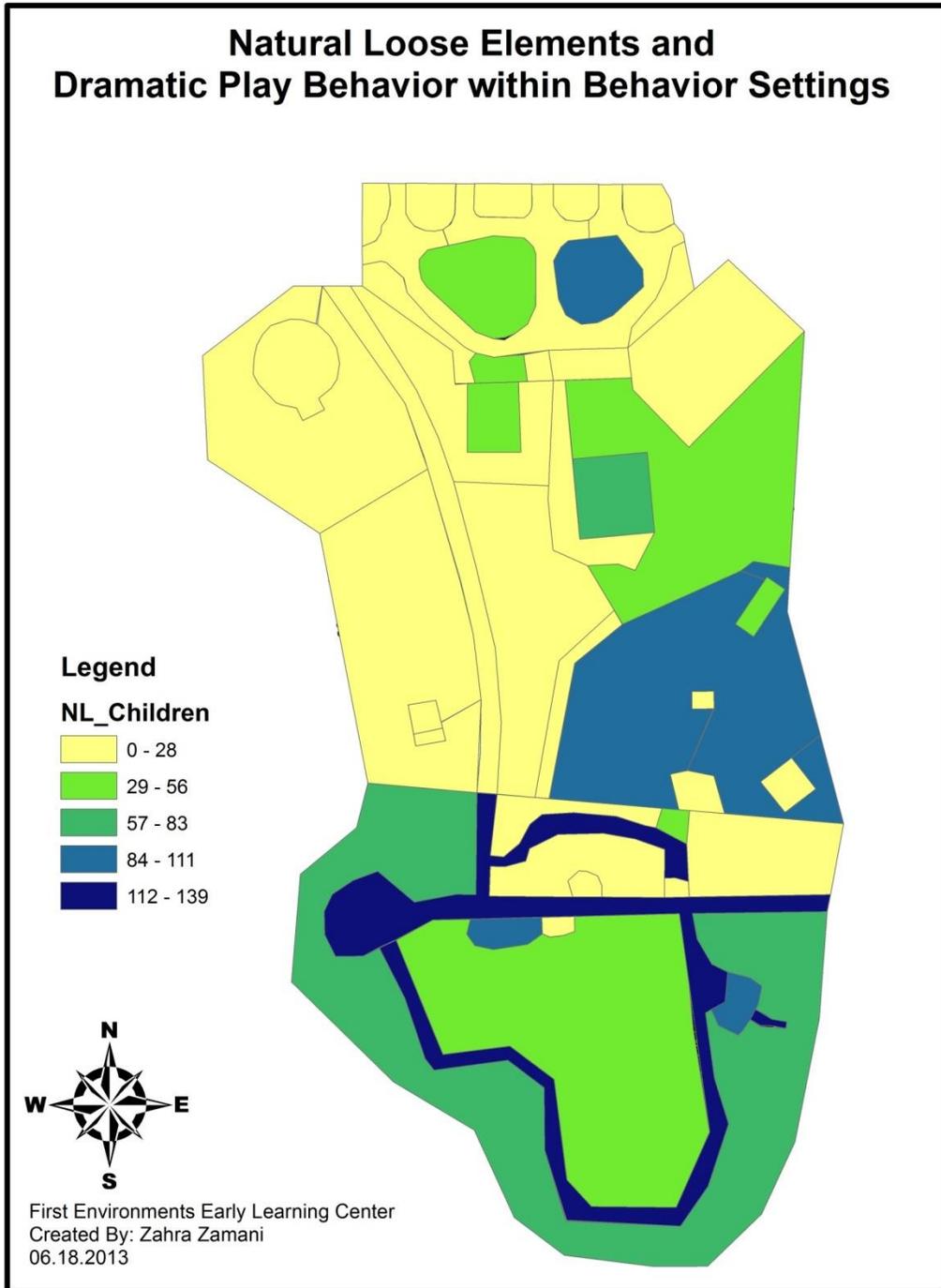


Figure E.19. Natural loose elements and dramatic play behaviors.

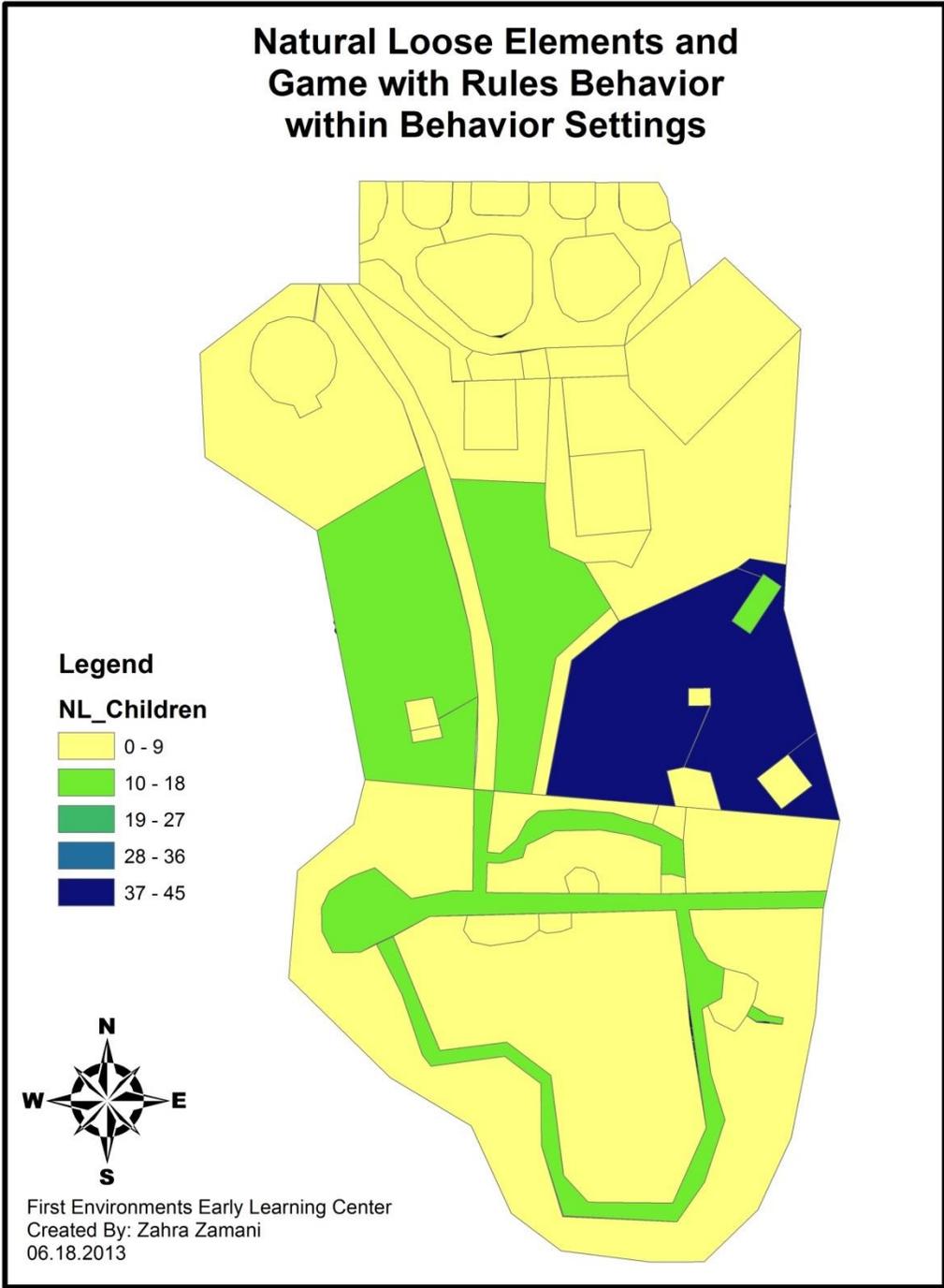


Figure E.20. Natural loose elements and game with rules play behavior.

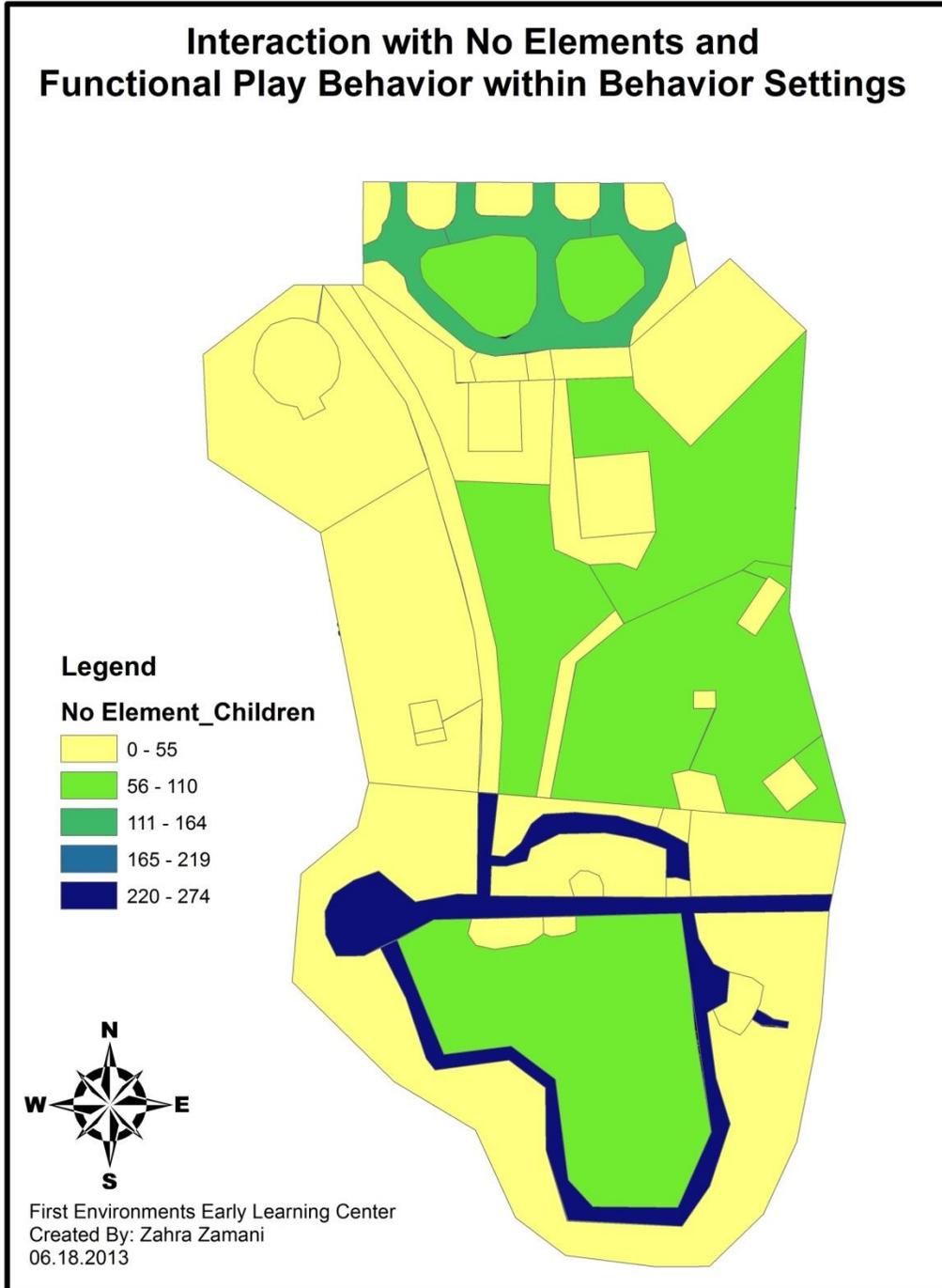


Figure E.21. Interaction with no elements and functional play behavior.

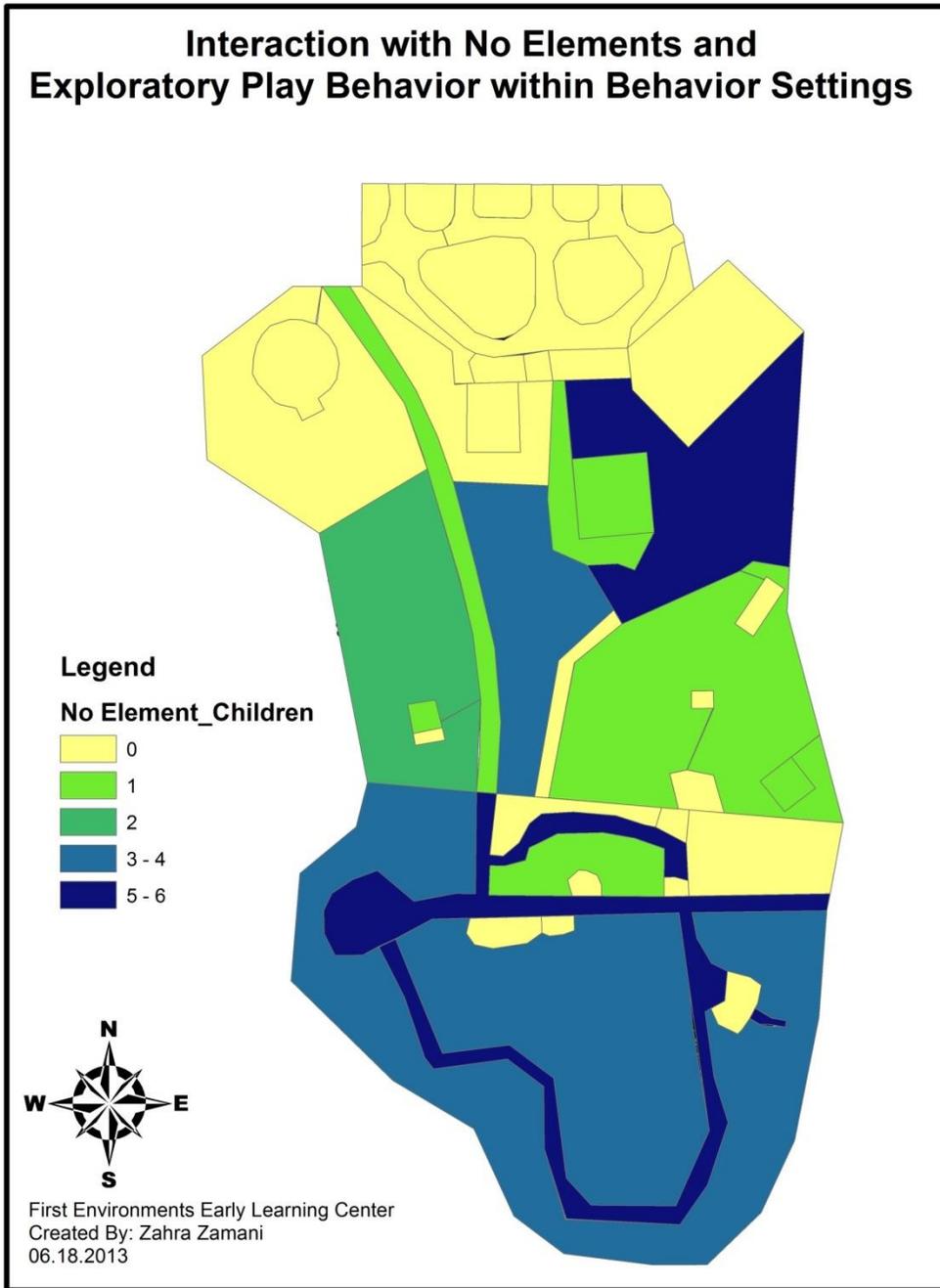


Figure E.22. Interaction with no elements and exploratory play behavior.

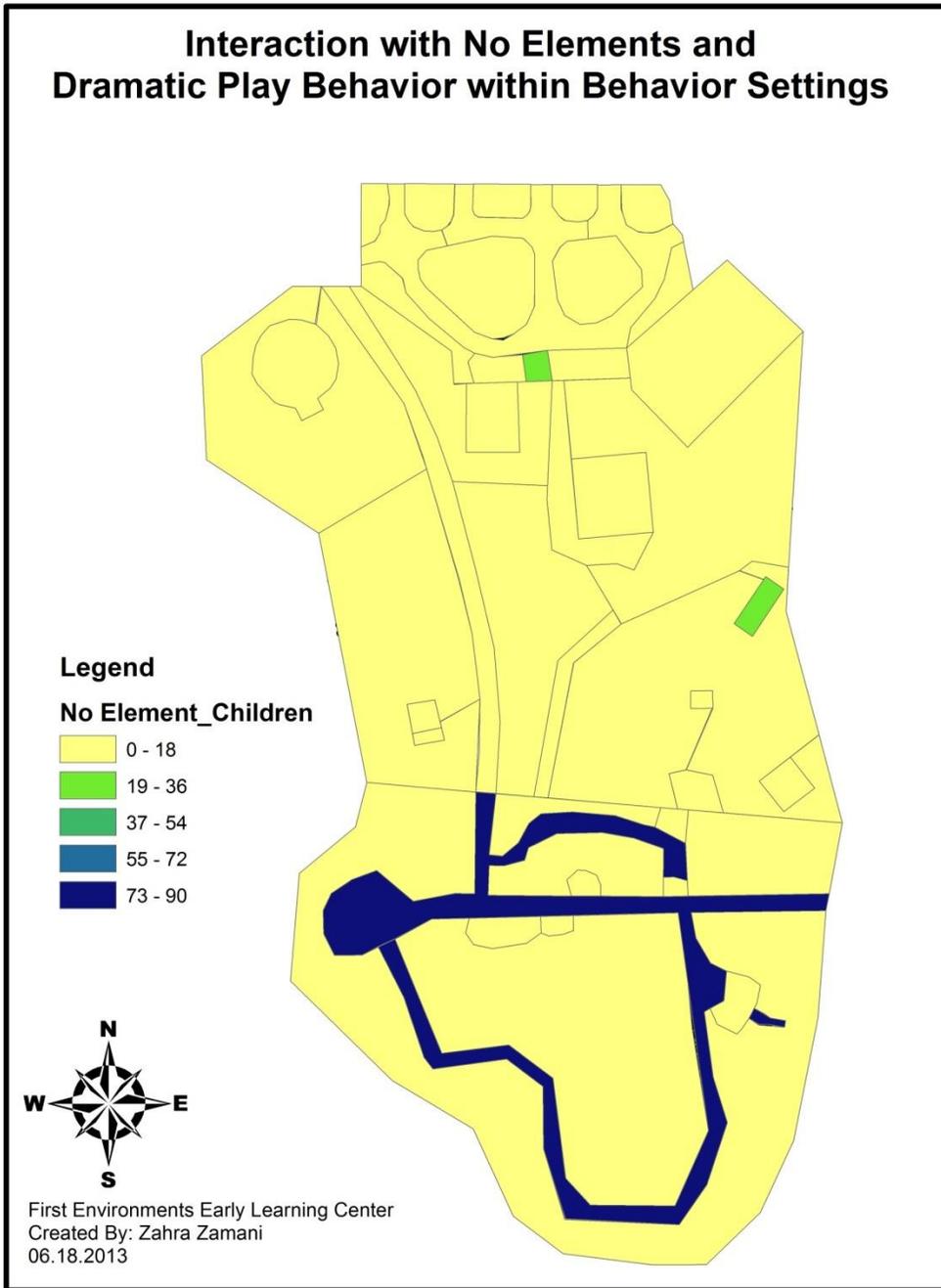


Figure E.23. Interaction with no elements and dramatic play behavior.

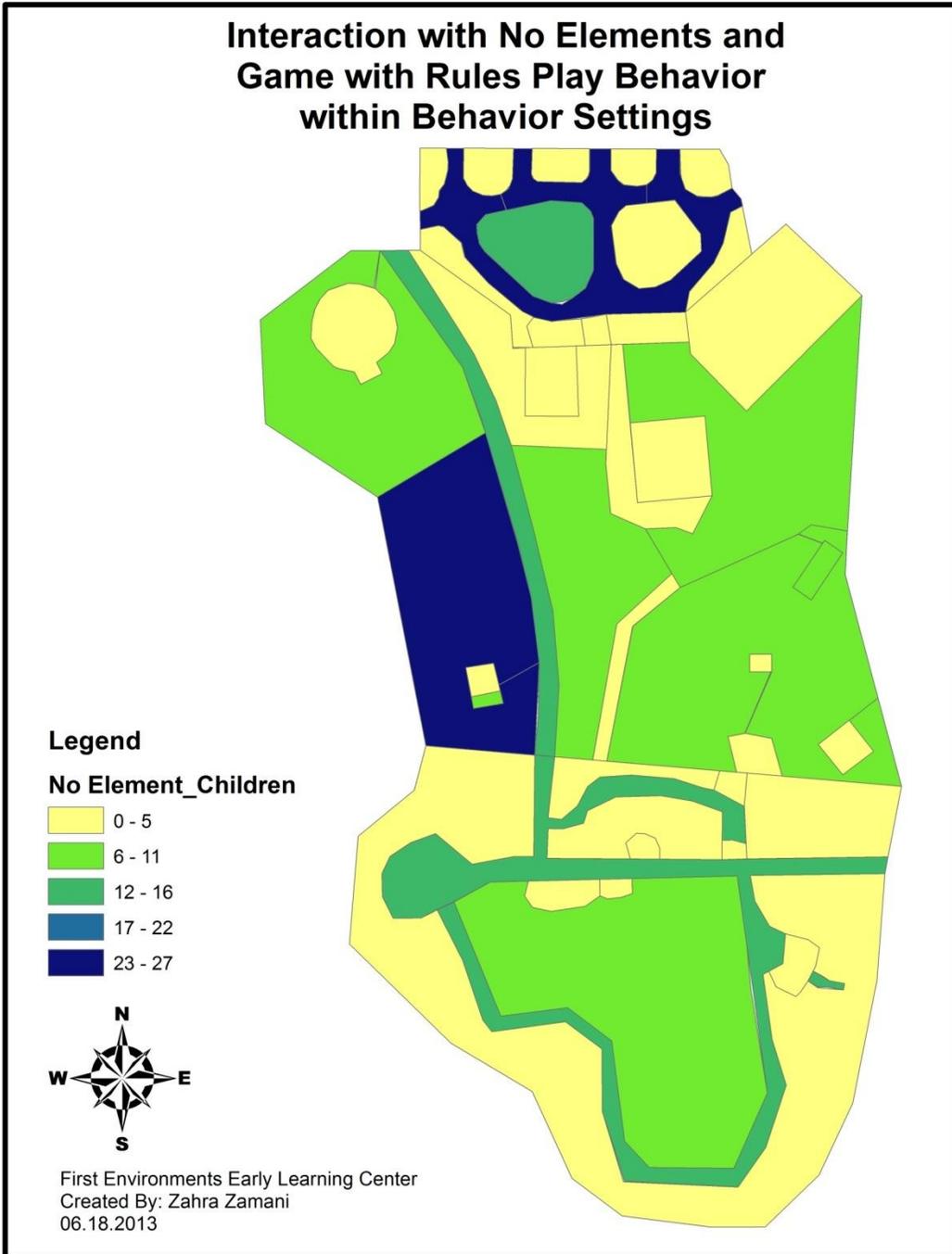


Figure E.24. Interaction with no elements and game with rules play behavior.

## Appendix F: Coded Elements and Behavior Settings based on Photo Preference

Table F.1. Preferred elements and behavior settings and associated cognitive play behaviors (N=24).

ID	Element	Behavior Setting	Explanation	Cognitive Play Behavior
1	1- Grass	1- Hill	1- I like rolling down the grass hill	1- Functional
	2- Swing	2- Swing	2- Swing	2- Functional
	3- Sand	3- Sand	3- Sand box: play in it, we pretend.	3- Dramatic
2	1- Tire	1- Green	1- I play animals in the tire	1- Dramatic
	2- Tree	Patches	2- We play dinosaurs in the back woods.	2- Dramatic
	3- Structur e	2- Trees 3- Structure	3- We play 'people' on the top, and princess over there. On the slide, we are just being active.	3- Dramatic
3	1- Tree	1- Trees	1- I like it, I play "Star Wars" there.	1- Dramatic
	2- Green	2- Green	2- I play "Star Wars" there.	2- Dramatic
	Tube	Tube	3- Star Wars	3- Dramatic
	3- Rope	3- Rope		
4	1- Rope	1- Rope	1- Because you climb on it. We play climbing bow. Sometimes I swing.	1- Functional
	2- Swings	2- Swings	2- Because you swing and I always like it	2- Functional
	3- Green	3- Green	3- I climb up on it and I like to hang from the tree. There is a bar tree that I	3- Functional,
	Tube, tree	Tube	hang on. You climb a tree and try to hold on to it for three hours.	Game with Rules
5	1- Green	1- Green	1- Because I like to play there, we play "Cheetahs".	1- Dramatic
	Tube	Tube	2- Playing rope swings. The game is dancing on the rope swings. You dance	2- Game with
	2- Rope	2- Sand-	while you swing. I move my legs while I am swinging.	Rules
	3- Structure	Rope 3- Structure	3- I like to go on the slide because it is so fun.	3- Functional
6	1- Tree	1- Tree	1- Back woods I play "Ninja."	1- Dramatic
	2- Green	2- Green	2- To play "star wars" and chase my friends.	2- Dramatic
	tube	tube	3- I like hiding in the structure and pretend to be fighters.	3- Dramatic
7	3- Structure	3- Structure		
	1- Green	1- Green	1- Because you can get in it and on the top. Sometimes we play "dinosaurs".	1- Dramatic
	tube	tube	Sometimes I am the baby dinosaur, sometimes I am the baby coyote, I	2- Dramatic
2- Loose logs and leaves	2- Trees	2- Trees	always want to be a baby something.	3- Functional
	3- Bikes	3- Loop	2- Some people we say: "Who's next?" and someone comes up, and does not	
			have to come up, but sometimes comes up and says, I like this. But we say: "do you have something to trade with?" they say: "no" or "yes". If they do have they can get one and if they don't they cannot have one. Sometimes I	

Table F.1. Continued.

			say "Who's next?", and sometimes stand buy something. 3- I like playing with the bikes mostly, and I just play with bikes, because sometimes I get to go fast, even though if someone is on the bike with me I can go fast, because I have really strong legs.	
8	1- Tire 2- Swing 3- Structure	1- Green Patches 2- Swing 3- Structure	1- You can bounce or walk on it. You can imagine being in an island. 2- Sometimes, I jump off the swings. 3- I like to go down the slide.	1- Dramatic 2- Functional 3- Functional
9	1- Bike 2- Trees 3- Green tube	1- Loop 2- Trees 3- Green tube	1- I ride bikes. 2- I run around, and play "storm troopers". 3- I like to climb it and go inside.	1- Functional 2- Dramatic 3- Functional
1 0	1- Sand 2- Rock 3- Bike	1- Sand 2- Stone- lined swale 3- Loop	1- I like to dig the sand because it is fun!. 2- To find rocks. 3- I like to bike around.	1- Constructive 2- Exploratory 3- Functional
1 1	1- Structure 2- Rope 3- Swings	1- Structure 2- Rope 3- Swings	1- I sometimes play "Sky Landers"; we pretend to be "sky Landers". 2- I usually play on the ropes when I am in the back woods. I just like to take my shoes off so my shoes don't get stuck. 3- Sometimes, I go on the swings and sometimes I go on the rope in the "Woods".	1- Dramatic 2- Functional 3- Functional
1 2	1- Green tube 2- Balancing wood 3-Sand	1- Green Tube 2- Green Patches 3- Sand	1- Because I like to climb on it and get inside it. 2- I like to balance on that. 3- I like to play with the sand to make food.	1- Functional 2- Functional 3- Dramatic
1 4	1- No element 2- Sand 3- Bike	1- Pathway, hill 2-Sand 3- Loop	1- I like to run on them. 2- I dig in the sand. 3- I like riding on them	1- Functional 2- Constructive 3- Functional
1 5	1-Trees 2-Sand, Rope 3-Tire	1-Trees 2- Sand- Rope 3- Grass	1- We play with sticks. We play "Ninjas" with friends, it is fun! 2- I play tick tack toe in there [sand], and monkey swings with the rope 3- We play jail.	1-Game with rules 2-Game with Rules, dramatic 3-Dramatic

Table F.1. Continued.

16	1- Green tube 2- Ground 3- Balancing wood	1- Green Tube 2- House 2 3- Green patches	1- We play "Kitty Cats" in it. 2- We pretend it to be an ice cream store. 3- We balance on it.	1- Dramatic 2- Dramatic 3- Functional
17	1- Stick 2- Swing 3- Sand	1- Trees 2- Swing 3- Sand	1- We play sticks, and chase each other. 2- We swing. 3- I like to build castles in the sand.	1- Game with Rules 2- Functional 3- Dramatic
18	1- Swing 2- Ground 3- Rocker	1- Swing 2- House 3- Rockers	1- I like playing on the swings. 2- We play "horse" with friends. 3- We swing on them, I figure it out because of the mulch.	1-Functional 2- Dramatic 3- Functional
19	1-Rope 2- Rock, water, 3- Ground, grass, tree	1- Rope 2- Stone-lined swale 3- Pathway, Hill	1- Because it is fun. Sometimes we go on the rope. We climb on it. 2- I like playing in the rock area when there is water and when I have boots on. We find worms and we put them in the water and that means that dig and die or live. If they let them be there for a long time, they would die. We just filled up water, then we brought all of them on the sidewalk, and then we put them on the sidewalk to see if the worms are alive. If they wiggle a bit they are alive. 3- I like doing the race and chase friends. We also like to go on the grass. I like the where all the trees the thing behind the grass where the woods are, the thing before that.	1- Functional 2- Exploratory 3- Game with Rules
20	1- Green tube 2- Swings 3- Grass	1- Green tube 2- Swing 3- Hill	1- It is so much fun! We pretend in there. 2- Swing down. 3- I like to run!	1- Dramatic 2- Functional 3- Functional
21	1- Climber 2- Swing 3- Structure	1- Sand 2- Swing 3- Structure	1- I climb on the little sculpture thing and it is so fun getting down. 2- I like swinging because I like swinging back and forth and getting higher. 3- I like swinging down the slide and I also love climbing up that little thing behind it.	1- Functional 2- Functional 3- Functional
22	1- Sand 2- Shelves 3- Green tube	1- Sand 2- Gazebo 3- Green tube	1- I love to dig in the sand box. Sometimes I make a sand castle with wet sands. 2- I play with my friends in the shelves and we hide when we are bats. When we mix the dirt, we pretend to make food. 3- We play "princess" in the tube or imagine being "sharks".	1- Dramatic 2- Dramatic 3-Dramatic
23	1- Rope, shade 2- Structure, bike 3-House	1- Sand 2- Structure 3- House 1	1- I like the ropes. I swing a lot and play there all day long. 2- I like the slide in the Bikes. I like it because it is really fun, and there is a lot of toys, like the rope swings and the bikes. 3- We hide inside the house and plan to fight.	1- Functional 2- Functional 3- Game with rules

Table F.1. Continued.

24	1- Ground	1- House	1- I really like them. I play "Kitty" and "Baby and Mommy."	1- Dramatic
	2- Rocker	2- Rockers	2- We play "Mommy and baby" there where someone will be the baby and	2- Dramatic
	3- Green tube	3- Green tube	another mummy. 3- I try to go inside and run away so they wouldn't get me. I play "princess" and "mummy" there.	3- Game with Rules, Dramatic
25	1-Ball	1- Loop	1- I shoot basketball.	1- Functional
	2- Shelves	2- Gazebo	2- I like to hide in the shelves.	2- Game with Rules
	3-Structure	3- Structure	3- I like going up the structure and looking around.	3- Exploratory

Appendix G: Examples of Children's Drawings



Figure G.1. This drawing shows the stone-lined swale, rockers, and ropes. The drawing is an example of how young children can draw the outdoor map.





Figure G.3. The drawing displays the curve of the pathway that connects different behavior settings. There is a bridge over the stone-lined swale and the child has sketched small details.



Figure G.4. The drawing displays the sand area and the pine tree. This child has imaged an imaginary volcano that he builds with sand, and example of a dramatic play behavior.

## Appendix H: Coded Drawings

Table H.1. The coded elements and behavior settings in drawings based on child's ID number.(N=22)

<b>ID</b>	<b>Manufactured Fixed</b>	<b>Manufactured Loose</b>	<b>Natural Fixed</b>	<b>Natural Loose</b>	<b>Behavior Settings</b>
1	Swing			Grass, sand	Hill, swing, sand
2	Swing		Tree		Woods, swing
4	Swing, bridge, climber		Rock		Stone-lined swale, swing, sand-climber
5	Swing, fence	Tire, bike	Tree		Loop, sand box(2), trail in woods, swing, green patches, camp
7	Bridge, swing, arch, fence		Tree, rock	straw, puddle, grass	Swing, woods, stone-lined swale, hill, pathway, music wall, deck (wood, music 2)
8	Bench, bridge		Rock	Sand	Stone-lined swale, music wall, loop, sand box, pathway, table
9	Bridge, gate (end of pathway)		Tree, rock	Grass, mud	Woods, gazebo, stone-lined swale, pathway
11	Gate	Tire		Grass, sand	Loop, sand box, hill, green patches, camp
12	Swing, rocker, arch, balancing beam, table	Tire (back woods), bike, plate	Tree	Sand, mulch, flower	Swing, sand box, woods, camp, rockers, structure, storage, pathway, green patches, tables
13	Basket ball, shade structure		Tree	Sand, mulch, leaves	Green patches, woods, sand box, side walk (pathway), structure, rockers
14	Swing		Tree	Sand, dirt, log	Sand box, pathway, swing, woods, loop
15	Swing, bridge, rocker, arch (small swing)	Rope (wood), rack	Tree, bush, rock	Grass, sand	Sand box, woods, swings, stone-lined swale, loop, pathway, rope, rockers, storage, deck (manufactured)
16	Swing, arch		Tree	Mulch, flower, sand	Pathway, sand box, loop, swing, gazebo, music wall, rocker, structure, deck
17	Fence (end of pathway)		Tree, bush, rock	Stick, grass	Stone-lined swale, woods, pathway, green patches, deck (woods)

Table H.1. Continued.

18	Fence (on swings, arch), swing, bridge, rockers, arch, sand climber, gate (towards the back woods)	Rope in woods, tire, rope swings	Tree , rocks	Sand, grass, mulch	Sand box, swing, wood, pathway, rockers, music wall, hill, stone-lined swale, gazebo, rope, camp
19	Bridge	Bike	Rock	Mulch, sand	Stone-lined swale, hill, loop, sand box, pathway, structure, rocker
20	Swings, rockers	Bike	Tree	Mulch, sand, grass	Woods, hill, sand box, rockers, green patches, storage, structure
21	Swing, green tube, slide, rocker, climber	Rope swing, bike, tire	Tree , rocks	Sand, stump (dirt), mulch, log	Swing, pathway, sand box, rope swing, woods, green tube, rockers, stone-lined swale, structure, camp, house, deck (music wall), gazebo, loop, trail, green patches
22	Slide		Tree	Mulch, grass, sand	Woods, sand box, structure, rockers
23	Balancing beam, green tube	Tire		Sand	Pathway, sand, music wall, green patches, green tube, camp
24	Swing, climber (climbing wall)		Rock	Mulch, sand	Swing, sand box, pathway, stone-lined swale, loop, structure, rockers
25	Swing, structure		Tree, trunk	Leaves, mulch, sand	Woods, sand box, swing, pathway, structure, music wall, rocker

### Appendix I: Interview Codes Based on Cognitive Play Behaviors

Table I.1. Children's explanation for drawing contents and associated cognitive play behaviors.

<b>I</b>	<b>Children's Explanation</b>	<b>Elements</b>	<b>Behavior Settings</b>	<b>Cognitive Play Behaviors</b>
1	1- Hill: I like running down the hill.	1- No Element	1- Hill	1- Functional
2	1- Ball: I like to kick balls and run around the pathway, and pretend games such as 'Star wars' or 'princesses'. 2- Grass: I like playing princess (boy becomes prince and girl to princess) in the grass. We pretend to have a fancy dress.	1- Ball, No Element 2- No Element	1- Pathway 2- Green patches	1- Functional, dramatic 2- Dramatic
4	1- Structure: I like climbing the structure 2- Swing: I like swinging on the swings.	1- Structure 2- Swing	1- Structure 2- Swing	1- Functional 2- Functional
5	1- The trail in back woods: I play running to find a baby cheetah. 2- House: You have to look for the caves in the back woods; there is just one cave that is really a house. Me and (X) were hammering it we put nails in it. 3- Hill: there is the hill, where we run. 4- Sand box: We make sand castles in the sand box. 5- Mulch: We play mulch fight. You throw mulch at others and try not to get mulch on their eyes. 6- Grass: I grasp the grass. 7- Trees and straw: The other part in the back woods is the straw. We put straws in trees, so the trees become "strawee", so the straw will be all over the trees. I put them on trees. If you put the most straw on the tree you win! 8- Rope swing; on the bike playground. You stand on the bucket and you swing. I like that because it's so fun on it and I like to dance on it. I play dance on the swing. The other swing is on the other playground on the hill.	1- No Element 2- nail 3- No Element 4- Sand 5- Mulch 6- Grass 7- Trees, straw 8- Rope, bucket	1- Trail 2- House (Mixed) 3- Hill 4- Sand 5- Structure, rockers 6- Green patches 7- Trees (back woods) 8- Sand-Rope	1- Dramatic 2- Dramatic 3- Functional 4- Dramatic 5- Game with Rules 6- Functional 7- Game with Rules 8- Functional
7	1- Trees: I just cut them to part and they made us a little trail. 2- The rocks- in the stone-lined swale area: well, we just sometimes walk and sometimes there is water when it rains, it makes puddles. 3- Puddles: Sometimes we scoop the water in it. But yesterday it rained and when we went outside and there was a lot of water. So we scooped them in to	1- Tree 2- Rocks, water 3- water, bucket, worm 4- Rocker 5- Seat swing 6- Bikes	1- Trees, Trail 2- Stone-lined swale 3- Stone-lined swale 4- Rockers 5- Green patches (Bikes) 6- Loop 7- Music wall	1- Constructive 2- Exploratory 3- Exploratory 4- Functional 5- Functional 6- Functional 7- Constructive 8- Functional,

Table I.1. Continued.

	the bucket and put worms in it. But I didn't touch it because I don't like touching the worms. Then we dumped them out so we could see if they would die.	7- Musical elements	8- Pathway	dramatic
4-	Small swings [rocker]: I like playing there because we get to rock.	8- Ball, No Element		
5-	Seat swings in the bikes: it is little. You can only go slowly on it.			
6-	Bikes: I like the bikes better in the bikes playground. This is the path we go on.			
7-	Music Wall: I like to make music where the shade is. Pathway: I like running and kicking ball and play 'princess'.			
8	1- Stone-lined swale: This is the river, where the bath bubble came up! 2- Sand: This is a volcano in the sand box. 3- Sand box, climber: we make poisons with sand; we were putting it on the rooftop. 4- Music wall: you can make music. 5- Pathway: we usually play "star wars".	1- Water 2- Sand 3- Climber 4- Music instrument 5- No Element	1- Stone-lined swale 2- Sand 3- Sand-climber 4- Music Wall 5- Pathway	1- Exploratory 2- Dramatic 3- Dramatic 4- Constructive 5- Dramatic
9	1- Rock: I move rocks around. 2- Hill, tire: I run down this hill and there is a big tire, I pretend to be an animal in the tire. 3- Tree: I like to run in the woods and play "Ninja Turtles".	1- Rock 2- No Element, Tire 3- Tree	1- Stone-lined swale 2- Hill, green patches (Hill) 3- Trees (back woods)	1- Functional 2- Functional, dramatic 3- Dramatic
11	1- Hill: I like running down the hill. 2- Woods: I play 'Ninja' with my friends. I like to pretend to be 'panthers' with my friends. 3- Sand: I like jumping in the sand.	1- No Element 2- Trees 3- Sand	1- Hill 2- Trees 3- Sand	1- Functional 2- Dramatic 3- Functional
12	1- Swings: I swing on them. 2- Tire in back woods: I get inside of it. 3- Bikes: I like to drive them. 4- Sandbox: I make food.	1- Swing 2- Tire 3- Bike 4- Sand	1- Swing 2- Camp 3- Loop 4- Sand	1- Functional 2- Functional 3- Functional 4- Dramatic
13	1- Sand box: I throw the sand around. We make a big mountain, with lava coming out or make sand castles. 2- Basketball: I only play basketball in the "bikes".	1- Sand 2- Basketball	1- Sand 2- Green patches	1- Functional, dramatic 2- Game with rules

Table I.1. Continued.

14	1- Sand box: I just mix stuff and pretend to make cakes and sometimes pretend to make food.	1- Sand	1- Sand	1- Dramatic
		2- Climber	2- Sand-climber	2- Dramatic
	2- Climber: I hide in the sand structure and we play “snowy wolves” where we hide.	3- No Element	3- Stick pile (back woods)	3- Dramatic
				4- Functional
	3- Woods: we usually play in one of the wood houses [stick piles] and you think you are a “kiddy” and you live in the house.	4- Bike	4- Loop	5- Functional
		5- Log	5- Tree	7- Functional
	4- Pathway in the bikes [loop]: we usually don’t play anything there, we just walk on it. We also ride on it. We ride on tricycles	6- Rope	6- Rope (back woods)	
	5- Logs: we trip over the logs			
	6- Rope: In the back woods we usually play rope play.			
15	1- Rocks: I just walk around it. I think it is a brow woods.	1- Rock	1- Stone-lined swale	1- Functional
		2- No Element	2- Pathway	2- Functional
	2- Sidewalk: I just run and walk.	3- Trees, rope	3- Trees	3- Dramatic
	3- Trees: These are the trees out in the woods with lots of branches; where monkeys mostly swing on. This is just the vines. The monkeys just pick on the leaves and if it is a vine and they swing on it. But if it is a heavy branch and it has leaves on it if they can’t go they just pick the leaves on it, if there just the bananas they just pick the bananas and eat them. I try to swing on it with rope to imagine.	4- No Element (back woods)	4- Stage (back woods)	4- Dramatic
		5- Sand	5- Sand	5- Constructive
		6- No Element	6- Hill	6- Game with rule
		7- Bridge	7- Stone-lined swale	7- Functional
		8- No Element	8- Pathway	8- Functional
	4- Stage: I like playing pirate ships at the stage in the woods. We normally play football or soccer over there too.			
	5- Sand box: I just dig and dig in the sand until I get to the bottom.			
	6- Hill: we play football on the grass in the field.			
	7- Bridge: We walk around the bridge.			
8- Pathway: We run along the pathway.				

Table I.1. Continued.

1	1- Tree: I like to feel [touch] the trees. The bugs fell down and we pretended they spread.	1- Tree, bugs	1- Trees	1- Exploratory, dramatic
6	2- Green tube: we play kitty cats.	2- Green tube	2- Green tube	2- Dramatic
	3- Berry: the black ones at the “hills” on the bushes.	3- Bush	3- Green patches (Hills)	3- Exploratory
	4- Tire: we climb over it, and play “boats”.	4- Tire	4- Green patches, camp	4- Dramatic
	5- Swings: I swing on it.	5- Swings	5- Swing	5- Functional
	6- Club house: hill: play ice cream store with plates.	6- Plate	6- House	6- Dramatic
	7- Mulch: pretending the mulch is the castle.	7- Mulch	6- House (manufactured)	7- Dramatic
	8- Music wall: we sing with Ms Pamela sometimes.	8- No Element	7- Structure, Rockers	8- Constructive
	9- Sand, grass: we dig with a shovel and we make a castle. We play together, play hide and seek [with the climber], we make big castles with the sand. We build some things, we build some grass over there, and we build some haze over there. We just dig and build castle and we just put the grass over the castle. We also play ‘mummy’ and ‘daddy’ in the sandbox.	9- Sand, grass, shovel, bush, climber	8- Music wall	9- Constructive, dramatic, game with rules
	10- Rocks: I jump on the rocks. It is called “Jumping house”. We jump from one place and another friend jumps to another place, and the other friend jumps to the “two” place. Then I jump, and other friend jumps to the “three” place.	10- Rocks	9- Sand-climber	10- Game with rules
	11- Gazebo: play animals; we imagine being a “giraffe and poodle”.	11- No Element	10- Stone-lined swale	11- Dramatic
			11- Gazebo	
1	1- Stage in woods, stick: Sometimes we play with sticks and pretend on the stage.	1- Stick	1- Stage	1- Dramatic
7	2- Grass on the hill: we play “swords” with sticks.	2- Grass, stick	2- Hill	2- Dramatic
	3- Trees: I like to play hide and seek in the woods.	3- Trees	3- Trees	3- Game with rules
	4- Hill: I play ‘tag’ over the ‘hill’.	4- No Element	4- Hill	4- Game with rules
1	1- Sandbox: We play ‘forts’ or ‘mermaids’. I like the sand pit. I play with my friends and build whatever we want. I like digging in the sand.	1- Climber, sand	a. Sand-climber, sand	1- Dramatic, Constructive
8	2- Tunnel [green tube]: We play “kitty cats”.	2- Green tube	b. Green tube	2- Dramatic
	3- Shelves: we play “princesses”.	3- Shelves	c. Gazebo	3- Dramatic
	4- Short swings [rocker]: we play “horse”.	4- Rocker	d. Rockers	4- Dramatic
	5- Grass on hill: I roll.	5- No Element	e. Hill	5- Functional
	6- Stage [Music wall]: I play music.	6- Music elements	f. Music wall	6- Constructive
	7- Sidewalk (trail): I like to run on the tracks.	7- No Element	g. Trail	7- Functional
	8- Stage [at back woods]: I run around.	8- No Element	h. Stage (back woods)	8- Functional
	9- Rocks: We play “hop scotch”.	9- Rock	i. Stone-lined swale	9- Game with rule
	10- Bridge: I like where you can walk.	10- Bridge	j. Stone-lined swale	10- Functional

Table I.1. Continued.

19	1- Stage in the woods. We play “boats” where the platform is. 2- Hill: These are people running down the hill.	1- No Element 2- No Element	1- Stage (back woods) 3- Hill	1- Dramatic 2- Functional
20	1- Sand, climber: I climb. Make sand castles. 2- Slide: I slide down. I like to slide down because it’s fun. 3- Trees: shake them. 4- Tire: I go in it, or around it and sing. I also go inside and hide. 5- Swing: I like swinging on them.	1- Climber, sand 2- Structure 3- Trees 4- Tire 5- Swing	1- Sand-climber, sand 2- Structure 3- Trees 4- Green patches, camp 5- Swing	1- Functional, Dramatic 2- Functional 3- Functional 4- Constructive 5- Functional
21	1- Sand box: I like to play “sand wolves” and “sand snow”, and “sand sisters”. What I like about is because you get to do whatever you want. I pretend soft snails. We pretend to be soft and we have to live in soft otherwise we will die. We make sand castle. 2- Pathway on the hill: I like to run up and down it and have races. sometimes I run on the pathway and pretend to be a snail, and I also pretend that I am a fast ‘fairy’ when I go over the concrete. 3- Rocks in the stone-lined swale: I like to play, jump over the rocks. It’s where you jump on to rocks and try to miss a few of them. You actually try to jump from this and to all the way to a different one without touching that one, and then you jump over that one, trying to land on that one. I actually pick them up sometimes and I flip them over. You have to keep flipping it and see how much times you do it. If you get a really high one you win. 4- Rope swings in woods: I like to play on the swing because I like to swing on it. 5- Log: I like to jump on to the swing from the logs and swing off of it and do a back flip. That’s a game. I do it by myself 6- Swings: I like to do back flips and I like to do four doors on them too. 7- Tire: I like hide and play hide and go seek. 8- Scooters: on the bikes I like the scooters because I like riding on them. Because they go super fast! 9- Mulch: on the little mulch I like play on the swings. I like to play “catch the mulch”. It’s where you get a certain amount of mulch and see who has got the most.	1- Sand 2- No Element 3- Rock 4- Rope 5- Log 6- Swing 7- Tire 8- Bike 9- Mulch 10- Structure 11- Green tube 12- Trees 13- Stick 14- Tire 15- Rocker 16- Shelves	1- Sand 2- Pathway 3- Stone-lined swale 4- Rope (Woods) 5- Trees 6- Swing 7- Camp, green patches 8- Loop 9- Structure 10- Structure 11- Green tube 12- Trees 13- Trees, camp 14- Structure 15- Rockers 16- Gazebo	1- Dramatic 2- Game with rules, dramatic 3- Game with rules 4- Functional 5- Functional 6- Functional 7- Game with rules 8- Functional 9- Game with rules 10- Functional 11- Dramatic, functional 12- Game with rules 13- Constructive, dramatic 14- Game with rules, functional 15- Dramatic 16- Dramatic

Table I.1. Continued.

	10- Structure: I like to swing from here and then slide all the way down. I like to go all the way up. sometimes I really like sliding down it and you know what I do sometimes? I climb it up sometime and I slide back down!			
	11- Green tube: I like to play “kittens” (back woods). I like to play kittens because you do whatever you want besides purring. But you are not allowed to purr. I climb on it sometimes and sometimes I’m in it.			
	12- Trees: I like to play “climb it”, and then you have to climb a tree (back woods).			
	13- Stick: I like to pick up sticks and play with them. I throw them and sometimes I scrape shells with them. We pretend fire with sticks.			
	14- Tire: I love the tire. I get in it and I hide under it and when my daddy comes. Do you know what he says? Where is X? She is not here. I guess her mommy already picked her up. Do you know what else I do? I surprise them! I also like to play jump over where I have to jump over it, it is a little hard.			
	15- Short swings [rocker]: I like to play “sick fairy”. Someone has to be the good fairy and the other one gets sick. Stage [Gazebo]: Sometimes we play ‘fruit bats’. You hide from you people and when you see them you make a loud sound as a bat, and then you run away.			
22	1- Trees: I love to take the bark off the trees. Because sometimes we use the bark to make something, and we crack the bark on the soft place and we pull it off. Some of them are very sharp so it might cut our fingers. 2- Mulch: we throw mulch and drop it down the slide, and by the staircase [of the structure]. We like to play with the mulch. We fall on the mulch sometimes, but even it is softer than the grass, but we don’t know why. 3- Grass: we play on the grass. Sometimes we roll on the grass, but the grass is so soft. Sometimes we dig in the grass, and sometimes we pull the grass. Sometimes we pull the grass so we can make ‘stew’. 4- Sand box: my friends and I collect sand and pretend	1- Tree 2- Mulch 3- Grass 4- Sand 5- Structure	1- Tree 2- Structure 3- Hill, green patches 4- Sand 5- Structure	1- Constructive 2- Exploratory, Functional 3- Functional, Constructive, dramatic 4- Dramatic 5- Game with rules

Table I.1. Continued.

	it is pixy dust; some type of sprinkles that you think it is sprinkles that you use to make cake or cup cake.			
	5- Slide: we all slide, sometimes people hold on to each other and chain down the slide and say 'whee'. They slide in the air before they run.			
23	1- Music wall: because I like to play with X, and follow him, and hide. 2- Green tube: cause its fun. We play "who is the lion?" 3- Pathway: I always play with the path and I always go there and run.	1- No Element 2- Green tube 3- No Element	1- Music Wall 2- Green tube 3- Pathway	1- Game with rules 2- Dramatic 3- Functional
25	1- Trees: I like to play with the branches and shake them [sticks]. I like to run fast in the woods and jump. 2- Stage [music wall]: I like to make noises in the stage. I like the music parts and I sit where the music is. 3- Sandbox: I like to play in the sandbox and make cakes, sand pies, and pancakes. 4- House: We play 'super heroes'. We go inside the house and I pretend to the 'Iron man'.	1- Tree 2- Music instrument 3- Sand 4- No Element	1- Trees 2- Music wall 3- Sand 4- House	1- Functional 2- Constructive 3- Dramatic 4- Dramatic