ABC OF GREEN DESIGN: EXPLORING THE INFLUENCE OF PARENTS' PRO-ENVIRONMENTAL VALUES, BELIEFS, BEHAVIORS, AND KNOWLEDGE ON THEIR PREFERENCES RELATED TO GREEN CHILDCARE DESIGN

By

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To my children, my husband, and all those
who contributed their support to me

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LIST OF ABBREVIATIONS

AC	Adverse consequences
AR	Ascription of responsibility
CMU	Concrete masonry unit
EHCC	Eco-healthy childcare
ESB	Environmentally significant behavior
ETS	Environmental tobacco smoke
HVAC	Heating, ventilation, and air-conditioning system
LEED	Leadership in Energy and Environmental Design
NAEYC	National Association for Education of Young Children
NEP	New environmental paradigm
NHSPS	National Health and Safety Performance Standards
OEC	Oregon Environmental Council
URL	Uniform resource locator
USDA	United States Department of Agriculture
USGBC	United States Green Building Council
VBN	Value-Belief-Norm theory
VCT	Vinyl composite tile
VOCs	Volatile organic compounds

Abstract of Thesis Presented to the Graduate School
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Green design is becoming increasingly popular in many sectors. One of the fastest growing service sectors in the United States today is childcare. Although green design and childcare should create the ultimate brace, they rarely merge in contemporary research and practice.

Literature signals green design as crucial for healthy and safe environments, and the first years of children's lives as critical for their learning and proper neurological and social development. Some argue that the presence of green design in childcare is the most engaging way for children to learn about sustainability. However, green design is not the standard nor is it included among essential childcare quality variables. Why is there only a vague interest in green childcare design if its positive impact is apparent? Research identifies parents as ineffective evaluators of childcare quality, lacking the necessary appraisal knowledge and tending to evaluate childcare quality based on their own needs and preferences. This study thus has a twofold purpose: (1) to investigate parents' pro-environmental knowledge, values, beliefs, and behaviors and (2) to analyze

the influence of these variables on parents' preferences related to green childcare design.

The study explored these questions using two protocol-driven, sequential, self-administered electronic questionnaires with closed and open-ended questions. Framework for both instruments was derived from LEED assessment tools and Value-Belief-Norm theory, both adapted to address existing conditions of the two study sites. The study sample consisted of parents who utilize childcare services of two campus based child development and research centers located at the University of Florida.

As a statistical treatment, the study used ordinary least squares method, which modeled a relationship between one dependent and three factored independent variables, with the help of control variables. Results determined that parents' pro-environmental values, beliefs, behaviors, and knowledge positively influence their preferences. Findings suggested combined family income and education level as the demographic variables having the strongest effect on parents' green design preferences, and higher levels of education inversely related to greater green design preference. Although parents' pro-environmental behaviors and knowledge displayed as essential, it was their pro-environmental values and beliefs that tested as the largest influence on their preferences.

The study findings substantiated the importance of parents' general understanding of green design for their children's healthy and safe development. The study proposes further research in green childcare design and continuous environmental education of all design stakeholders in order to increase awareness at to the benefits of green design.

CHAPTER 1
INTRODUCTION

> We do not inherit the Earth from our ancestors; we borrow it from our children.
>
> -Unknown

Green. Pro-environmental. Sustainable. These words represent very recent, even fashionable, and widespread concepts that are applied to our existence in multiple ways. Although each of the three adjectives has its own meaning and purpose, they are often misguidedly interchanged with each other. Green, also called ecological, is a way of thinking and making decisions with environmental attributes as primary objectives, considering performance, quality, functionality, economics, and health benefits (Boise, 2010). Green is often connected with commercial products, architecture, and design. Pro-environmental, or environmentally significant, applies to human values, beliefs, behaviors, attitudes, and norms which ultimately have a positive influence on the environment. Sustainable encompasses both previous terms and even extends beyond them to include: economic viability, environmental health, and social responsibility (Boise, 2010; Winchip, 2007). Green, pro-environmental, and sustainable as theoretical terms translate into practical concepts that play important roles in formation of contemporary guidelines for many sectors and services, including childcare.

The beginning of sustainable development initiatives is credited to the World Commission on Environment and Development and its 1987 Brundtland Report, originally entitled *Our Common Future* (Winchip, 2007). As a result, long-term environmental strategies have become important to many industrialized nations and such issues have dominated the agenda on multiple international forums.

The education arena is considered a major contributor to and initiator of sustainable development because education empowers individuals to become active participants in the transformation of their societies. Learning focuses on the principles, attitudes and behaviors that enable children and adults alike to learn to live together in a world distinguished by diversity and pluralism (UNESCO, 2009). However, a generation after the Report was published, the human race still does not know how to "meet the needs of the present without compromising the ability of future generations to meet their own needs" [1] (WCED, 1987).

Durrett and Torelli (2009) define sustainability as "the art and science of leaving for future generations," which means understanding and respecting Earth's limited natural resources. According to the authors, there is no better place to employ the philosophy of sustainability and green design than in childcare facilities. Many studies identified the first years of children's lives as critical for their neurological development, language development, attention span, social skills, and problem-solving capabilities (Butin, 2000; Fontaine et al., 2006). Exposing children at this stage to the ideas of sustainability and green design practices could be the most artful and scientific way of leaving for future generations because everything children learn at a young age effects their behaviors as they grow.

Although sustainability has been identified as holding potential, childcare facilities' primary concerns are children's health and safety practices along with educational and developmental services. The former are described in the National

[1] This is the definition of sustainable development that has been accepted and preferred by most participants of sustainability and green design movement. The Brundtland Report created a framework for protecting Earth's ecosystems while considering social justice and economic concerns (Edwards, 2005).

Health and Safety Performance Standards (NHSPS), which are predominantly derived from pedagogical curricula. These guidelines cover nine areas of childcare facility operations and include: (1) Staffing, (2) Program activities for healthy development, (3) Health promotion and protection, (4) Nutrition and food service, (5) Facilities, supplies, equipment, and transportation, (6) Infectious diseases, (7) Children who are eligible for services under IDEA, (8) Administration, and (9) Licensing and community action (American Academy of Pediatrics, 2002; NRCKIDS, 2002)). Educational and developmental services are primarily promoted by The National Association for the Education of Young Children (NAEYC). It is the nation's largest organization dedicated to improving the well-being of children by setting research standards and providing resources to enhance early childhood program quality, improve the professional growth and working conditions of program staff, and to help families learn about and understand the need for high quality early childhood education (NAYEC, 2010).

Both prime sources—NAYEC and NHSPS—pledge childcare quality and are widely accepted and followed. Nonetheless, more than 40% of current childcare centers have poor performance and only one in seven of the centers provides good quality care for children overall (Butin, 2000). More than two decades of research in early childhood education confirms the need for more rigorous studies concentrating on other factors besides educational program quality. There is a strong belief among some researchers that the program quality itself may not be the most important determinant of children's general well-being (Love, Schochet, & Meckstroth, 1996).

According to Olds (2001), lack of consumers' (parents') demands for excellence is among the main issues that prevent sustainable, quality childcare. The quality of

childcare centers is a relative concept because of on-going societal changes. It is a growing political, educational, and social concern that deserves our full attention and constant updates (Butin, 2000).

A challenge to twenty-first-century education lies in the interconnectedness of previously applied but improved health and safety standards and educational and developmental services with new trends in sustainable development and green design. Yet, the paybacks of green schools go beyond the energy savings in comparison to conventionally designed schools (Kats, 2006).

In the United States (U.S.), more than 55 million students and more than five million teachers and staff spend hours in poorly designed buildings that have health and environment related consequences. Therefore, it is no longer a question of whether sustainability and green design are essential for people, the economy, and the environment (Ford, 2007). The question we should be asking is why is there only a vague interest in green childcare design from all the stakeholders (including designers, teachers, parents, and the government) if the negative impact of unsustainable design is apparent?

Purpose of the Study

The purpose of this study is to investigate the under-studied and under-researched concept of green design in childcare centers. This study considers green design as an important factor that influences children's overall well-being and development. Research substantiates the critical role of parents as informal monitors of childcare quality; these studies typically focus on factors such as location, cost, and educational curricula but have not investigated the impact of green design (Fontaine et al., 2006; Helburn et al., 1995). This study explores parents' inclination to green design

as a factor for quality childcare by assessing the extent to which parents' preferences related to green childcare design transmits their pro-environmental knowledge, values, beliefs, and behaviors.

Assumptions

This study entails several assumptions. First, parents as major consumers of childcare services are the main focus of the study. Second, the study aims to investigate and analyze the influence of parents' pro-environmental knowledge, values, beliefs, and behaviors on their preferences related to green childcare design. Any other knowledge, values, beliefs, and behaviors held by parents are not a direct part of this study and do not impact the findings.

Significance of the Study

In the past, childcare has predominantly been viewed as a domestic responsibility rather than parental choice of institutional care. Societal changes and the technological revolution have created a growing need for care of preschool children (Olds, 2001). Today, childcare is more of a necessity than a choice. More than 30% of children under the age of three and more than 50% of children between the ages three and five spend some part of their day in childcare facilities (Butin, 2000).

According to statistics, children attending childcare spend an average of ten hours of every day inside, often within one room (Olds, 2001). Although many studies show positive long-term developmental benefits of attending a preschool at an early age (Reynolds, Temple, Robertson, & Mann, 2001), strong evidence is building against the physical environment of childcare settings and their negative influences on children's health, learning, and development (Boise, 2010). Simple things such as toys, carpets,

furniture, and air expose children to chemicals and other contaminants that may have a serious impact on their overall well-being (Boise, 2010).

Parents, as decisive consumers of childcare services, are considered unsuccessful evaluators of childcare quality (Olds, 2001). Facilities that get poor or mediocre ratings from trained observers tend to receive very good scores from 90 of parents (Olds, 2001). It appears parents do not have sufficient information or the knowledge necessary to assess the level of quality and recognize its necessary components (Helburn et al., 1995; Olds, 2001). In most cases, parents relate childcare quality only to those aspects of care they can recognize, monitor, and value themselves, such as childcare cost and location (Helburn et al., 1995).

Although the ‘green boom’ enjoys popularity among customers in many sectors, it does not seem to be the case when it comes to childcare services. In order to create sustainable high quality learning environments for preschool children, it is essential first, to understand parents’ knowledge and attitudes about the status and effects of green design and then, to investigate and evaluate parents’ preferences related to green design in childcare facilities. Additionally, it is important to assess the level of influence parents’ pro-environmental knowledge and attitudes have on their green design preferences.

Research Question and Hypothesis

The main research question this study attempts to answer is: *What is the influence of parents’ pro-environmental knowledge, values, beliefs, and behaviors on their preferences related to green childcare design?* Hence, the study tests the hypothesis that various levels of pro-environmental values, beliefs, behaviors, and knowledge lead parents to various preferences of green design for their children. *The more the parents*

know about green design and its benefits and the stronger their pro-environmental attitudes are, the more likely they are to desire and prefer green childcare options. Should the findings be significant and preferences for green childcare practices start growing, this study can be the first step in further discussion and new research topics in the childcare innovative architecture and green design areas.

Definitions

Terms used in this study that require clarification are: (1) sustainability – maintaining the quality of resources assuming economic viability, environmental health, and community responsibility (Boise, 2010), (2) green design – safe, sustainable, and functional design which uses environmentally friendly products and practices (Boise, 2010), (3) pro-environmental – having a positive environmental impact or meaning, (4) values – ideals of an individual, group, or society (Bechtel, 1997), (5) beliefs – confidence in existence of something (Bechtel, 1997), (6) childcare center - a facility that provides care and education to any number of children in a nonresidential setting, or 13 or more children in any setting, if the facility is open on a regular basis and care is provided for some children for more than 30 days per year per child (depending on the literature type, the term varies and might be interchanged for preschool, daycare, or kindergarten) (American Academy of Pediatrics, 2002), (7) green school – educational building that employs green design strategies such as abundant natural daylight, outdoor views, high indoor air quality, good acoustics, and a comfortable temperature (LPA, 2009).

Summary

Although green design is becoming increasingly popular and childcare services are seen as a necessity for parents and children alike, these two topics rarely merge in

contemporary research. Early childhood studies focus on the importance of education on children's learning and development; research substantiates the importance of quality childcare for positive educational outcomes. Green architecture explorations validate the importance of the environment for occupants' health and safety. Therefore, the intention of this study is to provide a starting point for discussion and future research focusing on the green design of childcare facilities.

CHAPTER 2
LITERATURE REVIEW

That which is not good for the beehive cannot be good for the bees.

-Marcus Aurelius

This chapter presents a literature review pertaining to the purpose of the study. The first part of the chapter reviews the general information about childcare and childcare quality concepts together with childcare educational and architectural trends. The second part of the review identifies current green design practices in the U.S. educational sector and illustrates the major features and differences between conventional, green (LEED certified), and eco-healthy childcare centers. Finally, the chapter explains pro-environmental (environmentally significant) behaviors and corresponding value-belief-norm theory.

Concepts and Factors of Childcare Quality

Necessity vs. Significance

Nationwide, more than 60% of children under the age of five and over 40% of infants are enrolled in childcare for more than 30 hours a week (Fontaine et al., 2006). Starting at three weeks of age and before reaching the age of five, a child may have spent more than twelve thousand hours in a childcare center (Olds, 2001). Olds (2001) and Helburn et al. (1995) assume that childcare in the U. S. is a necessity which allows parents to have income opportunities and helps families to survive. Bredekamp & Copple (1997) state that increased demand for childcare services is due to the increased recognition of the importance of learning in the earliest years of life. Research shows that children's experiences during early childhood influence their later functioning in school and have effects throughout life (Bredekamp & Copple, 1997).

Butin (2000) argues that scientific research substantiates the critical role of the environment for optimal neurological development in early years. Fontaine et al. (2004) state that by the age of three, the child's brain reaches 90% of its full potential. This suggests that children learn the most at early stages of their development. However, many children for one reason or another are not able to reach their potential. According to Croan et al. (2000), 31% of childcare students have at least one health or physical challenge, 20% lag behind in cognitive development, and a little over 30% are behind in social and emotional development. These figures partially result from poor childcare quality that undoubtedly, among other factors, is influenced by building design and performance (Croan et al., 2000; Fontaine et al. 2006).

Quality

Moss (1994) defines quality as a dynamic and relative concept based on general values, beliefs, and preferences. Love, Schochet, and Meckstroth (1996) claim that quality childcare involves environmental and experiential features that contribute to children's overall comfort. However, no clear consensus exists on how to categorize the large number of environmental variables that bear upon childcare quality (Love, Schochet, & Meckstroth, 1996). Establishing quality definitions and characterizing decisive quality variables is an extensive process that has to be constantly monitored and redefined according to changing societal needs. The process should involve a range of stakeholders, with parents among the most important ones because they directly represent children's needs (Moss, 1994).

According to Helburn et al. (1995) the list of variables that influence childcare quality can be endless but the most common factors include: state and profit sector, teacher characteristics, wages of teaching staff, adult-child ratio (classroom structure),

total number of enrolled children (center structure), administrator characteristics, public support, and costs and fees. However, the authors claim that the single most important factor determining childcare quality is the classroom structure (Helburn et. al, 1995). In contrast, Fontaine et al. (2006), who based their study of quality in early care and learning environments on The Early Childhood Environment Rating Scale instrument, considered the following variables as most influential: space and furnishings, personal care routines, language-reasoning, activities, interaction, and program structure. Nevertheless, in both studies, it is evident that none of the variables can be directly influenced and decided upon by parents. Additionally, no up-to-date research includes green design as one of the influential variables.

Parents commonly thought of as caring the most about the quality of their children's care facility are considered ineffective evaluators of quality (Olds, 2001). The conditions that affect parents' choice of childcare centers are the facility location, parents' income, and their ability to acquire the information essential to make a good choice and to monitor the quality of childcare services (Helburn et al., 1995). Moreover, parents tend to evaluate childcare quality based on their own needs and preferences which, many times, are not those that mirror prescribed childcare quality requirements (Helburn et al., 1995).

Bredekamp and Copple (1997) imply that the potential benefits of quality childcare are well documented but they are not the norm—only 15% of childcare programs provide care that supports children's health and social and cognitive development. To support such an argument, Olds (2001) cites a study which concludes that 40% of

childcare centers provide inadequate quality due to, among other issues, safety hazards and poor equipment.

As research continues to redefine childcare quality and to stress the importance of first years of children's lives, it is crucial to realize that childcare design is an important component of quality care (Butin, 2000). Dudek and Baumann (2007) as well as Kopec (2009) agree that a pedagogical vision is fundamental for a successful school design but so are children's needs and parent's perspectives. However, the inclusion of green design as a contributor to healthy and safe learning environments seems to be limited by, among other factors, parents' perspectives and low demand.

Spatial Layout

As Kopec (2009) points out children have unique physical and biological characteristics which make them vulnerable to environmental hazards that are present in many of the childcare buildings. Butin (2000), in addition, considers childcare facility design a crucial constituent. According to Johnson et al. (1998) adequate spatial zoning and materials within the spaces for children can encourage their proper behavior and have an influence on learning and development.

Green Design

Kopec (2009) agrees that proper layout is important for achieving a safe, healthy and enjoyable educational environment but he underlines the importance of such environmental factors such as proper ventilation, daylight and views, access to fresh air, minimal level of indoor pollutants, thermal comfort, green materials, and cleanliness. Currently, only a miniscule portion of literature and research concentrates on green childcare design and its influence on children's health, safety, learning and development. However, a considerably larger amount of literature focuses on the use of

green design in primary, secondary, and higher education facilities which, instead of discouragement, may serve as an inspiration.

Ford (2007) emphasizes the benefits of green schools—children are healthier and more productive, buildings have superior indoor air quality and thermal comfort and therefore expose children to fewer chemicals and environmental toxins. In addition, such buildings serve as living laboratories to engage children in science, art and environmental stewardship. Day and Midbjer (2007) add that the presence of green design practices in childcare environments is the most engaging way for children to learn about sustainability. Although the firm LPA (2009) argues that public awareness of green buildings has dramatically increased and as a result has positively influenced the architectural approach to sustainability in recent years, the number of green childcare facilities is still less than satisfactory (see Figure 2-1 LEED certified buildings).

Childcare Trends

Conventional Childcare

Since Homer's time, Athenians believed that children were their future on both, the familial and the community levels (Lascarides & Hinitz, 2000). Already Plato saw a connection between the way children played and the way they thought and acted in their adulthood. He proposed the first type of childcare, a village temple, where children's development and behaviors were closely monitored by nurses (Lascarides & Hinitz, 2000).

Today, childcare is one of the fastest growing professions due to high demand from working parents (Olds, 2001). Childcare centers can be established as private for profit, private nonprofit, public, or mixture of these categories (Helburn et. al, 1995). Helburn et al. (1995) believe that the type of ownership can affect the objectives of

childcare and subsequently its quality and parents' satisfaction. According to Olds (2001), the majority of over 100,000 existing centers were created under tight budgets and time frames in such spaces as churches, basements, and supermarkets. Only a few of these centers operate on the premise that children and parents are the real clients and consumers of childcare services. Further, even fewer of the centers realize the importance of the environment for children's health, safety, learning, and development (Olds, 2001).

Olds (2001) states that researchers consider the first three to five years of children's lives crucial for foundation of their personalities, belief systems, and ways of perceiving the world. Additionally, the author writes that the design of a center is an important factor that can promote or hinder contact between the child and his caregiver. Therefore, designing environments that encourage movement, support comfort, foster competence, and promote sense of control should be the required necessity of all childcare centers (Olds, 2001). According to Dudek (2007), contemporary schools are built from a variety of floor plans with ideas that promote and integrate the use of technology, break-out spaces and project rooms, specialized learning environments, and multi-functional spaces. Childcare design, however, is many times unnecessarily strictly codified by room schedule, rules, and regulations (Dudek & Baumann, 2007).

Contrary to adults who access their world through verbal and written communication, children explore their surroundings through physical, emotional, and aesthetic self-expression (Dudek, 1996). Therefore, design of the childcare center, including the division of its spaces and the form in which they are offered to children are

among the most important criteria of successful, sustainable, and green childcare facilities (Dudek, 1996; Olds, 2001).

Green Childcare and Leadership in Energy and Environmental Design

In the U.S., the United States Green Building Council (USGBC) is considered a leader in green design and sustainability development. The USGBC created a Leadership in Energy and Environmental Design (LEED) rating system that measures buildings' environmental performance.[1] Even though the USGBC is committed to green design in educational buildings, according to their 2009 statistics only 5,090 educational buildings out of over 49,600 registered projects hold one of four LEED certifications and merely 1.72% of all certified buildings represents childcare facilities (see Figure 2-1).

According to USGBC, its Education Sector is driven by the *Green Campus Campaign* and the *Green Schools Campaign*. Both initiatives aid in development of tools and resources specific for K-12 schools and higher education facilities, and assist their members in sustainability and green design goals achievement. These sources provide an introduction to LEED rating system and variety of green building project profiles that hold a LEED certification. Currently, there is not a specific rating system for childcare facilities. For the purposes of this study, however, two LEED documents play an important role: (1) LEED 2009 for Schools New Construction and Major Renovations (LEED for Schools) and (2) LEED 2009 for Existing Buildings Operations and Maintenance (LEED EB).

[1] The USGBC is a committee-based, member-driven, and consensus-focused not for profit organization. Through LEED green building certification program, which is a standard for sustainable buildings across the U.S., the USGBC transforms the built environment. The LEED rating system provides definitive standards of green building design, construction, planning, and performance. The LEED evaluations are designed for rating new and existing commercial, institutional, and residential buildings on four levels: certified, silver, gold, and platinum.

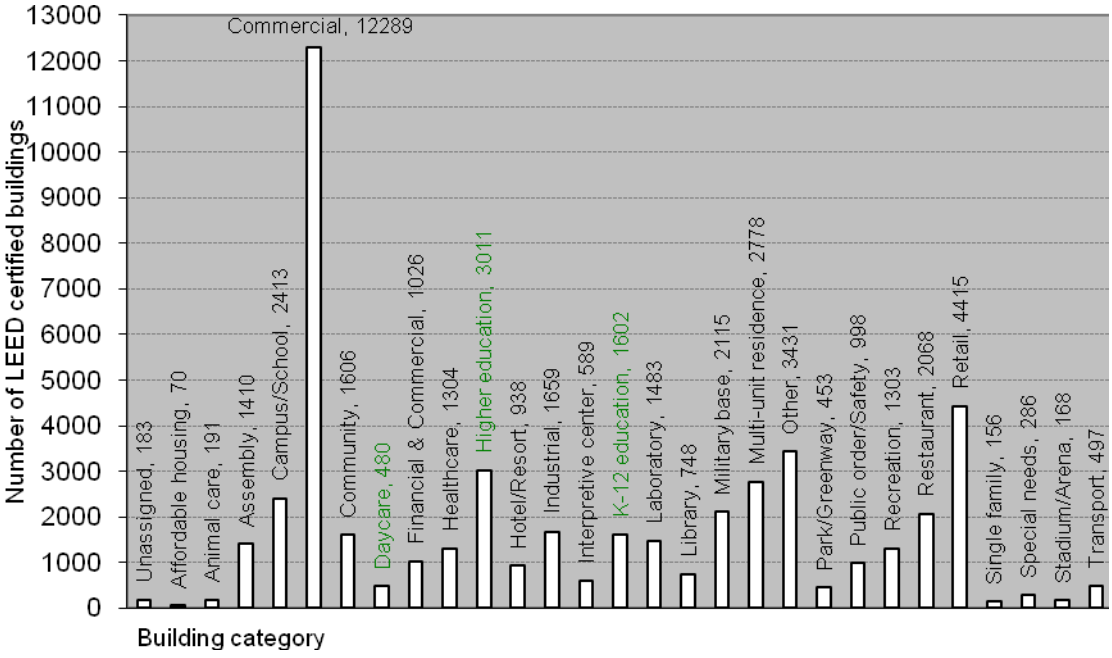

Figure 2-1. LEED certified buildings. The bar graph illustrates category and number of LEED certified buildings in the U. S. (USGBC, 2009).

Each rating system is divided into five environmental categories: (1) Sustainable sites, (2) Water efficiency, (3) Energy and atmosphere, (4) Materials and resources, (5) Indoor environmental quality, and one additional category (6) Innovation in design and operations. LEED EB and all new versions of LEED rating systems (called v3) add the category Regional priority credits (see Figure 2-2). LEED for Schools addresses design and construction of new school buildings and major renovations of existing school buildings. It tackles issues such as master planning, class acoustics, mold prevention and environmental site assessment (USGBC, 2010). Whenever a project does not involve significant design and construction activities and focuses more on operation and maintenance activities, LEED EB is more appropriate (LEED for Schools, 2009). LEED EB evaluates the sustainability of ongoing operations in existing buildings and provides

the school with a report of the building's performance, operation and maintenance policies, and green design update (USGBC, 2010). While the underlying principle is the same in both documents, each rating system includes specific matters that can serve as a frame of reference for the study's survey instrument. Therefore a careful selection of criteria extracted from both rating systems can be used for understanding green design trends that can be applied in new or existing childcare facilities (see Table 2-1). The following section summarizes six LEED categories that presented as crucial for the purpose of this study.

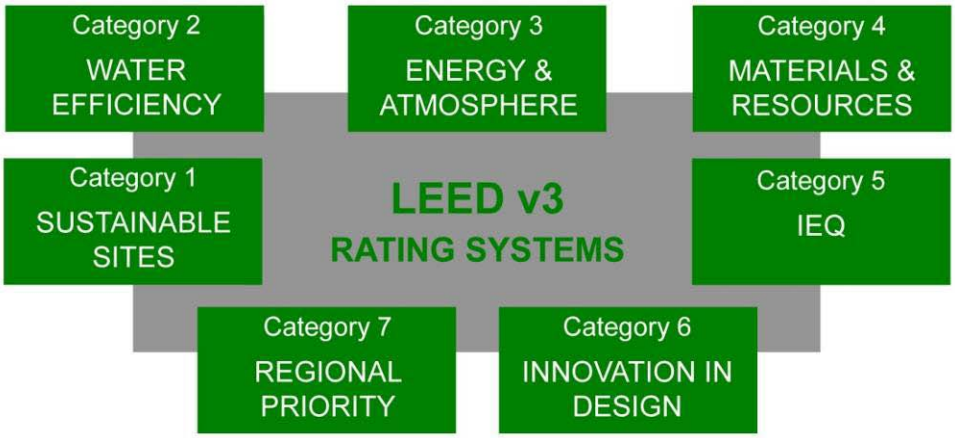

Figure 2-2. LEED v3 rating systems - general distribution of categories.

Sustainable sites.

This category highlights the importance of site selection, stormwater management, heat island effect reduction, and alternative transportation. Each building should be designed at minimal footprint to maximize surrounding open space and minimize disruptions to existing ecosystems. Site development should include all potential expansions and building design should consider additional community needs. During the design phase of the project, it is important to develop an erosion and

sedimentation plan that would maintain natural stormwater flows by promoting infiltration. Existing buildings can improve their sites by reducing or replacing of concrete surfaces and landscaping techniques that reduce heat absorption of exterior materials and require little maintenance. Buildings should be located near mass transit and have minimum size parking lot with alternative fuel stations. The school curricula should support bicycling and the facility should provide bicycle racks and shower and changing facilities (LEED EB, 2009; LEED for Schools, 2009).

Water efficiency.

The second category emphasizes minimal indoor plumbing fixtures and fitting efficiency, water efficient landscaping, and cooling tower water management. Potential strategies include usage of automatic water control systems, mainly water meters on visible places and water-conserving plumbing fixtures such as low-flow toilets, aerators, and shower timers. Both strategies, which can be controlled by all users, strengthen their environmental consciousness and might serve as powerful educational tools for children. School facilities should implement high-efficiency irrigation technologies, water-efficient and climate-tolerant native or adapted landscaping, and alternative water sources such as rainwater, stormwater, and air conditioner condensate. Special water management strategy should address the appropriate chemical treatment of water (LEED EB, 2009; LEED for Schools, 2009).

Energy and atmosphere.

Some of the major intentions of this category are to enhance commissioning and management, to optimize energy efficiency performance, to measure performance, and to create on-site renewable energy sources. Early in the design process, commissioning authority personnel should be designated to lead and

Table 2-1. LEED for Schools vs. LEED EB – comparison of credits (Cr.) and prerequisites (Pr.). Based on and retrieved from www.usgbc.org on May 16, 2010.

	LEED 2009 for Schools New Construction and Major Renovation	LEED 2009 for Existing Buildings: Operations and Maintenance
	Category 1: Sustainable sites	
Pr. 1	Construction activity pollution prevention	N/A
Pr. 2	Environmental Site Assessment	N/A
Cr. 1	Site selection	LEED certified design & construction
Cr. 2	Development density & community connectivity	Building exterior hardscape management
Cr. 3	Brownfield redevelopment	Integ. pest mngmnt., erosion control, & landscape mngmnt.
Cr. 4	Alternative transportation	Alternative commuting transportation
Cr. 5	Site development	Site development
Cr. 6	Stormwater design	Stormwater quality control
Cr. 7	Heat island effect	Heat island reduction
Cr. 8	Light pollution reduction	Light pollution reduction
Cr. 9	Site master plan	N/A
Cr.10	Joint use of facilities	N/A
	Category 2: Water efficiency	
Pr. 1	Water use reduction – 20% reduction	Minimum indoor plumbing fixture & fitting efficiency
Cr. 1	Water efficient landscaping	Water performance measurement
Cr. 2	Innovative wastewater technologies	Additional indoor plumbing fixture & fitting efficiency
Cr. 3	Water use reduction/process water use reduction	Water efficient landscaping – reduce by 50%-100%
Cr. 4	N/A	Cooling tower water management
	Category 3: Energy & atmosphere	
Pr. 1	Fund. commissioning of building energy systems	Energy efficiency best management practices
Pr. 2	Minimum energy performance	Minimum energy efficiency performance
Pr. 3	Fundamental refrigerant management	Fundamental refrigerant management
Cr. 1	Optimize energy performance	Optimize energy efficiency performance
Cr. 2	On-site renewable energy	Existing building commissioning
Cr. 3	Enhanced commissioning	Performance measurement
Cr. 4	Enhanced refrigerant management	On-site and off-site renewable energy
Cr. 5	Measurement & verification	Enhanced refrigerant management
Cr. 6	Green power	Emissions reduction reporting
	Category 4: Materials and resources	
Pr. 1	Storage & collection of recyclables	Sustainable purchasing policy
Pr. 2	N/A	Solid waste management policy
Cr. 1	Building reuse	Sustainable purchasing – ongoing consumables
Cr. 2	Construction waste management	Sustainable purchasing – durable goods
Cr. 3	Materials reuse	Sustainable purchasing – facility alterations & additions
Cr. 4	Recycled content	Sustainable purchasing – reduced mercury in lamps
Cr. 5	Regional materials	Sustainable purchasing – food
Cr. 6	Rapidly renewable materials	Solid waste management – waste stream audit
Cr. 7	Certified wood	Solid waste management – ongoing consumables
Cr. 8	N/A	Solid waste management – durable goods
Cr. 9	N/A	Solid waste management – facility alterations & additions

Table 2-1. Continued

	LEED 2009 for Schools New Construction and Major Renovation	LEED 2009 for Existing Buildings: Operations and Maintenance
	Category 5: Indoor environmental quality	
Pr. 1	Minimum indoor air quality (IAQ) performance	Minimum IAQ performance
Pr. 2	Environmental tobacco smoke (ETS) control	ETS control
Pr. 3	Minimum acoustical performance	Green cleaning policy
Cr. 1	Outdoor air delivery monitoring	IAQ best management practices
Cr. 2	Increased ventilation	Occupant comfort
Cr. 3	Construction IAQ management plan	Green cleaning
Cr. 4	Low-emitting materials	N/A
Cr. 5	Indoor chemical and pollutant source control	N/A
Cr. 6	Controllability of systems	N/A
Cr. 7	Thermal comfort	N/A
Cr. 8	Daylight and views	N/A
Cr. 9	Enhanced acoustical performance	N/A
Cr.10	Mold prevention	N/A
	Category 6: Innovation and design process/ Innovation in operations	
Cr. 1	Innovation in Design	Innovation in operations
Cr. 2	LEED accredited professional	LEED accredited professional
Cr. 3	The school as a teaching tool	Documenting sustainable building cost impacts
	Category 7: Regional priority credits	
Cr. 1	Regional priority – specific credit	Regional priority – specific credit

overview the commissioning process activities. Building envelope and systems should be designed to meet baseline requirements and to reduce stratospheric ozone depletion which can be achieved by zero use of chlorofluorocarbon-based refrigerants. To increase energy performance and to decrease environmental and economic impacts associated with excessive energy use, the facility should utilize energy efficient office and maintenance equipment and appliances. Use of meters on major mechanical systems and computer-based building automated systems provide ongoing accountability and optimization of building performance. Each project should be assessed for potential nonpolluting renewable energy sources such as solar, wind, geothermal, low impact hydro, biomass and bio-gas (LEED EB, 2009; LEED for Schools, 2009).

Materials and resources.

Out of all LEED categories, this category might have the largest direct influence on occupants' health. While LEED EB concentrates mostly on sustainable purchasing policies and solid waste management, LEED for Schools widens the category by building reuse, construction waste management, materials reuse, recycled content, regional and rapidly renewable materials, and certified wood. During the construction process and facility operation, it is important to designate an area for recyclable collection—glass, plastic, metal, paper, cardboard, and organic waste and to identify local waste handlers. A construction waste management plan should address appropriate disposal and recycling of debris. To extend the life cycle of existing buildings, elements that pose contamination risk should be removed but other existing structures should be reused. Incorporating salvaged materials such as beams, posts, flooring, paneling, door panels, brick, and cabinetry in a new project lessens the impact on extraction and processing of virgin resources. Whenever it is economically feasible, the project should incorporate materials that are locally sourced, renewable, and of recycled content. Such materials as bamboo, wool, cotton insulation, agrifiber, linoleum, strawboard, wheatboard, and cork have positive environmental, economic, and performance attributes. Adhesives, sealants, paints, and coatings should have no or very low amount of volatile organic compounds (VOCs). Carpets and cushions should meet the Carpet and Rug Institute Green Label Testing Program (LEED EB, 2009; LEED for Schools, 2009).

Volatile organic compounds such as benzene, formaldehyde, and ethylene glycol are chemicals commonly found in paints and coatings; they easily evaporate at room temperature and together with other cancer-causing agents generated by combustion

such as carbon monoxide and nitrogen dioxide belong to common sources of indoor air pollution (Kopec, 2006). Interior materials such as carpeting and plastic toys, piping, and wall coverings release dust and fibers that are detrimental to building occupants. Prolonged exposure to these chemicals and particles may trigger asthma attacks and can permanently damage the nervous system, liver, and kidneys, and can cause certain types of cancers (Kopec, 2006).

Indoor environmental quality.

The fifth category addresses environmental tobacco smoke (ETS) control, ventilation, acoustics, artificial lighting, daylighting and views, thermal comfort and design, occupants comfort and green cleaning. To establish minimum indoor air quality, each childcare facility should have appropriate mechanically and naturally ventilated spaces and prohibit smoking. For naturally ventilated spaces, the following eight steps should be followed: development of design requirements, plan of airflow paths, identification of spaces that need special attention, determination of ventilation requirements, estimation of external driving pressures, selection of ventilation devices—types and sizes, and analysis of design. To monitor air delivery and potentially hazardous contaminants, it is important to install carbon dioxide and airflow measurement equipment and feed the information to the heating, ventilation, and air-conditioning (HVAC) system. During construction, it is necessary to properly protect HVAC system, control pollutant sources and interrupt any contamination. Minimum acoustical performance in classrooms and core learning spaces can be achieved by reducing exterior noise and by installing sound absorbent materials that have a Noise Reduction Coefficient of 0.70 or higher. Each occupant should be able to control lighting and thermal comfort. Positive lighting strategies include lighting controls, task lighting,

usage of compact fluorescent lighting, and designing for considerable amount of daylighting. Design strategies that maximize daylight and views include building orientation, shallow floor plates, exterior and interior permanent shading devices, high-ceiling reflectance values, and lower partition heights. Occupants should be able to adjust the amount of heat in the space according to individual or group needs by incorporating operable windows, automatic building mechanical systems, thermostat controls, or local diffusers at floor, desk, and overhead levels. To reduce potential presence and recurrence of mold in a facility, it is important to follow the Environment and Protection Agency's Mold Remediation for Schools and Commercial Buildings. Finally, to reduce exposure of building occupants to potentially hazardous chemicals, biological and particulate contaminants, the childcare facility should utilize only environmentally safe cleaning and personal hygiene products (LEED EB, 2009; LEED for Schools, 2009).

Innovation in design and operations.

The intent of this category is to provide design teams and projects with the opportunity to achieve exceptional building performance. To support sustainability and green design solution among all the users, it is important to educate all childcare users and encourage ongoing relationship between high-performance features of the building and the students. Tracking building operation cost can help to document building economical impact and highlight possibilities of additional improvements (LEED EB, 2009; LEED for Schools, 2009).

Eco-healthy Childcare

Eco-healthy childcare (EHCC) is an emerging standard created by the Oregon Environmental Council (OEC) in 2007. As opposed to LEED, the certification is free of

charge and consists in attaining positive marks on all steps of the endorsement form (see Appendix A). The form consists of 30 questions divided into 12 categories and includes three requirements: (1) use of non-toxic techniques for inside and outside pest management, (2) no smoking during childcare operation hours (with a note that smoking should be prohibited permanently), and (3) lead exposure control (OEC, 2010).

According to OEC (2010), the checklist requires childcare centers to use non-toxic pesticides and control air quality by preventing and treating mold, adequate ventilation, and limited number of unoccupied cars at the parking lot. Cleanliness practices such as daily vacuuming of rugs, limited use of chlorine bleach, and use of non-toxic cleaning products and least-toxic disinfecting and sanitizing products are among the top priorities on the checklist. Furthermore, the checklist suggests for childcare facilities to incorporate only solid wood furniture and polyvinylchloride free plastic toys. The checklist prohibits the use of scented and unscented candles, manufactured air fresheners, aerosol sprays, mercury-containing thermometers and thermostats, and wall to wall carpeting in children areas. The childcare facility also has to perform a radon check and provide recycling for paper, cardboard, glass, aluminum, plastic bottles and mercury batteries. To avoid lead exposure from water lines, childcare centers should use only cold water and let it run 10 to 30 seconds until it feels noticeably colder (OEC, 2010).

Although most of these 30 steps represent low-cost solutions that have positive impact on occupant's health, not all of them are necessarily environmentally friendly. Besides other negative impacts for the environment and sustainable development, fulfillment of these steps does not consider energy and water efficiency. However, up to

date, EHCC has 23 partner organizations and more than thousand certified members in 44 states across the nation (OEC, 2010).

Pro-environmental Behavior and Value-Belief-Norm Theory

In 1997, Bechtel stated that despite rising publicity, only a few people were aware of all the growing environmental threats or of the attempts that have been made in order to improve the already undermined environmental status. Ten years later, according to Evans et al. (2007), only some people would dispute that human behavior has the potential to dramatically influence Earth's health and environment. Within a decade, the outlook on environmental protection and associated human behaviors changed drastically. According to Stern (2000), the negative environmental impact is largely a by-product of individual's desires to achieve overall human comfort which leads to selfish and unsustainable behavior patterns. Therefore, evaluating, understanding and improving people's environmentally significant behaviors is an essential step in providing ourselves with a healthier planet and our children with a better future (Evans et. al, 2007).

Stern (2000) defines environmentally significant behavior (ESB) as one that is undertaken with the intention to positively change or benefit the environment. Such behavior can be (1) direct (i.e. proper disposing of household waste) or (2) indirect—individual's behaviors adapts to the context that constantly changes (Stern, 2000). Furthermore, Stern (2000) clarifies four types of ESB: (1) environmental activism, (2) nonactivist behavior in the public sphere, (3) private sphere environmentalism, and (4) other environmentally significant behaviors.

The first type of behavior is represented by committed environmental activism and recruitment. Behaviors in the public sphere affect the environment indirectly by

influencing public policies. Private-sphere environmentalism focuses on behaviors linked to the individual's purchase, use, and disposal of household products that have an environmental impact. Additionally, each individual may affect the environment through other behaviors such as influencing the actions of organizations to which they belong. Such behaviors can have an immense environmental impact because organizational actions are the largest direct causes of environmental harms (Stern, 2000).

Corraliza & Berenguer (2000) write that relationships between individuals and the environment have been characterized by different studies of cultural (values) and psychological (beliefs) factors that stem from the study of environmental attitudes. According to the authors, environmental attitudes are defined as individual's relatively durable and organized predispositions to act in the name of environmental protection. Poortinga, Steg, & Vlek (2004) define values as important culture-related life standards that provide guidelines for formation of attitudes and behaviors. Values are ordered in two dimensions. While one dimension extends from the self-interest pole to altruism (value theory), the second contrasts liberal and conservative values (Corraliza & Berenguer, 2000). In contrast to values, beliefs are more a matter of fact; they can be questioned and challenged (Bechtel, 1997). According to Corraliza & Berenguer (2000), environmental beliefs are characterized as results of rational cost-benefit analysis derived from an individual's environmental behavior.

To clarify the relationship between environmental values and beliefs, Stern and his colleagues developed a value-belief-norm theory (VBN) of environmentalism. Stern states (2000) that this theory is based on existing studies and links value theory, norm-

activation theory and the new environmental paradigm (NEP) perspective through a chain of variables that affect each other as they progress down the chain (Stern, 2000). According to Schwartz (1973, 1977) the norm-activation theory establishes that pro-environmental behavior arises in response to personal moral norms activated in individuals who believe that certain conditions may pose threats to others (awareness of adverse consequences—AC) and that actions they could take may avoid the consequences (ascription of responsibility to self—AR). The NEP, as defined by Bechtel, Verdugo, & Pinheiro (1999), symbolizes belief that humans are part of nature and must consider this reality in the use of resources.

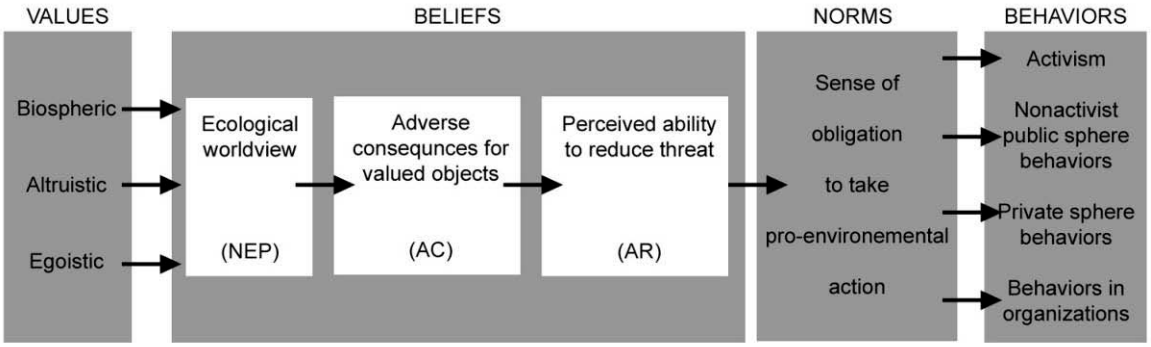

Figure 2-3. Schematic representation of variables in Value-Belief-Norm Theory. Arrows represent direct effects. Based on and published with permission of Paul C. Stern.

Stern (1999) summarizes VBN theory, illustrated in Figure 2-3, as one holding the premise that “pro-environmental actions occur in response to personal moral norms about such actions and that these are activated in individuals who believe that environmental conditions pose threats to other people, other species, or the biosphere” (p. 85). In general, VBN theory proposes that environmentally significant behavior depends on a wide range of causal factors. Although this theory is not useful for promoting change in specific behaviors (Stern, 2000), it might be influential and

inspiring in exploring the influence of parent's pro-environmental knowledge, values, beliefs, and behaviors on their preferences of green childcare design.

Summary

First, the literature review explained the concepts and factors of childcare quality. Second, it identified childcare trends from the educational and architectural points of view. Third, it discussed main elements and ideas of pro-environmental behavior.

The reading evaluation aided in the recognition of current green design practices in the U.S. educational sector formed predominantly by the USGBC and illustrated the main features and differences between conventional, green (LEED certified), and eco-healthy childcare centers. Although early childhood educational and architectural research substantiates the importance of the environment for children's learning, development, health, and safety; however, green design practices were not considered as important variables of these studies. In addition, parents as main consumers of childcare services do not have a direct influence on the quality variables. Further, they are considered poor evaluators of childcare quality mainly because they do not have the knowledge that is necessary for accurate assessment. Instead, parents build their evaluations on existing and accessible personal preferences.

These facts led the researcher to the assumption that parents' insufficient knowledge and various levels of personal pro-environmental habits and behaviors may be important ones among the many causes of green design absence in childcare facilities. Therefore, the literature review also defined the main features of pro-environmental behavior and associated VBN theory which together with LEED assessment tools served as the framework in exploring parents' pro-environmental

knowledge and behaviors and their subsequent preferences related to childcare green design practices.

CHAPTER 3
METHODOLOGY

> The world will not evolve past its current state of crisis by using the same thinking that created the situation.
>
> -Albert Einstein

The objectives of this study are (1) to investigate parents' pro-environmental knowledge, values, beliefs, and behaviors and (2) to analyze the influence of these variables on parents' preferences related to green childcare design. As the title of the thesis suggests, exploratory research played a major role in the investigation. The first step in the exploration process consisted of an extensive literature review. Because the study topic concentrates on a very current issue, primary investigation was conducted not only from published materials such as books and articles, but also from web sites that track the dynamic progress of sustainable development and green design. A subsequent and chief step in the exploration consisted of surveying parents' pro-environmental knowledge, values, beliefs, behaviors, and green design preferences. This chapter presents the research methods by specifically addressing the study setting, study participants, survey instruments, survey procedures, methods of analysis, expected findings, and limitations.

Study Setting

Two child development and research centers operated by a large public university in the State of Florida represented the context and the site for the collection of data. Both facilities are located on the university campus. They are managed by the same director and offer childcare to children ages six weeks to five years. Observation of existing conditions in both centers aided in the development of an additional framework for both survey instruments (besides two LEED rating systems and VBN theory). For

reference, both childcare centers are described in greater detail and depicted in Appendix G.

The first center (referred to hereafter as Childcare 1) was established 40 years ago. This center serves children who have at least one parent or guardian associated with the university. The center consists of three buildings and is located in the northwest part of the university campus. The building has been remodeled several times, with the latest reconstruction being over 10 years ago. The second center (referred to hereafter as Childcare 2) is adjacent to the university hospital located in the southeast part of the campus. This center was established as a partnership with the Colleges of Medicine and Public Health & Health Professions. The building is more than 30 years old and has been remodeled several times for different purposes. Originally, the building housed patient rooms. Later, it served as an adolescent psychiatric in-patient department and then as an office space. The last renovation in 2008 created space for a childcare center.

Being located on the university campus that values and promotes sustainability, both centers implement several sustainable and green design practices. Both facilities prefer using solid wood and pressed wood furniture. Whenever possible, the centers practice natural ventilation and turn off the lights when the classrooms are not in use. In addition, both childcares feature their own butterfly and vegetable gardens, and serve the United States Department of Agriculture (USDA) approved meals. In order to minimize waste, Childcare 1 has two compost piles for the leftover food. Finally, both centers have their own recycling programs for cans, bottles, and cardboard.

Study Participants

Non-probability purposive sample was generated by contacting 184 families that utilize childcare services in either of the two child development centers; only one parent per family was asked to complete the questionnaires. Purposive sample design was chosen because of its assumption that every subject in the study population had the required information and would be willing to share it (Kumar, 2005).

The participants for this study included two groups of parents. The first group, Childcare 1, was composed of parents who are full-time undergraduate or graduate students, staff, or faculty in any of the university's units. The second group, Childcare 2, comprised of parents who are undergraduate and graduate students, interns, residents, post-doctoral students, fellows, and faculty of the two hosting colleges (Medicine, and Public Health & Health Professions).

Prior to contacting participants, the researcher applied for and was granted permission to engage in research with human subjects by the University's Institutional Review Board (IRB) (see Appendix B). Before the participants could complete each of the two questionnaires, they were asked to read and agree to the Informed Consent Forms that explained the purpose of the study and the participation regulations (see Appendices C & D).

Survey Instruments

The data collection instruments for this study consisted of two self-administered electronic questionnaires with closed and open-ended questions (see Appendices E & F). Both questionnaires were designed according to a mixed methodology approach, which is beneficial in many different settings and can be applied in various phases of the research project (Tashakori & Teddlie, 1998). Although the focus of the study was

on the quantitative data, additional qualitative questions were incorporated in order to explore participants' own views on the study topic. Quantitative research methods intend to make generalizations about social phenomena with the purpose to create associated predictions and provide causal explanations (Glesne, 2006). Qualitative research methods, in contrast, help to clarify a "social phenomena from the perspectives of those involved and to contextualize issues in their particular socio-cultural-political milieu" (Glesne, 2006).

Parent Questionnaire 1

The first questionnaire was intended to obtain general demographic information of the sample. Additionally, a series of questions was designed to determine the level of parents' pro-environmental (1) values and beliefs, (2) behaviors, and (3) knowledge. The questionnaire consisted of 28 questions that were divided into four categories.

Demographic information.

Several authors state that variables such as cultural background and religious preference might be influential in determining the individual's behaviors and views of the environment (Bechtel, 1997; Bechtel, Verdugo, & Pinheiro, 1999). A few studies indicate strong relationships between environmental concern and variables such as income, occupational sector, and political affiliation (Olofsson & Ohman, 2006; Van Liere & Dunlap, 1980). Therefore, in addition to other demographic information, this questionnaire incorporated the following items: (1) combined family income, (2) level of education, (3) country of origin, (4) religious preference, (5) political views, and (6) race. Questions were designed either as multiple-choice items with single response or as fill-in types of responses.

Pro-environmental values and beliefs.

While some authors recognize values and beliefs as strong determinants of individual's pro-environmental behavior (Bechtel, 1997; Stern, 1999), other authors consider these attitudinal variables to be important but not sufficient in explaining all types of behaviors (Corraliza & Berenguer, 2000). For the purposes of this study, however, some questions about pro-environmental values and beliefs were included in the questionnaire. The questions were selected from Bechtel (1997) and Stern (1999) and were modified by the author to better address the focus of this study. Parents' values and beliefs were measured using a five-point Likert scale, with values ranging from 1=strongly disagree to 5=strongly agree. An optional answer (DK/NA) was included for respondents who did not know the answer or preferred not to answer the question.

Pro-environmental behaviors.

Questions related to parents' pro-environmental behaviors were chosen from Stern (1999) and Bechtel, Verdugo, and Pinheiro (1999) and again were modified by the researcher to better address the focus of this study. Families' behaviors were measured using a five-point verbal frequency scale with values ranging from 1=never to 5=always, including an optional answer (DK/NA).

Pro-environmental knowledge.

Seven multiple choice questions and three true or false questions were derived from the LEED EB and the LEED for Schools rating systems, as well as from the existing conditions in both child development centers. In accordance with both rating systems, the questions were ordered into the following categories:

- sustainable sites (question 19)
- water efficiency (question 20)
- energy and atmosphere (question 21)
- materials and resources (questions 22-24, 27)
- indoor environmental quality (questions 25 and 26).

Completed pro-environmental knowledge tests received numerical scores, which were then decoupled with the parents' preferences for green childcare design that were assessed in the second questionnaire. This process was performed in order to better ascertain the level of influence of parents' pro-environmental knowledge on green design preferences.

Parent Questionnaire 2

The second questionnaire entailed a series of 16 questions to ascertain parents' preferences related to green childcare design. In order to create a stronger correlation between parents' pro-environmental knowledge (independent variable) and their preferences (dependent variable), the questions were arranged into six categories corresponding with the study setting, the LEED EB and LEED for Schools rating systems as follows:

- sustainable sites (questions 1 and 2)
- water efficiency (question 3)
- energy and atmosphere (question 4)
- materials and resources (questions 5 through 7)
- indoor environmental quality (questions 8 through 10)
- innovation in operations (questions 11 and 12).

Parents' preferences were measured using a five-point Likert scale, with values ranging from 1=strongly disagree to 5=strongly agree. An optional answer (DK/NA) was included for respondents who did not know the answer or preferred not to answer the question. Furthermore, the second questionnaire included four open-ended questions (questions 13-16).

Survey Procedure

The questionnaires were created using a commercial survey server. In an effort to preserve the privacy of the respondents, all communication was handled through the childcare centers' director. Parents first received an e-mail message from the childcare centers' director with the study description and her support for participation in the surveys. Then, a message written by the researcher was similarly forwarded; the mail contained the researcher's introduction, purpose of the study, the URL addresses of the surveys, and an attachment with significant study terms. Such mails were sent to the parents by the director on four separate occasions. The study was conducted over a period of 13 days. A message with the first survey was sent to the parents on July 6, 2010. An additional reminder to complete this questionnaire was sent on July 9, 2010. The second questionnaire, with the additional reminder to complete the first questionnaire, was distributed on July 12, 2010. A reminder to complete the second questionnaire was sent on July 16, 2010. Due dates for each survey were specified in the accompanied e-mails; the last acceptable day for submitting both questionnaires was July 19, 2010. Participants who had submitted the questionnaires on the first instance were asked to ignore the reminders. Because the submitted surveys had no identifying information, it was not possible to send reminders only to those who had not already responded.

Before completing each questionnaire, participants were asked to read the Informed Consent Form located on the first page of each survey. Only after reading the consent form and agreeing to participate could parents complete and submit the questionnaire. At the beginning of the first questionnaire, the participants were asked to create a six-character alphanumeric combination, which was used as their password in

the second questionnaire and as the pairing code for data collection. In order to have a valid data set, each parent had to complete both questionnaires. The approximate time for completing the first questionnaire was 20 minutes; completing the second questionnaire was estimated to last 15 minutes. After submission, results were sent directly to the researcher. Participation in the study did not grant any benefits and posed no more than the minimal risks to the subjects. Furthermore, participation in the study was voluntary, confidential, and granted no compensation.

No pilot test was administered in this study. Instead, before distribution, surveys were carefully reviewed by the thesis committee and the statistician to detect any ambiguities and uncertainties, such as issues with wording or terminology, and to check the approximate timing and sequencing of questionnaires' completion.

Methods of Analysis

To evaluate the influence of parents' pro-environmental knowledge, values, beliefs, and behaviors on their preferences related to green childcare design, a linear regression model approach (referred to as OLS or Ordinary Least Squares) was utilized. In general, this statistical treatment attempts to model the relationship between one dependent and one or more independent variables. The dependent variable, which was created from the responses of parents' preferences, is quantitative and (theoretically) continuous. Additional tests regarding collinearity and heteroskedasticity were performed in order to ensure the validity of the results but were not included in the data analysis.

This study consisted of three sets of variables:

Control Variables

Demographic information. Because of the diversity of the variables, each question from the first section of the first questionnaire (questions 1-9) was individually coded and accounted for. The majority of answers in the demographic section were coded using a numerical scale as follows:

- Question 2 (1=child development center at Newell Drive, 2=child development center at Village Drive)
- Question 3 (1=one child, 2=two children, and 3=more than two children)
- Question 4 (1=$20,000-$40,000, 2=$40,000-$60,000, 3=$60,000-$80,000, 4=$80,000-$100,000, and 5=more than $100,000 of combined family income)
- Question 5 (1=some college, 2=college graduate, and 3=post-graduate grade of school)
- Question 8 (1=very liberal, 2=somewhat liberal, 3=moderate, 4=somewhat conservative, and 5=very conservative).

Answer options that were not chosen by any of the participants were not utilized in the coding process; therefore, each control variable had a different range of scale. Binary variables were created from answers to questions 6 and 7 and were coded as follows:

- Question 6 (1=US citizens and 0=all other countries of origin and 2)
- Question 7 (1=all religions combined and 0=no religious affiliation).

Due to their complex nature and variety of responses that did not appear to be significant, answers to questions 1, 3, and 9 were not utilized in the statistical analysis.

Independent Variables

Pro-environmental values and beliefs. First, answers to questions 10 through 13 in the first questionnaire were transformed into numerical scores ranging from

1=weakest pro-environmental values and beliefs, to 5=strongest pro-environmental values and beliefs. To unify all the responses, question 13 was coded in reverse. Then, the numerical scores were factored into a single independent variable measuring parents' pro-environmental values and beliefs by creating a mean score.

Pro-environmental behaviors. Answers to questions 14 through 18 in the first questionnaire were transformed into numerical scores ranging from 1=weakest pro-environmental behaviors to 5=strongest pro-environmental behaviors. Again, by creating a mean score from all the responses in this section, a second combined independent variable was created that measured parents' pro-environmental behaviors.

Pro-environmental knowledge. From the test on pro-environmental knowledge (questions 18-29 in the first questionnaire), each participant was assigned a numerical score which was first transformed into a 5-point scale and then factored into a single independent variable measuring parents' pro-environmental knowledge by creating a mean score.

Dependent Variable

Parents' preferences related to green childcare design. Answers to twelve questions from the second survey (questions 1-12) were transformed into numerical scores ranging from 1=weakest preference to 5=strongest preference. To ensure that all responses were in the corresponding scales, answers for reversed questions (5 & 10) were coded in reverse. In order to account for the plausible effect of the set of independent variables on parents' preferences, the twelve numerical scores were combined into one variable by creating a mean score, which was utilized as the primary dependent variable.

The qualitative responses obtained from the second survey (questions 13 – 16) were manually coded and sorted in four groups that addressed: (1) the main reasons for choosing a particular childcare facility, (2) understanding of the term “green design”, (3) the most desired green design features, and (4) childcare-environment-related health and developmental problems.

Expected Findings

The expected findings were derived from the main objectives of the study. First, it was probable to assume that the evaluation of parents’ pro-environmental knowledge, values, beliefs, and behaviors would yield various results among individual participants and an average or somewhat advanced level among all participants combined. The study participants do not represent a typical group of parents; besides their possibly advanced levels of general and pro-environmental knowledge, the participants might be influenced by some pro-environmental practices that are already employed in both study settings. Second, the relationship between major variables of this study was anticipated to be strong and positive—with the rising levels of parents’ pro-environmental knowledge, values, beliefs, and behaviors increase parents’ preferences related to green childcare design.

Limitations

The study entailed several limitations. First, data collected from only two childcare centers in central Florida limited the sample size and demographics. The chosen childcare facilities focus on high quality care in multi-cultural, multilingual, university based environment which enables programs and support systems not generally available to other centers. Although neither of the facilities is LEED or Eco-Healthy

certified, they both encourage and attempt a number of pro-environmental practices (i.e. emphasizing natural views and ventilation, using wood furniture, recycling, etc.).

Second, electronic questionnaires require clear instructions and careful wording of items which are necessary for successful distribution and scoring. The most difficult aspects were the construction and interpretation of surveys and accompanied e-mail messages. Given the diversity of the population sample, it is conceivable that some potential participants may have chosen not to complete the surveys due to cultural or language barriers.

Although the results of this study may be inadequate due to other variables beyond the researcher's control (i.e. collecting the data during summer time when people tend to travel more, the centers' status and parents' demographics), the researcher believes the final results accurately reflect the influence of parents' pro-environmental knowledge and attitudes on their preferences for green childcare design.

Summary

Exploratory survey-driven research played a major part in the investigation of this study and was used to answer the research question posed in the first chapter. All study participants signed the appropriate informed consent forms before completing the surveys. Some limitations to the study that could influence the data collection and analysis were anticipated and introduced, along with the description of the study setting, study participants, survey instruments and variables, sampling procedures, and methods of analysis.

CHAPTER 4
FINDINGS

Our deeds determine us as much as we determine our deeds.

-George Elliott

This chapter presents data analysis of the major study variables. First, the chapter evaluates demographic descriptive statistics. The second part of the chapter analyses the findings of the linear regression (OLS) models and in greater detail reviews the pro-environmental responses.

Demographic Descriptive Statistics

From the overall number of 184 contacted families, 66 parents decided to participate in the study; the sample size *n=66* yielded a response rate of almost 36%. A slight majority of the participants were the faculty members (see Table 4-1). Almost two-thirds of the participants utilized the childcare services of Childcare 2 (see Table 4-2). Further, over 70% of the participants claimed a single child attendance to the centers (see Table 4-3). Fifty percent of the participants exhibited a yearly combined family

Table 4-1. Parents' affiliation to the University.

		Number of Parents	Percentage
Affiliation to University	Student	12	18.2
	Faculty	25	37.8
	Staff	17	25.8
	Other	12	18.2

Table 4-2. Childcare facility location.

		Number of Parents	Percentage
Childcare Facility	Childcare 1	24	36.4
	Childcare 2	42	63.6

Table 4-3. Childcare attendance.

		Number of Parents	Percentage
Childcare attendance	One Child	47	71.2
	Two Children	16	24.2
	More than 2 children	3	4.6

Income higher than $100,000 (see Table 4-4). The vast majority of the participants declared post-doctoral level of education and country of origin being the U.S. (see Tables 4-5 and 4-6). Although the study sample represented a variety of religions, almost half of the participants self-identified as non-religious (see Table 4-7). Close to 90% of the participants expressed their political affiliation as ranging from moderate to very liberal (see Table 4-8). Finally, the vast majority of the participants declared Caucasian race (see Table 4-9).

Table 4-4. Combined family income.

		Number of Parents	Percentage
Family Income	Under $20,000	0	0.0
	$20,000-$40,000	3	4.6
	$40,000-$60,000	9	13.6
	$60,000-$80,000	11	16.6
	$80,000-$100,000	10	15.2
	More than $100,000	33	50.0

Table 4-5. Last grade of school completed.

		Number of Parents	Percentage
Completed Education	Not a high school graduate	0	0.0
	High school graduate	0	0.0
	Some college	1	1.5
	College graduate	11	16.6
	Post-doctoral students	54	81.9

Table 4-6. Country of origin.

		Number of Parents	Percentage
Country of Origin	Australia	1	1.5
	Brazil	1	1.5
	Canada	2	3.0
	China	4	6.0
	Hong-Kong	1	1.5
	India	3	4.5
	Iran	1	1.5
	Philippines	1	1.5
	Romania	1	1.5
	United Kingdom	1	1.5
	United States	50	76.0

Table 4-7. Religious affiliation.

		Number of Parents	Percentage
Religious Affiliation	Catholic	7	10.6
	Jewish	2	3.0
	Protestant	16	24.2
	Muslim	0	0.0
	None	31	47.0
	Other	10	15.2

Table 4-8. Views on political matters.

		Number of Parents	Percentage
Political Views	Very Liberal	12	18.2
	Somewhat Liberal	27	41.0
	Moderate	19	28.8
	Somewhat Conservative	7	10.5
	Very Conservative	1	1.5

Table 4-9. Ethnicity.

		Number of Parents	Percentage
Ethnicity	White	50	75.8
	Black	0	0.0
	Hispanic	3	4.5
	Asian	10	15.2
	Other	3	4.5

Linear Regression (OLS) Models

Although the thesis title proposed parents' pro-environmental values, beliefs, behaviors, and knowledge as primary variables having an influence on parents' preferences related to green childcare design, many authors suggested that previously discussed demographic variables may as well influence parents' preferences (Bechtel, 1997; Bechtel, Verdugo, & Pinheiro, 1999; Olofsson & Ohman, 2006; Van Liere & Dunlap, 1980). In order to determine the relevance of all the variables, the statistical analysis consisted of three OLS models which tested for a plausible overall effect of the selected independent and control (demographic) variables on parents' preferences related to green childcare design (dependent variable). Three demographic variables—

parents' affiliation to the University, childcare attendance and parents' ethnicity—were excluded from the statistical analysis since their respective distributions were extremely skewed and the validity of results including these variables would be compromised.

Table 4-10. Linear regression estimates on parents' preferences related to green childcare design.

	Model 1 (Nine variables)	Model 2 (Eight variables)	Model 3 (Seven variables)
Childcare facility	.093 (.089)	---	---
Combined income	.080** (.036)	.064* (.033)	.062** (.031)
Education (last grade of school completed)	-.199** (.094)	-.207** (.093)	-.202** (.091)
Country of Origin	.121 (.090)	.120 (.090)	.119 (.089)
Views on political matters	-.051 (.046)	-.050 (.046)	-.049 (.045)
Religious affiliation	.021 (.082)	.018 (.083)	---
Pro-environmental Values & beliefs	.206*** (.069)	.221*** (.067)	.220*** (.067)
Pro-environmental Behaviors	.193** (.076)	.182** (.076)	.179** (.074)
Pro-environmental Knowledge	.068** (.033)	.071** (.033)	.071** (.033)
Constant	2.062*** (.556)	2.234*** (.532)	2.250*** (.523)
N	66	66	66
F	5.27***	5.78***	6.71***
R^2	.4584	.4478	.4473

Note: Cell entries report coefficients and robust standardized errors (in parentheses). Asterisks denote confidence levels as follows: *p<0.10 two tailed, **p<0.05 two tailed, ***p<0.01 two tailed.

The results of the first linear regression model (Model 1) indicated a strong relationship (99% and 95% confidence level) between the three factored independent variables (pro-environmental values and beliefs, behaviors, and knowledge) and the dependent variable (parents' preferences related to green childcare design). Specifically, pro-environmental values and beliefs demonstrated having a profound effect on the participants' preferences for green childcare design (99% confidence level). Apart from confirming the hypothesis stated in Chapter 1, Table 4-10 indicated that both combined family income and education level affect parents' preferences. While with the rising education level of parents their green design preferences decrease, with their rising income level their green design preferences increase. The overall strength of Model 1 was confirmed by a high R-squared; with this set of predictors it was probable to explain almost 46% of the green design preferences variance.

Because the first model indicated the childcare facility variable as insignificant, the second linear regression model (Model 2) tested only eight parameters. With an extreme confidence level (99% and 95%), the three pro-environmental variables (values and beliefs, behaviors, and knowledge) confirmed their strong influence on parents' preferences for green childcare design. While the negative effect of parents' education became a bit more profound (but with confidence level still at 95%), the confidence level of combined family income influence on parents' green design preferences dropped to 90%. Additionally, Model 2 indicated the religious affiliation variable as irrelevant; therefore it was not considered for further testing.

The third model (Model 3), which tested seven variables, affirmed a significant negative effect of education and a strong positive effect of combined family income on

parents' green design preferences for childcare centers. In both cases, the variables tested on the 95% confidence levels. Country of origin and views on political matters did not prove as intensely significant parameters in any of the three models. Once again, even with the alterations in control variables, Model 3 confirmed extreme confidence levels (99% and 95%) in the positive influence of parents' pro-environmental values, beliefs, behaviors, and knowledge on their preferences related to green childcare design. Particularly pro-environmental values and beliefs demonstrated a 99% confidence level in the profound effect on the respondents' green design preferences. With the given set of predictors, it was probable to explain almost 45% of the green design preferences variance. A prominent relationship of the three factored independent variables and the dependent variable is depicted in Figure 4-1.

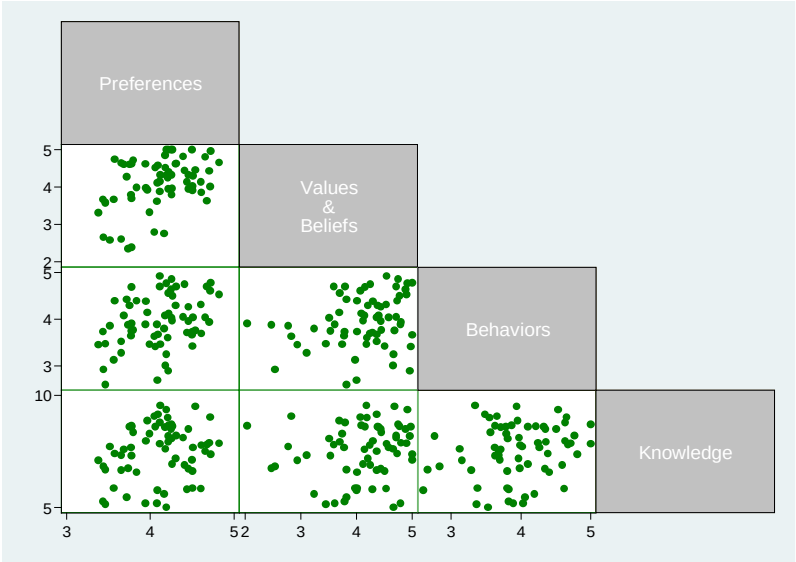

Figure 4-1. Scatter plot matrix diagram of pro-environmental (independent and dependent) variables.

Pro-environmental Responses Review

Figure 4-2 illustrates the distribution of responses for the pro-environmental values and beliefs section (Parent Questionnaire 1; questions 10 through 13). An

overwhelming majority of the participants (78%) strongly agreed that toxic substances in air, water, and soil could cause serious health problems to adults and children. Approximately the same proportion of the participants (81%) claimed they would be willing to pay higher taxes in order to better protect the environment. More than half of the participants (56%) strongly agreed that climate change affects our future. Half of the participants believed that humans should live in harmony with nature without excessive exploitation of natural resources.

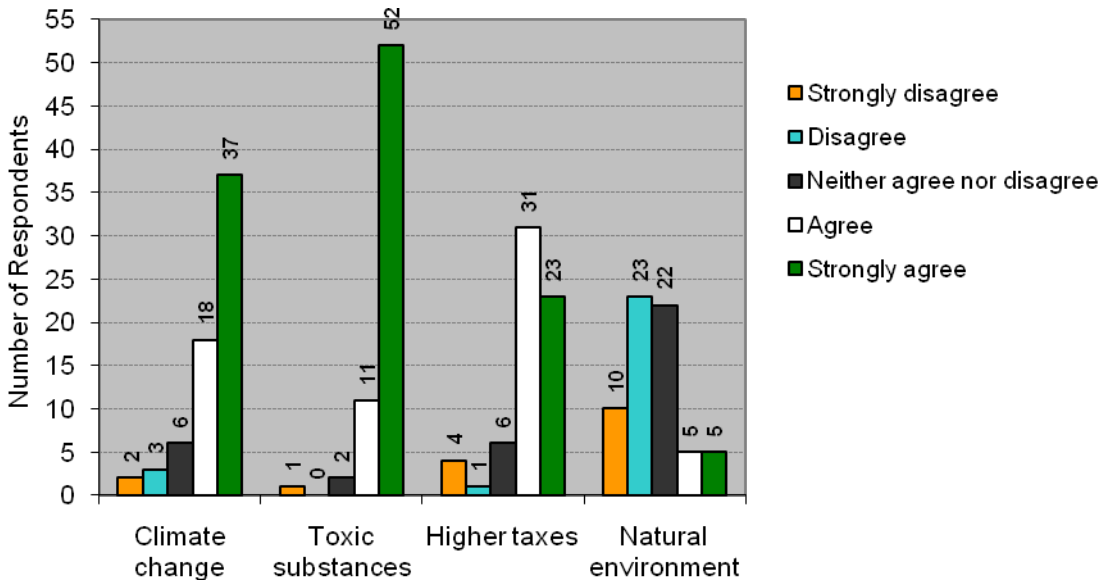

Figure 4-2. Pro-environmental values and beliefs response review. Sample size n=66.

The division of responses for the pro-environmental behaviors section (Parent Questionnaire 1; questions 14 through 18) is depicted in Figure 4-3. The vast majority of the participants (almost 94%) declared engaging in strong recycling activities, natural ventilation, and use of energy saving appliances and light bulbs in their households. Approximately 85% of the participants admitted to efficient water use on rare and irregular basis. A slightly smaller proportion of the participants declared that they purchase and use green cleaning products sometimes, often, or always.

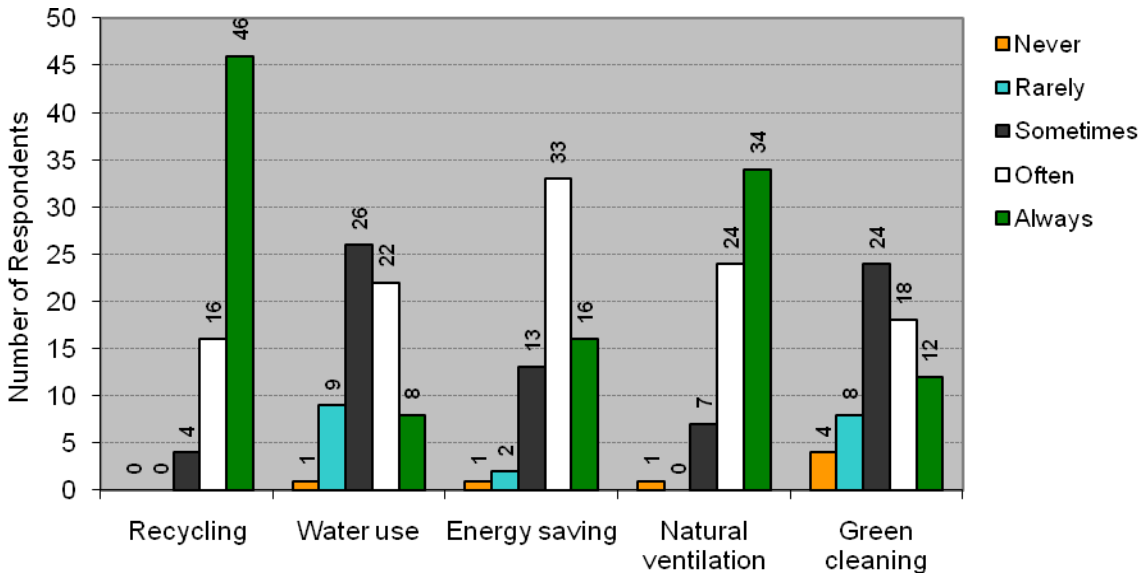

Figure 4-3. Pro-environmental behaviors response review. Sample size n=66.

Figure 4-4 presents the distribution of responses from the pro-environmental knowledge test (Parent Questionnaire 1; questions 19 through 28). Out of ten questions, only the last statement discussing the interior contaminants which may trigger asthma and allergic reactions was answered correctly by all 66 participants. Other questions, answered predominantly correctly, included problems of water efficiency, energy performance, prevention of indoor air pollution, and interior materials and furniture. However, a detailed question about antimicrobial, antistatic, and easy to clean flooring suitable for a childcare facility was answered incorrectly by the majority of the participants (62%). In addition, the vast majority of the participants did not seem to have appropriate knowledge in regard to indoor environmental quality (75%). Finally, more than half of the participants (54%) marked an incorrect response for the daily amount of waste generated by an average American. The overall distribution of correct responses—with the numerical amount and percentage proportion—is depicted in Figure 4-5.

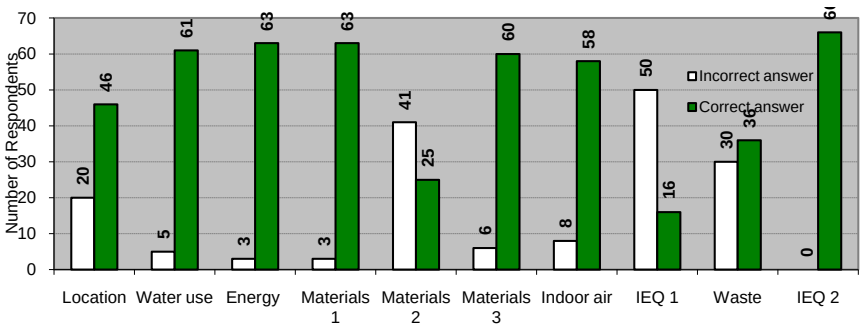

Figure 4-4. Pro-environmental knowledge response review. Sample size n=66.

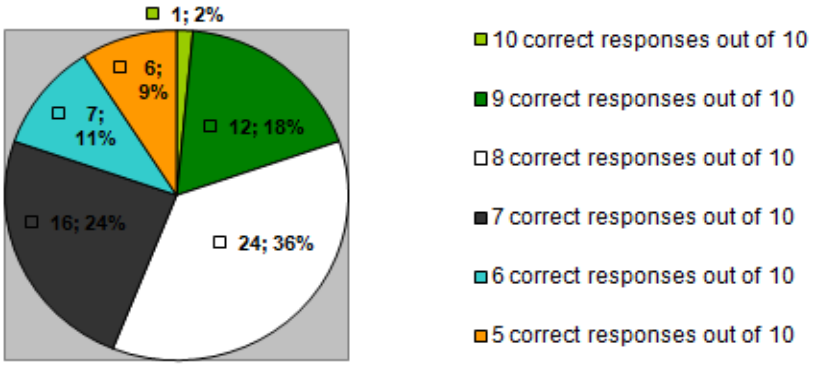

Figure 4-5. Distribution of responses from the pro-environmental knowledge test. Sample size n=66.

Figure 4-6 illustrates parents' pro-environmental preferences related to green childcare design (Parent Questionnaire 2; questions 1 through 12). All participants declared strong preferences for daylight and views of nature and for a recycling program. The vast majority of the participants would prefer their childcare facility to practice environmental education and protection (almost 94% of the participants), energy efficiency (almost 88% of the participants), water efficiency (almost 85%

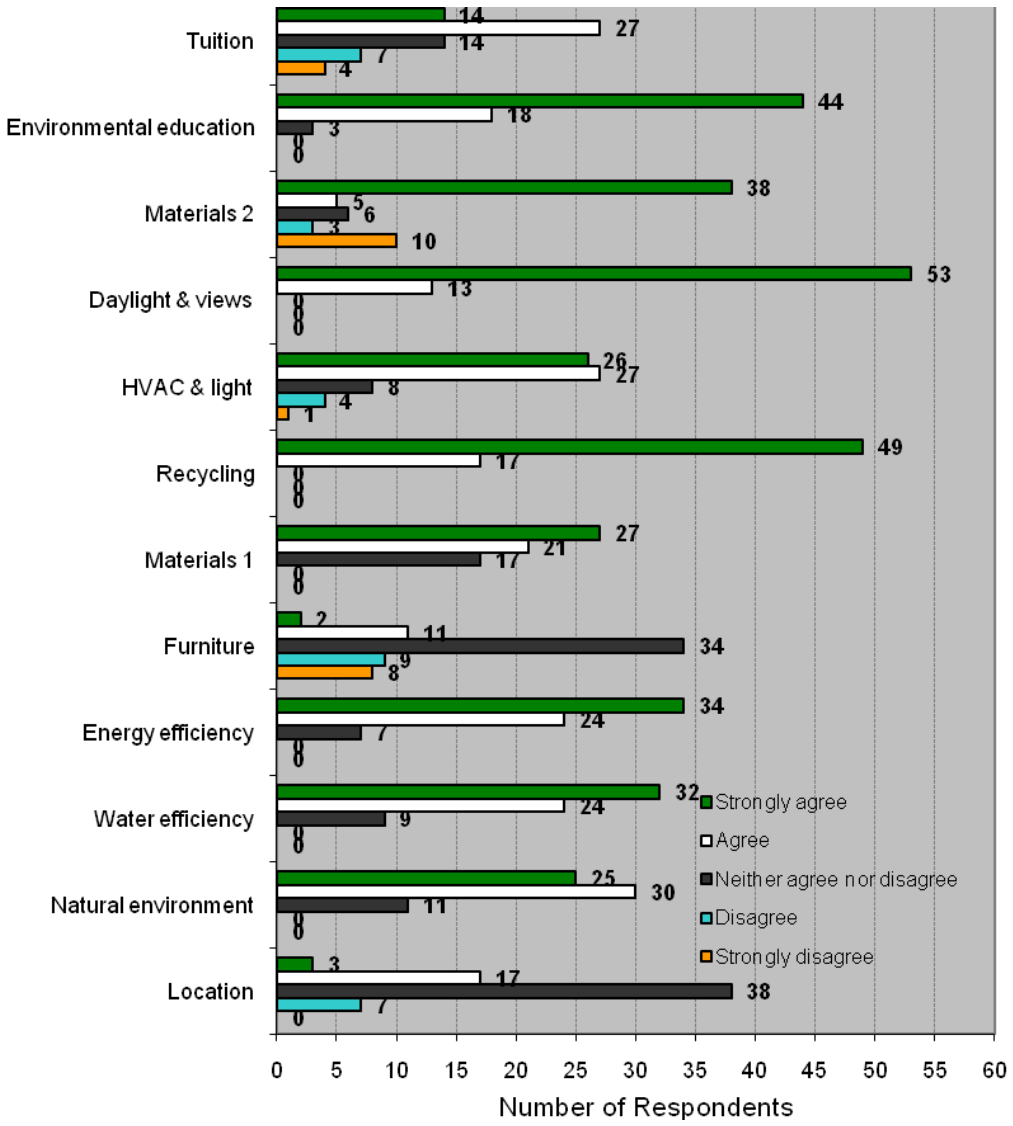

Figure 4-6. Preferences related to green childcare design response review. Sample size n=66.

of the participants), abundance of outdoor natural environment (83% of the participants), occupant-controlled HVAC and lighting (80% of the participants), and locally obtained renewable interior materials (almost 73% of the participants). A large

proportion of the participants (62%) would prefer to pay higher tuition in order for their children to attend a childcare facility that implements green design practices. More than half of the participants were unsure about preferring the location of childcare facility in close proximity to public transportation. Reversed questions discussing the interior materials offered a variety of responses. Over half of the participants (51%) were undecided about the use of plastic and pressed wood furniture. Only 13 participants (not even 20%) displayed strong disagreement with the use of paints and coatings with high levels of VOCs.

Summary

In conclusion, demographic descriptive statistics aimed to depict major characteristics of the study sample by showing the representation of parents' affiliation to the University, childcare facility, childcare attendance, combined family income, completed level of education, country of origin, religious affiliation, views on political matters, and ethnicity. Three OLS models determined the level of significance of six demographic variables and four factored pro-environmental variables. While linear regression tests determined the irrelevance of childcare facility and religion variables, they affirmed a significant negative effect of parents' education and a strong positive effect of combined family income on the parents' green design preferences related to the childcare facilities. The scatter plot matrix diagram illustrated the strong relationship between the pro-environmental variables and the degree of influence they have on each other. Bar graphs depicted and in greater detail illustrated the participants' responses for the pro-environmental values, beliefs, and behaviors, knowledge, and preferences sections.

CHAPTER 5
DISCUSSION

> Don't let us forget that the causes of human actions are usually immeasurably more complex than our subsequent explanations of them.
>
> -Fyodor Dostoevsky

The purpose of this study was to evaluate the extent to which parents' preferences associated with green childcare design relate to their pro-environmental values, beliefs, behaviors, and knowledge. A review of literature indicated that parents carry an important role as informal evaluators of childcare quality and, at the same time, lack the necessary appraisal knowledge. Furthermore, the review highlighted that although sustainability and green design are crucial for healthy and safe environments, they are not included among important childcare quality variables. Contemporary educational and architectural studies seem to miss the connection between the green design phenomenon, childcare environments, and parents' (or consumers') pro-environmental inclinations. This chapter discusses the study findings framed by the research question stated in Chapter 1 and by the theories presented in the literature review. Additionally, the chapter includes conclusions and implications for future research.

Discussion of Findings

Even though several authors emphasize the benefits of sustainability and green design—to name a few, Boise, 2010; Durrett & Torelli, 2009; Ford, 2007; Kopec, 2009—neither concept is considered a driver in most existing childcare environments. Some authors state that parents as main consumers of childcare services are considered poor evaluators of their quality (Fontaine et al., 2006; Helburn et al., 1995; Olds, 2001), which could contribute to their lack of demand for green design, and therefore for green design not being included among the commonly cited childcare quality variables and practices.

However, contrary to Olds (2001) and Helburn et al. (1995) who state that parents do not have sufficient information and knowledge necessary to assess the level of childcare quality, this study sample demonstrated significant awareness of sustainability concepts and strong preferences related to green childcare design.

Findings discussed here are organized according to the three groups of study variables: (1) demographics, (2) pro-environmental values, beliefs, behaviors and knowledge, and (3) preferences related to green childcare design (see Figure 5-1). Finally, this part of the chapter discusses major qualitative findings.

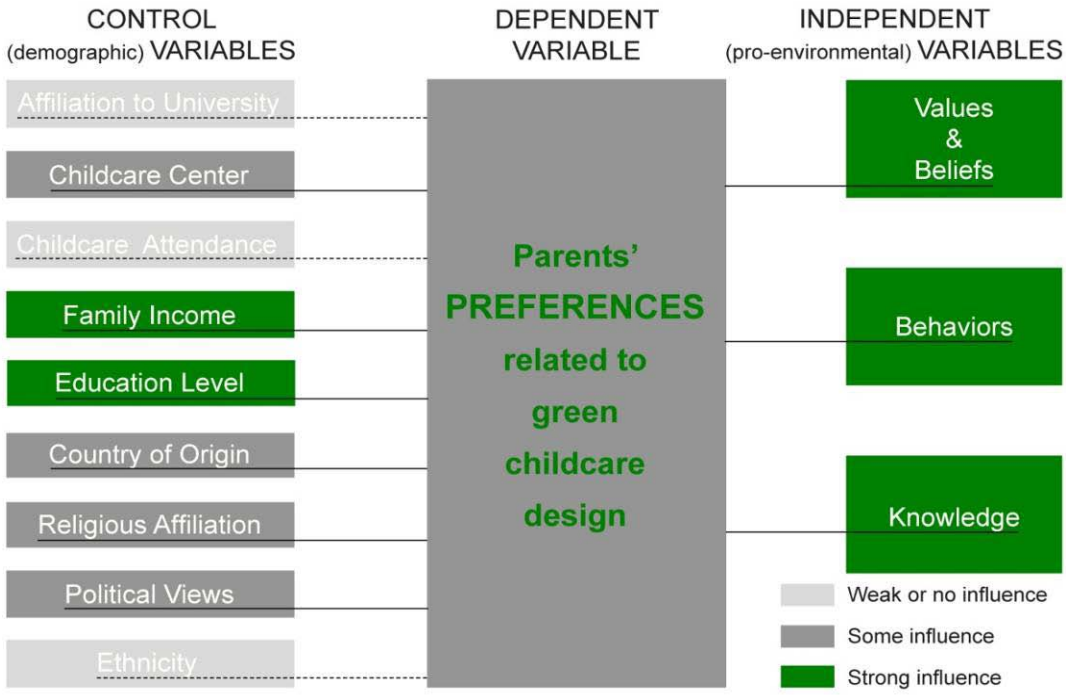

Figure 5-1. Relationship between variables.

Demographic Variables

In this study, demographic questions were used to create a group of control variables. Although some of these variables demonstrated strong influence on parents' preferences related to green childcare design, their role was to remain constant

throughout each of the three linear regression tests and allow for observation and profound evaluation of the relationships between the independent and dependent variables. Most demographic variables were included in the study given the prevalence of suggestions that they could have a strong influence on the individuals' views of the environment. While Bechtel, Verdugo, and Pinheiro (1999) believe that cultural background and religious affiliation might influence individual's behaviors and views of the environment, Olofsson and Ohman (2006) together with Van Liere & Dunlap (1980) believe that individuals' income, occupation, and political affiliation may dictate their environmental concerns.

Contrary to the literature, study findings suggested that occupation, affiliation to the University, country of origin, religious affiliation, views on political matters, and ethnicity did not test as significant influences on parents' preferences related to green childcare design. One reason for the low level of influence of these variables could be their rather skewed distributions. More than 75% of the participants declared professional affiliation to the University (faculty, staff, or other), country of origin being the U.S., and white ethnicity. Almost 60% of the parents stated liberal political views and nearly 50% of the parents declared no religious affiliation. Universities in general are multicultural environments, with professionals, students, faculty and staff members who offer occupational, cultural, religious, political, and even ethnic diversity, the study sample size was probably not large enough to demonstrate a greater demographic variety that would prevent disproportions of some demographic variables.

Out of nine control variables, however, two demonstrated strong influence on the parents' preferences related to green childcare design. Even with their skewed

distributions, combined family income and level of education tested as highly significant. According to the study's findings, combined family income demonstrated to have a strong positive influence on parents' preferences. Fifty percent of the participants declared having acombined family income larger than $100,000, which could be attributed to their faculty and staff positions within the University. In addition, 63% of the participants stated their affiliation with the Colleges of Medicine and Public Health & Health Professions. The majority of healthcare-related professions tend to have higher salaries than many other occupations in different sectors (Bureau of Labor Statistics, 2010). Previous studies cited by Olofsson and Ohman (2006) indicate that individuals with higher family incomes tend to support and commit to environmental organizations, although their financial ability to pay fees for environmental improvement is often stronger than their true concern about the environment.

The most counterintuitive finding of the study was the negative effect of completed education level on the parents' preferences related to green childcare design. Literature indicates there is a positive relationship between educational attainment and environmental concerns (Olofsson and Ohman, 2006). This study, however, did not support Olofsson's and Ohman's (2006) findings. Although 82% of the participant pool declared post-doctoral education and 16% declared a college level education, their preferences related to green childcare design were negatively influenced and detected as weaker than expected. Some research findings state that active college students play an important role in environmental and ecological debates (Olofsson & Ohman, 2006), suggesting that as parents, college graduates might have already accrued a degree of, and perhaps continue pursuing further, environmental knowledge. Indeed,

according to the study settings' director, parents with advanced degrees (PhD. and medical) frequently ask for research-based documentation to support childcare practices (P. Pallas, personal communication, August 11, 2010). Parents' concerns range from the skills they should expect their child to exhibit at various developmental stages, to what type of play equipment is safe and age-appropriate. These parents are more likely to complete internet searches and research reviews to educate themselves on a topic before discussing their concerns or recommendations with the director. Even though the results of this study exhibited parents' strong preferences related to green childcare design, the negative effect of education still displayed as essential; parent-initiated investigation into the topic may be a crucial influence on findings. Parents' interest in scientific inquiry may translate into higher expectations related to the pro-environmental character of the childcare facility and services. However, such expectations may not be easily met because (1) parents may think there is not enough evidence to support the claims made by the childcare center or (2) childcare center is lagging behind in its efforts.

Pro-environmental Values, Beliefs, Behaviors, and Knowledge

In this study, pro-environmental values, beliefs, behaviors and knowledge represented a set of independent variables. Some authors suggest that pro-environmental knowledge and attitudes, although related to the individuals' behaviors, have a weak or nonexistent influence on people's actions (McKenzie-Mohr & Smith, 2006). As already discussed in the literature review, the VBN theory of environmentalism developed by Stern and his colleagues (1999) challenges this position and emphasizes that pro-environmental behaviors occur in response to

personal moral norms in individuals who believe that environmental conditions pose threats to other people and to the biosphere.

The results of this study supported the findings of VBN theory and identified an influential relationship between the parents' pro-environmental values, beliefs, behaviors, knowledge and their preferences related to green childcare design. Corraliza and Berenguer (2000) consider values and beliefs as important culture-related life standards and psychological factors that provide guidelines for formation of people's behaviors. However, both authors also state that the same values do not influence the same types of behaviors in the same ways. According to numerous studies, preferences are an expression of underlying aspects of human functioning (Kaplan & Kaplan, 1995). Therefore, preferences are intimately related to an individual's values, beliefs, and behaviors, which consequently play an important role in the formation of those preferences. In fact, the findings of this study detected such a relationship and mutual influence of pro-environmental values, beliefs, behaviors, and preferences with 99% and 95% confidence levels for the pro-environmental values and beliefs on parents' preferences and for the pro-environmental behaviors and knowledge on parents' preferences respectively.

The values and beliefs survey section consisted of four questions that aimed to ascertain parents' general attitudes about the environment. More than 80% of the participants confirmed their agreement with each of the statements and affirmed that problems of climate change, toxic substances, and exploitation of the natural environment are part of their personal concerns. To protect the environment, the same percentage of the parents' would be willing to pay higher taxes, which could be related

again to the higher income potential or could be considered as an expression of willingness to engage in activist pro-environmental behavior (Stern, 2000).

Pro-environmental behaviors questions were designed to determine the participants' personal environmental actions, which may eventually be important in shaping the development of their children's pro-environmental attitudes and behaviors (Evans, 2005). Overall, approximately 80% of the participants stated they practice listed pro-environmental behaviors sometimes, often, or always. While most of the answers may have been based on the parents' personal routines, some theories suggest that a number of green design features could have been chosen because of their convenience (McKenzie-Mohr & Smith, 2006). One such example is recycling. According to McKenzie-Mohr and Smith (2006), recycling is a popular option of pro-environmental behavior, because it alleviates guilt for not making more difficult and inconvenient changes toward sustainable living. Therefore it is the green behavior of choice for many people. The same explanation could apply to the use of energy efficient lighting and appliances. Almost 94% of the participants declared the use of energy saving appliances and light bulbs in their households on regular basis. To support this theory even further, it is important to highlight the finding that only 8 out of 66 parents economize the water used for shower and washing on daily basis (always). Short showers seem to be one of the biggest personal discomforts; therefore might not be practiced as often as recycling.

The pro-environmental knowledge test was administered to determine the participants' general understanding of green design practices. The structure of this test was framed by two LEED rating systems (LEED EB and LEED for Schools) and by the

existing conditions in both study settings. As already mentioned in Chapter 3, the selected centers are located in a university-based environment, which enables programs, support systems, and sustainability practices not generally available to other childcare facilities (see Appendix G). Although more than 56% of the parents received very good scores (at least eight correct responses out of ten) on the pro-environmental knowledge test, there was a number of participants who did not recognize some green design practices in their entirety.

Two answers with the lowest scores addressed issues of interior material selection and indoor environmental quality. First, although almost 95% of the participants were able to recognize positive environmental attributes in interior materials and furniture, 62% of the participants were not able to properly choose a specific flooring type. Out of four possibilities (carpet, linoleum, tiles, and concrete), 47% of the participants chose tiles instead of linoleum as the best antimicrobial, antistatic, and easy to clean flooring suitable for a childcare facility. It was quite apparent that many parents did not consider issues of safety, acoustics, and maintenance when making their choice. According to Bowers (2005), linoleum used to be very popular choice but after a decade it came to be viewed as cheap and boring. However, with a wide range of colors and patterns now available and with production that is environmentally conscious, linoleum is becoming widely specified again. It has an integral finish that requires minimal maintenance, resists scratches, and contributes to better acoustical performance (Bowers, 2005). Although there are some concerns about emissions from the linseed oil, which is an integral component of linoleum, VOCs emitted from the vinyl flooring or from the tile adhesives are regarded as a greater threat (Green Resource Center, 2010).

Second, 75% of the participants presented misinterpretation of the indoor environmental quality (IEQ) concept. Although more than 65% of parents understand IEQ consists of components such as daylight, views and artificial lighting, only 24% of the participants recognized that heating and occupant's control of the environment are just as important. The fact that 63% of the participants are associated with the field of medical sciences may also have contributed to such test results; while indoor air quality issues such as daylight, natural ventilation, and non-toxic materials are a part of the participants' everyday professional lives, other components of IEQ may not be apparent to them on such a regular basis. Both of these problematic areas, interior material selection and IEQ, represent basic yet complex green design issues that might require better education of consumers and all design stakeholders. Despite minor ambiguities and only few results that point to the differences in preferences attributable to knowledge about the environment (Kaplan & Kaplan, 1995), the study findings detected that the achieved level of pro-environmental knowledge had a strong positive influence on parents' preferences related to green childcare design. However, it is possible to assume that the level of pro-environmental knowledge does not always have to be influenced by values, beliefs, and behaviors, or vice versa.

Preferences Related to Green Childcare Design

Parents' preferences related to green childcare design represented a group of dependent study variables. These consisted of 12 statements, with their framework based on two LEED rating systems and two study settings. Based on the results of the study, all participants prefer their childcare facility to have strong recycling programs and an abundance of daylight and views. Almost 80% of the participants prefer their childcare facility to use energy efficient appliances, water efficient plumbing fixtures,

HVAC and lighting controlled by occupants, environmental education, and plenty of natural environments surrounding the childcare center. In order to achieve green childcare design, over 60% of the participants would be willing to pay higher tuition. Again, this finding might be related to the high combined family income levels claimed by the study participants. More than 50% of the participants indicated in the survey they had no preference in the location of their childcare facility in regards to its proximity to public transportation. However, the qualitative results of the survey revealed that more than 70% of the parents enjoy the centers' locations because of the closeness to their work sites. LEED rating systems include the use of alternative transportation, including mass transportation, as one of the credits. The city, the university, and even the hospital, to which one of the centers is attached, offer public and alternative modes of transportation. Yet, the study participants seem to prefer personal transportation. The existing transportation system has limited reach and frequency, which are great constraints in humid subtropical climate. It is probable, that study participants find the use of personal vehicles more convenient for their job and family schedules.

Out of 12 statements in the preferences section, two of them were presented as reversed questions; these in turn offered responses that did not strongly correlate with the results of the pro-environmental knowledge test. First, although parents' proved their understanding of low-toxic and renewable materials in the knowledge test and stated their strong preferences for them in the following statement, 50% of the participants were unsure about the use of plastic and pressed wood furniture. Second, 65% of the participants would agree for their childcare facilities to use paints and coatings with high levels of VOCs, even though they exhibited a very good understanding of toxic

substances and indoor air pollution in the previously administered pro-environmental knowledge test. This finding only supports many research theories that although reversed questions help to break a boring survey routine, thus increasing the likelihood that questions will be answered accurately, they have to be administered with extra caution (Kumar, 2005).

Overall, it is safe to conclude that both observations and study findings suggest that parents' preferences related to green childcare design are closely related to their pro-environmental values, beliefs, behaviors, and knowledge. Areas of uncertainty identified through reversed questions and/or questions about the location of the childcare centers' proximity to public transportation might stem from the participants' own inconvenience or lack of attention to the questions.

The inclusion of additional questions about parents' pro-environmental attitudes and behaviors, and their green design preferences might have generated even more insightful results. An example of such a question would be: If you had a choice, would you select a green childcare facility instead of the current one? However, it is important to acknowledge that there is a considerable difference between answering a survey and making real-life choices, where additional factors might weigh in. Furthermore, it is known that many respondents tend to answer more cautiously when their names are published and their commitments are written down (McKenzie-Mohr & Smith, 2006). This study's surveys were anonymous, which may have contributed to obtaining these inconsistent findings.

Qualitative Findings

Although they were not required of the participants, qualitative responses about their childcare facilities and desired green design features were elicited through the

second questionnaire, questions13 through 16. As mentioned previously, in addition to two LEED rating systems and VBN theory, the structures of both surveys (especially the pro-environmental knowledge test and parents' preferences related to green childcare design) were partially based on the two existing study settings. Qualitative results of this study not only verified findings stated in the literature review but also appeared to confirm the researcher's premise that the study setting might have influenced parents' pro-environmental attitudes and green design knowledge and preferences.

The research of Helburn et al. (1995) as well as the results of this study concur that the three most common reasons for choosing a particular childcare facility include childcare center location, educational curriculum taught by experienced teachers and staff, and the facility's reputation. Approximately one sixth of the participants also noted the importance of the childcare's cleanliness, cost, and hours of operations. Parents' green design desires seemed to be largely derived from what their childcare centers cannot or do not currently offer. More than 25% of the participants declared their wishes for each of the following green design features:

- occupant-controlled high efficient HVAC
- energy efficient lighting and appliances
- recycled and low-toxic/non-toxic interior materials and furniture
- natural ventilation and views of nature

Additionally, some parents would like their childcare facilities to incorporate solar power, bigger outdoor play areas, green educational curriculum with strong recycling activities, and locally grown produce. While most of the answers are likely based on the parents' observations of their present childcare facilities, McKenzie-Mohr's and Smith's (2006) theory of convenience might still apply, especially in the case of recycling activities. Twelve parents also commented on their children's health problems; they

listed allergies, recurring ear infections, and communicable diseases as the major health and developmental problems that could be traced to the childcare environment. Finally, all parents attempted to define the term ‘green design’; almost all explanations concluded that such design should be environmentally friendly and safe for children.

In summary, the results of this study concluded profound influence of parents’ pro-environmental values, beliefs, behaviors, and knowledge on their preferences related to green childcare design. Study findings suggested that combined family income and completed education level belong to the demographic variables that have the strongest effect on parents’ green design preferences. Furthermore, although participants’ pro-environmental behaviors and knowledge displayed as essential, parents’ pro-environmental values and beliefs tested as the variables with the biggest influence on their preferences. The study findings clearly substantiated parents’ general understanding of green design importance for children’s healthy and safe development.

However, the results of the study also contradicted several findings stated in the literature. Most importantly, higher levels of parents’ completed education displayed as inversely related to greater green design preferences. Also, despite being identified as childcare evaluators with limited knowledge, parents demonstrated significant pro-environmental knowledge. What is more, study participants displayed strong preferences related to green childcare design, even though both study settings currently offer more green design and sustainability practices than the majority of other childcare facilities within the state of Florida. These facts only enforce the question: “Should parents still be considered ineffective evaluators of childcare quality, predominantly

because of their high demands?" Although the study sample was limited in size and demographics, this question might be worthy of further discovery.

Conclusions and Implications for Future Research

The positive impact of sustainable development and green design in any environment, including those for early childcare, has been confirmed by a number of studies (Butin, 2000; Fontaine et al., 2006; Kopec, 2009). As Fontaine et al. (2006) write, a high-quality care setting is essential for the optimal development of young children; a complete assessment of the spaces, curriculum and activities, materials, equipment, nutrition and health factors can uncover critical information for parents, center administrators, teachers and staff.

This thesis demonstrated that one of the crucial stakeholders of childcare design—parents—have strong pro-environmental values, beliefs, behaviors, and knowledge that positively influence their preferences for green childcare facilities. Although parents' interest in green childcare design is far from vague, there are a number of barriers that prevent green design development in early childhood environments.

First, although parents are considered major consumers of childcare services, in general they seem to have limited decisive power on their elements of quality. Although the study settings' director claims parents' preferences influence everything from hours of operation to meals served (Pallas, P. Personal communication, September 20, 2010), such parental influence might not be present in all childcare facilities, especially not when it comes to including green design practices as one of the quality variables. Requirements of childcare quality variables need to be monitored and updated according to changing societal needs (Butin, 2000); if green design is important for the overall development of children and if parents have strong preferences for it, then

parents should be given more power to include green design among key childcare quality variables. Additional research should assess the role of parents in green design decision-making and evaluate their preferences according to shifting societal needs. Education for sustainability is a lifelong process and must begin at the earliest stages of individuals' lives (Evans, 2005).

Second, although parents are interested in green childcare design, there are not enough options for them to make a choice between conventional and green childcare. According to LEED statistics (2009), the number of existing green childcare facilities in the United States is under 2%. There are more than 480 green childcare centers in the U.S. (USGBC, 2010); additional green childcare facilities might exist but not be officially certified and therefore are excluded from the list of LEED certified buildings. Some of these centers might oppose the certification because it is too complex, expensive, or does not fulfill their green design visions and approaches. Further investigation of green childcare centers existence, types, and other statistics is strongly recommended.

Third, it is important to realize there are two ways of building a green childcare facility which might have an effect on the clients', consumers', and users' preferences and decisions. While one way is to construct a new green childcare, which on average costs 5% more than a conventional building (Durrett & Torelli, 2009), another option is to reuse and recycle an existing construction at a comparable or even lower cost than new construction. However, even though most of the green design features would improve every childcare environment, they often have higher initial costs and tend to save energy and environment over the life cycle (Durrett & Torelli, 2009; Ford, 2007). Additionally, the efficacy of green building rests on the correct use by its occupants.

Therefore, whether the facility is new or reused, it is necessary to provide the building and all design stakeholders with the tools, knowledge, and resources to make green vision a reality (Ford, 2007); merely talking about the benefits of green design is not sufficient. These facts strongly encourage additional research in the areas of green design education and pre-design programming.

Fourth, this study concentrated solely on parents. However, teachers, staff, and the government could also contribute to the presence of green design in early childcare environments. Currently, teachers and staff generally concentrate on educational and operational services of childcare facilities. The government carries an important role as childcare cost and quality regulator. Some authors claim that government, business and private philanthropies need to increase their financial support for childcare services, which, in addition, could improve the levels of childcare quality (Helburn et al., 1995). Although legislation enforcement is not always popular (such as regulation of auto emissions), it has been proven to work in some circumstances (McKenzie-Mohr & Smith, 2006); perhaps greener governmental policies would lead to greener childcare designs. Additional studies examining teachers', staffs', and government's green design knowledge and preferences might reveal important data that could have a strong impact on green childcare design presence and future.

Now I know my ABCs (of green design)
Next time won't you sing with me?

APPENDIX A
ECO-HEALTHY CHILD CARE CHECKLIST

Eco-Healthy Child Care Checklist

The Eco-Healthy Child Care Checklist offers **25 easy-to-follow steps** that will immediately benefit the health and well-being of all the children in your care.

Follow these instructions to get started on going green!

1. Answer all 25 questions on the checklist.

2. Comply with at least 20 of 25 items, including # 1 and #5, which are required.

3. If you can't answer "yes" to 20 items, take steps to make improvements. Please call for assistance.

4. Fill out the form as instructed and submit for approval.

5. Fold the checklist with return the address showing. Tape it closed, attach postage and mail.

YES	NO	?		
				Pesticides and Pest Prevention
○	○	○	**1.**	We use non-toxic techniques both inside and outside the facility to prevent and control pests (both insects and weeds). If a serious threat remains and pesticide application is the only viable option, parents are notified in advance and a licensed professional applies the least-toxic, effective product at a time when children will not be exposed to the application area for at least 12 hours. **Required**
				Air Quality
○	○	○	**2.**	We avoid conditions that lead to excess moisture, which contributes to the growth of mold and mildew. We maintain adequate ventilation and air flow, we repair water leaks, and we keep humidity within a desirable range.
○	○	○	**3.**	We do not allow cars or other vehicles to idle near the facility.
○	○	○	**4.**	We do not use scented candles or air fresheners.
○	○	○	**5.**	We do not permit smoking anywhere on the premises or in sight of children. **Required**
				Household Chemicals
○	○	○	**6.**	We use biodegradable, non-toxic cleaning products and least-toxic disinfecting products. When other products are required, they are used only for their intended purpose in strict accordance with all label instructions. We store cleaning products where children cannot access them.
○	○	○	**7.**	We only use chlorine bleach when and where it is required or recommended by state and local authorities. We use it prudently and never use more than necessary.
○	○	○	**8.**	We do not use aerosol sprays of any kind.
○	○	○	**9.**	We use only low-VOC latex paints and do not paint when children are present.
				Lead
○	○	○	**10.**	We use only cold water for drinking, cooking and making baby formula, and we run the water for 5-10 seconds or until it feels noticeably colder.
○	○	○	**11.**	Our facility was built after 1978 (after lead paint was banned) — OR — the facility was built before 1978, but we keep the building free of flaking or peeling paint and regularly wash all areas around doors and windows.
○	○	○	**12.**	We do not use imported, old or handmade pottery to cook, store or serve food or drinks.
○	○	○	**13.**	We supply a rough mat at the entrance of our facility and encourage the wiping of shoes before entering — OR — we are a shoe-free facility.

Mercury

❍ ❍ ❍ **14.** We do not use any mercury-containing thermometers. Instead we use digital thermometers.

❍ ❍ ❍ **15.** We securely store and recycle all used batteries and fluorescent and compact fluorescent light bulbs.

Furniture and Carpets

❍ ❍ ❍ **16.** Furniture is in good condition without foam or inside stuffing exposed (same goes for stuffed animals or any other foam item).

❍ ❍ ❍ **17.** Furniture is made of solid wood, with few, if any, items made of particleboard.

❍ ❍ ❍ **18.** We do not have wall-to-wall carpets.

❍ ❍ ❍ **19.** Area rugs are vacuumed daily and cleaned at least twice a year using biodegradable cleaners.

Art Supplies

❍ ❍ ❍ **20.** We use only non-toxic art supplies approved by the Art & Creative Materials Institute (ACMI) (see www.acminet.org/index.htm for a list).

Plastics and Plastic Toys

❍ ❍ ❍ **21.** We avoid toys made out of soft plastic vinyl (i.e., we buy only those labeled "PVC-free").

❍ ❍ ❍ **22.** We never use the microwave to heat food that is in plastic containers, plastic wrap or plastic bags.

Treated Playground Equipment

❍ ❍ ❍ **23.** We do not have playground equipment made of treated wood.

Need tips?
Please contact us:
www.oeconline.org/ehcc
503.222.1963 x119

Recycling and Garbage Storage

❍ ❍ ❍ **24.** We recycle all paper/cardboard, glass, aluminum and plastic bottles.

❍ ❍ ❍ **25.** We keep our garbage covered at all times to avoid attracting pests and minimize odors.

The **Eco-Healthy Child Care** (EHCC) program was created by the Oregon Environmental Council (OEC) to ensure that child care settings are as healthy, safe and green as possible by reducing children's exposure to toxins. For more information on the program or OEC, visit **www.oeconline.org/ehcc.**

Endorsement Form

Thank you for working to make your child care Eco-Healthy!

1 Verify your responses:

"The information provided on this Eco-Healthy Child Care Endorsement Checklist is true to the best of my knowledge."

Parent or non-employee witness (signature) date

Facility owner or director (signature) date

2 Please record your facility information:

Facility name # of children served

Street address or P.O. Box

City State Zip Code

Contact name Phone

Contact email

❍ I would like to receive OEC's free online newsletter.

FOR VERIFICATION • OFFICE USE ONLY

Approved by (signature) date

Eco-Healthy Child Care

APPENDIX B
INSTITUTIONAL REVIEW BOARD PERMISSION

UF Institutional Review Board
UNIVERSITY of FLORIDA

PO Box 112250
Gainesville, Fl32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

DATE: June 17, 2010

TO: Zuzana Vatralova

FROM: Ira S. Fischler, PhD, Chair
University of Florida
Institutional Review Board 02

SUBJECT: **Approval of Protocol #2010-U-0563**

TITLE: Influence of Parents' Pro-Environmental Knowledge, Values, Beliefs, and Behaviors on their Preferences of Green Childcare Design

SPONSOR: None

I am pleased to advise you that the University of Florida Institutional Review Board has recommended approval of this protocol. Based on its review, the UFIRB determined that this research presents no more than minimal risk to participants, and based on 45 CFR 46.117(c), An IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: *(1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.*

The IRB authorizes you to administer the informed consent process as specified in the protocol. If you wish to make any changes to this protocol, ***including the need to increase the number of participants authorized***, you must disclose your plans before you implement them so that the Board can assess their impact on your protocol. In addition, you must report to the Board any unexpected complications that affect your participants.

This approval is valid through **June 16, 2011**. If you have not completed the study by this date, please telephone our office (392-0433), and we will discuss the renewal process with you. It is important that you keep your Department Chair informed about the status of this research protocol.

ISF:dl

APPENDIX C
INFORMED CONSENT FORM 1

INFORMED CONSENT 1

Please read this consent document carefully before you decide to participate in this study.
Thank you in advance for your participation.

Influence of parents' pro-environmental knowledge, values, beliefs, and behaviors on their preferences of green childcare design.

Purpose of the research study: This study explores parents' preferences for green design as factor of quality childcare by assessing the extent to which parents' preference for green childcare design relates to their pro-environmental knowledge, values, beliefs, and behaviors.

What you will be asked to do in the study: You will be asked to complete two surveys that seek to find out (1) parents' pro-environmental knowledge, values, beliefs, and behaviors—PARENT QUESTIONNAIRE 1 and (2) parents' preferences of green childcare design—PARENT QUESTIONNAIRE 2. Before you start completing this first questionnaire, you can review the attached form with definitions of important terms.

Time required: Approximately 20 minutes.

Risks and benefits: You will be asked specific questions that you may consider of a personal nature. You will not have to answer any question you do not wish to answer, and your refusal to answer any questions will carry no penalization. You will not benefit directly by participating in this study other than your indirect contribution to understanding the challenges and opportunities for the creation of green childcare centers. There is no more than the minimal risk for participating in this study.

Compensation: You will not be compensated for completing the survey.

Confidentiality: You will not be asked to give your name or contact information. Both questionnaires will be sent to you through the childcare facility director. Neither the researcher, nor any other person handling the study data will be given your name or e-mail address. Any personal demographic information requested in the survey will only be used to compare your answers to other participants. Your responses will be anonymous and will only be associated to the assigned code number. Code numbered information will be used for all data analysis. When the study is completed and all data have been analyzed, any information linking participants to the study will be destroyed. Participants' names will not be mentioned in any report.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at anytime without consequence.

Whom to contact if you have questions about the study:
Zuzana Vatralova, Graduate Student, Department of Interior Design,

Maruja Torres-Antonini, Associate Professor & Graduate Coordinator, Department of Interior Design, 334 Architecture, P.O. Box 115701, Gainesville, FL 32611, ph.: (352) 392-0252 x335

Whom to contact about your rights as a research participant in the study:
IRB02 Office, PO Box 112250, University of Florida, Gainesville, FL 32611-2250, ph.: (352) 392-0433.

Agreement: I have read the procedure described above. By clicking on the following link I voluntarily agree to participate in the study.

(here will be located the electronic link for the first survey)

Principal Investigator: Zuzana Vatralova Date: June 10th, 2010

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2010-U-563
For Use Through 06-16-2011

APPENDIX D
INFORMED CONSENT FORM 2

INFORMED CONSENT 2

Please read this consent document carefully before you decide to participate in this study.
Thank you in advance for your participation.

Influence of parents' pro-environmental knowledge, values, beliefs, and behaviors on their preferences of green childcare design.

Purpose of the research study: This study explores parents' preferences for green design as factor of quality childcare by assessing the extent to which parents' preference for green childcare design relates to their pro-environmental knowledge, values, beliefs, and behaviors.

What you will be asked to do in the study: You already completed one survey that sought to find out (1) parents' pro-environmental knowledge, values, beliefs, and behaviors—PARENT QUESTIONNAIRE 1. Now you are asked to complete the follow-up survey which aims to find out (2) parents' preferences of green childcare design—PARENT QUESTIONNAIRE 2. Before you start completing the questionnaire, you can review the attached form with definitions of important terms.

Time required: Approximately 15 minutes.

Risks and benefits: You will be asked specific questions that you may consider of a personal nature. You will not have to answer any question you do not wish to answer, and your refusal to answer any questions will carry no penalization. You will not benefit directly by participating in this study other than your indirect contribution to understanding the challenges and opportunities for the creation of green childcare centers. There is no more than the minimal risk for participating in this study.

Compensation: You will not be compensated for completing the survey.

Confidentiality: You will not be asked to give your name or contact information. Both questionnaires will be sent to you through the childcare facility director. Neither the researcher, nor any other person handling the study data will be given your name or e-mail address. Any personal demographic information requested in the survey will only be used to compare your answers to other participants. Your responses will be anonymous and will only be associated to the assigned code number. Code numbered information will be used for all data analysis. When the study is completed and all data have been analyzed, any information linking participants to the study will be destroyed. Participants' names will not be mentioned in any report.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at anytime without consequence.

Whom to contact if you have questions about the study:
Zuzana Vatralova, Graduate Student, Department of Interior Design,

Maruja Torres-Antonini, Associate Professor & Graduate Coordinator, Department of Interior Design, 334 Architecture, P.O. Box 115701, Gainesville, FL 32611, ph.: (352) 392-0252 x335

Whom to contact about your rights as a research participant in the study:
IRB02 Office, PO Box 112250, University of Florida, Gainesville, FL 32611-2250, ph.: (352) 392-0433.

Agreement: I have read the procedure described above. By clicking on the following link I voluntarily agree to participate in the study.

(here will be located the electronic link for the second survey)

Principal Investigator: Zuzana Vatralova Date: June 10th, 2010

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2010-U-563
For Use Through 06-16-2011

APPENDIX E
PARENT QUESTIONNAIRE 1

For identification purposes only, please write a six-character alphanumeric combination with your first and last initial and month and day of birth (e.g. ZV0916). You will be asked to use this password again in a follow-up "PARENT QUESTIONNAIRE 2". __ __ __ __ __ __ [FI, LI, MM, MM, DD, DD]

For each of the questions 1-8 select the most appropriate answer.

1. What is your affiliation with the University of Florida (UF)?

- ___ UF student; College of _____
- ___ UF faculty; College of _____
- ___ UF staff; College of _____
- ___ other; specify _____

2. Which childcare facility does your child/do your children attend?

- ___ Baby Gator Child Development Center at Village Drive
- ___ Baby Gator Child Development Center at Newell Drive

3. How many of your children attend this facility?

- ___ one child
- ___ two children
- ___ more than two children; specify ___

4. What was your combined family income in 2009?

- ___ under $20,000
- ___ $20,000-$40,000
- ___ $ 40,000-$60,000
- ___ $60,000-$80,000
- ___ $80,000-$100,000
- ___ more than $100,000

5. What was the last grade of school you completed?

- ___ not a high school grad
- ___ high school grad
- ___ some college
- ___ college grad
- ___ post grad

6. What country are you originally from?

- _____

7. What is your religious affiliation?

- ___ Catholic
- ___ Jewish
- ___ Protestant
- ___ Muslim
- ___ None
- ___ Other

8. How would you describe your views on most political matters?

- ___ Very Liberal
- ___ Somewhat Liberal
- ___ Moderate
- ___ Somewhat Conservative
- ___ Very Conservative

9. What is your ethnicity?

- ___ White
- ___ Black
- ___ Hispanic
- ___ Asian
- ___ Other

For each of the questions 10-13, select only one number on a scale 1=strongly disagree through 5=strongly agree. If you choose not to answer a question or you do not know the answer, select "DK/NA".

10. Climate change is affecting the future of our children.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

11. Toxic substances in air, water, and soil can cause serious health problems to adults and children.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

12. Our family would be willing to pay higher taxes in order to protect the environment.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

13. Humans have the right to modify the natural environment to suit their needs.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

For each of the questions 14-18, select only one number on a scale 1=never through 5=always. If you choose not to answer a question or you do not know the answer, select "DK/NA".

14. Our family recycles.

1	2	3	4	5	DK/NA
Never	Rarely	Sometimes	Often	Always	

15. Our family economizes water used for showers and washing.

1	2	3	4	5	DK/NA
Never	Rarely	Sometimes	Often	Always	

16. Our family uses energy saving appliances and light bulbs.

1	2	3	4	5	DK/NA
Never	Rarely	Sometimes	Often	Always	

17. Our family opens windows for natural ventilation.

1	2	3	4	5	DK/NA
Never	Rarely	Sometimes	Often	Always	

18. Our family buys green/environmentally friendly cleaning products.

1	2	3	4	5	DK/NA
Never	Rarely	Sometimes	Often	Always	

For each statement 19-28, choose the item you believe is the best answer:

19. Childcare facilities located in urban areas face the following challenge(s):

a. ___ indoor pollution from materials such as plywood, paint, and carpet
b. ___ deficiency in learning from the natural environment
c. ___ outdoor air pollution from factories and traffic
d. ___ all of the above
e. ___ a and c only

20. Plumbing fixtures that help to reduce the water use are:

a. ___ water meters
b. ___ low-flow toilets
c. ___ aerators
d. ___ shower timers
e. ___ all of the above

21. The best way to increase energy performance and decrease energy cost in buildings is by:

a. ___ the use of energy-efficient appliances
b. ___ the proper door and window sealing
c. ___ the use of control meters on major mechanical systems
d. ___ the use of non-renewable energy sources
e. ___ all but d

22. Interior furniture, fabrics, and carpets may contain toxic materials such as formaldehyde and various flame retardants which are known human carcinogens and asthma triggers.

a. ___ true
b. ___ false

23. The best antimicrobial, antistatic, and easy to clean floorings suitable for childcare facility is:

a. ___ carpet
b. ___ linoleum
c. ___ tiles
d. ___ concrete
e. ___ all of the above

24. Bamboo, linoleum, wool, cotton, and cork are the materials that have the worst environmental and performance attributes.

a. ___ true
b. ___ false

25. The best way to prevent indoor air pollution in a building is by:

a. ___ testing for nitrogen
b. ___ use of least-toxic biodegradable cleaning products
c. ___ use of low or no VOC (volatile organic compound=toxic substance) paints
d. ___ natural ventilation
e. ___ all but a

26. The best way to improve indoor environmental quality is by:

a. ___ maximizing daylight and views
b. ___ having heating and lighting controlled by occupants
c. ___ using compact fluorescent lighting
d. ___ all of the above
e. ___ a and c only

27. Every day, an average American generates:

a. ___ one pound of waste
b. ___ two pounds of waste
c. ___ four pounds of waste
d. ___ ten pounds of waste

28. Presence of dirt, moisture, and warmth encourages the growth of mold and other contaminants which may trigger asthma and allergic reactions.

a. ___ true
b. ___ false

APPENDIX F
PARENT QUESTIONNAIRE 2

For identification purposes only, please write a six-character alphanumeric combination with your first and last initial and month and day of birth (e.g. ZV0916). You were asked to use this password in "PARENT QUESTIONNAIRE 1". __ __ __ __ __ __ [FI, LI, MM, MM, DD, DD]

The first part of this questionnaire deals with preferences related to green childcare design. For each of the questions 1-12, circle only one number on the scale 1=strongly disagree through 5=strongly agree. If you do not wish to answer a question or you do not know the answer, choose an option "DK/NA".

1. I prefer our childcare facility be located near public transportation.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

2. I prefer our childcare facility be in a small building, surrounded by the natural environment.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

3. I prefer our childcare facility use water efficient plumbing fixtures.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

4. I prefer our childcare facility use energy efficient appliances.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

5. I prefer our childcare facility use plastic and pressed wood furniture.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

6. I prefer our childcare facility incorporate locally obtained, renewable interior materials with recycled content as often as possible.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

7. I prefer our childcare facility have recycling program.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

8. In each childcare classroom, I prefer occupants be able to adjust the amount of heat and light according to their needs.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

9. I prefer our childcare facility maximize daylight and views of nature.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

10. I prefer our childcare facility use paints and coating with high levels of volatile organic compounds (VOCs).

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

11. I prefer environmental education and protection be included in our childcare facility's educational curriculum.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

12. I prefer to pay higher childcare tuition in order to have a green/environmentally friendly childcare facility.

1	2	3	4	5	DK/NA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	

Please provide the appropriate answers to questions 13-16.

13. What are the three main reasons you chose the childcare facility your child attends/your children attend?

▪ _____ ▪ _____ ▪ _____

14. What do you understand under the term "green design" to encompass or to mean?

_____
_____
_____
_____

15. What are the three environmental/green design features you would like to see in your childcare facility, if any?

▪ _____ ▪ _____ ▪ _____

16. Has your child/have your children experienced any health or developmental problems that could be traced to the childcare environment? If yes, please specify:

_____
_____
_____

APPENDIX G
STUDY SETTING DESCRIPTIONS

Childcare 1 is surrounded by a 3.3-acre-large conservation area from the north side, family and graduate campus housing from the south side, a two-lane road from the east and a quiet neighborhood buffering the campus golf course from the west side. The center is located near public transportation and has designated parking spaces for a limited number of vehicles. The main exterior and interior building materials include concrete masonry units (CMU), gypsum board, and wood siding. Each of the three buildings features large operable windows which serve as a plentiful source of daylight and natural ventilation. Whenever weather permits, windows are open. The thermostat is set by the university to stay at 74°F for air-conditioning in the summer and 70°F for heat in the winter. Ceilings in all spaces are composed of acoustical tiles; lighting consists of recessed luminaires with fluorescent tubes. Several classrooms are located in large open spaces, which allow groups of children to perform activities simultaneously, but may contribute to acoustical privacy issues. The flooring materials in the majority of spaces consist of vinyl composite tiles (VCT) and area rugs demarcating different activity zones. The infant room features nylon carpet; the flooring in the administrative offices consists of ceramic tile and area rugs. Most of the furniture utilized in the classrooms is made from solid wood and pressed wood materials, only a few toddler chairs are plastic.

In addition to the facility's central kitchen, in which a cook prepares the USDA approved meals, each building features its own kitchenette for heating food, food storage, cleaning, and learning purposes. In order to minimize waste the facility has two compost piles for the leftover food. Composting products are used as nutritional support

for vegetable and butterfly gardens located in the facility's yard. Fenced playground areas located around the buildings are large and feature zones for various activities. Finally, the center has its own recycling program for cans, bottles, and cardboard. The following images (Figure 4-1 through Figure 4-8) depict Childcare 2.

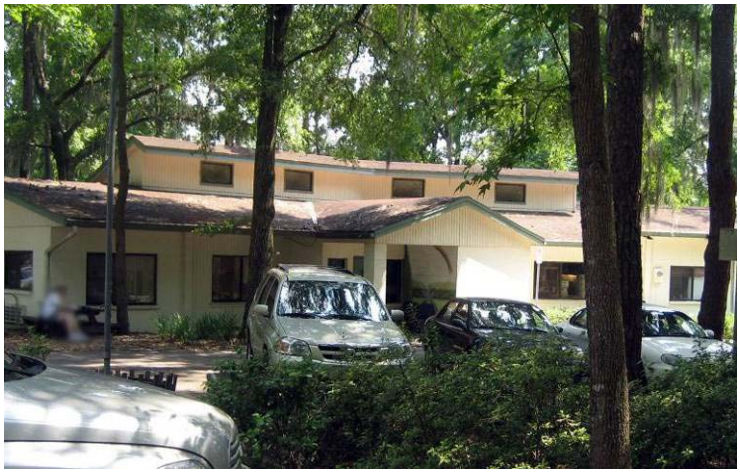

Figure G-1. Main building with classrooms, main kitchen, and offices. Photograph taken by Zuzana Vatralova.

Figure G-2. Typical classroom 1. Chairs are lifted for daily cleaning purposes. Photograph taken by Zuzana Vatralova.

Figure G-3. Kitchenette in a typical classroom suite. Photograph taken by Zuzana Vatralova.

Figure G-4. Personal storage area. Chairs are lifted for daily cleaning purposes. Photograph taken by Zuzana Vatralova.

Figure G-5. Multipurpose play space. Photograph taken by Zuzana Vatralova.

Figure G-6. Herb garden. Photograph taken by Zuzana Vatralova.

Figure G-7. Outdoor deck/play area. Photograph taken by Zuzana Vatralova.

Figure G-8. Outdoor playground. Photograph taken by Zuzana Vatralova.

Childcare 2 is located in close proximity to the northern part of the University hospital situated in the south-east campus corner. In contrast to the other structures in the immediate neighborhood, the center is only one story tall. It creates the impression of being located in a valley, with a green park-like area on the north-west side and a busy two-lane road sloping down on the east side. The childcare facility is located in close proximity to busy streets and public transportation; therefore, the center is fenced from all sides. There is abundant parking in the immediate area, including a five-story parking garage across the street for hospital employees, a large surface lot for residents

of university housing, and a small surface lot for parents dropping off or picking up children at the center. The building is concrete block construction with exterior brick veneer. Although all windows in the facility are operable, they are rarely opened for natural ventilation. Most of the day, windows serve as a source of natural daylight, the blinds are closed only during nap time. The thermostat is controlled by the hospital and set at 70°F. The ceiling in most spaces consists of painted gypsum board and acoustical tiles. Recessed cans and recessed troffer luminaires with fluorescent tubes are the only source of artificial lighting. Each age group has its own classroom suite separated from the other spaces by a door with a glass insert. The majority of spaces feature VCT flooring and area rugs, except the infant room, which has nylon wall-to-wall carpet in the largest classroom. All classroom and hallway furniture is made of solid wood.

The meals for children are prepared by the hospital according to USDA requirements. However, each classroom suite features its own kitchenette and restroom areas. Similar to Childcare 1, Childcare 2 has its own butterfly park and small vegetable garden and a recycling program for bottles, cans, and cardboard. The outside play area attached to the north-west side of the building is comprised of three large zones: an asphalt bicycle track, a green area with swings and sandboxes, and an additional asphalt area with a climbing structure, slides and a storage shed. The following images (Figure 4-9 through Figure 4-15) depict Childcare 2.

Figure G-9. Main entrance. Photograph taken by Zuzana Vatralova.

Figure G-10. Hallway and personal storage area. Photograph taken by Zuzana Vatralova.

Figure G-11. Typical classroom 2. Photograph taken by Zuzana Vatralova.

Figure G-12. Arts and craft preparation and cleaning area. Photograph taken by Zuzana Vatralova.

Figure G-13. Butterfly garden. It separates the childcare facility and the hospital. Photograph taken by Zuzana Vatralova.

Figure G-14. Outdoor asphalt play area. Photograph taken by Zuzana Vatralova.

Figure G-15. Outdoor playground area and herb garden. Photograph taken by Zuzana Vatralova.

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BIOGRAPHICAL SKETCH

Zuzana Vatralova was born and raised in Stara Lubovna, Slovakia. She received her first bachelor's degree in Legal Studies at the Comenius University in Bratislava, Slovakia. She moved to the United States in 2002 to accompany her husband during his graduate studies. Zuzana's English language skills were limited to the point of nonexistent at the time. She, however, worked hard on improving her English to pursue a degree in interior design at the University of Florida. Zuzana completed her Bachelor of Design degree in interior design, with highest honors, in 2009 and immediately embarked upon her Master of Interior Design degree. Zuzana finds passion and inspiration in her family; her research interest is the design of learning and educational environments. It is from these sources that her research topic evolved. Zuzana is open to constant learning from all available sources and likes to teach others. She appreciates sustainable, contemporary, and functional design. After the completion of her master's degree, she plans to return to her native Slovakia where she would like to open her own graphic and design studio, and pursue an academic career.