ACT FOR CHILDREN

A Study of How Architecture Can Foster Development
During the Stages of Early Childhood

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DEFINITIONS

DAYCARE

"The care of a child in a residence outside the child's own home for gain or otherwise, on a regular basis, for any part of a 24 hour day"(Minnesota administrative rules, human services department, chapter 9502.0315).

INFANT

"A child who is at least six weeks of age but less than 12 months of age" (Minnesota administrative rules, human services department, chapter 9502.0315).

CHILD

"A person ten years of age or younger" (Minnesota administrative rules, human services department, chapter 9502.0315).
Newborn

NEWBORN

"A child between birth and six weeks of age"
(Minnesota administrative rules, human services department, chapter 9502.0315).

ABSTRACT

What role does architecture play in fostering the stages of early childhood development? The first five years of a child's life are the most crucial years of their developmental process as they grow not only physically but also cognitively, socially and emotionally. Children are impressionable human beings drastically impacted by their surrounding environments. Through design, we can enhance the lives of the users through well informed environments that are not only healthy but safe, functional and beautiful. This paper seeks to investigate the stages of development and identify key prepared environments that facilitate learning in early child development. The results suggest that, in terms of the ideal environment for children, not one prepared environment takes precedent over the others. Scale, light, color, safety, security, spatial arrangement, and nature all play an integral role in the development of children. Designing for children is no simple task. As designers we have the responsibility and ethical duty to provide a comprehensive analysis on the needs of our clients. It is our role to ensuring a healthy and nurturing environment while providing a developmentally appropriate and stimulating environment to our nation's youngest generation.

KEYWORDS

Child development, environmental quality, physical environment, fostering learning, infants, toddlers, preschool children

EARLY CHILDHOOD DEVEOPMENT

"From birth through age five, moving from the bassinet to the schoolyard, young children develop at a faster pace than any other time in their life" (Shonkoff & Phillips, 2000). Each day, month and year of a child's life represents the beginning of a new stage of development. Every year of a child's life is precious, but the first three are important because of the rate of growth and learning (Olds, 2001). Four key areas of study for developmental psychology are cognitive, which is the mental process of knowing; social, which looks at how individuals interact with others and social situations; emotional, which studies how people process and cope with understanding emotions of oneself and of others; and lastly physical, which concentrated on gross and fine motor skills as well as puberty (May, 2011). It's important to realize that "every child grows and develops at his or her own pace. Still, development tends to follow a predictable path" (Mayo Clinic Staff, 2010).

A comprehensive study of the developmental milestones of a children's life will enable a thorough understanding of what built environments support and enhance optimal development. The following content provides insight into a children developmental stages from birth to five years of age, as this is the age range of children enrolled in child care centers.

BIRTH TO EIGHTEEN MONTHS

FIVE-YEAR-OLD

EIGHTEEN MONTHS TO TWO YEARS

FOUR-YEAR-OLD

THREE-YEAR-OLD

BIRTH TO EIGHTEEN MONTHS

"In the first eighteen months after birth, an infant makes miraculous progress" (California Department of Education, 2016). Erickson referred to this time as the oral sensory stage where newborns use their reflexes; sucking, grasping, staring, and listening to begin to experience and discover the world around them (as cited in Morrison, g. s. 1991). During this time, mothers loving and caring attention towards a child is crucial in establishing a trusting relationship. Failure to experience trust will result in feeling worthlessness and mistrust (Morrison, g. s. 1991). Also, during this time in development, infants begin to experience the world through taste, smell, sight, and sound. One way to help foster learning amongst infants is provide a stimulating environment but not overwhelm them. If a child becomes over stimulated, the brain begins to experience stress which is not optimal for enhancing development. Remember, the foundation of learning is laid during the first five years as children are experiencing profound changes (Olds, 2001). Any little or big obstruction could be detrimental later in life. "A newborn infant is born into a new world with no prior knowledge or experiences of time, space, color and form. Such ideas must be built upon sensory experience and the ability to submerge oneself into independence and distinguish things in his environment and what the purpose is" (Standing, E. 1962). As professor William James said, "the universe is nothing but a big, buzzing, booming confusion" (as cited in Standing, E 1962) for infants. Parents, and caregivers are responsible for providing interactions during these first few months which will provide a foundation for greater successes.

	Birth to Eighteen Months
Social and Emotional	-"Infants at this age develop feelings of trust and attachment through being held or having someone talk to them and respond when they fuss or cry" (Brotherton, S.,2006). -"Learning to read emotion and express it through observation and imitation" (Brotherton, S.,2006). -"By one month of age, infants display emotions" (Brotherton, S.,2006). -By 4 months, can recognize faces and feelings of caregivers (Brotherton, S.,2006). -Temper tantrums (Centers for Disease Control and Prevention. 2017). -Soon after a discovery is made, one-year-olds will try and make it happen again (Centers for Disease Control and Prevention. 2017). -Imitate caregivers weather it may be making similar faces or copying similar sounds (Oesterreich, L.1995) (Centers for Disease Control and Prevention. 2017).
Language	-Children show what they want through pointing or shaking their heads "yes" or "no" (Centers for Disease Control and Prevention. 2017). -Imitation of adult conversations and actions (Oesterreich, L.1995). -First words are mentioned by 12 months (Oesterreich, L.1995). -Mama and dada (Centers for Disease Control and Prevention. 2017). -Points to objects they want (Centers for Disease Control and Prevention. 2017). -Vocabulary is limited but can speak several singular words. (Centers for Disease Control and Prevention. 2017).
Cognitive	-"Points to one body part" (Centers for Disease Control and Prevention. 2017). -Identifies ordinary things (Centers for Disease Control and Prevention. 2017). -Smiles at 2 months (Morrison, g. s.1991). -At the age of one, writing is still not developed but experimenting with writing utensils often takes place (The Public Broadcasting Service. n.d.).
Physical	
0-3 months	-Arms and legs begin to move actively (Centers for Disease Control and Prevention. 2017). -Suck and grasp everything within reach (Morrison, g. s.1991). -Holds head up (Centers for Disease Control and Prevention. 2017). -Lifts head up and begins to follow objects (Bee,1992)
3-6 months	-Rolling over (Morrison, g. s.1991) (Centers for Disease Control and Prevention. 2017). -Sits up properly (Centers for Disease Control and Prevention. 2017). -Grasps for objects (Morrison, g. s.1991). -Sits propped up with support of pillows (Centers for Disease Control and Prevention. 2017) (Oesterreich, L.1995). -Reaches for objects (Bee, 1992). -Lifts head and chest when experiencing tummy time (Centers for Disease Control and Prevention. 2017).
6- 9 months	-Sits without assistance of a pillow (Oesterreich, L.1995). -Moves around by crawling (Morrison, g. s.1991). -Begins crawling even upstairs (Olds, 2001). -Moves objects from one hand to the other (Bee, 1992). -"Rolls from back to stomach and stomach to back" (Oesterreich, L.1995). -Grabs for drinks but stills needs assistance well drinking (Oesterreich, L.1995). -Teeth appear (Oesterreich, L.1995).
9-18 months	-"Pulls up to stand" (Centers for Disease Control and Prevention. 2017). -Walks and pulls toys without assistance (Centers for Disease Control and Prevention. 2017) (Morrison, g. s.1991). -"Rolls ball to adult (Bee, 1992).

EIGHTEEN MONTHS TO TWO YEARS

At this age, toddlers begin to experience a vast amount of new emotions including; frustration, anger, excitement curiosity, independence, shame and guilt (Lee, 1977). This flood of emotions will often lead to resistance to suggestions by adults and lead to extensive mood swings such as; dependence to independence; eagerness to irrigation; and friendly co-operation to resistance (Lee, 1977). Though, children are experiencing a variety of different emotions, they are beginning to think about how they feel, and how feelings relate to words. Intense curiosity about everything, including the environment, allows for exploration and investigations but is often interrupted by the short attention span of young children (Lee, 1977).

Generally, children at 18 months are busy imagining and creating through pretend play such as feeding a doll (Center for Disease Control and Prevention, 2017). It is very common to see young children at this age engaging in occupations or roles such as; sweeping the floor, vacuuming the carpet or stirring a pot (Standing, E. 1962). Each ordered movement has an attended purpose, in this case, linking the mind and body as one instrument (Standing, E. 1962). This assumption of the mind and body becoming one instrument can be linked to walking alone, eating with a spoon, undressing, drinking from a cup and pulling toys when walking (Center for Disease Control and Prevention, 2017).

Around two years of age, children are increasingly active by walking up and down stairs and running (Center for Disease Control and Prevention, 2017). Independence is beginning to form when toddlers start self-feeding and controlling their bladder (Lee, 1977). Although, children begin on this adventure towards independence, occasional tantrums, nightmares and irrational fears way serve as hurdle (Lee, 1977). It is no wonder why parents refer to this stage of development as the "terrible twos". The struggle between reliance on adults to a sudden desire for independence can occur with a "flick of a light switch". However, the love and affection demonstrated by children outweighs all the temper tantrum. Remember, during each stage of development children need role models.

	Eighteen Months to Two Years
Social and Emotional	-Experiences new emotions; anger, guilt, shame, excitement, joy, and sadness through temper tantrums (Dosman C, Andrews D, 2012) -Anxiety fades from separation (Mayo Clinic Staff. 2010) -Begins to recognize and manage feelings (The Public Broadcasting Service. n.d.). -Finds pleasure in completing tasks (The Public Broadcasting Service. n.d.). -Imitates peer's actions (The Public Broadcasting Service. n.d.). -Enjoys affection from adults because of increased separation anxiety (Dosman C, Andrews D, 2012) -Begins to understand symbolic representation (Dosman C, Andrews D, 2012)
Language	-"Says several single words" (Centers for Disease Control and Prevention. 2017). -"Says sentences with 2 to 4 words" (Centers for Disease Control and Prevention. 2017). - "Speak about 50 words" (Mayo Clinic Staff. 2010). -Quickly learning new words established by their environment. Pronunciation is still challenging (The Public Broadcasting Service. n.d.). -Understands simple sentences much as "I want mum" and "no" (The Public Broadcasting Service. n.d.). -Absorbing the language all around them (The Public Broadcasting Service. n.d.).
Cognitive	-"Finds hidden objects" (Mayo Clinic Staff. 2010). -Demonstrates understand that specific objects belong together (Centers for Disease Control and Prevention. 2017 -Enjoy sensory exploration (The Public Broadcasting Service. n.d.). -Points to others for attention (Centers for Disease Control and Prevention. 2017). -Manages toys by shape and color (Mayo Clinic Staff. 2010).
Physical	-"Walks alone" (Mayo Clinic Staff. 2010) -Crawling up stairs, climbs on object, and begins to run (Mayo Clinic Staff. 2010) -Walks on his or her own but may struggle to move around objects (Centers for Disease Control and Prevention. 2017) -Pulls toys as a means of walking (Centers for Disease Control and Prevention. 2017). -Fine motor skills are developing but still are immature (The Public Broadcasting Service. n.d.).

THREE-YEAR-OLDS

At the age of three, children can generally be classified as happy and companionable little human beings who demonstrate the need for opportunity which afford them an increasing level of independence (Lee, 1977). During this age children learn primarily through exploration utilizing all the five senses; smell, touch, sound, taste and sight. While playing, child can ignore distractions and continuing completing the task on hand. Preschoolers at the preoperational stage of development use their perceptions of the environment, along with bits of information gathered during their past experiences, to understand their world (Miller, n.d.).

Also, during this age language begins to take off making major improvements with pronunciation, grammar, sentence structure and rhyming (Mayo Clinic Staff, 2016). Children also become eager to initiate conversations with parents, peers and teachers discussing areas of interest and personal experiences (Centers for Disease Control and Prevention. 2017). Their interactions with family and those around them help shape their personality and help develop their own way of thinking. As mentioned earlier language begins to take off during this stage, meaning that children are aware of numbers often represented by proudly raising the correct amount on their fingers. Thus, children begin to recognize numbers from one to nine often counting items in groups while labeling each object with a number or two (Mayo Clinic Staff, 2016). The complexity of counting without seeing physical objects will often be accomplished closer to kindergarten but should not be limited by the intelligence of a three-year-old.

	Three-Year-Old
Social and Emotional	-Imaginary companions (Dosman C, Andrews D, 2012). -Group and peer play (Dosman C, Andrews D, 2012). -Begin to build and show affection to familiar peers; teachers, parents, and friends (Centers for Disease Control and Prevention. 2017). -Children will show a wide range of emotions. During this time a sense of individuality and personal preferences are developed. (Centers for Disease Control and Prevention. 2017). -"Imitates parents and playmates" (Mayo Clinic Staff. 2010). -Expresses feelings, needs and opinions. Emotions are not limited to sadness, anger, happiness or boredom. (Mayo Clinic Staff. 2010) (Centers for Disease Control and Prevention. 2017). -Grasps the concept of "mine" and "his/hers" (Centers for Disease Control and Prevention. 2017). -Seeks approval by parents (Oesterreich, L.1995). -Play with other children but prefers to play independently (Oesterreich, L.1995).
Language	-"Carries on a conversation using 2-3 sentences" (Centers for Disease Control and Prevention. 2017). -Identifies and names familiar objects (Centers for Disease Control and Prevention. 2017). -"Speaks 250 to 500 or more words" (Mayo Clinic Staff. 2010). -"Vocabulary growth in number words, emotional state words, common category names, and common family member names" (The Public Broadcasting Services. n.d). -"Continues to increase their vocabularies for nouns, pronouns, action words, descriptive words, quantifiers, location words, connecting words, and question words". (The Public Broadcasting Services. n.d).
Cognitive	-Enjoys listening to stories, conversations and music (The Public Broadcasting Services. n.d). -Fantasizes and enjoys dramatic play (The Public Broadcasting Services. n.d). -"Understands the concept of same and different" (Centers for Disease Control and Prevention. 2017). -Repeatedly asks why questions (Mayo Clinic Staff. 2010) -Can work with simple 3 or 4-piece puzzles (Centers for Disease Control and Prevention. 2017). -Identifies and speaks the names of colors (Mayo Clinic Staff. 2010) -Recognizes common sounds (Oesterreich, L.1995).
Physical	-Weights on average of 25-44 pounds (Oesterreich, L.1995). -Very active in climbing and running (Mayo Clinic Staff. 2010). -The ability to walk up and down stairs (Mayo Clinic Staff. 2010). -"Move with greater sureness" (The Public Broadcasting Services. n.d). -"Climbs well" (Centers for Disease Control and Prevention. 2017).

FOUR-YEAR-OLD

"Preschoolers are avid learners, eager to master skills, agile to their feet, able to manage tools and implements, and beginning to show interest in child-to-child social life and play" (Olds, 2001). When it comes to learning, four-year-old are developing self-control and ingenuity (Public Broadcasting Services, n.d). Their pretend play is more complex and imaginative and can be sustained for longer periods (Public Broadcasting Services, n.d). Play becomes a critical key component to the development of a child. A simple plastic toy seen as an object by many, simply transforms into an object manipulated by a child's imagination (Centers for Disease Control and Prevention. 2017) (Mayo Clinic Staff, 2016) (Public Broadcasting Services, n.d). For example, a boat is merely not just a boat in the complex minds of a child, it is the wind whispering past the ears and the crew members, imaginary playmates, suddenly taking cover to avoid the piercing winds amongst their faces. Though this seems simply abstract during this age, it demonstrates learning and imagination in and of itself.

Additionally, four-year-old begin to experience significant social and emotional growth. During this time, child continue to learn what actions trigger certain emotional responses while acknowledging that others may react to the same situation differently (Public Broadcasting Services, n.d). Over time children will become more independent in managing their own feelings well utilizing a variety of different coping strategies (Public Broadcasting Services, n.d). Children develop self-control and appropriate emotional expression by observing how others manage their emotions and experiences. For instance, if a child experiences a routine checkup at the doctor's office, he or she may imitate the experience with Barbie's or stuffed animals. Also, four-year-olds are socially beginning to show progress in developing friendships while continuing to seek guidance from adults if problems with other children arise (Centers for Disease Control and Prevention. 2017) (Mayo Clinic Staff, 2016).

As children near the age of five, the transition to kindergarten can be a difficult time for any parent, child, and educators. During these significant changes, children need love, patience, understanding and genuine attention (Centers for Disease Control and Prevention. 2017). Though this transition is a bit overwhelming, with new rules and new friends, support and guidance from parents and educators are sure to assist in this difficult process.

	Four-Year-Old
Social and Emotional	-Develops self-control over emotions (Dosman C, Andrews D, 2012) -Children develop independence, self-control and creativity (The Public Broadcasting Service. n.d.). -Engages with others and shows consideration in pleasing friends (Centers for Disease Control and Prevention. 2017). -Copes with emotions (The Public Broadcasting Service. n.d.). -Shows vast improvement in social interactions (The Public Broadcasting Service. n.d.). -Enjoys participating in new things (CWenters for Disease Control and Prevention. 2017). -Expresses interests and likes/dislikes (Centers for Disease Control and Prevention. 2017). -Engages in make-believe play (Centers for Disease Control and Prevention. 2017).
Language	-Understand words associate with sounds (The Public Broadcasting Service. n.d.). -Begins to ask questions (Oesterreich, L.1995). -Recognizes similar words in the environment Oesterreich, L.1995). -"Can say first and last name" (Centers for Disease Control and Prevention. 2017). -Understands basic grammar (Centers for Disease Control and Prevention. 2017). -"Tells stories" (Centers for Disease Control and Prevention. 2017).
Cognitive	-Ability to track and differentiate between the seasons and different times such as morning, afternoon and night (Mayo Clinic Staff. 2010) (Centers for Disease Control and Prevention. 2017). -During story time children will being to pay attention to the story sequence; beginning, middle, and end (Centers for Disease Control and Prevention. 2017). -Understanding and practicing pre-math skills (The Public Broadcasting Service. n.d.). -"Understands the idea of counting" (Centers for Disease Control and Prevention. 2017). -Hands on exploration helps distinguish reality from fantasy (The Public Broadcasting Service. n.d.).
Physical	-Starts to get ready independently (Mayo Clinic Staff. 2010) -Fine motor skills continue to develop such as using scissors (Mayo Clinic Staff. 2010) -"Hops and stands on one foot up to 2 seconds" (Centers for Disease Control and Prevention. 2017). -Shows improved hand-eye coordination (Centers for Disease Control and Prevention. 2017) (The Public Broadcasting Service. n.d.). -Hopping, walking, jumping, running, climbing trees and walking with confidence (The Public Broadcasting Service. n.d.).

FIVE-YEAR-OLD

Every day, every hour, every minute you and your children will learn a little more about each other. "School-age children physically are a ball of energy seeking any games or environments which provide them unstructured free play" (Lee, 2017). Playtime outdoors has become I whole new scene with scooters, bicycles, and jump ropes. (Lee, 2017) (The Public Broadcasting Service. n.d.). At this stage of development, children gain strong social-emotional capacity (self-confidence, self-control, communication and cooperation), become motivated to learn and lastly develop intellectual skills (Dosman, C. F., Andrews, D., & Goulden, K. J. 2012). This new-found courage encourages continuous exploration and pushes children to expand on their abilities. It is no surprise that your once shy toddler has turned into a social butterfly. Though, "often content to play alone for long periods, mastering a skill, but also plays with other children, especially in building and imaginative play" (Lee, 1977). A noticeable shift in the child's social and emotional development becomes evident through the empathy and concern shown for others. Because of an increase in self-confidence, the language skills are well developed, and children begin to ask deeper questions as a mechanism for cognitive development (The Public Broadcasting Service. n.d.). Because of the increased awareness of the world around them, children begin to understand that other people can form opinions about them and acceptance from others becomes more important (The Public Broadcasting Service. n.d.).

"Five-year-old children have left their teetering toddler years behind them and are well on their way to becoming more coordinated and precise in their movements as they enter their school-age years" (Lee, 2017). "The average five-year- old can hop and stand on one foot briefly, walk with alternating feet on a balance beam, and catch an 8-inch ball with elbows near the body" (Olds, 2001). Fine and large motor skills, continue to become more refined as children cut pictures out of magazines, skip, jump, climb, use a fork and spoon and string beads on a strand of yarn (Centers for Disease Control and Prevention. 2017). As five marks the beginning of a new adventure for most children, learning to cope with a new environment can be overwhelming. The environment where 4 strands of development occur; emotional and behavioral, cognitive and intellectual, physical and motor, and social and language deserve close attention to insure a proper setting that stimulates development and progression (May 2011).
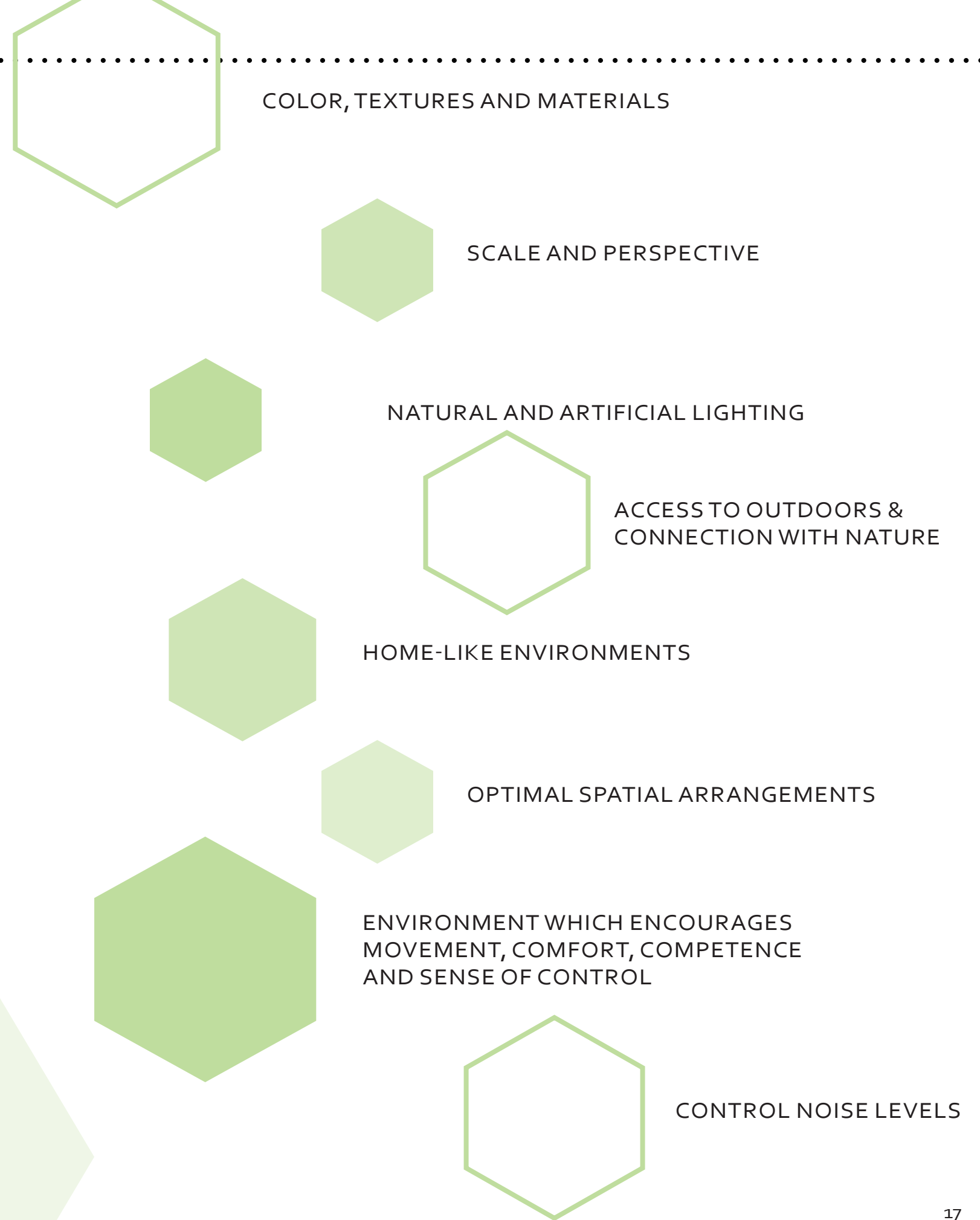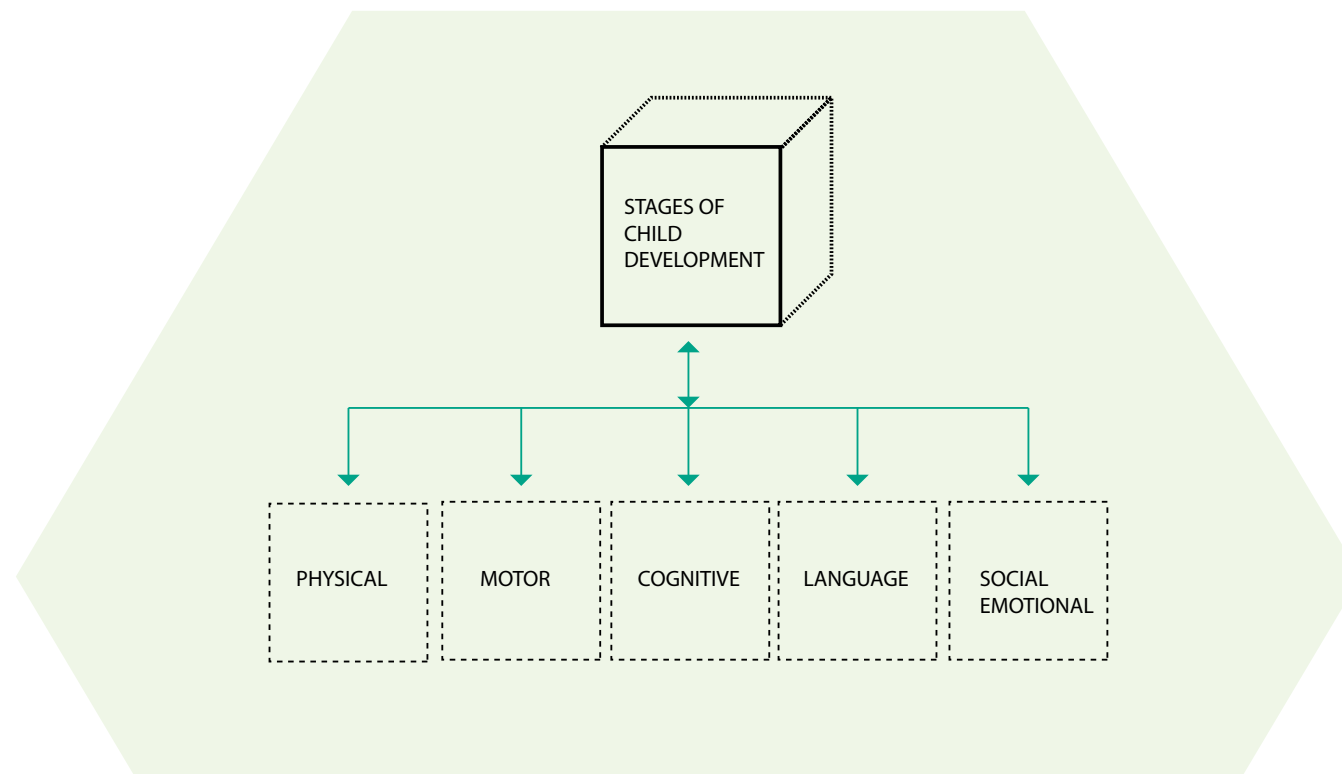
	Five-Year-Old
Social and Emotional	-In Nelsons textbook of pediatrics by Feigelman it states that children manage feels and emotions with greater independence. (as cited in U.S. National Library of Medicine. 2017) -Social beings who enjoy learning new things and prefer engaging in activities with other children. -"Improved skills for forming and maintaining friendships with adults and other children" (The Public Broadcasting Service. n.d.). -Desire to be like friends (Centers for Disease Control and Prevention. 2017). -Understands the difference between genders (Centers for Disease Control and Prevention. 2017). -Understands the difference between "right" and "wrong" and begins to follow the rules (Mayo Clinic Staff. 2010). -Begins to experience initiative versus guilt (Morrison, G.S. 1991) -Continues to push the boundaries in attempt to try new things. (Centers for Disease Control and Prevention. 2017).
Language	-"Pronounce words clearly, speak in complex and compound sentences, use grammar for the most part and have good-sized vocabularies that continue to grow rapidly" (The Public Broadcasting Service. n.d.). -Understands the concept of rhyming and begins to use it (Mayo Clinic Staff. 2010) -Pronounces words clearly (Centers for Disease Control and Prevention. 2017). -Speaks words using future tense and compound and complex sentences (Mayo Clinic Staff. 2010). -"Says name and address" (Centers for Disease Control and Prevention. 2017). -Development of language is remarkable (The Public Broadcasting Service. n.d.). -Initiate conversations (The Public Broadcasting Service. n.d.).
Cognitive	-Understands basic shapes and numbers (The Public Broadcasting Service. n.d.). -Begin to do simple subtraction and math (The Public Broadcasting Service. n.d.). -Understands at least 6 body parts (Centers for Disease Control and Prevention. 2017) -Sequence events chronologically (Mayo Clinic Staff. 2010) (The Public Broadcasting Service. n.d.). -"Can count 10 or more objects" (Centers for Disease Control and Prevention. 2017)
Physical	-"Increased abilities to balance and coordinate movements allow them to ride a bike with training wheels, swim, jump rope and perform most ball-related skills". (The Public Broadcasting Service. n.d.). -Balance increases (Centers for Disease Control and Prevention. 2017) -Finger flexibility allows children to engage in writing, (The Public Broadcasting Service. n.d.). -"Hops, swings and somersaults" (Mayo Clinic Staff. 2010). -Engages in most gross motor skills including; jumping, running and climbing. (Centers for Disease Control and Prevention. 2017)

RESEARCH

The purpose of this project is to illustrate the importance of the built environment on early childhood development. The research presented represents a synthesis of existing research through literature reviews along with observations and interviews. Upon receiving approval form North Dakota State University Institutional Review Board, personal interviews were conducted with two NDSU faculty members. Each interviewee had extensive knowledge and or experience working with young children. The researcher compelled a list of questions which addressed a range of topics that provided insight into the background of early childhood development and optimal learning environments. Based on the information gathered, prepared environments were developed to help inform the design of child care centers that are intended to support the activities of both children and adults.

The target audience for this study includes primarily directors of child care centers, parents, teachers, and architects or other related design professionals. This research can provide insight into ways of improving indoor and outdoor environments which promote optimal early childhood development. It is hoped that children will experience positive outcomes from professionals who apply and review the information obtained from the study.

The procedure for the research study was completed in the following order: (1) Review literature sources supporting the research, (2) Developing the methodology and research instruments. (3) Approval by North Dakota State University Instructional Review Board, (4) Data collection through interviews, case studies, and literary reviews, (5) Documentation and transcription of results, and (6) Analysis and make informed conclusions of the finding.

COLOR, TEXTURES AND MATERIALS

SCALE AND PERSPECTIVE

NATURAL AND ARTIFICIAL LIGHTING

ACCESS TO OUTDOORS & CONNECTION WITH NATURE

HOME-LIKE ENVIRONMENTS

OPTIMAL SPATIAL ARRANGEMENTS

ENVIRONMENT WHICH ENCOURAGES MOVEMENT, COMFORT, COMPETENCE AND SENSE OF CONTROL

CONTROL NOISE LEVELS

STAGES OF CHILD DEVELOPMENT

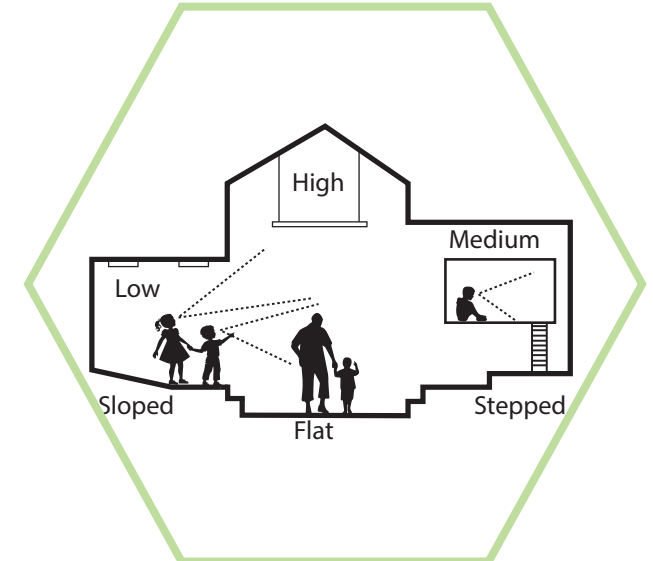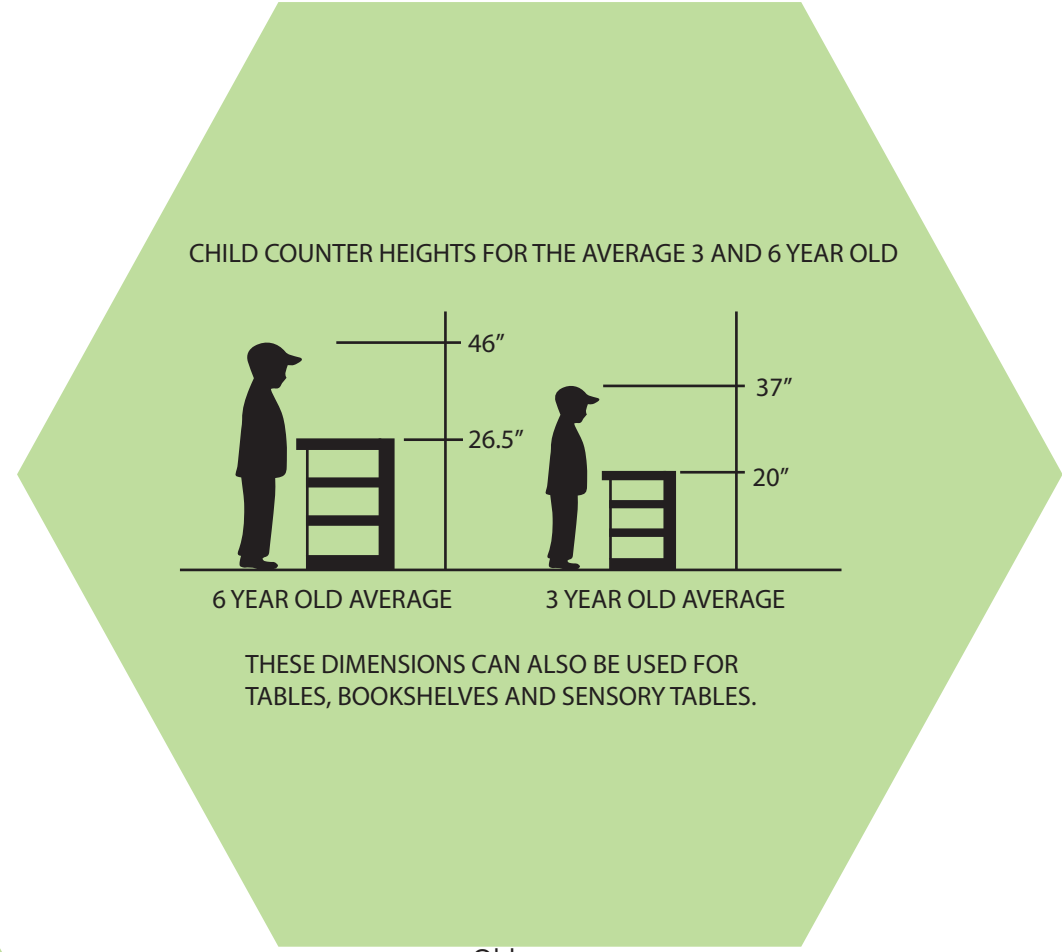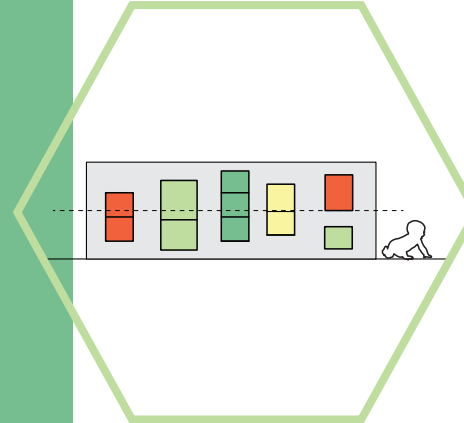| PHYSICAL | MOTOR | COGNITIVE | LANGUAGE | SOCIAL EMOTIONAL |

SCALE AND PERSPECTIVE

Whether we realize it or not, children are affected by their environments which can either produce beneficial or detrimental impacts on children. Architects need to adopt and adjust the buildings scale to fit the growth of a child in terms of not only functionality but also aesthetic value. Any space available for children is viewed as a playground. "Children experience spaces in different ways, and that different spaces have different meanings for children. Experience and meaning both play a role in how knowledge about a space is acquired" (Bell, 2012). For example, take a simple long corridor, adults view this space to get to further spaces or an end destination. Children on the other hand, view this space as a gymnasium or running space. Providing a variance in spatial heights and widths will allow children to discover and explore within.

Scale is an essential element in the design of child care centers because of its prominent effects on the emotional, social and cognitive development of children. Once children start walking and talking, they don't look at people's faces as much (Anonymous 2. 2017, October 18). Providing opportunities for children to get a little higher to the adult level instead of the caregivers always having to get down to the child's level (Anonymous 2. 2017, October 18). In a previous study (Clark, 2007), one of the common design issues identified was scale and perspective in day care facilities. From the research, it was concluded that children paid greater attention to the ground, rooftops and the sky (Clark, 2007). Also, within the environment there were multiple examples that served as a disadvantage to young children. For example, "a typical school entranceway with brick walls appeared very daunting from the perspective of a 3-year old" (Clark, 2007). When designing, it's important to take in account close-up details and consider far-away spaces.

Some architectural solutions to address scale and perspective includes; designing floating clouds on the ceiling to mimic the sky, providing lower shelves and cupboards and lastly provide unique flooring patterns such as circles (Clark, 2007). According to interviewee 1, North Dakota State University achieves scale by draping materials along the ceiling tiles and hanging mobiles or toys from the ceiling. NDSU child care center is located on main campus in E. Morrow Lebedeff Hall. Since the building was originally designed to accommodate adults and college students, unique solutions have been implemented to help lower the ceiling and soften the environment for children of all ages (Anonymous 1. 2017, September 26).

CHILD COUNTER HEIGHTS FOR THE AVERAGE 3 AND 6 YEAR OLD

46"

37"

26.5"

20"

6 YEAR OLD AVERAGE

3 YEAR OLD AVERAGE

THESE DIMENSIONS CAN ALSO BE USED FOR TABLES, BOOKSHELVES AND SENSORY TABLES.

Olds, 2001

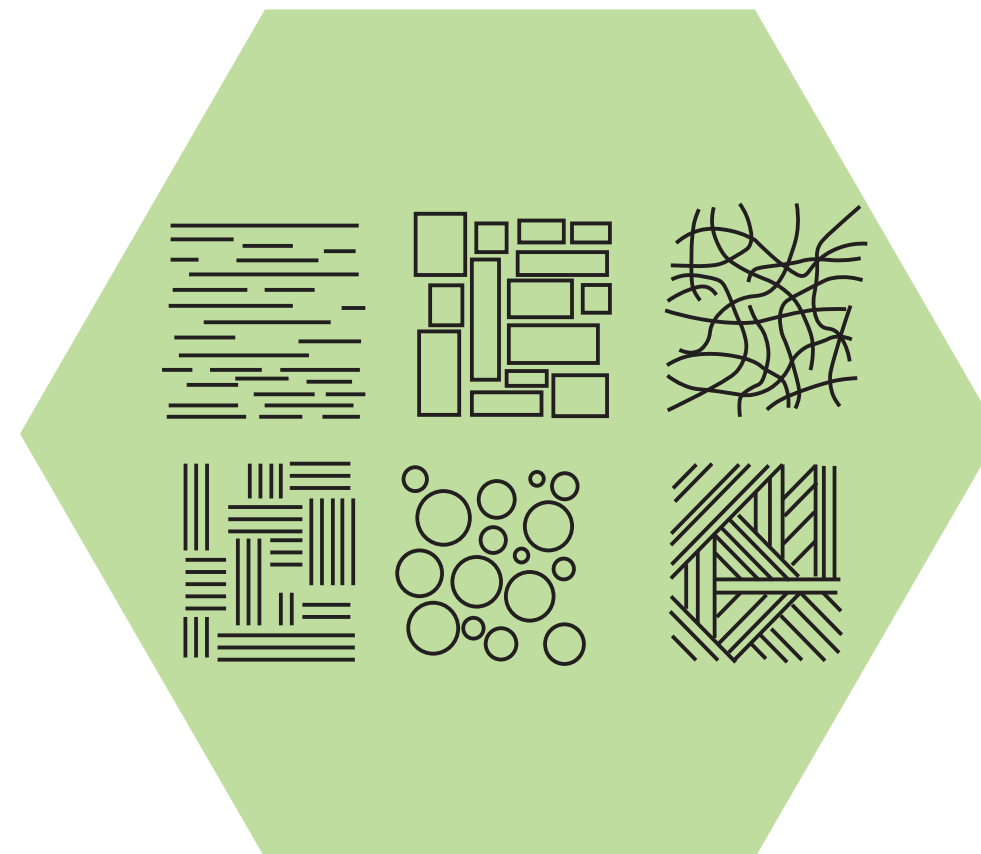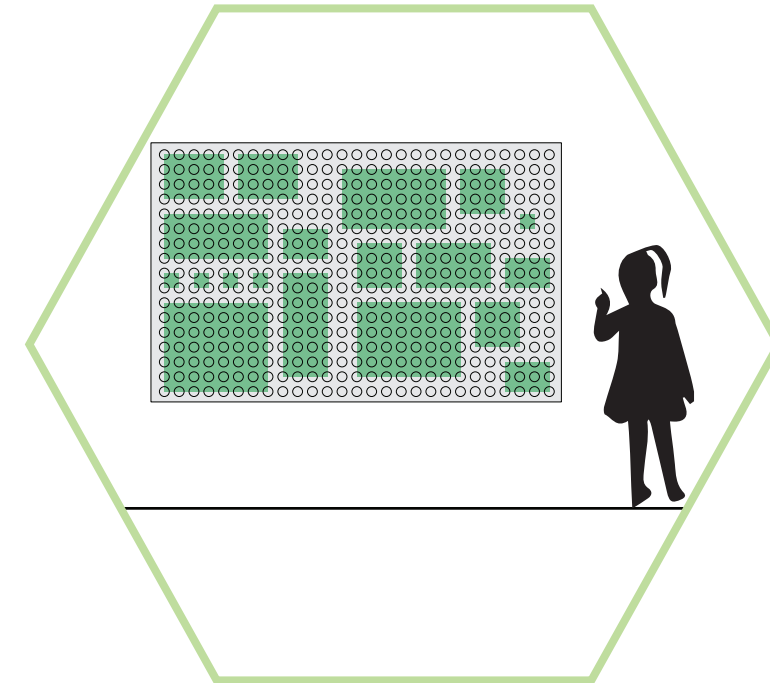High

Medium

Low

Sloped

Flat

Stepped

COLOR, TEXTURES AND MATERIALS

Color selection in child care centers is a critical component not only for architects but also for interior designers. Color can evoke emotional appeal and if used improperly it becomes very clear physically, cognitively and emotionally. Offering a balance of bright colors and neutral colors will provide children will a comfortable yet an engaging environment. Bright colors should be applied primarily to draw the child's attention to an area, space or object. Softer colors can be used in areas in which the activity evokes and reflects a calmer atmosphere; reading space, napping area and quiet play space. Research as shown that "children are wonderfully sensitive and responsive to nuances in both lighting and color. For example, children are particularly attuned to the colors of nature and human skin tones" (Nair, p & Fielding, R. 2005). As designers we need to be aware that color-aesthetics are highly subjective, and each user may or may not experience different emotional responses. Based on direct observations of the North Dakota State University day care center and based on an interview conducted, neutral colors were used for the toy shelves, carpet, and walls to ensure that the children and the toys within the space can be the color (Anonymous 1. 2017, September 26). From the research conducted, conclusions can be formed that the furnishings and finishes should serve as backdrop to the bright bold toys within that space. However, color is not the only element to consider when design a facility.

Textures and materials are equally important to color. According to interviewee 2, textures is one way to help encourage the sharing of information between children to children or between children to adult. (Anonymous 2. 2017, October 18) Different types of surfaces within an environment allow children to physically touch and explore the environment. Providing these opportunities for children will assist in neurodevelopment. (Anonymous 2. 2017, October 18) "Everything in the outside world shapes development through experiences that a child's senses-vision, hearing, smell, touch and taste-absorb" (Brotherson, 2005). Once these experiences are made, the neural circuits become wired which facilitate learning (Brotherson, 2005). The optimal time for visual development is during the first few months, which allows children to perceive and interact with the world. As indicated from the research, textures are important for the physical, social and emotional development of young children from birth to twelve years of age (Brotherton, 2005).

The Appropriate use of Colors, textures, and materials serve to assist in wayfinding, spatial orientation, space definition and prevent overstimulation. By successfully implementing these tools, architects will not only positively influence development but also provide features which separates the typical institutional space as well as add richness to the environment.

INTERIOR COLORS, TEXTURES AND MATERIALS

WALLS	- Add a small amount of colors to prevent the institutional feelings - Children's spaces shall be warm symbolizing energy (Earth tones). - Brighter colors should have a matte finish
FLOORS	- Dark colors appear heavy, while light tones show dirt easily. Find a mixed hue color- red, orange, yellow, blue, green or violet with analogous colors -Wood floorings should be used in messy play areas, offices and communal areas - Vinyl Resilient flooring should be used in toilet areas, messy zones, and food preparation spaces. - Carpet should be used in quiet and active areas to ensure comfort
EXTERIOR	- The exterior color scheme should represent the geographical location and should incorporate small drops of color.
Information obtained from Olds,2001 guidelines for color	

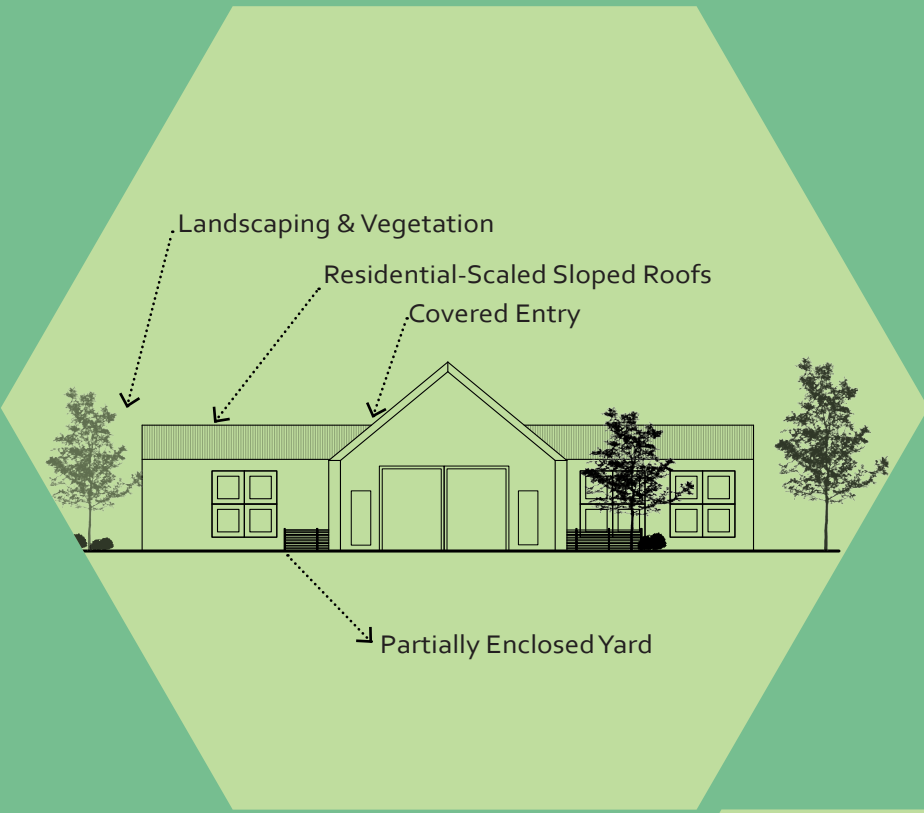
(Sönnecken, E. 2015)

(Tiainen, J.2014)

(Ogawa, . 2015)

(Mørk, A. 2014)

(Huthmacher, W. 2015)

(Krischner & Oberhofer photography, 2015)

Landscaping & Vegetation
Residential-Scaled Sloped Roofs
Covered Entry
Partially Enclosed Yard

HOME-LIKE ENVIRONMENTS

Home-like environments have become a template for new educational facilities (Moore and Lackney, 1994). Transitioning from home environments to institutionalized educational facilities is a very difficult time for any young child (Moore, Gary T. and Lackney, Jeffrey A, 1994). Unpredictable environments "increases children's ack of ease and control" (Olds,2001). Providing home-like features such as front yards, front porches, and a friendly entry conditions can help reduce a child's anxiety and help reassure both the child and parent that the interior aesthetics will also successfully reflect a warm and welcoming environment (Moore, Gary T. and Lackney, Jeffrey A. 1994).

Research has shown that children establish symbolic meanings on built elements during their early years (Olds, 2001). "Floors represent support and emotional security, walls represent both separation and enclosure, and a roof symbolize shelter (Olds, 2001). Every object within the built environment teaches children "properties of the physical world and is incorporated into a child's thoughts and feelings (Olds, 2001). Children naturally establish properties and emotional thoughts and feelings towards homey environments. Identification markers such as a gable roofs, reflects the typical form of a home. Also, a low, visible, sloping roofline provides feelings of security (Olds, 2001). By providing children with friendly and welcoming environments this will allow children to establish their own sense of place, sense of belonging and sense of stability. "When children feel comfortable in their physical surrounding, they will venture to explore materials or events around them" (Olds,2001).
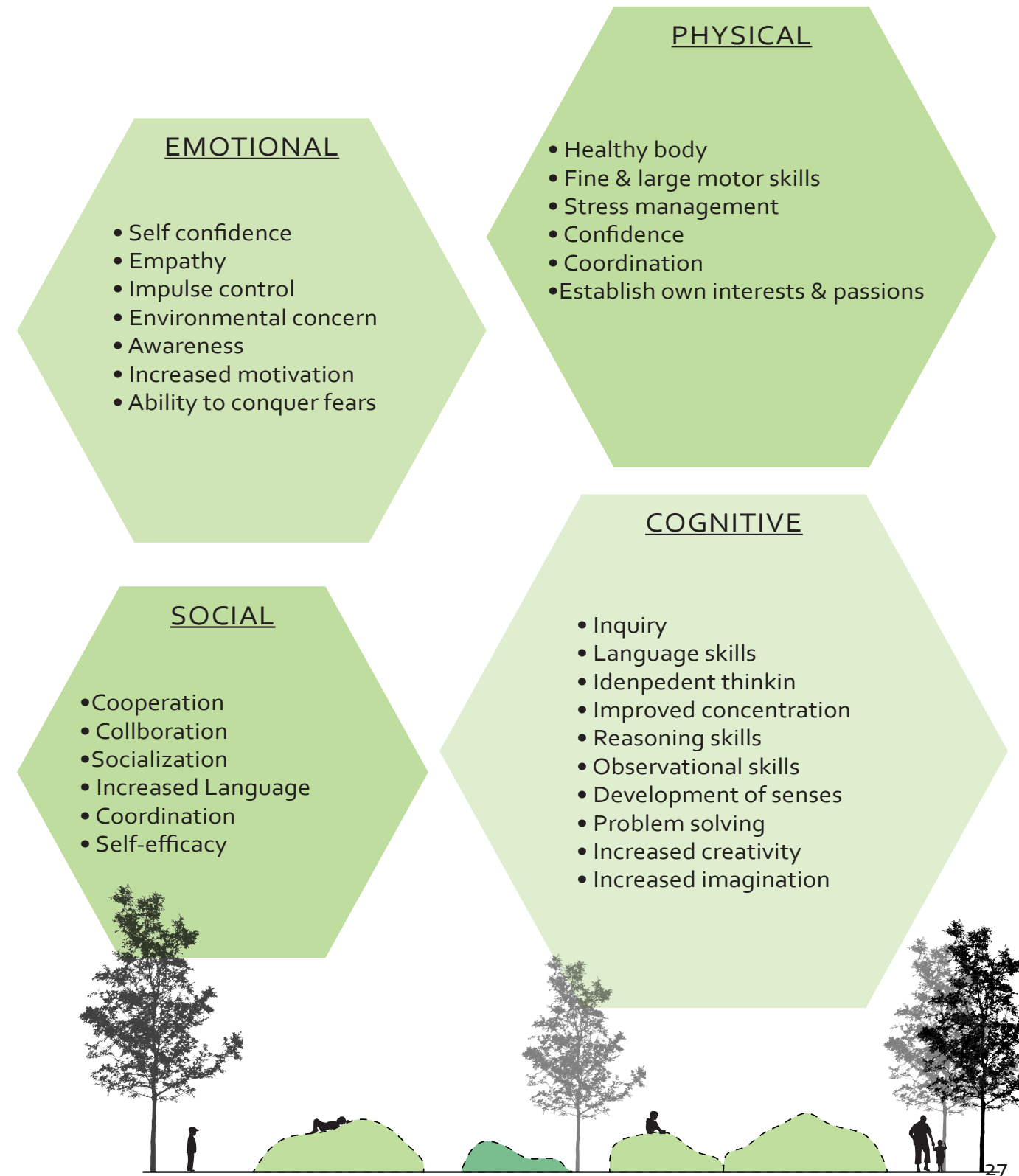
OUTDOOR ENVIRONMENT & NATURE

Doctor Maria Montessori once said that "every child is born as an explorer" (Standing, E. 1962). Any child who is two or three years of age will engage themselves in exploration, experimenting and discovering" (Standing, E. 1962). As architects, they should assist in the natural tendency of children and provide space which will enable them to travel alone maximizing the opportunities for individual growth and research (Standing, E. 1962). Providing easily accessible natural spaces provides many cognitive, social, physical and emotional benefits. Some design strategies to seamlessly integrate nature into the built environment along with successfully design outdoor play areas include;

• Provide a variety of different surfaces so children can take their little scoters out on the cement or have a nice softer material such as grass to watch the clouds go by (Anonymous 1. 2017, September 26).
• Provide transparency between the indoor and outdoor spaces which creates an extension of the indoor learning (Nair, p & Fielding, R. 2005).
• Provide children with specialized equipment.
• Private spaces for individual children (Olds 2001)
• Design spaces for small gardens (Muzaffar, F., & Mirmoradi, S. 2012).
• Allow for areas with different shading (Anonymous 1. 2017, September 26).
• Create views to the natural spaces from the indoors, transparency (Muzaffar, F., & Mirmoradi, S. 2012).
• Divide the play yard into different age groups (Olds,2001)
• Provide landmarks to assist in wayfinding (Olds, 2001)
• Easily accessible storage space (Olds, 2001)

Although this is not a complete compilation of the benefits of connection children to natural environments, one thing is known, outdoor environments are crucial in the development of young children. Regardless if a child is indoors or outdoors, space needs architectural expression well addressing and meeting the needs of young children (Muzaffar, F., & Mirmoradi, S. 2012)

DEVELOPMENTAL BENEFITS OF PLAY

PHYSICAL

• Healthy body
• Fine & large motor skills
• Stress management
• Confidence
• Coordination
•Establish own interests & passions

EMOTIONAL

• Self confidence
• Empathy
• Impulse control
• Environmental concern
• Awareness
• Increased motivation
• Ability to conquer fears

COGNITIVE

• Inquiry
• Language skills
• Idenpedent thinkin
• Improved concentration
• Reasoning skills
• Observational skills
• Development of senses
• Problem solving
• Increased creativity
• Increased imagination

SOCIAL

•Cooperation
• Collboration
•Socialization
• Increased Language
• Coordination
• Self-efficacy

ADEQUATE LIGHTING

Adequate natural and artificial lighting For children to perform their best, light needs to be bright enough but remain comfortable. "Daylighting is important because there are direct connections between our physiological well-being as humans and the amount of daylighting we get" (Nair, p & Fielding, R. 2005). Too much light in a space plays a significant role in harming visual development (Siegel, na). This can cause stain on the eyes resulting in fatigue, crankiness, headaches and visual perception. Because of infants and toddlers limited mobility and limited amount of outdoor time, classrooms should be located on the south side of the building to optimize sun gain and classrooms should have easy access to the outdoors (Olds, 2001). Since children spend a vast amount of time trapped in educational buildings, understanding the direct correlation between development and lighting is crucial (Nair, p & Fielding, R. 2005). The lighting within a space should reflect to the activities being performed within a space. For example, spaces where children are playing on tables or painting should use task-oriented lighting which is designed for a specific task. Although, lighting is often overlooked in many child care centers because of budget, the lastly effects of lighting are prominent and should always be considered.

One way to increase the amount of natural lighting is through transparency. If children can see activities within a space, this can help reduce and relieve anxiety and apprehensions (Clark, 2007). Transparency using windows creates a sense of openness and brightness within a space. Also, daylighting can be implemented into the facility through skylights, windows, and light selves (Nair & Fielding). In addition to natural and artificial lighting, noise also substantially influence and effect children's comfort and performance in child care centers.

Natural Lighting

Reading Room
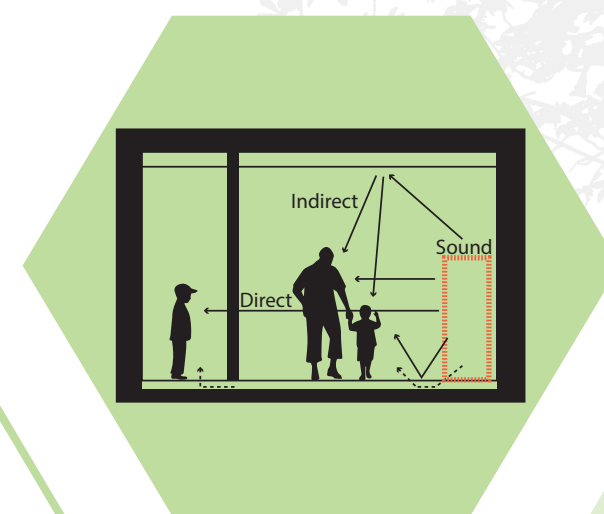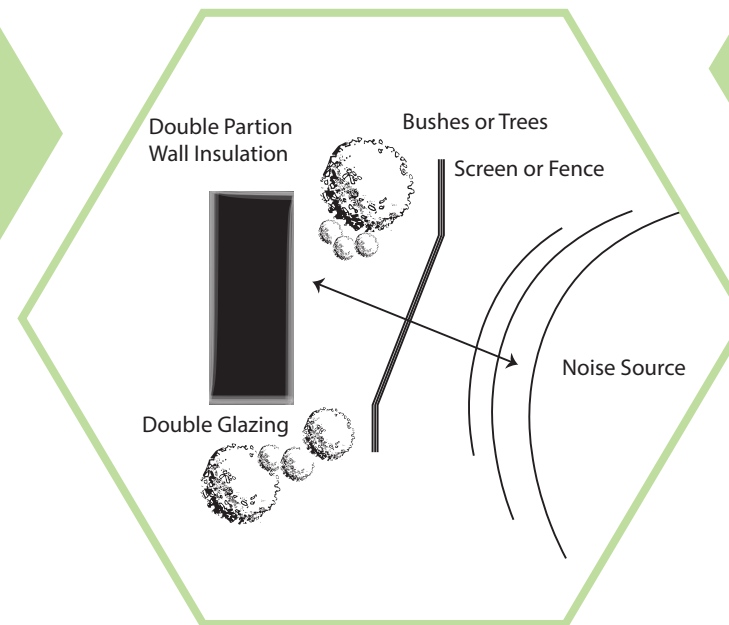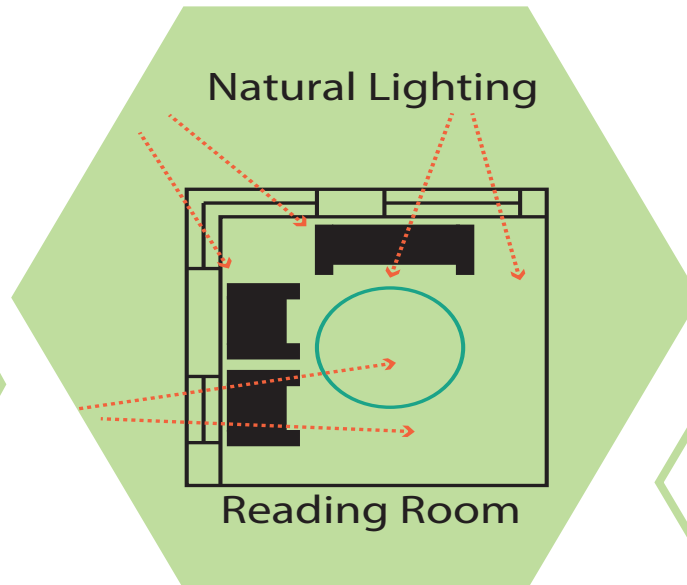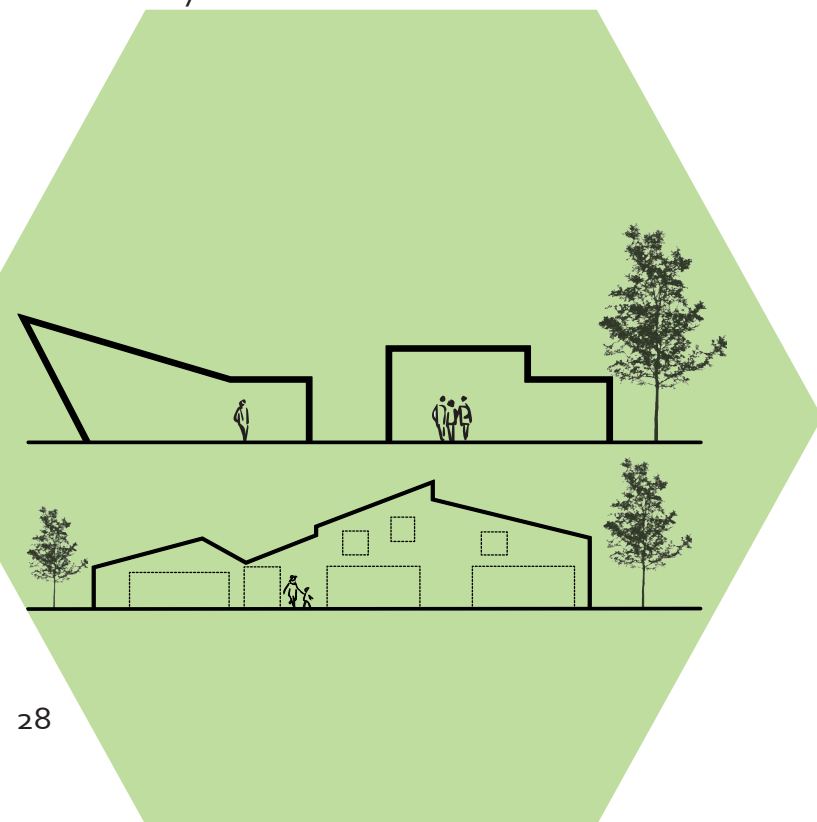
CONTROL NOISE LEVELS

Noise occurs all around us, but the most common noises children are exposed to are transportation, music, and other people (Evan, E. W, 2006). Chronic noise which occurs repeatedly within an environment can have effects on cognitive development, long-term memory, reading abilities and speech perception (Evan, E. W, 2006). In addition, teachers are also directly impacted by chronic and acute noise exposure. "Teachers in noisy schools are more fatigued, annoyed, and less patient than teachers in quieter schools (Evan, E. W, 2006). Finding solutions in addressing noise-related problems in child care centers is important in preventing elevated blood pressure levels and neuroendocrine stress hormones in children. "Babies need to be able to hear words that are spoken to them. Having an abundant amount of background noises within a space is going to obstruct and overwhelm the hearing of young children" (Anonymous 2. 2017, October 18).

A variety of design solutions can be implemented to manage the amount of noise in a classroom. For example, carpet on the floors versus concrete or wood allows absorption of noise, absorbent tile on the ceiling and spatial arrangement can all drastically reduce the amount of acoustics in a room. Noisy activities such as music and blocks should be in transition areas or away from quiet spaces. Considering noise levels in classrooms are often forgotten by designers. "The architect, along with acoustical engineers, needs to consider design options that help reduce sound transmission within and between spaces" (Siegel, na). Acoustical goals for designers should include; "to create a harmonious and pleasing acoustic environment" (Olds, 2001) and lastly "to control, absorb, or dissipate unwanted noises" (Olds, 2001).

Double Partion Wall Insulation

Bushes or Trees

Screen or Fence

Double Glazing

Noise Source

Indirect

Sound

Direct

OPTIMAL SPATIAL ARRANGEMENTS

Room size, scale, proportions, arrangement, furniture all play a significant effect on the development of young children. Awareness of the needs of children during each stage of development is important in designing environments that support them. A poorly designed room can create obstacles not only for the staff but also for children's growth and development. Below is a discussion of design considerations suggested for infants, toddlers and preschoolers.
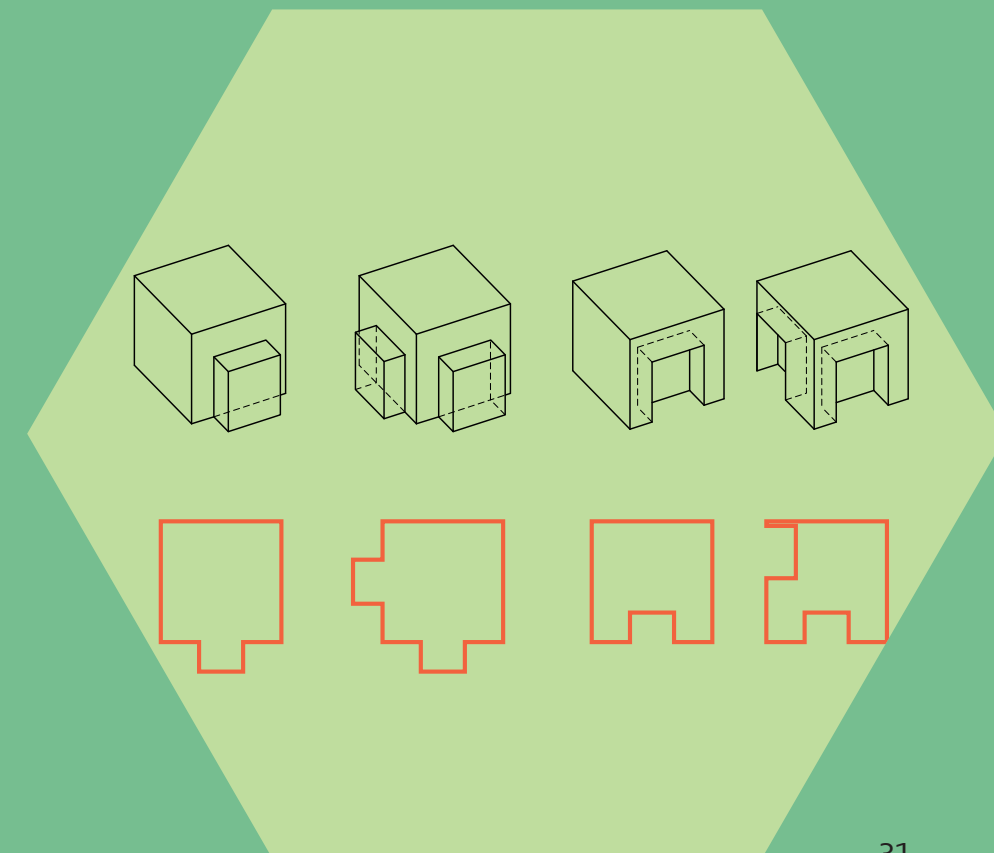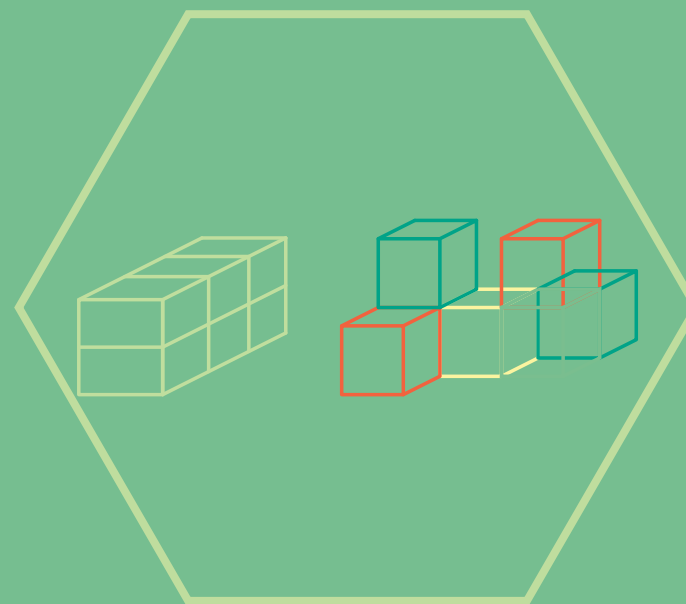
"The needs of infants and toddlers can be most easily discussed in three separate areas: the need to be held and carried, the need for sensation, and the need for movement" (Olds, 2001). The need to be held provides children with the most basic human experiences of safety, security, and love (Olds, 2001). Often, child care centers recommend that infants remain in the care of their mothers for the first six months to help promote the need for physical contact (Olds, 2001). Although, design cannot provide physical contact for infants, design can provide solutions to help supplement experiences of physical contact (Olds, 2001). For example, group size, opportunities for fostering movement, optimal sensory experiences and comfort are all ways to foster or distract from physical contact. (Olds, 2001) Also, another important thing is ensuring infants and toddlers are within sight and sound always (Anonymous 1. 2017, September 26). Architecturally, avoiding any sharp angles, columns or spatial layouts which create visual obstructions should be avoided at all costs. (Anonymous 1. 2017, September 26) Clear sight lines most be provided for all teachers throughout the whole room. (Anonymous 1. 2017, September 26)
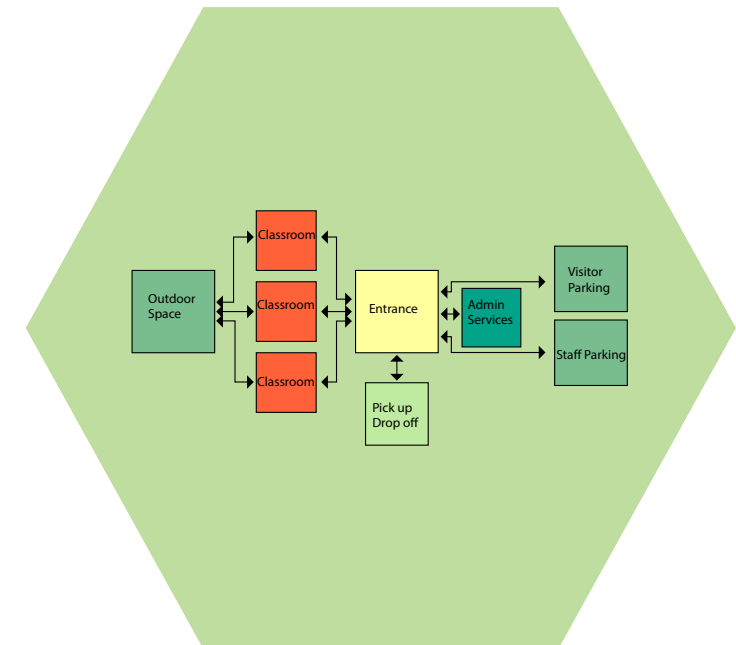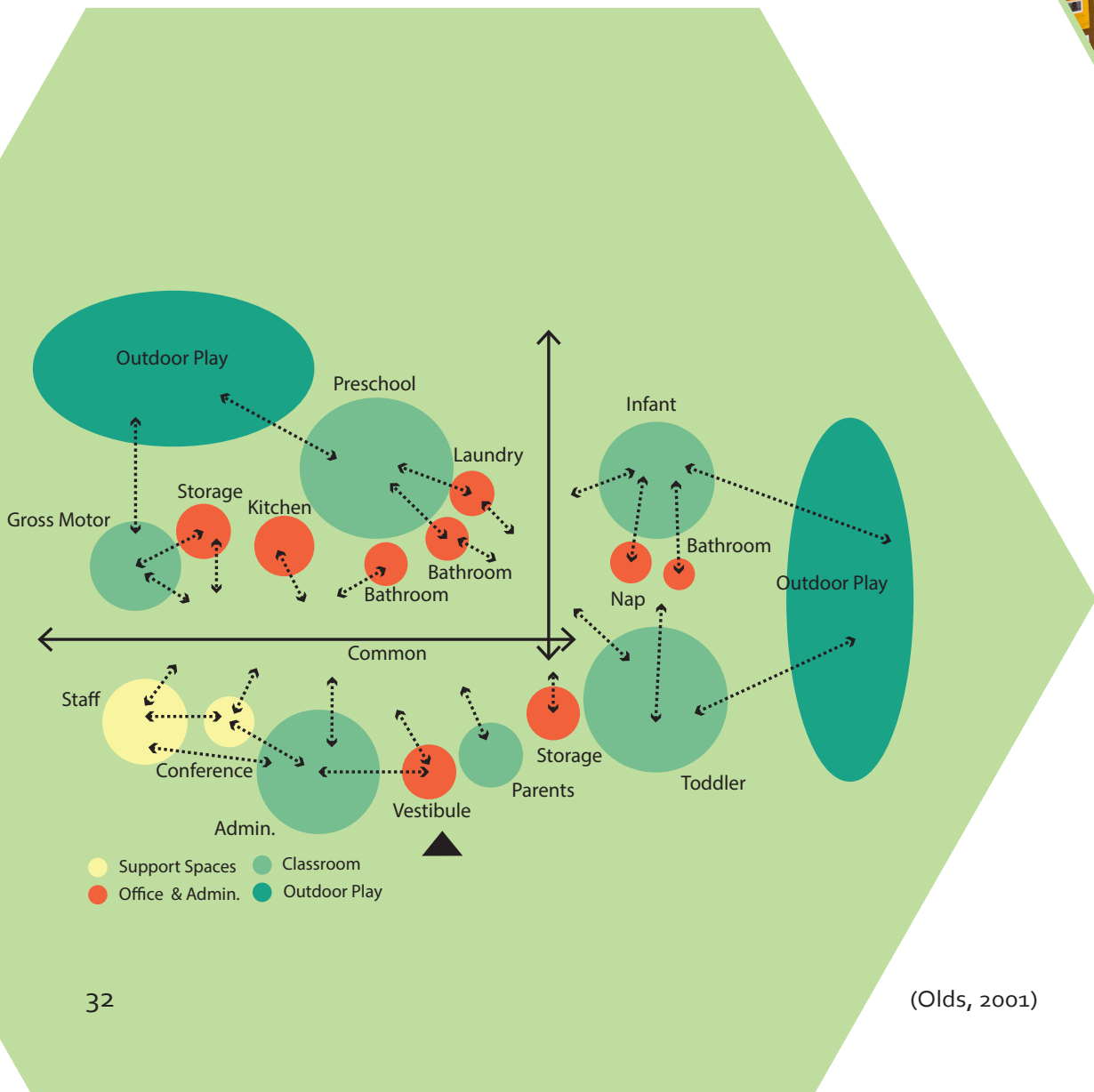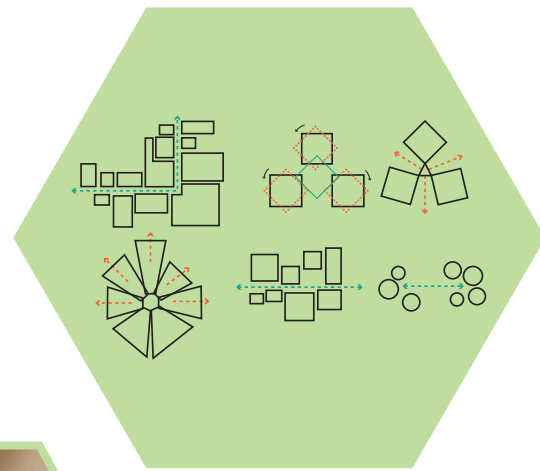
Furthermore, infants and toddlers are also undergoing the sensorimotor stage. During this period of development, infants are discovering the relationships between their bodies and the environment (Olds, 2001). Sounds, colors, light, shadows and tactile experiences are all ways to ensure a plentiful environment for young children. Also during this crucial year in development children are mastering movement; bending, crawling, climbing, and walking (Olds, 2001). To help foster this stage of development providing a nurturing environment which fosters safe movement is essential. Ways to achieve this include;

1)   "Use walls to support play panels, vertically mounted toys, grab bars, textures, mirrors, and reflective surfaces at different heights" (Olds,2001).
2)   Use a variety of different flooring surfaces.
3)   Walls can be subtracted to provide unique alcoves or seating.
4)   Provide changes in levels and platforms (Olds, 2001).

"Preschoolers and kindergartens grow at a relatively calmer and more steady pace compared with the rapid changes they experienced during their first three years" (Olds, 2001). Children are developing a greater sense of independence and self-control well slowly expanding their social circle to other peers besides their immediate family. Providing spaces that facilitate a wide range of activities will accommodate a variety of interests well promoting exploration (Olds, 2001). According to interviewee 1, When it comes to language development, more affordances for movement, interactions and motor skills will allow language to be produced naturally (Anonymous 1. 2017, September 26). For example, wide open spaces versus contained spaces allows and encourage children to share information between children to children or between children to adult. (Anonymous 2. 2017, October 18) There are many different types of children, some are shy, quiet, timid, outgoing, friendly and self-confident (Anonymous 2. 2017, October 18). Providing opportunities for a variety of different types of children would be helpful. For example, cozy nooks for timid children or large spaces for the children who are very exuberate. Also, windows to the next classrooms, can offer children visual sight to other children and allow them to visualize other activities being performed (Anonymous 2. 2017, October 18).

Olds, 2001

Outdoor Play

Preschool

Infant

Gross Motor   Storage   Kitchen   Laundry

Bathroom

Common   Bathroom   Bathroom   Nap   Outdoor Play

Staff

Conference   Storage

Admin.   Vestibule   Parents   Toddler

Support Spaces   Classroom
Office & Admin.   Outdoor Play

(Olds, 2001)

ENCOURAGES MOVEMENT, COMFORT, COMPETENCE & SENSE OF CONTROL

One key design element is to allow for more affordances for movement. Providing a safe and secure environment serves as an invitation for children to move freely, create boundaries, and explore (Olds, 2001). Ramps or stairs can be incorporated into the built environment to help foster motor development (Anonymous 2. 2017, October 18)
Restricting movement repetitively can create a variety of learning and behavioral deficiencies such as hyperactivity, attention deficits and poor motivation (Olds, 2001).

The second design component which is essential is providing comfort. "When children feel comfortable in their physical surrounding, they will venture to explore materials and events around them" (Olds, 2001). According to interviewee 1, for a child to engage in independent play, children must have a trust worthy relationship with the teachers. Children must have the basis of feeling comfortable and safe to participate in play. No play usually begins until this relationship is established. According to study conducted by Olds, as performance increases so does stimulation. Having changes in stimulation is better than having a static environment based on optimal levels of responsiveness. Architecturally, this can be accomplished through variations in elements such as scale, ceilings, textures, materials, furnishings, height, light and noise. Each space within a child care center offers a unique opportunity for children to seek out different levels of stimulation.

The third basic environmental need is to provide a facility that promotes and fosters competence. As discussed previously scale is a constant design problem forcing young children to feel intimated, frustrated and helpless. The normal day to day things which adults take for granite such as a light switch, faucet, drinking fountain and chair are inadequately designed to accommodate the needs of children (Olds, 2001).

Lastly, providing an environment which encourages a sense of control through privacy, predictability and orientation is important in the development of young children. children's need for privacy is directly linked to the development of sense of self. Infants, have no knowledge of privacy because they are unaware that other individuals exist. Also, another important attribute to consider when designing is predictability. A well-designed center will have predictable paths and wide-open spaces for children to interfere future activities.

In summary, balancing all four basic needs; movement, comfort, competence and sense of control are important in designing any child care center. Every child care center provides an opportunity to improve the concept of design. Quality design needs architects, interior designers, developers, corporations, educators and specialists to look beyond budgets, schedules, time-frames and look at the welfare of the users- the children.

CONCLUSIONS

During the research gathering and while interviewing, it became obvious that to create a design that fully meets the needs of the client, it is important to understand what the use of the space is. Though children view space as a playground, space should be designed to promote the holistic development of a child. As research has shown, specific prepared environments- spatial layout, warm and friendly environments, lighting, scale, perception, nature, color and textures all play a significant role in foster learning. In the future, breaking away from the typical "intuitional" day care center and pushing away from the standard will allow designers to create a healthy, nurturing and safe environment which facilities growth and development (Gur, 2014). With present emphasis on education within society and the vast amount of time children spend in day care centers, more than ever, it is time to consider the physical environment and the impacts it has on a child's developmental process.

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