

AN APPROACH TO IMPROVE CHILDREN'S HOSPITAL FACILITIES BY
INCORPORATING A PLAY SYSTEM WITH STIMULI THAT
ALLOWS FOR IMAGINATIVE PLAY TO AID IN
CHILDREN'S DEVELOPMENT

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A Thesis

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfillment of the

Requirements for the

Degree of

Master of Industrial Design

Auburn, Alabama

August 10th, 2009

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Master of Industrial Design, August 10, 2009
(B.INDD., Auburn University, 2007)

145 Typed Pages

Directed by Tin Man Lau

Hospitalization can be traumatic for both children and their families. Children require play in children's hospitals because it is beneficial for their development and crucial for their healing process. Incorporating play into a children's hospital can be beneficial for two reasons: it helps children understand why they are in the hospital while acting as a therapist and leads children back to the healthy lifestyle they knew before hospitalization (Pellegrini). The main objective of this project is to create an approach for both designers and playground companies to use if they choose to create a play system in a children's hospital environment.

When children are playing in hospital playrooms, they are faced with many limitations. There are also limitations of the patients: many children are required to carry an IV, and others have varying handicaps, anything from a cast to a wheelchair. These limitations make it difficult for children to play, especially in a playground setting.

Children's hospitals are a special entity of their own. They were created because "Children are different. And they need different health care that focuses on their unique needs, involves their parents from start to finish and is provided in places designed to be kid-sized and child friendly" (NACHRI 3). While children's hospitals offer multiple ways of play, outdoor play is an entity within itself that is not available to hospitalized children.

An approach was created in order to guide others through the process of creating a play system in a children's hospital. This approach was then followed by a design project that used the approach to create a play system modeled for Vanderbilt Children's Hospital.

The project deliverable is a unique play structure that incorporates activities for the whole family, and in some way this system will also be an educational outlet for the child, parent and siblings. The objective is for the child to be able to use certain provided elements in order to be creative and make their own environment to play in.

This play system will give children and their families a place to creatively express themselves and forget about their suffering in the hospital. The play system incorporates the criteria outlined in the approach to make a universally accessible playground that aids in children's development.

ACKNOWLEDGEMENTS

This Thesis would not have been possible if it had not been for the remarkable support and teachings I have received from the Department of Industrial Design at Auburn University. The past six years of undergraduate and graduate learning have made me into the designer I am now. I would especially like to thank my committee for all of their support. I truly admire them and their work. They have been excellent mentors.

I also need to acknowledge my fellow students and friends in Wallace Center who have been a constant encouragement for both my undergraduate and graduate studies. Thank you for all of your help, support and friendship.

I am also blessed to have an extremely supportive family and fiancée who have helped me through it all. Thank you so much for your love and support. I could not have done this without you, either.

Style manual or journal used: MLA

Computer software used: Microsoft Word

Adobe Illustrator

Adobe Photoshop

Solid Edge

Hypershot

Rhinoceros

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CHAPTER 1: INTRODUCTION TO THE PROBLEM

1.1 Problem Statement

“You can learn more about a person in an hour of play than in a year of conversation.”

-Plato

Many children who are hospitalized often experience psychological problems after their hospitalization (Petrillo, Sanger). Many studies show that this is caused by lack of awareness and the absence of play. Without being aware of their illness, children are often scared of things that are misconceived. Play is a natural part of a child’s development and a lack of play can cause a child to be depressed and behind developmentally (Petrillo, Sanger). There is a specific area in children’s hospitals that could use improvement: the child’s playroom. The playroom is an excellent opportunity for children and their families to come together as a community to alleviate the fear and pain of the hospital. A playroom can serve as an educational and therapeutic facilitator in a way that doctors cannot comprehend. However, as much as playrooms lack, there is also a need for playground play in children’s hospitals. Playground Play is also considered free play, or imaginative play. This thesis will take an in-depth look into playgrounds in hopes that one could be created for a children’s hospital.

1.2 Need For Study

Children who are hospitalized not only suffer from their procedures and treatments, but also often suffer psychologically from their illnesses. This study is to support the importance of play in the everyday lives of children. Play is therapeutic for children mentally, physically, and behaviorally. Children who require medical attention are frequently visiting the hospital, and thus taking time away from their playtime. A specific play system designed for children with special needs in the hospital is not only therapeutic, but also crucial for their healing process. “Children are different. And they need different health care that focuses on their unique needs, involves their parents from start to finish and is provided in places designed to be kid-sized and child friendly” (*Pediatrics* 5).

By studying the importance of play associated with hospitalization, a new type of play system was developed. This play system incorporates the necessary elements gathered from research of children playing on playgrounds and in other outdoor environments to alleviate the stress for children and their families during their stay in the hospital. Many children suffer psychologically because they are unaware of what will happen to them while they are in the hospital. The American Academy of Pediatrics issued a policy statement that “urged doctors to relieve needless suffering by helping children better anticipate and assess pain, creating soothing environments and getting parents more involved” (Warner 2). With a new play system geared to fit children during hospitalization, they will be less stressed because there will be means to explain illness and therapeutic exercises to help them understand different medical problems. By

solving these problems, children will have a more effective hospital stay and will recuperate faster with less psychological harm.

1.3 Objectives of Study

The objectives of this study is to research the experience for children in children's hospitals. The study will also incorporate the benefit of play and education in hospitals. The study will identify the key aspects that either benefit or harm children during hospitalization. There will be research in specific areas of the hospital and with different playground components. After the research a new approach will be created to aid designers and playground manufacturers to create an innovative playroom that uses education and therapeutic play to alleviate stress on children and their families during their hospital experience.

1.4 Definitions of Terms

1. Child Life Specialist- a person who provides the environment and opportunity to counteract the stresses inherent in most hospital experiences
2. Child Life Council- a professional organization recognized by the American Academy of Pediatrics
3. Distraction Play- play that takes the child's mind off of the pain from their treatment
4. Inpatient- patient who stays in a hospital while receiving medical care or treatment
5. Outpatient- a patient who receives treatment at a hospital, as in an emergency room or clinic, but is not hospitalized
6. Hospice- a health-care facility for the terminally ill that emphasizes pain control and emotional support for the patient and family, typically refraining from taking extraordinary measures to prolong life

7. Chronic Illness- long lasting illness, usually for life.
8. Play- a dynamic, active and constructive behavior that is an essential and integral part of all children's healthy growth, development, and learning across all ages, domains and cultures
9. Psychoanalysts- a professional who studies the method of psychological therapy originated by Sigmund Freud in which free association, dream interpretation, and analysis of resistance and transference are used to explore repressed or unconscious impulses, anxieties, and internal conflicts, in order to free psychic energy for mature love and work.
10. Psychosociologist- a professional who studies subjects, issues, and problems common to psychology and sociology.
11. Physical Development- the development of a child's body and physique
12. Social Development- the development of a child's ability to interact with others
13. Emotional Development- the way a child expresses themselves through their emotions
14. Cognitive Development- planning skills and attitudes along with creativity and divergent thinking
15. Infant- birth to two years of age
16. Toddler- ages 2-4
17. Early School Age- 4-6 years old
18. Sensorimotor Play- simple but consistent action schemes through trial and error along with practice
19. Pretend Play- children carry out plans, take on roles, and transform objects as they express their ideas and feelings about their social world.
20. Anxiety- distress or uneasiness of mind caused by fear of danger or misfortune
21. Egocentrism- thinking of oneself without thinking of others
22. Universal Accessibility- refers to the ability of all people to have equal opportunity and access to a service or product from which they can benefit, regardless of their social class, ethnicity, background or physical disabilities. It is

a vision, and in some cases a legal term, that spans many fields, including education, disability, telecommunications, and healthcare. It is tied strongly to the concept of human rights.

1.5 Literature Review

Children require play in children's hospitals because it is beneficial for their development and crucial for their healing process. Hospitalization is a traumatic experience for people of all ages, especially for children. A child is developing cognitive behaviors, and events of trauma and stress outside of their normal lives can lead to future psychiatric problems. There are concerns that medical professionals are not taking this psychological aspect into account. Harold Geist, a consulting psychologist at the University of California at Berkeley, states, "The magnificent and technical achievements of modern medicine somehow seem to overshadow the human aspect of treatment of disease and nowhere is the psychology of treatment and "humanness" needed more than in the preparation and care of children before, during and after hospitalization" (Geist 4).

Many medical professionals can overlook children's needs during their hospitalization. Doctors and technicians can talk over the child to where they do not understand what is happening, thus heightening the fear and stress of the child. It is essential for professionals to create an environment for children that helps them feel a sense of understanding and normalcy while they are undergoing surgeries or treatments. Not only is the special attention of professionals necessary but also for all other members of the family in order for the child to cope with their hospitalization.

The environment of healthcare is substantially important for the child's healing process. By using color theory and environmental psychology, a hospital can become a

place of comfort for children and their families, rather than a stressful stark environment. Incorporating play into the everyday treatments and procedures of hospitalization will help the healing process for the child.

1.5.1 The Importance of Play

“Play sustains children’s inborn curiosity while they manipulate and change their surroundings” (Boss, Chapman). In today’s society, with new technologies, deforestation, and lack of outdoor areas, children are losing time to play. Adults are forgetting the importance of play in a child’s life. Parents forget that “play-- a dynamic, active, and constructive behavior-- is an essential and integral part of all children’s healthy growth, development and learning across all ages, domains, and cultures” (Isenberg, Quisenberry 1). Play is also defined as “the spontaneous activity of children” (Longo 1). This being said, it is important for a child to constantly have play implemented in their life. Play is how children blindly develop crucial life skills while they think they are just having fun. Incorporating this into the hospitalization process could be vital for the stress and fear relief of children.

“The absence of play is an obstacle to the development of healthy and creative individuals” (Isenberg, Quisenberry 1). If a child remains isolated from play, he or she will lose the opportunity to gain cognitive growth, proper behavior, and problem solving skills. Bev Boss and Jenny Chapman state “we must advocate for places where children wonder, discover, imagine, construct, and learn by trial and error so that from their experiences they can develop their own framework of knowledge and a firm sense of self.” In most cases where a child is hospitalized, they are already scared and

traumatized. Being in a hospital could mean isolation for the child, and, without play, a child's development could suffer greatly if play is not implemented into their normal hospital routine.

One of the hardest things for adults to grasp is the distinction between play and other types of learning.

According to Isenberg and Quisenberry, there are five behaviors that can qualify play: 1) intrinsically motivated and self-initiated, 2) process oriented, 3) non-literal and pleasurable, 4) exploratory and active, and 5) rule-governed" (2). These qualifications describe how the child learns through play. Play also "increases peer relationships, releases tensions, advances intellectual development, increases education, and increases chances of children speaking and interacting with each other" (Longo 2).

While child psychology plays an important role in children's play, there are different aspects of play. As a child develops, they respond to play in different ways, thus proving play's developmental importance. The foremost qualities that are enhanced when children play are their physical, cognitive, and emotional skills.

In terms of a child's physical development, play is essential in the development of "motor skills and body awareness" (Isenberg, Quisenberry 1). In many circumstances, children only have physical education once a week, and recess is the only time children have the opportunity to get exercise in their day. The amount of play a child is exposed to can significantly affect their physical development because play is their form of exercise. Incorporating play into a child's daily routine can help decrease the number of obese children. "Play" is a less offensive word than exercise and can tend to be more appealing to both children and adults. If children are used to physical activity, then there

is a greater possibility that they will continue to exercise as adults. In a hospital, many children lack physical activity, and there are many times when they are solely entertained by television or video games and do not have the chance to play in a physical manner. Many children are also physically impaired and do not have the ability to exercise, but by implementing similar means in handicapped playgrounds in an indoor setting there will be ways to accommodate these children and give them the physical activity they need (Pellegrini).

Along with physical development, play also affects social development. Humans are social beings, which forms the meaning of society. By playing, children are forced into social situations with other children and adults. They are forced to learn how to act as a member of a group. In Isenberg and Quisenberry's paper on play, they state, "Play provides the rich experience children need to learn social skills; become sensitive to others' needs and values; handle exclusion and dominance; manage their emotions; learn self control; and share power, space, and ideas with others" (3). Many children participate in games on the playground, which teaches children "How to subordinate their behavior and wishes to the rules of the game" (3). As was stated in the section on child psychology, a child leaving the state of egocentrism is a child who is developing into the concrete operational stage by accepting and understanding the ideas and needs of other children. Many anti-social children have been proven to be susceptible to clinical depression (Petrillo, Sanger). To engage children with others while he or she is in the hospital could be one of the most successful and preeminent ways to surpass the other elements that could developmentally hinder a child while he or she is staying in the Hospital(Pellegrini).

Play is in many ways associated with a child's cognitive development. Cognitive development is the construction of thought processes, including remembering problem solving and decision making, from childhood through adolescence to adulthood. Play has an important role in child learning on the playground and in the classroom. "They identify improvements to attention, planning skills, and attitude creativity and divergent thinking perspective taking, and language development" (Isenberg, Quisenberry 3). These life skills are all very crucial to the child's social and developmental well being.

"Children's play depends largely upon the play materials, equipment, and role models available to them. Early exposure to appropriate play activities and materials is important and provides a sound basis for development" (Isenberg, Quisenberry 5).

Piaget's theory in cognitive development states play is one of the most crucial aspects in furthering a child's problem solving skills. In the preoperational stage, play stimulates identifying objects and imitating others. Children build this knowledge off of each other, and a hospitalized child will be behind the learning curve if they are not given a chance to play and communicate with other children. As children mature and begin the concrete operational stage, children need to be around others to improve problem-solving skills. Without play, children will not be with others, and solitude can be one of the worst things for a child's development (Casey).

Play not only effects a child's physical, social and cognitive development, but it also impinges on children's emotions. "It is the happiness that children can achieve

though play that may be the most important message to communicate to parents about the benefits of physical activity in children” (Brunette, Whitaker 3). In many studies for both adults and children, it is been shown that exercise relieves feelings of depression and anxiety. “These stresses experienced by a child’s brain result in a number of physiologic responses in the body collectively referred to as an “allostatic load” (Brunette, Whitaker, 3). Many children can easily become depressed while they are in a hospital for a long amount of time. The look on a child’s face when they enter a playroom exudes happiness because playtime makes children happy, and for a hospital playroom it is crucial for the emotional well being of a child (Isenberg, Quisenberry).

Many studies show that most of the benefits of playing are frequently seen when children are playing outside rather than inside. This can be for numerous reasons, but the most predominant is that we are human beings and our natural element is outdoors. Children see the outdoors as an endless place of exploration and wonder. Whether it is watching animals in their habitats, watching a plant grow, or understanding the importance of the sun, there are many wonders in the outdoors that give children a unique outlet for their imagination and creativity (Bos, Chapman)

1.5.2 Outdoor Play

There is a growing need for outdoor space for children to play. In many neighborhoods, parents are scared to let their children go outside. Theresa Casey describes the outdoors as

“Opportunities to develop friendships and negotiate relationships;
opportunities to grapple with the full gamut of emotions including those

such as jealousy, boredom or anger as well as happiness and satisfaction; opportunities to the risks, have adventures and misadventures; to have contact with nature and the environment” (Casey 6).

When discussing a hospital play system, it is important to look at aspects of outdoor and indoor play. There is a sense of wonder that is absent in indoor playrooms, especially in hospitals. The research conducted in this thesis looked closely at outdoor play that gives children a creative freedom to craft their own environments, and how this imaginative play helps the healing process of children.

Play is an important aspect of a child’s life and becomes even more crucial for children who are hospitalized. Patients have a wide variety of problems but are all on a common ground when it comes to playtime. They require play whether they are mentally handicapped, a cancer patient, burn victim or patient receiving his or her check up. A hospital has a great chance of inhibiting the children being treated. If mistreated or misled, a child can suffer trauma from a hospital visit aside from the treatment they are already there for. By implementing play in a hospital, a child has the chance to experience normalcy in an environment that can be anything but normal. Children’s hospitals must be aware of the importance of play in their facilities and do everything in their powers to ensure that they provide a superior outlet for children to play.

1.5.3 Children's Hospital Facilities

There is a reason why children are set apart from adults. Children lack mature behavioral and developmental skills that need to be nurtured and monitored as they grow into adults. "Children were not just poor versions of adults, but inhabited a world of their own with its own logic and rules" (Davis 21). This being said, children have many special needs "Children are not small adults. Children are unique individuals with their own specialized needs" (NACHRI 1).

"Children are different. And they need different health care that focuses on their unique needs, involves their parents from start to finish and is provided in places designed to be kid-sized and child friendly. Because they're growing and developing, children's health care needs are constantly changing. They require extra time, extra monitoring, specialized medications, and caregivers with the skills and compassion to understand the needs of children. For example, hospitalized children under age 2 require 45 percent more routine nursing care" (NACHRI 3).

An article published by the National Association of Children's Hospitals states the importance of pediatric care: "While children's hospitals represent less than 5 percent of all hospitals, they account for more than 40 percent of inpatient days and 50 percent of costs for children hospitalized in the United States - \$10 billion worth of care every year" (NACHRI 3). In the United States there are approximately 250 children's hospitals, which only accounts for fewer than 5 percent of all hospitals (NACHRI 1).

Children's hospitals are extremely important in that there are a lot of underprivileged children that require medical attention. "Children's hospitals protect this unique population. They are dedicated to ensuring that every child has access to high quality, cost effective, primary, preventive and specialty care services tailored to fit their needs" (NACHRI 4). These underprivileged children are a large number of patients for children's hospitals. The warmer the environments, the better off the children are in understanding their illness because much of the time they do not always have parents present (NACHRI).

"The children's hospital in your community is really three hospitals in one: a hospital that specializes in treating children with complex, chronic or congenital conditions; a community hospital for all area children providing preventive and primary and acute care; and a safety net hospital for uninsured or underinsured or publicly covered children" (NACHRI 1).

All children who set foot into a hospital are in need of special attention. Those who are in for a long stay need to be reassured that this is a fun place filled with toys and other ways to ease the suffering that awaits them. In Alan G. Davis's book, *Children in Clinics*, he discusses in extensive detail the special needs of children in hospitals for both short term and long-term visits. He describes children as "not just poor versions of adults, but inhabited a world of their own with its logic and rules which the worker sought to grasp to make that the child's actions sensible" (Davis 21).

The environments in children's hospitals are frequently different from other hospital environments. Colors are brighter, furniture is smaller, and there is usually an underlying theme throughout the space. These are obvious differences, but important ones. It is the same reason why a child's bedroom is different, and why younger school environments differ from those of a high school. Young children are more comfortable in a bright environment, and they tend to develop in a more efficient manner (Petrillo, Sanger).

As medical professionals begin to understand the special needs of hospitalized children, a profession is emerging to ease the stress of the hospitalization process for children and their families. In the 1970's, studies were administered that proved a less stressful environment will lessen the stress on a child, increase their surgical outcomes and improve their psychological outcomes. This profession is titled Child Life. These men and women work alongside the nurses and doctors with the sole purpose of making the child more comfortable. Whether it is using a stuffed animal to explain a medical procedure, or constantly checking in to give the child a sense of security, Child Life Specialists work to improve the environment of the hospital and to make the child at ease, which increases the outcome of their surgical stay (Child Life Council).

Child Life Specialists not only work with children but with the parents and families of the hospitalized child. "Child Life Specialists provide the environment and opportunity to counter act the stresses inherent in most hospital experiences," says Myra Fox, director of Child Life Services at the Children's Hospital in Boston. "We incorporate the child's perspective into the treatment plans. The staff contribute greatly to our understanding of the whole child" (Children's Hospital Boston 1).

Another study in 2001 done by the American Academy of Pediatrics caused the Academy to issue a policy statement that “urged doctors to relieve needless suffering by helping children better anticipate and assess pain, creating soothing environments and getting parents more involved” (Warner 2). This is one of many studies that stress the special needs of children. Children’s hospitals carry a greater responsibility than just healing; they are responsible for the entire experience of hospitalization and the effects to follow (Warner).

There are ways to alleviate pain and confusion for a child undergoing a hospital procedure. The way to do this is by the environment, distraction, education and reassurance. If the child sees the procedure performed on a doll, then they understand what is about to happen to them, and the idea of the surgery becomes less scary. The Children’s Hospital of Boston gives an example discussing a dialysis patient. “The two play games, work on projects such as making fashion books, simulate medical procedures on stuffed animals and props and practice deep breathing relaxation techniques” (Children’s Hospital Boston 1). The job of a Child Life Specialist has become beneficial for hospitalized children, and crucial for the best outcome possible of their hospitalization. An example scenario for a Child Life Specialist is as follows: a child life specialist uses lip balm for the children he or she is caring for.

“The point of the lip balm is “to give the child a sense of control and choice,” Millar says. Together, they smell each lip balm flavor, until Josh chooses his favorite. Millar rubs the balm all over the interior of his

induction mask. Holding it to his face, Josh grins. It smells just like cherries” (Herwald 1).

Alan Davis discusses the importance of the role of a parent when a child is in the hospital: “Bearing all these things in mind, it is not surprising that medical work with children and their parents is more oriented to the parents’ definition of the child’s status than to the child’s own and his or her experience of illness or health” (Davis 26). Child Life Specialists are trained to handle grieving parents. They “help family members understand their child’s response to treatment and can help parents maintain their caregiving roles by promoting parent/child play sessions and by sharing strategies for comforting their children during medical procedures” (*Pediatrics* 5). Even siblings need that extra comfort and reassurance. Many Child Life Specialists give them special tours of the ICUs, and dolls are also used to show the sibling what is about to happen to their brother or sister. “It is important to protect children and families from prolonged or repeated exposure to situations in which they feel overwhelmed, unable to escape, or unable to have choices” (*Pediatrics* 5).

The Child Life program has a vast effect on the hospital and its patients. According to *Pediatrics Magazine*,

“The increased survival rate of chronically ill patients has resulted in an expanded need for child life specialists in adolescent care... ill adolescents are making the transition to the adult health care system. Child

life specialists have often played a role with the health care team in helping with that transaction”(*Pediatrics* 5).

The emerging profession of the Child Life Specialist proves the importance of treatment for children in the hospital. The positive effects of the Child Life Specialist show that with explanations, distractions and special care, the stress level of a hospitalized child is dramatically decreased. With this decreasing stress, there are in turn better results of the child’s hospitalization. “A 2001 survey by the National Association of Children’s Hospitals and Related Institutions found that 95% of 118 responding hospitals employed child life specialists.”

“A ratio of 1 child life specialist to 15-20 inpatients has been used successfully in some institutions; however, the patient’s age and mobility, the patient population on the unit and the institution’s needs should influence the staffing allocation” (*Pediatrics* 2).

Because of the growing need for more Child Life Specialists it is important to explore other options of play and relieving the stress of hospitalized children, whether it is educating by a child’s playroom, a play system, the hospital room itself or other programs that teach parents ways to alleviate the suffering and confusion of their child without the constant supervision of a Child Life Specialist. As children’s hospitals become more and more focused on the need of children, it is important that every aspect of a children’s hospital caters specifically to these sick children. By further exploring the

options to ease child and family suffering during hospitalization, the children's hospitals will become overall more successful by setting themselves apart (*Pediatrics*).

1.5.4 Psychological Outcomes of Hospitalized Children

“Psychological preparation is a “process of communication, accurate and developmentally appropriate information, identifying potential stressors, as well as planning and practicing coping strategies” (*Pediatrics* 4).

The first steps a child takes in the hospital could be one of the most significant points in a child's hospital stay. This is the first impression of what this experience will entail. Geist describes this experience for the child in his book *A Child Goes to the Hospital*: “Everything is strange: white uniforms, suggestive equipment and a bewildering amount of activity of strange people” (Geist 29).

Studies have shown that the heart rate of a child entering the hospital within the first twenty seconds can predict the possibility of post-traumatic stress disorder in children. “Recent findings support the ability of initial HR to predict PTSD symptoms in child trauma victims. Specifically, HR assessed upon admission to the ED significantly predicted PTSD (Post Traumatic Stress Disorder) severity and diagnostic status” (Nugent, Christopher, Delahanty 2). This supports the importance of making the child feel comfortable from the very moment that they step into the hospital. Risking PTSD would undermine the purpose of the Child Life Specialist within the first twenty minutes of being in the hospital (Nugent, Christopher, Delahanty).

The goal of a children's hospital is to convey the totally opposite experience. From the moment they see the building, all fears are released, and, when they walk into

to the lobby, they are excited to be in a new and exciting place. Making the child feel this sense of security is crucial for their psychological development because they view the hospital as a positive experience rather than remembering the fear they felt entering the hospital.

1.4.5 Parental Influence

A child in the hospital is as significant and traumatic for the family as it is for the child himself or herself. Many studies and resources stress the relationship and participation of the parents during the child's hospitalization. Without parental guidance, the child will have a difficult time deciphering the change his or her body is experiencing. The parent who guides and disciplines him or her on a normal basis is responsible to aid him or her in understanding his or her illness. If this occurs then the child will feel less guilt because he or she understands what his or her body is experiencing and he or she realize it is out of his or her control.

Harold Geist writes about a study performed by Prugh concerning one hundred children. They were admitted with primary medical needs for eight days. Fifty had regular parental visits and the other half had restricted family visits. Geist describes the results:

“In assessing the influence of hospitalization on both groups, the reactions of the children were divided into severe, moderate and minimal categories. Severe was defined as anxiety after three months from discharge; moderate was defined as less than three months and minimal by mild and transient disturbances in adaptation largely in the hospital... In

the main, children in both groups who achieved most successful adjustment on the ward were those who seemed to have the most satisfying relationship with their parents, especially their mother” (Geist 6).

The age group most affected by this change were children two to four years old. These children are still in a highly developmental and dependent stage of their lives. This study might have been set in a standard that was too black and white and also gives minimal statistical data. However, other studies show that without parental guidance, a child is disturbed by their own maleficent behavior. In many cases children are experiencing disorders or taking medications that force them to ornery and malicious behavior. Geist describes Anna Freud’s view on the matter stating, “To the distress of illness is added the distress of separation from the home, and here the child is defenseless. He submits with his body but retreats with his mind” (Geist 35).

This study shows some of the early discoveries of parental importance in the hospital. Since then many studies have been conducted to explore options of parental involvement during their child’s hospitalization. For parents, involvement with their child can be difficult, but the psychological outcomes for the child far outweigh the stresses on the parent.

“As parents are often the most important source of comfort to the children, it is critical that pediatric intensive care staff are able to identify the predominant sources of parental distress and are able to implement strategies that can help parents to manage these stressful situations in the most constructive way” (Callery 1).

In a survey of 6,000 parents in thirty-eight hospitals, parents rated the care they received while they were in the hospital. The parents rated everything contributing to their experience and the results were surprisingly good except for over twenty percent had a problem with the child's care. The area of care the parents were concerned with was the communication between the medical professionals and their patients. Thirty percent of parents felt that they were not communicating very well and because of that it was more difficult for them to care for their child during and after hospitalization. Thirty percent might not seem like much at first, but out of the six thousand parents 1,800 of them were not communicating properly, making communication the leading problem for children in the hospital (*Children's Health* 1).

“It is subtly implied that they cannot change a drink or change his diaper because no one tells them they may. Sometimes they must ask permission even to visit their child” (JSTOR 1). This database is discussing how nurses and doctors should handle parents. There are many times a parent feels completely helpless; their child's illness is out of their control, and they are depending on strangers to help their child. Parents have a sense of importance when they are in control. Many times it is helpful to be personal with the parent. “Show how Susan likes her bed fixed at night” reminds the parents of their special knowledge about their child and their special capability to make her comfortable”(JSTOR 1).

St. Joseph's hospital in Marshfield, Wisconsin, wrote guidelines to parents who have hospitalized children. They state “the best way to develop a good relationship with the health care providers is to express your ideas, concerns and opinions regarding your

child's treatment" (St. Joseph's 1). They also encourage parents to be as knowledgeable as possible with their child's illness. The more they know, the more they can participate and maintain some of the control they are used to having.

As a parent, sometimes it can be difficult to balance attention towards the child. In many cases parents have given too much attention and emphasis during the hospital stay, so the child will expect the same when they leave the hospital (St. Joseph's).

In many cases the parent and siblings of the hospitalized child will experience trauma in the hospital. "Parents and other family members may be highly anxious about the child's illness or the various diagnostic and treatment regimens, and such anxiety can be transmitted easily to the patient" (*Pediatrics* 5).

A lot of this stress is due to understanding the illness of their child or sibling. A survey of 6,000 parents of children in 38 different hospitals shows that "Overall parental ratings of care were associated most closely with communication about their child's condition and involvement in the care of their child" (Children's Health 1). Parents are scared as it is, and the last thing they need to deal with is the confusion of what is happening to their child.

Misconceptions are very inhibiting in the child's healing process. For example, "One girl, she said, thought that she would die as soon as her IV bag ran out. As a result she didn't sleep through the night because she was fearfully watching each drip of her IV disappear" (Warner 2). This is a classic example of misconceptions and how important it is for the child and the parent to know exactly what is going on for their full stay in the hospital. The misconception of the child who was scared of her IV caused her to lose sleep and thus hindered her healing process. Without proper communication the child

and parents could have irrational and unreasonable hopes and fears. Robert Priedt describes the situation: “parents who felt confident talking with doctors, and parents whose child had been previously hospitalized were more likely to play a role in important medical decisions about their children” (Priedt 1).

In conclusion, parents play a significant role in the life of their child during hospitalization. The parent is the sole disciplinarian at home, and without their support the child is less likely to be able to cope with their illness. “Ultimately parents are responsible for the care of their child once they leave the hospital. When parents feel informed and empowered they are more likely to be prepared to care for their child” (Priedt 1).

1.6 Conclusions

Hospitalization can be one of the most terrifying things a child and his or her family could possibly experience. His or her body is acting out of his or her control, and he or she is forced to rely on strangers to fix him or her. A hospital environment has the possibility to be as friendly or as stark as the administration feels. It has been proven that easing stress on the child will not only help him or her understand their illness, but also help him or her heal faster if he or she finds that he or she is more comfortable in the hospital environment.

Children’s hospitals were created because children require different needs and attention than adults. Because their brain has not fully developed, children are more susceptible to harm or trauma if they are not treated as a child rather than an adult. Children’s hospitals are taking in a large percentage of research funding because working

with children is easier to research because children tend to heal faster. These children's hospitals also act as a safe harbor for underprivileged and uninsured children. Because of the special needs of children, the hospitals that treat them need to cater to their specific needs.

The Child Life profession was created because studies were showing that children were lacking an understanding of what they were experiencing during their hospital stay. What used to be termed "play ladies" is now one of the most important professions in the hospital. These Child Life Specialists work to alleviate the stress on both the children and their parents during the hospital stay. By using dolls, toys and other distractions, the Child Life Specialist explains procedures to the child and also acts as a mediator to the parents. As great a concept as this is, these Child Life Specialists are greatly outnumbered, taking up to 30 children at a time. They are also responsible for running the playrooms for the children. If these playrooms could carry some instruction for the parents and children, then the Child Life Specialists could divert some more specific attention to each child, and better perform their job.

Aside from Child Life Specialists, the parents are the most important facet of stress relief and comfort to the child. Parents are the ones who are usually disciplining and caring for the child, and hospitalization tends to hinder the disciplinary and caring practices of parents. Studies have demonstrated that children require parental influence and participation during their hospitalization. Even though the hospital stay can be even more stressful for the parents than the child, they need to stay aware of everything that is happening to their child. Self-education is parents of the most important things parents can do; it allows them to participate in the activities of the hospital. The parents often

offer crucial advice to the doctors, nurses, and child life specialists, because they are the ones that raised the child. An educational playroom would aid the vital process of parent and sibling education.

Along with education, play is also an important part of a child's behavioral development. Play incorporated with treatment is a therapeutic way to distract children from the pain and fear of being in the hospital. Play is a natural part of a child's behavioral development. For children in an inpatient unit, the ability to play is sometimes hard to come by. Therefore, Child Life Specialists are responsible for bringing play to the children. For oncology patients, their white blood cell count is so low they cannot afford to play with other children because their immune system is so low. A playroom that even caters to these patients could help the development of the child. Play affects the physical, psychological and cognitive development of children, and without it a child could become developmentally behind other children after their hospitalization. Incorporating a playroom catered to hospitalized children will be beneficial to their developmental skills by allowing them to interact with others and distract themselves from the other difficult aspects of the hospital.

Children require play in children's hospitals because it is beneficial for their development and crucial for their healing process. Children's hospitals were created to cater to the special needs of children because they require special care. Children are different because their behaviors are not fully developed. As medical professionals have become more aware of this difference, a new profession has emerged to lessen the stress of hospitalized children and their families. Child Life Specialists are trained to work as a liaison between doctors and the families to facilitate the hospital process. This is a new

profession, and most of the time the Child Life Specialists are highly outnumbered.

Creating a playroom will facilitate the job of a Child Life Specialist, educate parents and children as well as further their development by creating an outlet for play.

CHAPTER TWO: CHILD DEVELOPMENT THEORIES

2.1 Introduction

As it has been discussed earlier in this thesis, there is a concern for the development of children who are trapped in a hospital with no place to continue their learning and no place to play. There are many psychologists and teachers who have studied the development of children, but there are two in particular that have extensively impacted child psychology and children's learning environments. Jean Piaget was a pioneer in early child development and developed his own theory, which categorized children's learning ability in stages of development. Another pioneer of her time was Maria Montessori. Most elementary and early education facilities are based on her conclusions of almost one hundred years ago. Montessori was a doctor who studied children's learning environments and made significant conclusions on how to aid a child's development in an educational setting.

Piaget and Montessori were leaders in a movement to give children a better setting for home, school and play environments. Their theories and conclusions were instrumental in the final project of this thesis. It is crucial to understand the psychology of a child when designing environments for them. Using the findings of Piaget and Montessori, this playroom will give a child a place where they can create a play environment, which will enrich their mind as they have an extended stay in the hospital.

2.2 Jean Piaget

Jean Piaget was originally a scientist who became both a psychologist and a philosopher. Piaget's first interest was in marine life, and later became children and their behavior. While teaching in Paris at the Grand-Aux-Belles, he began working on a series of intelligence tests and realized the complexity of children's answers and became fascinated with their development. "This suggested to him that younger children were not less knowledgeable, but, instead, answered the questions differently than their older peers because they thought differently" (Pelligrini 20). Piaget's greatest contribution to child psychology was his theory of Cognitive Development, which describes a child's development to adulthood in four different stages.

The first stage of cognitive development is the sensory motor stage, which ranges from birth until the child is two years old. The sensory motor stage is the "root of all intellectual development" (Wadsworth 33). The sensory motor stage is a very detailed phase and includes six subcategories. The child enters the world using his or her reflexive behavior, and at two years, the child is moving toward their symbolic reasoning, which is the start of the second phase.

The second stage of cognitive development is the preoperational stage that ranges from ages two to seven. This stage begins with symbolic thinking and allows for creative play. At this time, the child is also extremely egocentric. They do not understand the views of others, and many of their actions revolve around themselves. "The ability for the child to decenter is the beginning of the third phase" (Boeree 4).

“Piaget considered that children primarily learn through imitation and play throughout these first two stages as they build up symbolic images through internalized activity.”

Most of the activities that involve ages two to seven focus less on language and development and more on symbolic memorization such as colors, shapes and the alphabet.

The third stage of cognitive development is the concrete operational stage, which ranges in children ages seven to eleven. The concrete operational stage begins by a child decentering and leaving egocentric thought and concludes with conversation and logical thinking. Children begin to understand the meaning of numbers and how to use them. As they eliminate egocentrism, they begin to understand the perspective of others and can use problem-solving skills, which brings the fourth and final stage.

The fourth stage is called the formal operations stage. This phase begins when children start puberty and can think abstractly on the data they are given. “Successful completion of the formal operations stage is evidenced by an appreciation for decentering views, a general lack of discrimination, creative viewpoints and a confidence in one’s differences from the mainstream” (*Life Script 3*).

These stages are significant to the design of a playroom because certain stimuli will pertain to children of different ages. To give children the paramount experience, the playrooms must engage their learning abilities without them knowing it. A playroom caters mostly to the children in the second and third stages of development. This is why the project is intended for children ages two to seven.

For the children in the preoperative development stage, they require many stimuli that encourage them to learn basic things, like color and numbers. In a playroom, this can

be implemented in many ways through the design. The older children from ages seven to eleven are going to require a more in-depth way to play, because they require time with each other and time to explore in order to reach the fourth level of development and master complex problem solving.

2.3 Maria Montessori

Maria Montessori began her research with children who had intellectual and developmental disabilities, and through her success she began to implement her methods to children without disabilities. The Montessori Method bases itself on the self-directed activity of children where the instructor acts more as an observer to the child. There are numerous activities and stimuli involved in the Montessori Method that are based on the developmental needs of the child in order to teach them lessons that help them learn and master tasks as they become more mature.

The main concept that is the foundation from the Montessori Method is that children develop and think differently than adults, and their education needs to be geared toward these differences. The Montessori Method goes against traditional schooling of discipline and tests, and teaches children through self-directed learning. While the Montessori Method mainly discusses the schooling environment, many of the principles of this method can be incorporated into the design of a hospital playroom. To make the environment adaptable for the child and for the supervisor to act as an observer rather than an instructor can be extremely constructive to the development and healing process of the child.

Montessori was very specific about the atmosphere the classroom provided. She created a classroom with smaller furniture for the children to move and create their own spaces.

“I had tables made with solid octagonal legs, spreading in such a way that the tables are at the same time solidly firm and yet very light, so light indeed that two four-year-old children can carry them about...I’m also delighted and had manufactured little chairs. My first plan for these was to have them cane seated, but experience has shown the wear on these to be so great that now I have chairs made entirely out of wood” (Montessori 82-83).

Along with the furniture, Montessori created a small washstand to fit the children and cubbies for their personal belongings that were low enough for the children to access. These methods are present in most preschool and elementary school classrooms. Children require an environment that fits the way they learn. By having child-sized furniture, Montessori claims that children learn to command movements by having things that they can easily move and adapt. If by an awkward movement a child upsets a chair, which falls noisily to the floor, he will have evident proof of his own incapacity.

This can also be said for a hospital playroom. The furniture and environment should be suited for the child. The furniture should be smaller, lighter, and colored for children. The idea for a personal space for the child is another idea that can be implemented in a hospital playroom. To give each child his or her own personal space

could give the child an extra sense of security and ownership while they are far away from home.

A teaching on which Montessori was extremely adamant is that discipline must come through liberty. “We do not consider an individual disciplined only when he has been rendered as artificially silent as a mute and as immovable as a paralytic. He is an individual, annihilated, not disciplined” (Montessori, 85).

Along with teaching children that discipline comes through liberty, Montessori also was an advocate for child independence. “Little children from the moment which they are weaned are making their way to independence” (Montessori, 97). Montessori believed that all of her teachings lead children on their way towards independence. This should be the role for most educators. Children are learning in schools to become a functional adult member of society. This value of independence is often absent from the hospital. The children require constant care and supervision from others; a hospital playroom is what children need to practice their independence. Playing is the way for children to explore and create. A successful playroom should offer this for each child to give them independence at a time when they are controlled by so many things at the hospital.

CHAPTER THREE: DESIGN RESEARCH

3.1 Introduction

Through literary research it is evident that there is a need for a stimulatory play system that improves a child's and their families' experience in the hospital. Researching the entire experience of hospitalization and the experience of play in a normal setting will not only further knowledge of the important criteria that will be necessary to create this play system, but it will also show the value of play for patients and parents. The value of stimulatory imagination is to ease the stress of the child and parent by creating an outlet for play. This play outlet facilitates parents and children during a time of trauma and mass stress, and it is proven that they will have a faster recovery period (Petrillo, Sanger).

In the beginning of the initial thesis proposal, basic interviews were conducted in order to give insight to the different needs in children's hospitals and specifically in their playrooms. Through basic research of the role of doctors, nurses, Child Life Specialists and parents of hospitalized children, it was obvious which direction this thesis would take. Doctors had little to do with the child until they were in their recovery. The doctor starts with a very brief meeting with the child, but the rest of their experience is on the medical side. Nurses tend to have a stronger relationship with the patient since they are conducting most of the basic tests with the child. The Child Life Specialist is there to know the child and to explain to them the tests being conducted. The Child Life Specialists are also the ones who encourage and play with the children. Their opinions

will be extremely important in this project. The parents also play a large role in the hospitalization process of the child. Creating a play system for parents to help their child play could ease their suffering as well.

By researching the roles of different groups of professionals in the hospital, certain conclusions were drawn. Doctors are too busy medically to attend to the play of the child. Nurses are busy with medical information and are usually understaffed. The Child Life Specialist is crucial to the comfort of the child, but usually a Child Life Specialist is taking care of up to 50 children at one time depending on the unit of the hospital. The parents interviewed said that the scariest part of the hospitalization process was the fact that there were medical professionals running about and not telling them about the actions they were performing or what was going on. Obviously communication is a big problem in the hospitals. The parents are usually briefed, but it is difficult to relay all of the information to the parents and to the sick child (Klinzing, Child Life Council).

After reading notes on others' observations of children playing, those who are well, and those who are hospitalized, play is a creative outlet that allows children to take their minds off of the hospital. Play more importantly is a means for self-expression. It is imperative to closely watch a child as they play. Observations done by Creative Machines Inc. also show that a creative environment is the best way to distract the patients from the hospital. They encourage arts and crafts and a stage for puppet shows and plays (Creative Machines Inc.).

In order to start preliminary research for this project it was vital to gain basic understanding of the hospitalization process. In order to fulfill this need, interviews were

conducted with Maggie Butler, a Child life Specialist. This interview was done in the beginning of the research process in order to attain a direction for the rest of the project. Miss Butler gave understanding of what the Child Life Profession is like and what helps, hinders the lives and healing process of hospitalized children

Later in the research process, more interviews were conducted with industry professionals. Janet Cross, the head of Child Life, and John Sparks, an architect, gave a tour of Vanderbilt Children's Hospital during which they answered questions and participated in discussions about the project for this thesis. Ron Daniels, a general contractor, was also interviewed about the possibility of this thesis project. These interviews and discussions not only provided answers for the research of this project but also provided sample materials for the product research.

After interviewing professionals and touring hospital facilities, the next step was to begin to access the market research. Market research consists of four elements: human, technical, marketing, and production functions, and also includes charts of existing product to be seen in the market research section of this thesis. The human factors of the play system would take into account the needs and behaviors of hospitalized children and well children. The technical functions would incorporate the social needs and necessary objects for children who have restrictions on their bodies, along with safety hazards illustrated in the section on playground safety. The marketing functions would discuss the number of playrooms per hospital, per floor, and per unit. How many are necessary? The production functions are the reality of these playrooms, and how creative you can get with the restrictions of the hospital and funding. This is all crucial information when designing a hospital play system.

After accessing these functions, it would be helpful to compare the existing playrooms and their components. A S.W.O.T analysis (strengths, weaknesses, opportunities and threats) was created to further investigate the components necessary for a successful play system.

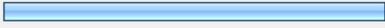
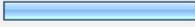
After these studies are done, there will be enough information to create the required performance criteria. The required performance criteria will incorporate all of the design methods to create a list or guideline for the rest of the design process.

3.2 User Research

3.2.1 Questionnaires and Surveys

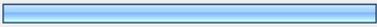
After reading a myriad of books and articles about play and hospitals it was evident that the Child Life profession would be fundamental in understanding the needs of hospitalized children. One of the preliminary methods of research was to send out a survey to Child Life Specialists. This survey was mainly to gather basic understanding about their career. How many children do they work with? What is the most useful activity? How do they keep the playground clean? Below is the actual survey.

1. What are your approximate work hours?			Response Percent	Response Count
Day Shift (9a.m.-5p.m.)			87.0%	87
Afternoon/Evening Shift (12p.m.-8p.m.)			11.0%	11
Night (3p.m.-12a.m.)			7.0%	7
Late Night (6p.m.-2a.m.)			0.0%	0
Morning (2.a.m.-8.a.m.)			1.0%	1
			answered question	100
			skipped question	0

2. Do you work in an inpatient or outpatient unit?			Response Percent	Response Count
inpatient			66.3%	59
outpatient			33.7%	30
<i>answered question</i>				89
<i>skipped question</i>				0

3. How would you rate the importance of the role parents play in the hospitalization of their child?							
	Not Important		Average		Very Important	Rating Average	Response Count
parents	0.0% (0)	0.0% (0)	2.2% (2)	5.6% (5)	92.1% (82)	4.90	89
<i>answered question</i>							89
<i>skipped question</i>							0

4. How would you rate your relationships with the Doctors and Nurses?							
	Bad		Fair		Excelent	Rating Average	Response Count
Relationship	0.0% (0)	0.0% (0)	15.7% (14)	52.8% (47)	31.5% (28)	4.16	89
<i>answered question</i>							89
<i>skipped question</i>							0

5. How many children are you in charge of at one time?			Response Percent	Response Count
1-10			22.5%	20
10-30			65.2%	58
30-50			10.1%	9
50+			3.4%	3
<i>answered question</i>				89
<i>skipped question</i>				0

6. What age groups do you specialize in? (check all that apply)			
		Response Percent	Response Count
0-2		78.2%	68
2-4		89.7%	78
4-6		90.8%	79
6-8		87.4%	76
10-12		89.7%	78
12-14		89.7%	78
14-18		82.8%	72
<i>answered question</i>			87
<i>skipped question</i>			2

7. Which of these products are the most effective?			
		Response Percent	Response Count
Building Toys		43.2%	38
Playground Toys		4.5%	4
Art Supplies		87.5%	77
Stuffed animals		15.9%	14
Dolls		36.4%	32
Video Games/TV/Movies		59.1%	52
<i>answered question</i>			88
<i>skipped question</i>			1

8. How would you rate your playroom facility?							
	Lame		Sort of Cool...		Awesome!	Rating Average	Response Count
Facility	3.4% (3)	11.5% (10)	29.9% (26)	41.4% (36)	13.8% (12)	3.51	87
<i>answered question</i>							87
<i>skipped question</i>							2

9. What is the most effective way to sanitize?			Response Percent	Response Count
Wipes			83.0%	73
Spray			14.8%	13
Automatic Sanitizer			2.3%	2
<i>answered question</i>				88
<i>skipped question</i>				1

10. How would you value a playroom that educates parents and children while dealing with their illness or injury?						
	Bad			Good	Rating Average	Response Count
Educational Playroom	0.0% (0)	7.9% (7)	19.1% (17)	73.0% (65)	3.65	89
<i>answered question</i>						89
<i>skipped question</i>						0

Figure 1: Questionnaire From SurveyMonkey.com

This survey was one of the first research components. By creating this survey, knowledge was achieved of the basic day for a Child Life Specialist. Most of the questions were as expected: that the specialists work 9:00 a.m.-5:00 p.m. shifts and do not do much overnight work, parents are important and they get along well with doctors and nurses.

However, some of the answers were surprising, such as each Child life specialist is mostly in control of ten to thirty children and in some cases they are in charge of over fifty sick children. This can be difficult for the Child Life Specialist to control, thus increasing the importance of a play system that allows children to play freely while someone can supervise numerous amounts of children. Another question that was useful was which products are the most effective elements of play. This answer goes against the

purpose of this project. Art supplies were the most effective by a landslide. However, later research will prove that this is the case because there is not adequate indoor play equipment for children with special needs.

3.2.2 Interviews

Throughout the beginning of the design research process, interviews with medical personnel were vital to understanding the hospital experience. The interviews were conducted with Child Life Specialists, doctors and nurses

The first interview displayed is in an interview with Maggie Butler, a Child Life Specialist who works in an emergency unit. The following are basic questions about her profession; they are as follows.

3.2.2.1 Questions for Maggie Butler

1. What is the main role for Child Life Specialists in a hospital?
 - a. To lessen the traumatic experience of children in the hospital
2. What are the means of easing the stress and suffering for hospitalized children?
 - a. Medical play equipment and play with normal everyday toys
3. What are the most effective tools?
 - a. Glitter wands, bubbles, music, ball with lights
4. What are the age groups that you deal with?
 - a. Birth to 18 years
5. Which children experience the most problems dealing with their illnesses?

- a. Very sick children, sleeping, secures, stitches, bones (bones reduced and IV)
 - b. Traumas, people who are in a stretcher around doctors and nurses, no family
6. What are the roles of doctors and nurses with Child Life?
- a. We work together, they collaborate with the Child Life Specialists, 6 doctors and 4 treatment rooms, they have to wait on us to take care of certain situations, nurses and IV's. I let them know when the child is in too much pain and needs more medicine.
7. What are the roles of the parents?
- a. They have a large role. They are the number one support system. They know the child better than the doctors and specialists and their cooling mechanism
8. What are the roles of the siblings?
- a. They get in the way... Same thing as the parents...they are encouraging; what to do with the sibling is one of the hardest parts.
9. What is the general time period a child spends in the hospital?
- a. 30 sec. to 6 hours or days.
10. How many children are you in charge of at one time?
- a. Anywhere from 1 to 35 or 40, every child in the hospital
 - b. 7 specialists
 - c. 2 emergency room specialists

After the first interview, further reading was conducted and a second interview was performed with more in-depth questions. Below is that second interview

Part II

11. Who is in charge of running the playrooms at the hospital?
 - a. Child Life runs the playrooms
12. Are there any problems regarding the playrooms in the hospital?
 - a. Infection control and cleaning
 - b. Toys that are getting recalled
13. What toys are found in the playrooms
 - a. Toys in general
 - i. Video games
 - ii. Nintendo
 - iii. Art and crafts
 - iv. Etc.
14. In your daily routine is there anything that slows down your work process? Why?
 - a. Having to clean toys
15. Are there restrictions for the types of toys children can use while they are in the hospital?
 - a. Kids who are contagious cannot play in the playroom
 - i. Contact precaution
 - ii. Oncology kids cannot come into the playroom
 1. Immune system is down

16. Is it difficult to find toys that are suitable for children in the hospital?
 - a. They only get toys that can be sanitized
 - b. Everything has to be wiped off and sanitized
 - i. No stuffed animals
17. Do you have specialized toys for Child Life?
 - a. Zanie dolls
 - i. Have all the body parts heart etc.
 - ii. Puppets, which are cloth
18. Where do you find specialized toys?
 - a. Zanie dolls from different companies
19. Do children ever have any bad reactions to the toys you bring?
 - a. Kids that don't like clowns are usually scared
 - b. Don't pretend that she is a real person
20. Could an educational playroom facilitate your job?
 - a. Anything that they can do to empower the parents. They are sometimes helpless. This helps bring them together.

The interview with Maggie Butler is the most thorough interview that was conducted throughout the preliminary interview process. Ms. Butler was interviewed on two separate occasions; once after very basic primary research, and the second time was after more in depth research. The first interview provided a basic understanding of the Child Life profession: How many children she works for, her hours, and the most effective tools to ease the stress on the child. The second interview was discussing the

specific tasks and hold-ups of the child life profession. The second interview showed that there are important factors for a Child Life Specialist in the playrooms. One of the most obvious, yet surprising, is the issue of sanitation.

As the supervisor of the playrooms, Ms. Butler is required to sanitize toys after each use. The drugs and treatments given to the children cause their white blood cell count to be low. This means their immune system is not as strong as it is normally. The sanitation slows down her work process and takes away from the time she should be spending with the children. The second interview also stresses the importance of toys in a playroom. The toys that seem to be the most effective are the plastic ones that are easy to clean. There are also very effective toys that Ms. Butler uses called Zanie dolls. They are equipped with every body part and organ so the child can learn what their body is about to experience. The importance of these dolls proves the importance of education. If there were a program or room that allowed parents in to use these dolls to explain the procedures, both parties would have a better understanding of the procedure, which is proven to create an easier recovery period.

3.2.2.2 Tour of Vanderbilt Children's Hospital

For the ideal play system, it was critical to have a facility in mind while working through the design process. Because of connections and location, Monroe Carrel Jr. Children's Hospital at Vanderbilt was the hospital of choice. Contact was made with John Sparks, one of the lead architects in building the hospital, and Janet Cross, the head of Child Life Services at the hospital. Mr. Sparks, and Mrs. Cross gave a thorough tour of the hospital, describing the design aspects and themes of the hospital. The main focus of

this tour was the Child Life Playrooms. This was very helpful in the research of this thesis project and allowed for a concrete place to keep in mind while designing this play system.

There were five playrooms, which were separated depending on certain age groups. There were also two outdoor areas; one was an outdoor garden, and the other was an outdoor playground with limited play areas. Not only were these playrooms an outlet for play and imagination, but also the entire hospital was geared towards children. The theme of the hospital was Tennessee nature, which changed on each floor. Figure 2 is an example of the first floor that represents water. Each floor has three “neighborhoods” for easy navigation by color, number and shapes. Each follows the theme “ribbons of healing, rivers of hope.”



Figure 2: Water Hallway in Monroe Carrel Jr. Children’s Hospital at Vanderbilt

Along with the themes on the floors there was an overall theme in the entranceway of the hospital that will carry through the themes in the design project. The theme in the grand entranceway that is the entrance from the emergency room is a magic

theme with bold color and magical stars. The grand staircase is the “piece de resistance” of the entire hospital. The pillars make you feel like you are entering a magical land, and not a hospital. The ribbons that flow around the pillars are covered in stars. The stars represent the children that are being cared for in the hospital. “The children are the stars of this hospital” (John Sparks). The magical theme is one that will be carried throughout the project. It is a theme that allows for more imagination than a theme such as pirates, balloons and castles. Below is an image of the main staircase.

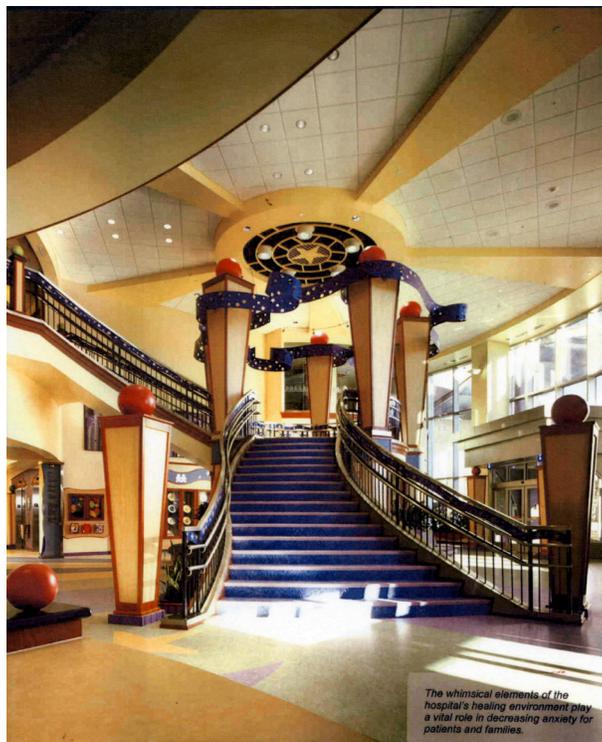


Figure 3: Entrance of Monroe Carrell Jr. Children's Hospital at Vanderbilt.

The focus of the tour was to attain special access to the Child Life playrooms on each floor of the hospital. The first playroom was a sibling playroom in the bottom floor. The size of the playroom was smaller than expected, and this was going to be the case for the rest of the hospital. The sibling playroom consisted of smaller tables, a fish tank, a table with a train set, and cubbies where games and art supplies were stored. Many Child

Life Specialists believe that games, arts and crafts are very beneficial for sick children, but this is not always the case. There was no area where the children could run and exercise their imagination. Below is an image of the sibling playroom.



Figure 4: First Floor Sibling Playroom at Monroe Carrell Jr. Children’s Hospital at Vanderbilt

The second floor playroom was designed for infant to preschool children, which includes children from newborn to four years old. The types of toys provided in these rooms were small walkers, mobiles for infants and toddler games. The school age playroom was similar to the preschool playroom. This playroom was meant for children ages five to eleven. The furniture was a little larger and there were more advanced games and play equipment. The teen room was different because of the amount of electronics in the room. There was every game system imaginable along with a pool table and large TV.

All of these play rooms have adequate equipment for entertainment purposes and basic types of play. However, there is no play system or outlet for creative and imaginative play besides art supplies. If each room had a play system that was different

than the regular activities then the child would be more likely to use their imagination to play. Each playroom was equipped with very concrete means of play. It is important for children to experience free play while they are in the hospital, and many of these playrooms did not allow for that. The playrooms were also extremely small; there would hardly be enough room for a play place. The Child Life Specialists stressed a need for space because they had to store so many things for the art projects and games they play. If the child had the freedom to play by their own means, then there would not have to be specific art projects and not such a large need for storage.

There was one main waiting room for the children's hospital. It was surprising that there was a lack of play equipment there, too. Under the main stairwell there was a small waiting/play area. However, the area under the stairs was not accessible for children in wheelchairs, and Mrs. Cross said it had been unsuccessful. There was also a large train set that had some interactive components but not many. There were some smaller stations with boring activities, but nowhere in the waiting rooms for children to play.

3.2.2.3 Meeting with Ron Daniels, General Contractor for Little Tikes

Mr. Daniels is a general contractor for a company called Custom Recreation who installs Little Tikes play equipment in Hendersonville, Tennessee. The meeting with Mr. Daniels was important because he has installed many playgrounds for children with disabilities and knows a lot about mass production and installation of park structures. He

has been in the business for twenty-three years and had a lot of important pointers about designing playgrounds for indoor and outdoor use.

The meeting with Mr. Daniels took place in a restaurant while having a cup of coffee. The meeting began by discussing a basic overview of Mr. Daniels's job and responsibilities in order to enhance the interview. Mr. Daniels supplied the most recent materials for Little Tikes, including some samples for ground covers and, most importantly, safety information.

Safety was one of the first issues discussed, and Mr. Daniels explained the responsibility that falls to the playground company when it comes to injuries. Numerous precautions need to be made when designing this equipment. Mr. Daniels explained the three main categories of accidents on playgrounds: accessibility, fall zone and entrapment. Accessibility is how easily children can move and flow through the playground. It is also important for children with disabilities to have accessibility for all components of the playground, especially for this thesis project. Fall zone is the area that children could fall on while climbing on structures that are above a certain height. More information will be provided in the safety section of this thesis. Entrapment is also a dangerous category of accidents when it comes to playgrounds. Holes and gaps have to be a specific measurement, and there can be no ropes or anything that is a strangling hazard. See section 2.5 for more information on playground safety.

Mr. Daniels also discussed the importance of sanitation in both outdoor and indoor playgrounds. He installed a playground in a Chick-fil-A that had to be pressure washed and fully sanitized once a month. He said that the drainage of an indoor playground is more important than the drainage of an outdoor playground. Many indoor

playgrounds can become a “Petrie dish” for bacteria if they do not receive the proper measures of sanitation.

The ground covers for these play structures play a large part in the drainage, sanitation and safety. Mr. Daniels provided samples discussing the best options for indoor playgrounds. He stated that workers lock tiles or pour-in-place rubber would be the best option for an indoor playground in a hospital. They both provide an adequate cushion for fall heights, create good drainage for sanitation and can be made into any different customizable designs.

Mr. Daniels also discussed the importance of marketing and told stories of crazy clients that he has had to deal with in the past. His main argument was that products are not marketed to the child, but ideas have to be marketed to adults, and then they provide the equipment for the child. The child is secondary in terms of selling the idea and marketing the playground. This is something that was studied in- depth for this thesis and will be discussed in further research of this thesis. Mr. Daniels will continue to give feedback for this project as it is developed.

3.3 Comparative Product Charts

A Comparative Product Chart is a means of research to explore the strengths, weaknesses and potential changes in existing products. It investigates the designs of competing products in the early stage of the design process and provides a picture of where the designer is to begin and shows how he or she can improve the product already in the market. Below are comparative product charts for different elements of the

playground: layouts, structures, panels, and ground coverings. These charts are ideally going to create improvements and ideas for the project of this thesis.

For each chart, the product was chosen from two of the most popular playground companies: Little Tikes and Game Time. The products chosen are the products that were the most interesting and the most suited for this project.

3.4 Design Criteria

Design Criteria are the restraints and qualities that are required when designing a product. The Design Criteria of this thesis will summarize the attributes that are necessary for the project to be successful. The Design Criteria will pull from the research that was conducted to give a set of guidelines while designing the play system. The Criteria will keep the project on track without any additional components that could hinder the success of the project. When determining the Design Criteria, there are a few different areas, the user, the activities of the play system, the form of the play system, and the location and its constraints on the play system. Setting criteria points to meet for each of these areas will aid the design process in a successful direction.

The first area of criteria is the user. Who is this play system designed for? Children is the obvious answer but it is critical to also look at which types of children will play on this system because it is going to be placed in a hospital. The play system needs to allow for needs of healthy children, sick children and severely handicapped children. Not only is it important to look at the children, but also taking the parents into account is equally as important. The parents are in charge of the child and determine

whether or not the child is able to play. Parents often enjoy playing with their child, so the play system should also accommodate those things.

The first criterion for the user is that it is fun. If the project isn't appealing and fun, then what is the point of a playground? The idea of the "fun" criterion will reappear in each section of the design criteria.

Aside from that, the size of the playground should suit the anthropometric data of the child. There is a possibility that the playground will be for children ages two through twelve; therefore, the activities and components need to suit the size of the user. There should be no child that feels hindered for being too little or too small for any of the equipment. As Janet Cross, the Child Life Specialist, stated, "it is vital that you do not taunt any child. Each play area should be for everyone." There are specific anthropometric data for children, which is included in the third section of this chapter. Most of the existing playground material adheres to these requirements, but the new designs of this playground should also comply with these regulations.

Because children are not fully developed and will tend to use the play equipment in different ways than what it was meant for, the safety of the playground is also an important factor. The play system should adhere to the safety restrictions as outlined in the Chapter on Playground Safety. No holes should be between 3.5 and 9 inches to avoid entrapment, there should be proper landing areas around all equipment, and the ground cover must be a certain depth to ensure the fall heights of the playground system, even though this play system will be at one level. Protrusions of the hardware should be non-existent. These are all design criteria for the project in relation to safety for the user.

The users are the key factor in the design criteria of this project, but there is also the question of what is the user supposed to do? What activities are supposed to be supported in this thesis project? The activities for this project are activities that stimulate senses and encourage creative thinking during play. Many of the activities that were chosen in the comparative products research were chosen due to the activity that they supplied for the child and the outcomes of the child performing the activity. Stimulating senses is any activity that triggers sight, hearing, taste, smell and touch. It is proven in the literature review of this thesis that stimulation of a child's senses aid in their development.

Along with stimulating a child's development, these activities should encourage and develop the child's imagination. It was stated in the literature review of this thesis that imaginative play is beneficial for a child's development, and by seeing a child play through imagination it can help parent's, doctors, and Child Life Specialists understand the healing of children and see if they are experiencing any type of trauma.

The next criterion to be addressed is the question of what is the system supposed to look like? The play system will rely on the form of existing equipment, but in order to support the child's imagination and the existing theme of Vanderbilt children's hospital, a magical fantasyland theme will be the concentration of the play system. The children's hospital already contains a grand entranceway that looks like an entrance into a fantasyland, and the play system will incorporate these same elements to match the theme of the hospital, which supports the idea of imagination and stimulating the senses. The color scheme will consist of bright vibrant colors and include shapes that entice children to play.

As it has been stated, this play system will be placed in the Monroe Carrell Jr. Children's Hospital at Vanderbilt. For the design criteria, it is vital to state the location of the play system in order to understand the scale and space constraints of the play system. Mr. John Sparks, the architect of the children's hospital, supplied the floor plans of the building while giving a tour.

The area for the play system is to have a large configuration. The play system will be placed on one of the larger waiting rooms on the second floor of the hospital. This play system will have more of the components than the smaller system designed for the playroom.

CHAPTER FOUR: PLAYGROUND SAFETY

4.1 Introduction

In every interview conducted for user research, each professional seriously stressed the issue of safety. Many school and children's environments are steering away from playgrounds because of the liabilities involved. (SOURCE) However, The U.S Consumer Product Safety Commission has created a *Handbook for Public Playground Safety*, which was first published in 1981. The handbook offers safety recommendations for most play structures and explains the hazards of equipment.

The *Handbook for Public and Playground Safety* begins with an introduction and history of the guidelines. Then there is a general discussion on playground safety, and the handbook states, "because all playgrounds present some challenge and because children can be expected to use equipment in unintended ways adult supervision is recommended." This is particularly important to this project because it will be extremely necessary to make sure that this play system is to be placed in a supervised environment because it is going to have to suit special needs children. The discussion not only recounts the need for children safety, but also the reason children need playgrounds, and how to make the playground live up to its full benefits.

4.2 The *Handbook for Public and Playground Safety*

The next section discusses the main injuries on playgrounds and states that falls are the primary injury on playgrounds today. Other hazards are impacts by swings and other moving equipment as well as “pinch points, sharp edges, hot surfaces and debris.” It is imperative that when designing this play system that these elements and hazards need to be completely avoided because this play system will be used by sick children and its liabilities will be even higher than that of any other average playground.

There is an entire section dedicated to defining terms of playground areas and equipment. The U.S. Consumer Product Safety Commission felt this was necessary in order to create a common language between contractors, designers and the installers.

The following section is one of the most important sections in the handbook, which is on surfacing. This is the most important section because it is previously stated that falling on playgrounds creates the most injuries. The surfacing component is the element the child falls on and therefore a life saving element crucial for this project. One of the main factors for the surfacing of a playground is the critical height and the shock absorbency of certain materials. According to the Handbook for Public Playground Safety the critical height is “the fall height below which a life threatening head injury would not be expected to occur.” Below is a chart of critical heights of certain surface materials.

TABLE 1 — CRITICAL HEIGHTS (in feet) OF TESTED MATERIALS				
MATERIAL	UNCOMPRESSED DEPTH			COMPRESSED DEPTH
	6 inch	9 inch	12 inch	9 inch
Wood Chips*	7	10	11	10
Double Shredded Bark Mulch	6	10	11	7
Engineered Wood Fibers**	6	7	>12	6
Fine Sand	5	5	9	5
Coarse Sand	5	5	6	4
Fine Gravel	6	7	10	6
Medium Gravel	5	5	6	5
Shredded Tires***	10-12	N/A [†]	N/A	N/A

Table 1: Critical Heights (in feet) of Tested Materials from the Handbook of Public Playground Safety.

This table shows the height a surface must be with these materials underneath for protection. It describes them in a compressed and uncompressed form. However, if a child is at ground level they do not need surfacing materials. For this project surfacing materials will be required because certain elements of the play system are on the ground, but other elements could be hazardous if children use the equipment in other ways than its intended use. This play system will be in a hospital so many children could be more susceptible to injury.

The next section in the handbook is also a very important section. This is the section on recommended use zones for equipment. The primary pieces of equipment that require use zones are slides, swings, merry-go-rounds and rockers. Slides are the only piece of equipment that could possibly be included in this project. Below is an illustration for the use zone of a slide.

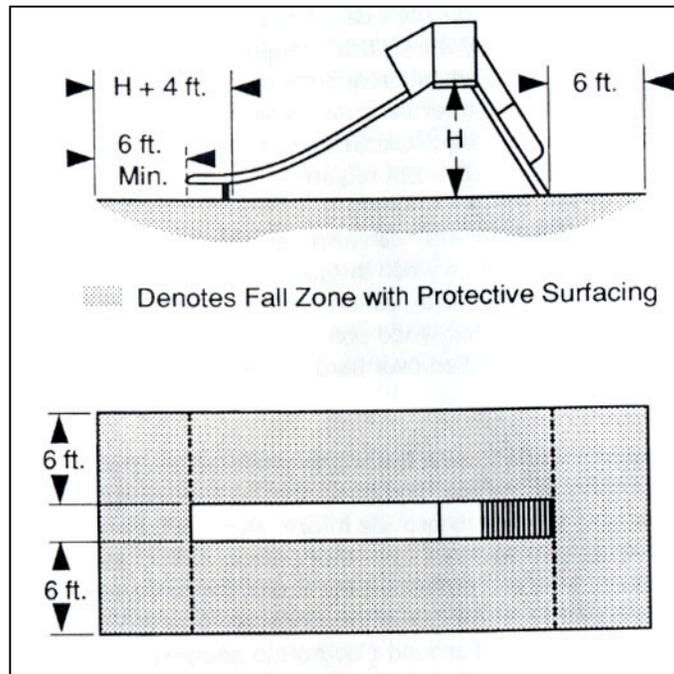


Figure 5: Fall Zone for Slides

A subject that is very important and occasionally overlooked is the installation and maintenance of the equipment. The best design could be a failure if it is not installed properly or not properly maintained. The section discusses the importance of clear assembly instructions that should be stored permanently near the site of the playground, and special attention should be given to the stability of the equipment for each facility and environment. As far as maintenance, the handbook states that “inadequate maintenance of equipment has resulted in injuries on playgrounds.” Therefore the indicated maintenance schedules should be strictly adhered to. Checklists are recommended in order to give an orderly and exact way to check all of the equipment.

These checklists and inspections should be filed in case there is injury, especially those that result in a lawsuit.

Hardware should be covered as to not have any sharp points, corners or edges on the playground because they can all be extremely hazardous. Many children have their clothes tangled on these points and edges, which could involve a serious entanglement injury. “Protrusions or projections on the playground equipment should not be capable of entangling children’s clothing because such entanglement can cause death by strangulation” (*Handbook for Playground Safety* 8). There are very specific measurements for these protrusion tests. Below are diagrams of these gauges.

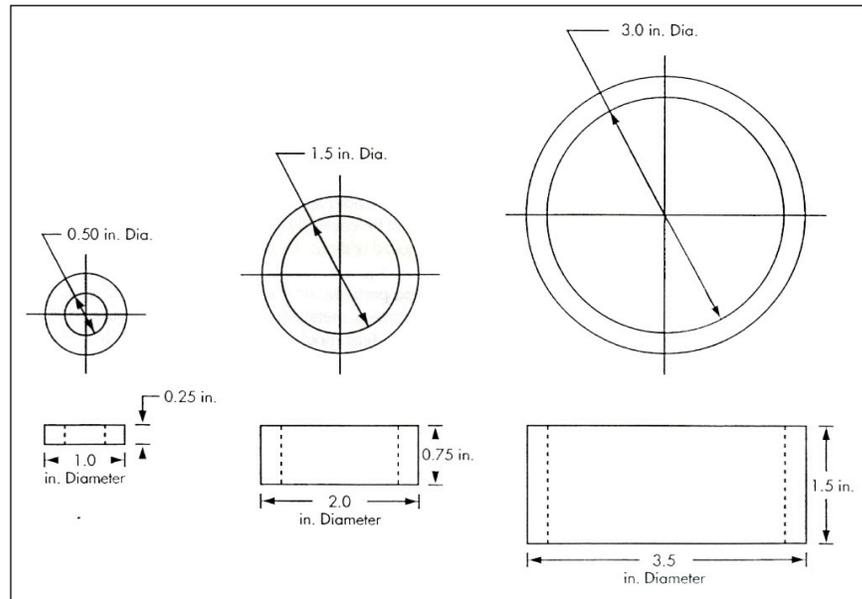


Figure 6: Protrusion Test Gauges.

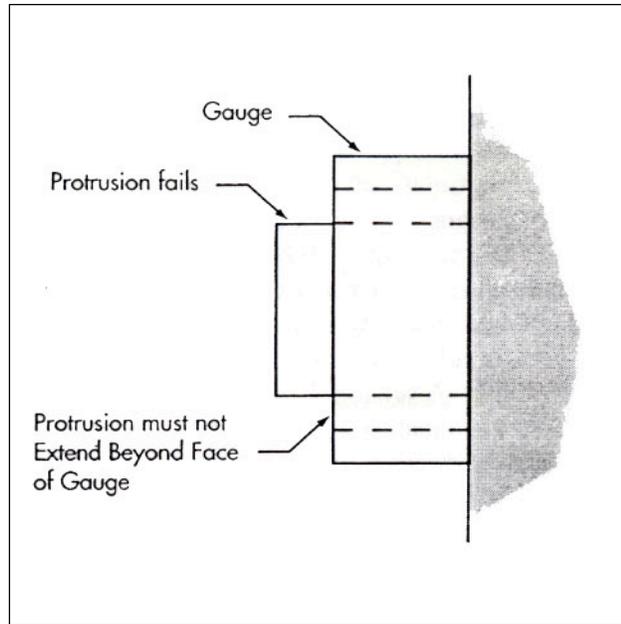


Figure 7: Protrusion Test

Another diagram demonstration of the rules of entanglement and protrusions is that of a slide area. Because there are slides used in the final project this diagram is particularly relevant.

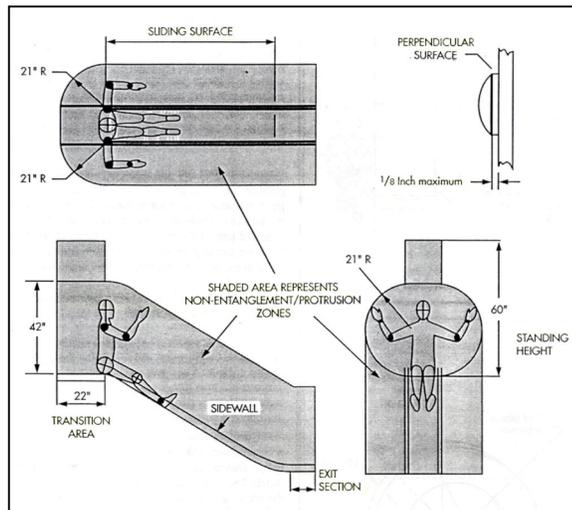


Figure 8: Areas on Slides Subject to Protrusion

In the Little Tikes Safety Handbook, which is generally the same as the Handbook for Public Playground Safety, there is a supplemental illustration of the definition of entrapment.

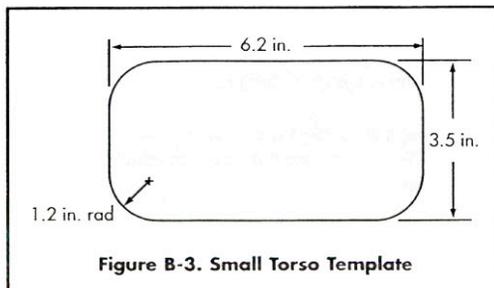
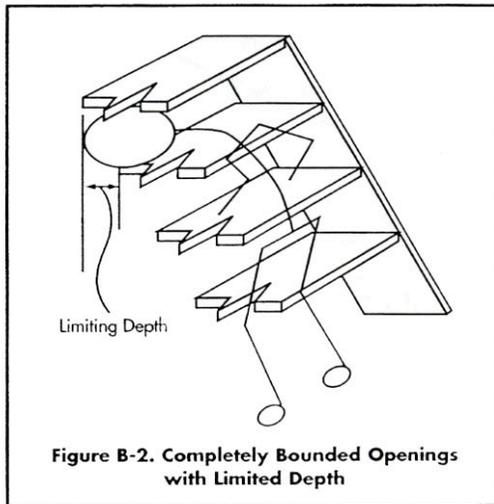
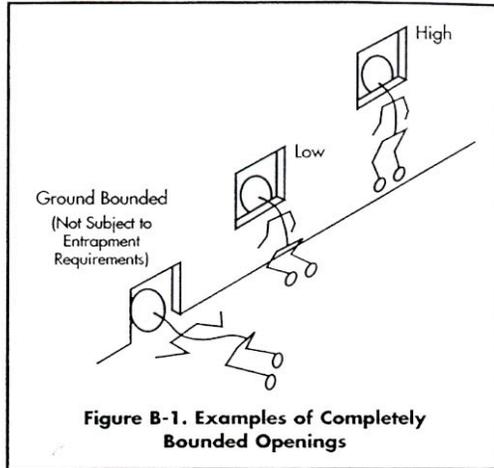


Figure 9: Illustrations of Entrapment

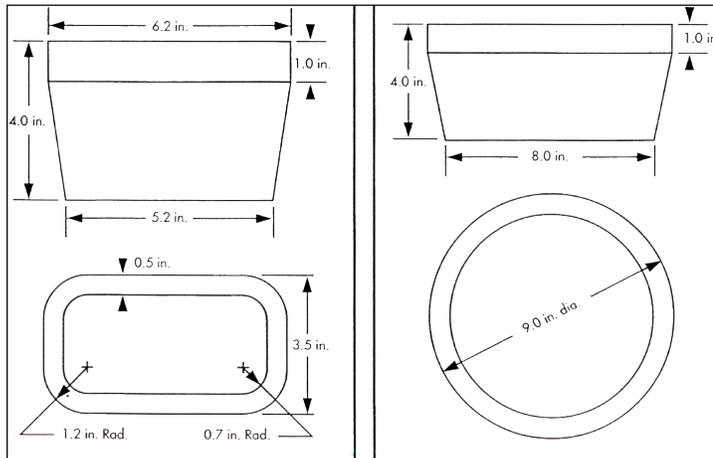


Figure 10: Small and Large Probes

Along with barriers and large hoes for entrapment, certain angle measurements are forbidden due to the risk of entrapment. The smallest angle allowed on a playground is fifty-five degrees. If an angle is less than that, then it is imperative to have a shield for that particular angle where it reaches below fifty-five degrees. Below is an illustration depicting the use of angles.

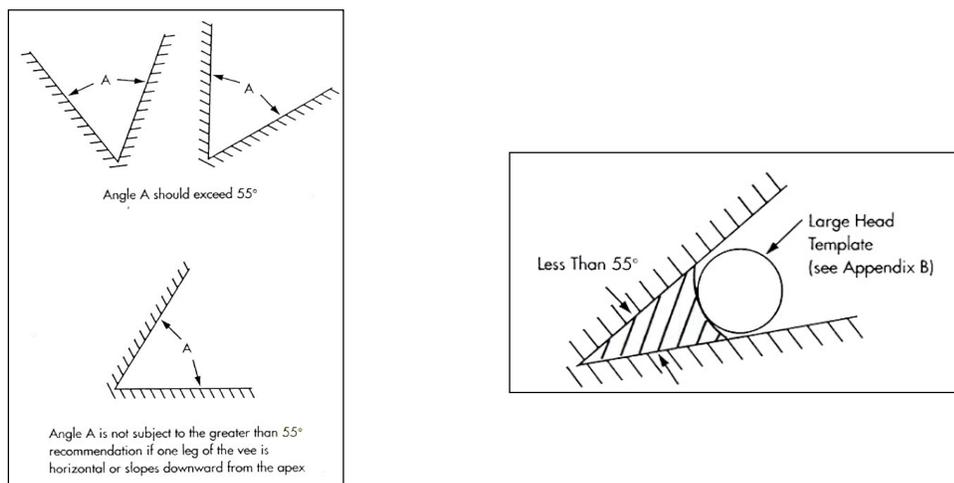


Figure 11: Angle Recommendations

The Handbook concludes with appendices on certain aspects that were not included in the 1997 handbook. There are detailed accounts of new materials and new equipment. This handbook is necessary for all individuals involved in playgrounds from the design process to the installation and then towards the maintenance. This handbook has saved many children's lives and will be an imperative aspect of this thesis project. Every measurement and recommendation will be taken into account, especially those appropriate to indoor and handicapped playgrounds. The back cover of the Handbook of Public Playground Safety lists a public safety checklist and it is as follows.

“Here are 10 important tips for parents and community groups to keep in mind to help playground safety.

1. Make sure *surfaces* around playground equipment have at least 12 inches of woodchips, sand or pea gravel, or are mats made of safety-tested rubber or rubber-like materials.
2. Check that the protective *surfacing extends* at least 6 feet in all directions from play equipment. For swings, be sure surfacing extends, in back and front twice the height of the suspending bar.
3. Make sure play structures more than 30 inches high are *spaced* at least 9 feet apart

4. Check for *dangerous hardware*, like open “s” hooks or protruding bolt ends.
5. Make sure *space* that could trap children, such as openings in guardrails or between ladder rungs, measure less than 3.5 inches or more than 9 inches.
6. Check for *sharp points or edges* in equipment.
7. Look for *tripping hazards*, like exposed concrete footings, tree stumps, and rocks.
8. Make sure elevated surfaces, like platforms and ramps, have *guardrails* to prevent falls.
9. Check *playgrounds regularly* to see that equipment and surfacing are in good condition.
10. Carefully supervise children on playgrounds to make sure they’re safe.”
(*Handbook for Playground Safety* 13).

4.3 ADA Handbook

Another design criterion for the user is accessibility. Because this play system is going to be designed for healthy, sick and disabled children, the play system needs to be designed to suit all of these children’s needs so no child is excluded from the play system. The Americans with Disabilities Act includes a section (section 15) of

guidelines for playgrounds and regulations for wheelchair access. The guidelines that pertain to this project are as follows:

1. For ground components there needs to be a minimum of 60" width
 - a. For areas less than 1,000 sq. feet then the width should be 44"
 - b. For elevated components, the width should be 36"
2. For transfer stations, there should be at least 24" of space
3. Handrails should be .95" to 1.5 inches
4. Each transfer step should be at least 8" tall
5. Platforms should have at least 14" of level
6. Seats should be 11"-14" (Slides do not comply)

The figure below demonstrates the area for a wheelchair as given in the ADA guidelines provided by the Self-Insured School of California.

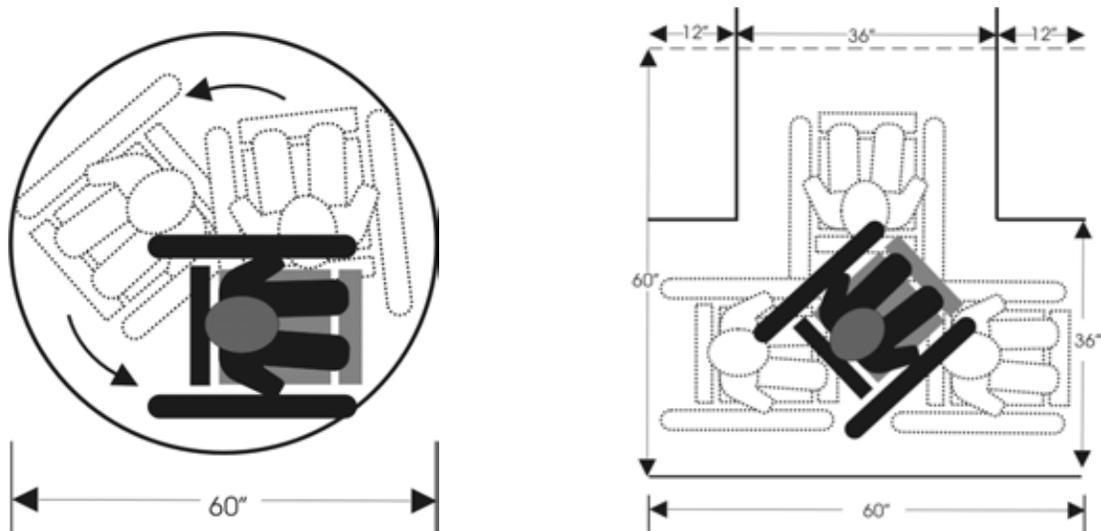


Figure 12: The ADA Width Requirements for a Wheelchair

Aside from the ADA requirements, it is essential to keep in mind the possibility of a child attached to an IV. There are many cases where the child can be mobile but must remain attached to a catheter or to an IV stand. The smallest an IV stand will go is approximately 50”; therefore, all ground components should allow for this clearance height.

The playground safety requirements are crucial for this thesis because the success of the model project depends on it. Without paying attention to every detail of this chapter, the play system would be obsolete if any component were to cause harm to a child.

CHAPTER FIVE: DESIGN APPROACH

5.1 Introduction and Overview

The goal of the previous chapters is to support the reasoning and theories behind this approach, which was used in the design project to create a stimulating and accessible playground for a children's hospital. This approach is created for a specific environment, which is a large indoor area of the hospital where there is enough room for a play system, include the surrounding areas and fall zones. It should be noted that the process, components and cleaning recommendations are specific for a hospital environment.

The approach is built by modifying basic approaches from playground companies while adding additional constraints in order to create the ideal environment for a children's hospital. There are three overall necessary components that apply to each stage of this approach. These are universal accessibility, aid in child development and compliance of a theme. The most important aspect of this project is the accessibility. It is the factor that makes the project unique. Universal accessibility is a rarity among playgrounds and is particularly imperative for a hospital environment.

Another important factor to include in each step of the process is the child's development. As it has already been discussed in the chapter on children's development, there are many theories to a child development. This project followed the ideas and teachings of Maria Montessori and Jean Piaget. All of the components of the

play system have a special purpose to trigger the child's senses and appeal to their needs, both of which are key attributes in both Montessori and Piaget's theories.

Lastly, most successful playgrounds have a common theme. As it is stated on the website for Fawns Safe Play, "Creating the right environment for the children to indulge their vivid imagination and providing props for their role-play is crucial to ensure they maximize the free play opportunities" (Fawns Safe Play 1). As it was stated in the previous chapters, free play is crucial for children's development. These three categories should be carried out and set as top priorities when designing using this approach.

There are four stages that follow the overall criteria. These stages are space selection, components, layout and implementation. The space selection stage is where the location is selected by using another set of criteria, which is to be discussed further in this chapter. The components stage is to decide which company and which components best fit the theme and needs for the children who will use the play system. After the components are selected, the next stage is the layout stage. This is the stage where the location and relationships of the components are selected. The final stage is the implementation of the playground and the plan of installation and upkeep is determined.

In order to prove the method of this approach, following this chapter will be an example project that follows each phase or criteria where it will be demonstrated how this should be followed. Because research was done with professionals at Vanderbilt Children's hospital, this will be the location of the play system. The components used and manipulated in this are from Game Time due to previous experience with their products and the immense choices of accessible components.

5.2 Overall Criteria

As it has been previously discussed in the introduction of this chapter there are three components to the overall criteria in this approach. These categories are universal accessibility, aid in child development and compliance of a theme. These are overall criteria because in literary and design research these three aspects seem to be the recurring items of importance. In each phase of this approach it is crucial for the individual following this approach that they are constantly revisiting these facets in order to achieve success.

The first and most important criterion is the accessibility of the play system. As stated in the introduction of this chapter, the factor of accessibility is what makes this approach original. Others have explored different ways to make universally accessible play systems, but it is rare to include a play system in a hospital while manipulating other existing equipment that better defines the user. Accessibility not only includes making all components available for children with special needs, but it will also not minimize the use and developmental enhancement of individuals who are not physically hindered. All ramps and panels and manipulated components must all have the same fun factor and interest for the child.

As discussed in the chapter on playground safety, the accessibility of the playground should comply with the Handbook for Playground Safety and the ADA Handbook. By achieving the goal of full universal accessibility, no child will be left behind. To once again quote Janet Cross, the head of Child Life services at Vanderbilt Children's Hospital, "the worst thing you can do with play is taunting a child." This is not referring to individuals, but to the equipment that is used to stimulate play for the child.

Vanderbilt Children's Hospital is an advocate in universal accessibility. The following project will implement this throughout the design approach to ensure that all children can enjoy this play system.

After the importance of universal accessibility, attention needs to be given to the child's development while using the play system. The literature review and design research includes questions and statements that stress the need to support a child's development during play and the potential danger of being hindered developmentally by a prolonged or traumatic stay in the hospital. Most hospitals are not equipped with free play facilities and allowing a play system in a hospital allows for the needs of free play to be met.

Maria Montessori discusses the teaching method of learning through experiences and letting the child remain in control and the instructor playing the role of overseeing the classroom rather than instructing it. Jean Piaget described the stages of cognitive development, and each stage is progressed and trumped through experiences that allow the child to react in certain ways in order to gain experiences, which allow him or her to progressively develop. The play system is built for the child and would be useless if it did not help the child play, which is proven to aid in their development. In the project associated with this approach, each phase will revert back to the theories and teachings of Montessori and Piaget to maximize the development of a child when he or she uses this play system.

The last criterion that should be followed throughout the approach is the theme of the playground. Scattered components that do not flow usually do not appeal to the child upon entering the play system. The play system should interest the child when they first

lay eyes on the play system. A theme could have more than one definition. A theme could be a color scheme with certain colors to convey a specific mood. It could also be a theme that matches the rest of the hospital to add continuity and appeal to the child. The theme could also be specific to itself to entice the child. The rest of the process is easier once deciding on a theme. In the area of playgrounds and play systems, there is a vast pool of components and ideas. Deciding on a theme can help narrow down the decisions that need to be made for the rest of the development of the play system.

The theme of this play system will mimic the theme of the main entrance and include other components to create a Whimsical Sky theme. The name of the playground will be “HOPE HEALS.” The name of the play system follows with the whimsical theme to help children feel apart from the earth and apart from their sickness. All components and properties should constantly revert back to this theme. This theme will inspire hope to children using the idea of taking them away from this earth where their sickness is real. This play system will help children and their families escape the reality of the reason they are in the hospital.

The criteria are critical to remember while using the following approach. Without them the general purpose for the play system will be lost. The play system should be accessible for all children while allowing the maximum use of play. The components for play should stimulate the child in order to aid in their development, and the play system should have a theme in order to narrow down components and entice the child. These criteria will be clearly associated with the implementation of the approach in designing a play system for Vanderbilt Children’s Hospital.

5.3 Phase One: Create the Space

The first part of this approach is to decide on the location of the play system. A children's hospital is very specific in terms of placement, technology and flow. Choosing a location where people frequent and are not limited is the better option for a large play system. Waiting areas and common spaces are ideal. These spaces are preferable because they are visited by the most people and can aid children who are staying long term or children who are just visiting for the day.

For specific-needs children who cannot interact with others a smaller unit of this play system could be installed in a specific sterile environment. When choosing a space there are certain things one should keep in mind. What is surrounding the area of the play system? Where is the traffic flow? The use of the play system should be maximized without causing a disruption to the flow of the hospital.

Accessibility is once again important because the area of the play system should be universally accessible if the play system stresses universal accessibility. It is also important to understand if the play system is going in an existing space or in a new space. A way to better understand the space is to attain a floor plan of the facility for the play system; by comparing different spaces it will be easier to select the space. Once a floor plan is attained, it is important to simplify that floor plan so one is not confused by all of the other elements of the floor plan and can concentrate on the space for the play system. The theme can be altered depending on what type of space is to be used and should follow the existing elements of the hospital. Choosing the right place for the play system will add to the success of the play system.

5.4 Phase Two: Selecting Components

The second phase for this approach is the component selection process. There are vast amounts of existing playground equipment and making the decision can be difficult without a direction of guidelines. The three main criteria should still apply to the choices of components. In many situations, the criteria that have been addressed will not allow for different types of existing equipment. There are three categories of components that are necessary to create a play system while following the three main criteria. These are, ground covers, play structures and panels. A children's hospital is a very specific location, and limits the choices when it comes to the issue of universal accessibility, and all of these categories should include components that apply to the criteria of accessibility, child development and theme of the play system.

In general, when designing a play system it is important to use one company for components because each company has different sets of patented hardware. In order for ease of assembly and layout, using one company is highly recommended. In the project following this approach, the two companies that offered the most in terms of the three main criteria were Game Time and Little Tikes. Both companies offered the most in terms of accessibility and also offered means of manipulation in their products. However, GameTime offered the most components of universal accessibility; therefore, they were the company chosen for the example play system.

In this approach, the component selection process was made easier by creating comparative product charts, a common way of categorizing and comparing products in design methodology. A Comparative Product Chart is a chart to compare components by listing the strengths, weaknesses and potential changes. By charting out

the strengths and weaknesses it was easier to select which components would be successful for a hospital setting and which components could be manipulated to be universally accessible. Below is a blank comparative product chart, which shows the methods that will be used in chapter six to create the example play system.

Comparative Product Chart				
	Product	Product	Product	Product
Existing Products				
Strengths				
Weaknesses				
Potential Changes				

Figure13: Blank Comparative Product Chart

Out of the four different components that are relevant to a hospital setting, the first to be addressed is the ground cover. Most playground companies do not produce their ground covers and attain it from other companies. Therefore outside research must be done in order to attain the numerous types of ground covers for the play system. The ground covers that are most suitable for a play system are the ones that have exceptional drainage and those that can be customizable. The drainage fits into the accessibility

category and it is also nice to have a customizable ground cover in order to fit the theme of the play system.

The second category of components is the play structures category. There are not many structures that are universally accessible. Some that are universally accessible are slides and swings, and merry-go-rounds; however, many of these structures require large use zones and take up too much space to be placed indoors. The components selected for this category should have small use zones, not require too much additional equipment and of course be universally accessible. A recommended component is a slide; they have use zone of only six feet. A swing set requires a much larger use zone and is therefore not ideal for a hospital. Small interactive climbers are accepted but not preferable.

Because so many structures are not accessible, it is also possible to create alternate equipment using existing structures. Some companies would be willing to work with the customer to make customized equipment. There are some features of the example play system that will incorporate different components to make an accessible structure. With all of the components selected the next step is to decide where the components should be placed.

5.5 Phase Three: Create a Layout

After the components for the play system are selected, the next part of the approach is to create the layout. There are numerous aspects to keep in mind when creating the layout because, without a proper layout, the components selection is useless. The things to keep in mind while creating a layout are the categories of the components and where are they placed according to other activities to maximize the use of the

components. Another important thing to the layout is the flow of the play system. By understanding the user flow, a designer can actually determine where the user walks and what he or she will see.

Space is also a key factor when designing a play system is the space. The space where each component is placed is extremely important when considering the safety specifications and use zones for particular equipment.

While considering these things, the first step to create a successful layout is to use the comparative product chart method to compare other playground layouts and compare what is successful and what is not successful.

After layout comparison, it is important to select the components for the play system and make a list of those selected components. With the list of components it is important to explore as many layouts as possible to attain the correct one. Create numerous layouts and compare them to one another to decide what works and what does not. Once a proper layout is created, then one needs to look into the implementation phase of the play system.

5.6 Phase Four: Implementation

For the implementation stage of this approach there are two factors that are crucial to ensure that the play system will be able to withstand time and use. The first factor is the installation. Both professionals and volunteers install many play systems. Because this play system will be in a children's hospital, it is crucial, if not mandatory, that there be mostly professionals who install this play system. The installer should take proper precautions to the surroundings while installing the play system. The ground

covers and support system should be an appropriate depth in accordance with the Handbook for Playground Safety, which is outlined in chapter two.

Along with the installation, the maintenance and upkeep is extremely important for the play system. Due to cleaning and sanitation, it is recommended that this play system be cleaned once a week. This cleaning can take place during a time of day where the playground is not used. Basic sanitation should be done daily. This is extremely important for the success of the playground due to the illnesses and lack of immune systems for the children who are staying in the hospital.

Sanitation checks should be done so frequently that it should be easy to tell when the playground is in need of a tune up for chipped paint and various other aesthetic fixes. The last aspect of implementation is the safety checks. All playgrounds and play system are required to have a safety check on various hardware and components quite often. It is recommended with this approach that a safety check be performed once a month in order to ensure that the children will be safe at all times. If all of these aspects of the implementation phase are completed, then the play system will last longer, have less repairs and benefit more children while they are hospitalized.

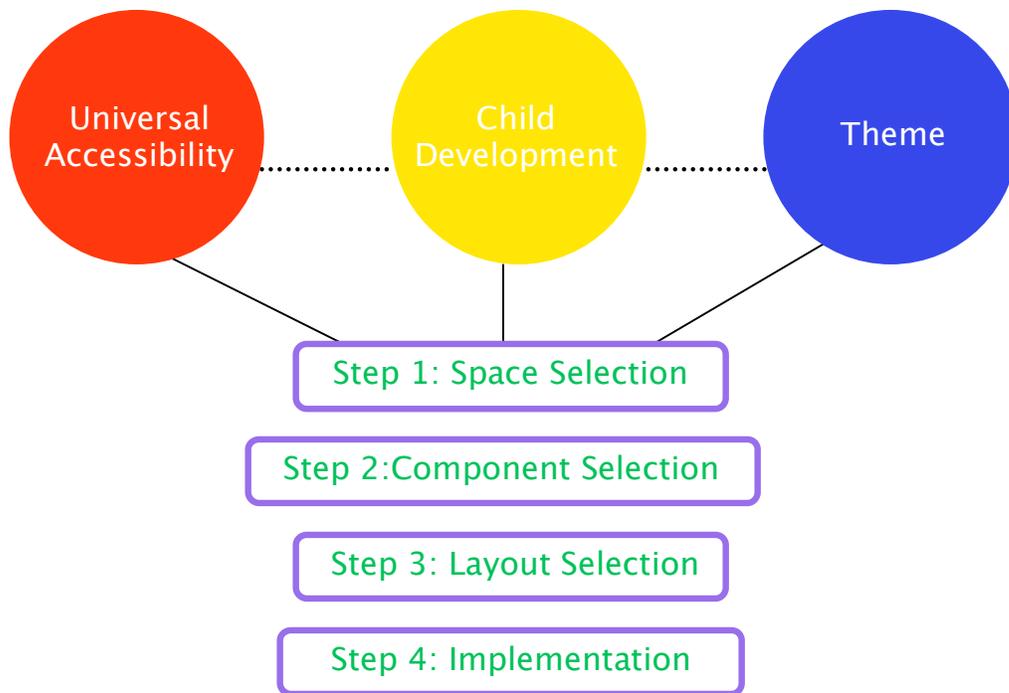


Figure 14: Diagram of the Approach

5.7 Conclusions

To conclude this approach, it is necessary to restate the three criteria that are essential to creating a successful play system for a children's hospital. The first is accessibility. In the tour given by Janet Cross and John Sparks at Vanderbilt Children's Hospital, it was evident that there was a lack of playground play at the children's hospital.

The next criterion is that the activities and components in this play system aid in the development of the child. Research was conducted in the area of child development, and, in chapter two, the theories of Jean Piaget and Maria Montessori are discussed in detail. Both of these pioneer child psychologists discovered the fundamentals of child development and how to teach children. When a child is hospitalized they are taken

away from their standard environments. If the child experiences long-term hospitalization, then it can hinder their development by blocking their exposure to the outside world and stimuli that allows them to grow mentally and physically. This approach encourages components and stimuli that make children active and encourage them to learn and use their creativity to play.

The last criterion is the theme of the play system. A play system that is based and built on a theme that is inspirational and entices children to play will be a more successful play system. The Hope Heals play system is based on the whimsical sky, celestial theme which will take children from this world and away from a place of sickness into a world of health. In the literature it is described that optimism and hope can have a healing affect on children. One of the goals of this play system is to encourage hope in children and their families in order to aid in their healing process during their hospital stay.

CHAPTER SIX: DESIGN PROJECT

6.1 Introduction and Overview

This chapter will describe the execution of the approach outlined in chapter five to show an example of how successful the approach can be when implemented properly. This project will keep in mind the three main criteria of universal accessibility, aid in child development and compliance of a theme. The project will also follow each of the phases in detail to prove the success of the approach.

6.1 Create the Space

For the example of this play system, the space that was chosen is the waiting area at Vanderbilt Children's Hospital. The space that the project will be modeled after is a section of the waiting room on the first floor. The waiting area is next to the grand entrance, which is a spectacular display of magical emotions. When a patient walks through the doors of the hospital, they enter a place full of color and shapes that mimic a fairy tale.

As beautiful as the entrance space is, other than the large staircase and a train set, there is hardly a place for the children to play and entertain themselves while they wait. This is an area frequented by the most individuals in the hospital. It is an ideal space because it accommodates play for both inpatients and outpatients. The location is ideal because it is next to a large parking garage and the shops for the hospital. The area next

to the waiting room is also an area with minimal traffic. It is the current waiting room where there are a few chairs and empty space.

The play area is also extremely accessible because it is on the first floor and is accessible by elevators and ramps. Because the hospital is new it would be impractical to create a new space for the play system; therefore, an existing space will be used. The existing area, floor plan, simplified floor plan and 3D model are displayed below.

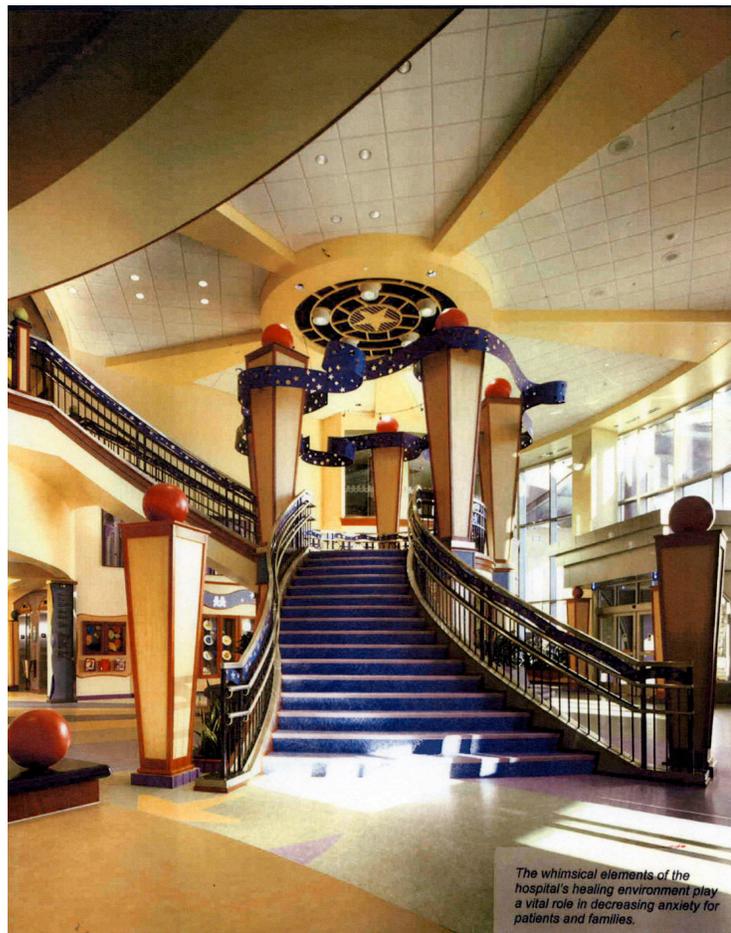


Figure 15: Entrance of Monroe Carrell Jr. Children's Hospital at Vanderbilt.

The photo above is the structure adjacent to where the play system will go. The theme is extremely prominent and the play system will follow the existing Whimsical

Sky playground. While touring Vanderbilt Children’s Hospital, this area was the most memorable and uplifting. The play system should have success if the same theme is applied.

Below is the floor plan of the first floor. The yellow outlined box indicates the area for the play system.

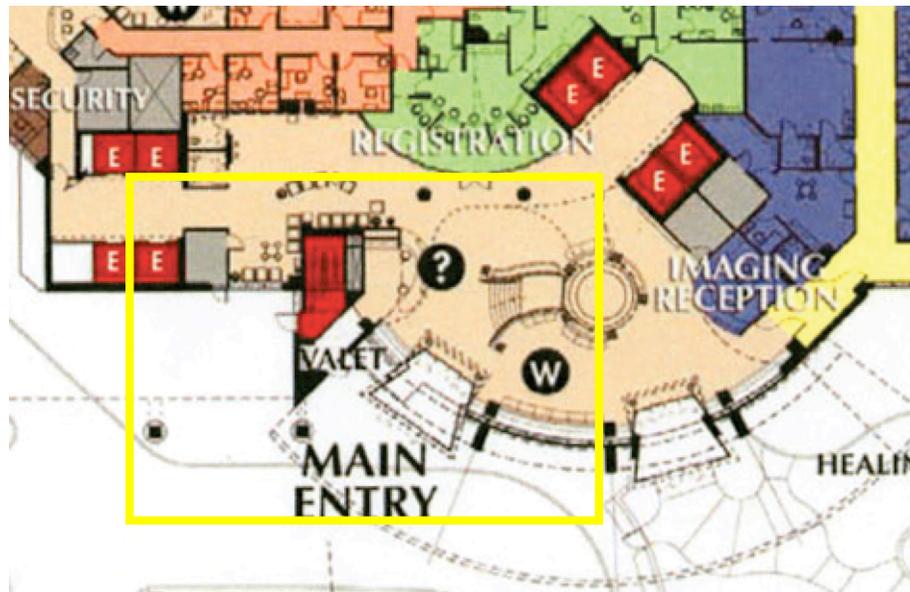


Figure 16: Floor Plan of The First Floor of Monroe Carrell Jr. Children’s Hospital at Vanderbilt

As it was stated in the approach, to gain a better understanding of the floor plan a simplified version of the floor plan was created to better outline the placement of the play system. This floor plan is displayed below.

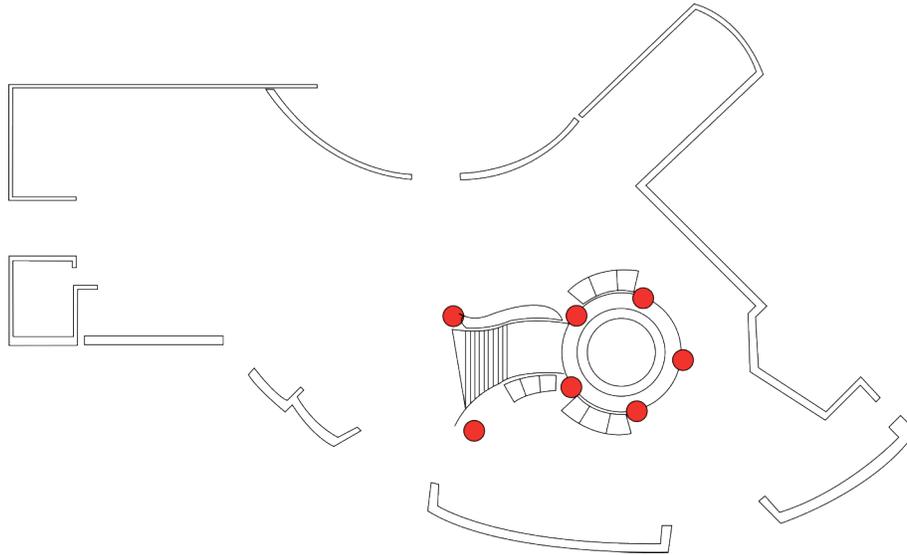


Figure 17: Simplified floor plan of the 1st Floor

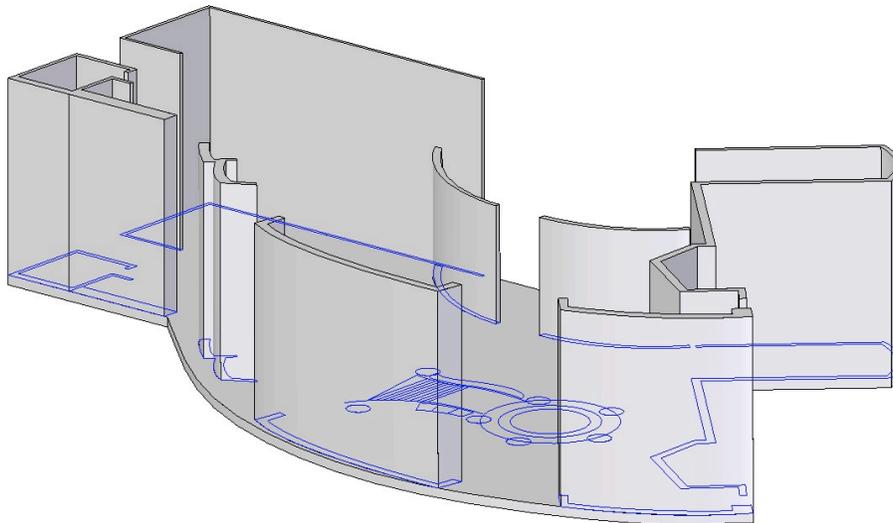


Figure 18: 3D Simplified Floor Plan of The 1st Floor

The 3D image depicting the floor plan gave a better understanding of the area or the play system and will also aid in the choices for the components and the layout of the

play system. The area for the play system is approximately 38 by 48 feet. By using the approach in chapter five a space was created that is well suited for the example play system.

6.3 Selecting Components

As it was stated in the chapter on the approach to create a play system in a children's hospital, the component selection is extremely important when designing a play system. The components that are selected in the project follow the categories and criteria that have been previously outlined in this thesis. The categories are ground covers, structures and panels. In this section, comparative product charts were completed for each category. The charts include components selected from both Little Tikes and GameTime. After accessing all of the components, it was evident that GameTime was the stronger company in terms of universally accessible components. Therefore, in the final model, the products used are the products from GameTime.

After selecting the components to be used to the play system, it was also evident that there were components that could be modified and embellished to create new play equipment. In this section there will be sketches of both existing equipment and modified equipment for the model play system.

To begin the selection process, comparative product charts are strongly encouraged in the approach for this thesis. The charts and explanations are as follows.

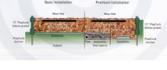
	Engineered Wood Fiber	Pour in Place Rubber	Poured Rubber Tiles	Recycled Tires
Existing Products				
Strengths	Inexpensive ADA Compliant Sustainable Easy Installation	Customizing ADA Compliant Sustainable Easy to Clean Good Drainage Safe Material Long Lasting	Customizable Colors ADA Compliant Sustainable Inexpensive over time Good Drainage Safe Material Long Lasting Easy Installation	ADA Compliant Sustainable Easy Installation Good Drainage
Weaknesses	Poor Drainage Messy Made for Outdoor Use Less Effective in cold Weather Lasts 5 Years	Expensive More Complicated Installation	Initially more expensive Not Ideal Drainage	Non Customizable Messy Not Ideal for Indoors
Potential Changes	Not Ideal for Indoor Environments Difficult to Sanitize Not Permanent. Not for Smaller Environments	Need to takes necessary steps for indoor use	Mainly for High Traffic Areas All you need is Concrete On the Bottom	Not For Indoors. Difficult to Sanitize Not permanent For Large Scale Environments

Figure 19: Comparative Product Chart of Ground Covers.

This is the Comparative Product Chart for the different possibilities of ground covers for the example play systems. Both GameTime and Little Tikes had the ground covers they used advertised in the catalog they provided, which made the research easy.

The ground covers in this chart include the standard inexpensive wood chips, pour-in-place rubber, poured rubber tiles and the loose recycled tire ground coverings. After assessing the different properties and possibilities for the ground covers, the choice was obvious. The pour-in-place rubber has the option to customize, which is ideal for the non-exact shape of the area, is ADA compliant, is easily cleaned and offers excellent drainage. Loose ground covers are not an option because they are more difficult to clean and the pour-in-place rubber can be customized, which is ideal for the theme criterion discussed in the approach.

The next category for component selection is the structures category. As it has been outlined in the approach, there are not many structures that offer universal accessibility. Below is the Comparative Product Chart for the structures.

	Free Standing Climber	Sky view Crawl Tunnel	Wide Tot Slide	Wheel Chair Platform Swing
Existing Playgrounds				
Strengths	Visually Appealing Structural	Visually Appealing Encourages imagination Makes children use other Forms of movement	Visually Appealing Multiple Age use Doesn't take up space	Visually Appealing Structural
Weaknesses	Not For Disabled Children Difficult to clean	Not Accessible Only one child at a time	Requires a fall Area and outside space Short	Not Visually Appealing Only for disabled children
Potential Changes	Could you incorporate An activity for disabled Children in a climber?	Have an Accessible Sky view Tunnel	Under the space restrictions How can a slide be Incorporated into an indoor Play system	If a swing is used in this project how can it be used for both children and be visually appealing?

Figure 20: Comparative Product Chart of Playground Structures from Game Time

The four components in this chart were selected because of their accessibility and ease of cleaning. The climber was selected because it is low to the ground and could offer some sensory play to a child who is disabled. However, after further investigation, it was obvious that this was an activity that would taunt a child unless some other activity was incorporated. The tunnel is another piece that is not wheelchair accessible; however, it is a component that could be further manipulated to create a tunnel that is universally accessible. The slide that was chosen for this chart was chosen because of the particular width. The problem with the slide chosen is that the bottom of the slide is raised above the ground, which would be a problem for a child who cannot walk. If a slide is used in

this play system, then the slide will have to be one that touches the ground. The swing was included because it allows a child to swing in a wheelchair. However, this piece of equipment is extremely bulky and offers no form or play for a child who is not in a wheelchair; therefore, this will not be a component selected for the play system.

The last component category is the panel category. Most of the components for the play system will consist of panels, which are the most accessible and easiest to sanitize. However, panels tend to be a boring part of the playground, offering minimal activity. The panels chosen will stimulate the senses and involved the children in the activity. The reason stimulatory play is important is relayed in the chapter two section on children’s development and behavior in reaction to play. The panels selected offered the best accessibility, are easily sanitized and will stimulate the senses of all children.

Comparative Product Chart- Playground Panels (Game Time)

	Bubble Wheel Panel	Bug Eye Panel	Driver Panel	Gizmo Panel
Existing Playgrounds				
Strengths	Multiple Activity Intriguing Accessible	Interesting Shape Easy To Clean Accessible Encourages imagination	Intriguing Good Detail Easy To Clean	Intriguing Good Detail Easy To Clean Accessible Stimulates the senses Multiple Activities
Weaknesses	How Can you use Both Activities at once?	Lose interest quickly	Should Simulate a Car More Accessible	Ideal Equipment for The Project
Potential Changes	Have the Dual Activity work together	Keep Shape and Allow for more activity	Make activity simulate A car and allow Wheelchair access	Could this have more Activities?

Figure 21: Comparative Product Chart of Panels from Game Time

The panels that were selected in the chart above all include accessible activities that allow the child to create their own play scenarios. The bubble wheel panel allows for the child to imagine that they are moving the playground, and the bubble allows for another imaginary aspect that simulates a window. The bug eye panel is similar but it distorts the vision for the child and the individual viewing them from the outside, which helps teach the child about reflections and light; also, stimulating and altering their vision can help with some of their cognitive development. The Gizmo panel is a new panel created by Game Time to make kids excited about panels. With a new form and new activities, the Gizmo Panel is eye-catching and also allows for multiple activities through one unit. The Gizmo Panel is customizable and easily accessible but incorporating multiple activities the panel maximizes the use of the space. Below is the next Comparative Product Chart of panels.

	Wheel Raised	Rain Wheel Panel	Wheel Recessed	Wavy Mirror Panel
Existing Playgrounds				
Strengths	Easily Accessible Stimulates Imagination Use with Multiple Ages Easy Installation	Stimulating Noise Intriguing Movement	Easily Accessible Simulate Imagination Allows viewing of The Playground	Stimulates Imagination Safe Multiple Age Use Easily Accessible
Weaknesses	Lacks Style	Not Accessible In a Wheelchair Noisy Large Component	Lacks Style Safety	Children would only use This for a short time
Potential Changes	Add More Elements Make height for Wheelchairs	Smaller Scale Make Handicap Accessible	Could Catch the IV On Bars Cannot be off the ground	Incorporate activity With Mirror

Figure 22: Comparative Products Chart of Playground Panels from Game Time

This is another chart of components from Game Time. The first component is another example of a wheel panel that is easily accessible by a wheelchair to pull up to. The rest of the panel uses the same hardware as the previous wheel panels. The next panel is another interactive panel that stimulates the senses. The Rain Wheel panel is a new product for Game Time. It incorporates components that spin while making noise that simulate the sound of rain. Then next panel is another wheel panel, which concaves to allow for another area aside from a platform. The last component is the Wavy Mirror panel. This panel has the same sensory benefits as the bubble mirror panel. It distorts the child’s vision and is also fun when they see their bodies morph depending on there they move. Below is an additional group of panels from Game Time.

	Mirror Panel	Space Window Panel	Store Window Panel	Tunnel Panel
Existing Playgrounds				
Strengths	Accessible for all Children Stimulates Senses	Creative Easy to Install Accessible Could be used for More than one child	Allows for Imaginative Play Involves Children in Groups Accessible	Intriguing Shape Fun
Weaknesses	Not a Full Activity Boring	Not Fully Accessible	Might not appear to Be a store Panel Boring	Not Accessible Too Short
Potential Changes	Have a Mirror Activity With more Activity	Make Activity more Wheelchair Accessible	Add more Detail to Entice children to The Activity	Make a long Accessible Activity

Figure 23: Comparative Product Chart of Panels from Game Time

This chart incorporated products that are similar to those which have already appeared in previous charts. The first is a flat mirror panel that incorporates similar sensory experiences with the wavy mirror and other panels. These activities are fun but as stated in the chart, it is an activity that will not grasp the child's attention for long. The Space Window panel is also important because a child in a wheelchair can still be able to see through the window, but the space window also offers monotonous activity. The next panel, a Store and Theater panel, offers a new creative activity for the child. It is accessible and allows for the child to create their own play environment. The theater window also encourages children to interact with each other, which helps aid in social development. The Tunnel panel offers some activity, but it not universally accessible. Below is a chart of the panels from Little Tikes. GameTime offered more variety in terms of panels, which is one of the main reasons that they will be the chosen company for the components.

Comparative Product Chart- Playground Panels (Little Tikes)

	Bongo Panel	Bubble Mirror Panel	Gear Panel	
Existing Playgrounds				
Strengths	Fully Handicap Accessible Appealing for All Children Colorful Inspires Imagination Encourages Music Multiple Components	Fully Handicap Accessible Appealing for All Children Inspires Imagination Stimulates the senses	Fully Handicap Accessible Appealing for All Children Colorful Inspires Imagination Stimulates senses	Allows for Imaginative Play Involves Children in Groups Accessible
Weaknesses	Noisy	Not Colorful Only for brief Use	How Difficult is it to turn? Can Multiple children use this?	Might not appear to Be a store Panel Boring
Potential Changes	Test the noise to see if it could potentially be disruptive	Create a more colorful version that can have multiple activities.	Allow for multiple children to use.	Add more Detail to Entice children to The Activity

Figure 24: Comparative Product Chart of playground panels from Little Tikes

These panels were selected for the activity they provide and for the benefit to the child's developmental skills. Each panel will be at a height and clearance for all children to play. Some activities will be lower for children in wheelchairs with higher components for children who are standing. Because panels have small use zones and are always on the ground they are going to be the main activities for this play system. In the next section the project furthers into where the play system will be placed and the layout of components. Before that element of the project could start it was essential to list the components that would be included in the project. From this list, the components were narrowed down further. From the component research it was necessary to identify the major components and activities that would be incorporated in the play system before the layout was designed. There are three major components that occupy the majority of the space in the play system. There are seven other activity panels that will be incorporated into the different layouts of the playground.

Little Tikes did not offer as many components as GameTime in terms of accessibility and the three main criteria that are being followed while designing this play system. However, the first component was one with striking interest. The Bongo panel from Little Tikes is a much improved from the Bongo panel of Game Time. With more interaction and more surfaces to play this panel offers more stimulatory activity. There is also a Bubble Mirror panel, which adds some excitement to the original bubble panel. The Gear panel is has a similar reaction to the Rain Wheel panel and gives a child a chance to manipulate a system which is proven to help in their cognitive development. There is also a Store panel, which mimics the one from Game Time and offers the same activity.

After the components were selected with the yellow circles, there were still aspects of universal accessible activity that were missing from the catalog of Game Time.

Therefore, in order to give this project some originality, sketches were done in order to gain a better understanding of existing products, and also, by sketching, new products were created by manipulating the existing products of Game Time. These sketches are shown below.

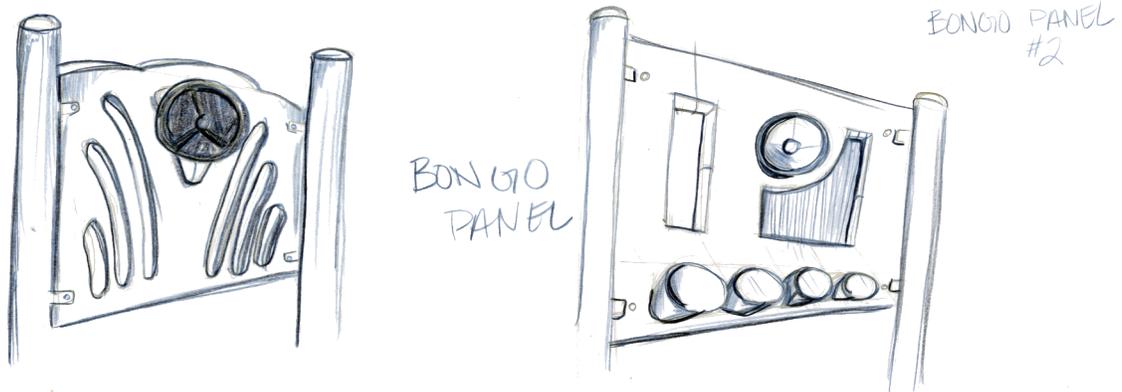


Figure 25: Sketches of Bongo Panels from Game Time and Little Tikes

These are both of the Bongo panels from Game Time and Little Tikes as seen in the Comparative Product Charts. The Bongo panel from Little Tikes is more visually appealing and offers more in terms of sensory activity; however, in order to be consistent, the Bongo panel from Game Time will be used in the model play system.

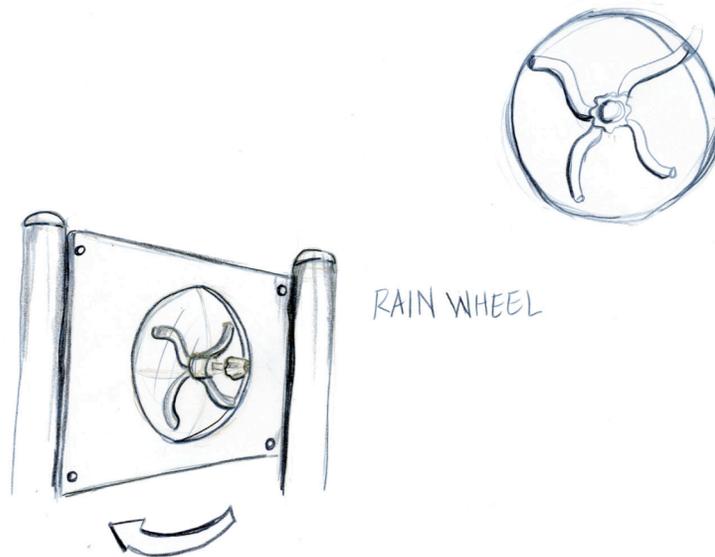


Figure 26: Sketch of Rain Wheel Panel

Above is a sketch of the Game Time Rain Wheel Panel, which stimulates the audio and visual senses. When the child pushes the button the wheel turns creating a sound that mimics the sound of rain.



Figure 27: Sketch of Slide and Slide Roof

This is a sketch of the possibility for a slide in the play system. This slide has a roof that mimics a sun. The sun roof mimics the theme of the existing setting of the play system, which is a whimsical sky theme. The slide is one that touches the ground so children who cannot walk will simply glide to the ground until an adult can assist them. The first major component is a slide. One of the most challenging parts of this thesis will be how to make a slide accessible for children in wheelchairs, casts and carrying IV's. The slide will have to be accessible by the second large component, a ramp. The only way to access the slide will be by a ramp of fifty-five degrees. There will be three ramps, one that is eight feet long and two that are twelve feet long. The ramp requires proper railing and width in order to be fully accessible. The third component will incorporate a tunnel for children of all abilities. Because most tunnels are for children to crawl in, it is important to make a tunnel for children to travel through using a wheelchair, or carrying an IV. Therefore a tunnel will be created with the existing tunnels and panels. The top of the tunnels will be attached on the sides with panels to create a walled tunnel enclosure. The tunnel will be 8 feet by 5 feet to allow for multiple children's use.

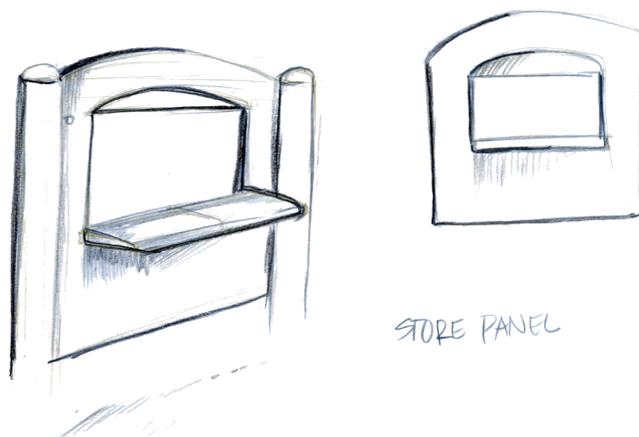


Figure 28: Sketch of Store Panel

The above sketch is of the Store panel in the Game Time Catalog. This Store panel will also act as a theater where a child can imagine a few different scenarios and create their own environment. It is also a place where they can work with their parents and other children.

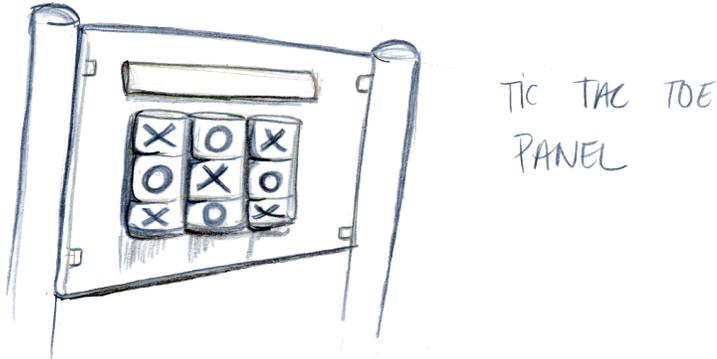


Figure 29: Sketch of Tic Tac Toe Panel

The Tic Tac Toe Panel was not originally in the Comparative Product Charts for GameTime, but was a last minute addition to the component list. This panel offers a game activity. It allows children who work together to increase social skills and also helps them learn rules, which is a crucial stage in Piaget's Theory of Cognitive Development that was discussed in chapter two.

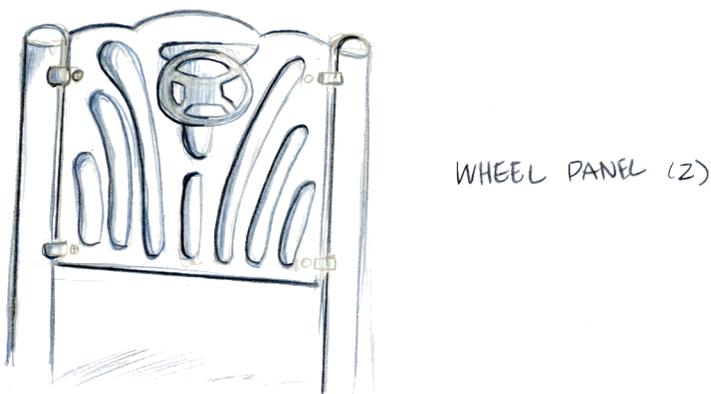


Figure 30: Sketch of Wheel Panel

The Wheel panel was seen in multiple places in the Comparative Product Charts. The Wheel panel allows for a child to imagine multiple scenarios while allowing them to move the wheel and manipulate the activity. The wheel attachment will be used frequently because it is easily attachable and offers for more activity.

These components will all be incorporated into the play system. The new components will use existing equipment, and some are new equipment to enhance the play system and the universal accessibility. Below are the components that are new or manipulated other components.

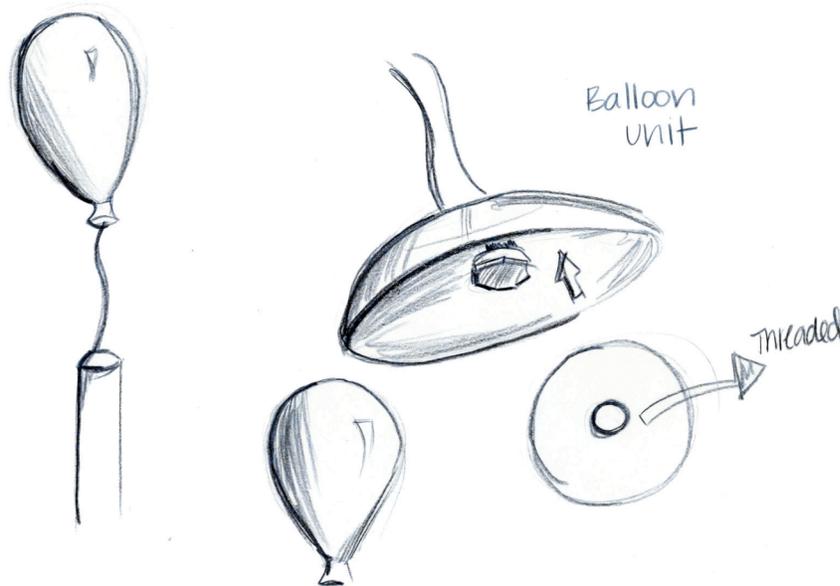


Figure 31: Sketch of Balloon Piece

The balloon piece is a piece that is going to enhance the theme of a whimsical sky. The balloon unit will be screwed into the poles and give the illusion that they are holding up the playground. There will be ten of these pieces in the final model.

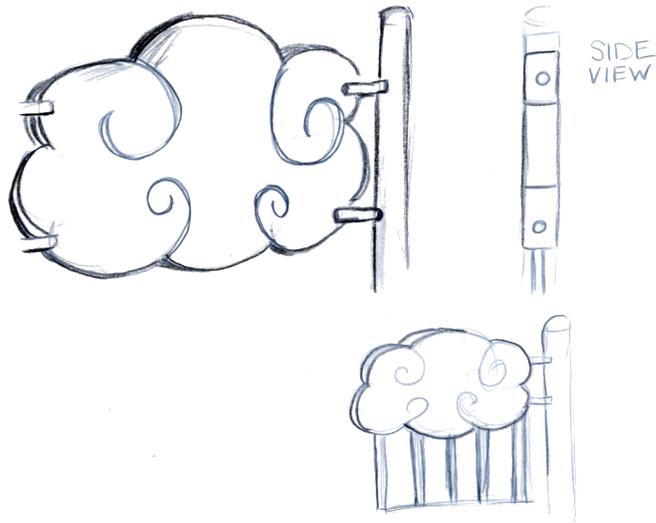


Figure 32: Sketch of Cloud Roof

Most playgrounds have some sort of roofing on the top of any raised surface. For the roofing on the model play system, a cloud shape was designed in order to mimic the Whimsical Sky theme. The cloud roofing will be rotational molded pieces that attach like panels. The ground cover shape will also mock this cloud shape.

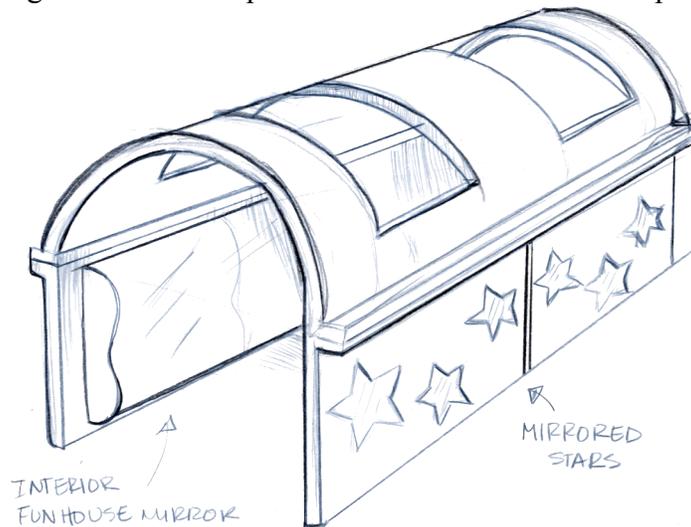


Figure 33: Sketch of Sky Tunnel with Fun House Mirrors

The last new component designed for the new play system is a combination of three components. The new component is a sky tunnel that is universally accessible with fun mirror walls. This tunnel incorporates multiple activities into one play structure while being accessible to all children. The ceiling in the area where this play system will be places covered in detail to mimic the sky. The outside of this tunnel will be equipped with mirrored stars, which match the stars on the grand staircase and go with the theme stated by the architect, John Sparks. “We have a lot of stars that stand for the children; they are our stars.” The tunnel consists of two fun house mirror panels and two sky view crawl tunnel pieces.

The Comparative Product Charts helped with the selection for the playground components, and sketching also furthered the development of the playground in terms of accessibility development and the theme. The three criteria were prominent in the selection of the components. All activities are either universally accessible, stimulate a child’s senses or creativity in order to further a child’s development, and many of the new structures to be incorporated into the play system promote the theme that has been chosen for the play system, a Whimsical Sky theme. Now that the components are selected, the next objective in the approach is to determine the layout.

6.4 Selecting a Layout

Following the suggestions given in the approach, the layout was created. The first step was to compare the existing layouts in both Game Time and Little Tikes and compare them to an ideal layout in a hospital setting. The next step was to list the

selected components and create multiple layouts until the proper one was chosen. The layout also follows the three main criteria given in the approach.

Below are the two comparative product charts for playground layouts. As was stated in the component section, these Comparative Product Charts aided in determining the successes and failures in existing equipment and the possibilities of change.

Comparative Product Chart- Playground Layouts (Game Time)				
	Kids Center	SS 87	Kid Time	Caravan
Existing Playgrounds				
Strengths	Uses interesting shapes Appealing for All Children Colorful Inspires Imagination	Accessible with ramps For both handicapped and Healthy Children	Colorful Inspires Imagination	Fully Handicap Accessible Appealing for All Children Colorful Inspires Imagination Multiple activities
Weaknesses	Small Requires a ladder Not Handicap Accessible	Too Big Not Colorful Includes activities that are not for handicapped children	Not for wheelchairs Only to crawl and run on Doesn't incorporate activity.	Some of the Activities are boring Small
Potential Changes	Put Activities on the ground level	Make on a smaller scale with elements for all children Add more color.	Fully Handicap Assessable Appealing for All Children Colorful Inspires Imagination	Larger system that incorporates more stimulating activities

Figure 34: Comparative Products Chart of Playground Layout from Game Time

In this Comparative Product Chart the components that were selected ranged from small-scale play systems with minimal components to large-scale play systems with multiple components. The first layout that was chosen is a small layout and much smaller than the plan for the new play system. This small layout was chosen due to the vibrant colors and incorporated activities with the panels of the system. The next layout was selected due to the accessibility it provided. The entire system is ramp accessible; however, this play system is on a much larger scale than the example play system. The

next product on the chart is a layout that is not entirely handicap accessible, but incorporates activities into the panels and uses small steps to reach the small-scale slide on the end of the play system. The fourth component is also on a smaller scale, but uses numerous activities in the panels. Not having any raised surfaces also creates a very accessible play system.

Comparative Product Chart- Playground Layouts (Little Tikes)

	Gabriel's Garden	Mattie Stepanek	Freedom Park	MaxPlay 3
Existing Playgrounds				
Strengths	Fully Handicap Accessible Appealing for All Children Colorful Inspires Imagination	Good Size/Layout Handicap Accessible Open	Fully Handicap Accessible Appealing for All Children Inspires Imagination	Good Size Appealing for All Children Colorful Inspires Imagination
Weaknesses	Extremely Large because of The Ramp System Not Enough Activities	Tunnels are not Accessible Not many Activities Not colorful	Too Big Small Slides Not colorful	Not Handicap Accessible Too tall
Potential Changes	Make a Smaller Handicap accessible Play system using a lot of color.	Make a similar Layout with more colors accessible tunnels and more activities.	Add Color Create Larger slides with a larger fall zone	Bring colorful Activities to one level for all children

Figure 35: Comparative Product Chart of Playground Layouts from Little Tikes

This is a Comparative Product Chart of some of Little Tike's existing playground layouts. The first layout shown was discussed with Ron Daniels in the interview previously discussed in Chapter Two. Gabriel's Garden is a one hundred percent accessible playground that was designed for children with special needs. The layout of the playground is so large due to all of the ramps that are necessary for all of the components. The second component is an ideal layout for this play system. It incorporates multiple activities in a playground setting that is all on one level. This will

be a starting goal of the model playground. The Freedom Park layout is similar to that of Gabriel's Garden. There are some accessible components; however, the play system is so large due to the ramps that it takes away from the number of activities that can be placed in the play system. The last play system is chosen due to its color and appeal. One of the main criteria for this approach is the theme. Some of the layouts that have been chosen are accessible; however, they are not visually appealing to the child. In order to entice a child to the play system, there needs to be a vibrant theme that encourages them to play and use their imagination. The other criterion of development is to make some of the components incorporate the same activity. This helps in children's development by creating certain areas for activity. In chapter one it is discussed how grouping is a stage in cognitive development. If the layout groups activities together, then it helps the child group and access the activities. The accessibility plays an immense factor in the layout of the play system. For any raised surface to be universally accessible, there must be ramps included in the play system. Ramps take up space and minimize activity. For the example play system, the ramps should try to utilize activity space while increasing accessibility.

The next step in creating a layout for the play system is to decide which components go where and how many units of each. In order to do this in an efficient manner, a sample poster of the simplified floor plan was created along with different shapes that represented different parts of the play system. Below are photos from this process, which begins with a sheet of components and is then followed by the layout process and the layout that were created from this process.

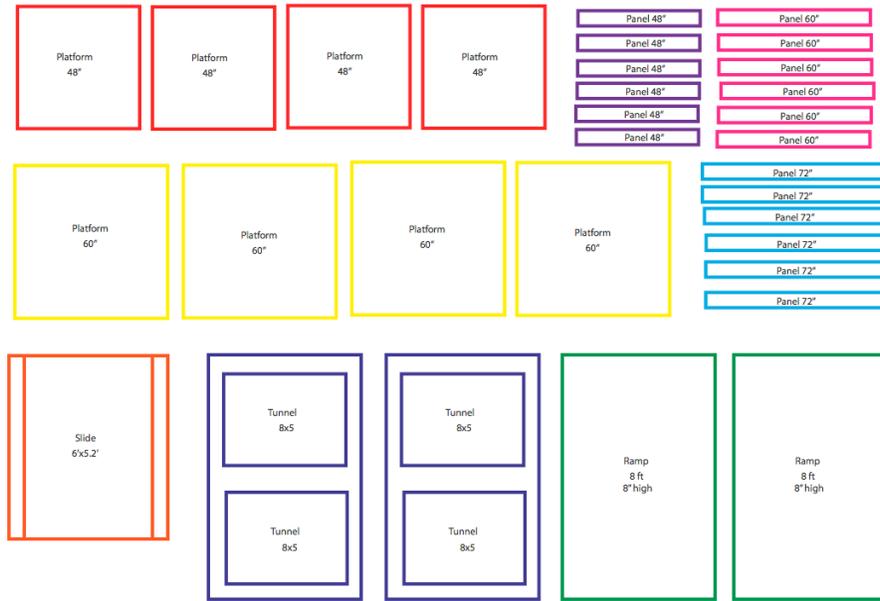


Figure 36: Layout Shapes

These are the main components that will be in the play system which were selected from the product comparison charts in the component selection process of this approach. There are multiple components, not all of which will be used in the play system; however, there are enough to sustain multiple layouts until the right one has been determined.



Figure 37: Layout Shapes Packet and Placement

By creating different layouts using the packets created from the larger image of shape, it was easier to picture the play system in terms of the traffic flow and components. Below are the initial layouts created for the sample play system.

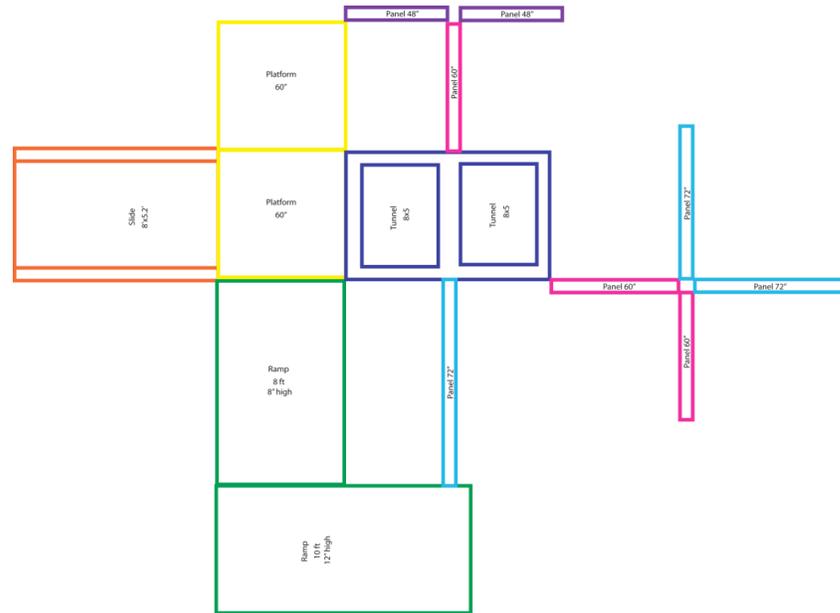


Figure 38: Layout One

This layout includes a slide component and multiple activity clusters. The tunnel is the center of the play system with two raised platforms. However, the clusters of panels are not distributed evenly, and the main cluster of panels block the flow of the tunnel. The ramp will require a platform, and there is not enough above area for children to move comfortably before sliding.

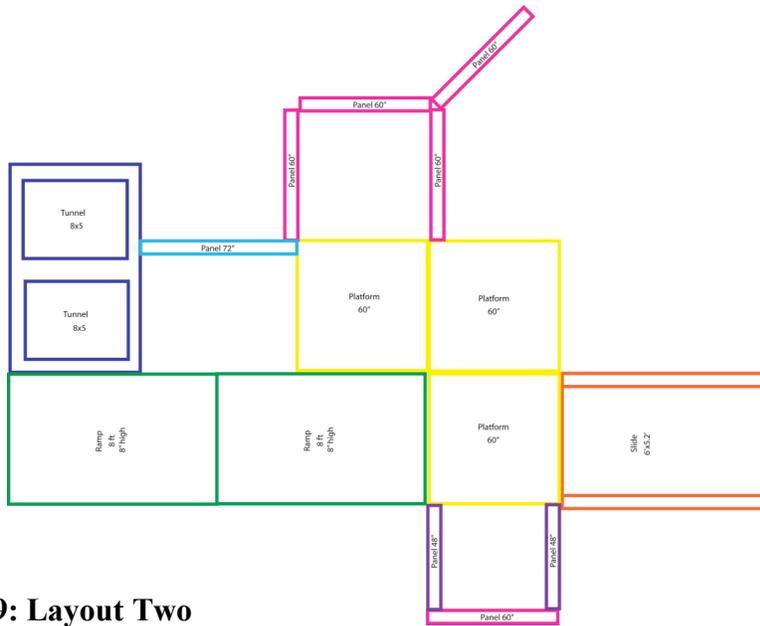


Figure 39: Layout Two

In layout two, the tunnel is no longer the center of the play system. There are panels that are arranged to fit into the given space with enough of a fall zone for the equipment that requires an extra surrounding area. The flaws with this design is that there is not enough platform space for complete access and the panels can tend to be closed off due to the issue of the user flow. Some activities might be cut off if numerous children are playing on this play system.

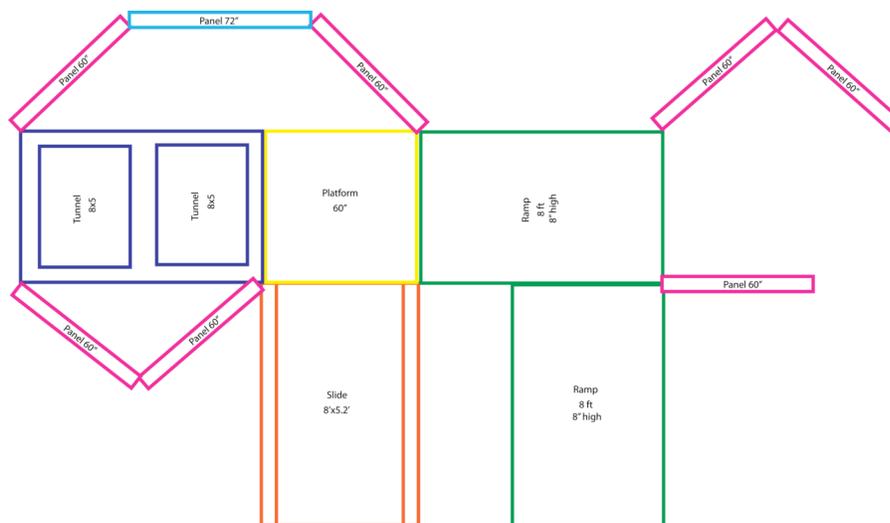


Figure 40: Layout Three

This layout incorporates the most components, but most of them are completely closed off. There is only one platform and two ramps that do not have a common platform. This layout could potentially hinder the accessibility of the child. There should be more above platform space and a platform between each ramp.

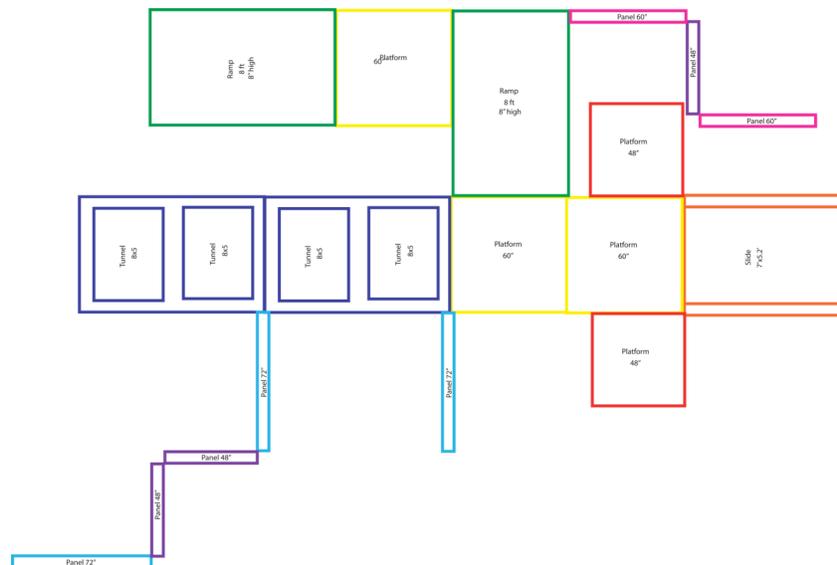


Figure 41: Layout Four

This layout incorporates more platform space and a platform between the two ramps. The tunnel is centrally located and the platforms are in a specific cluster. This would be a more successful layout if there were more components in the platforms and ramp system.

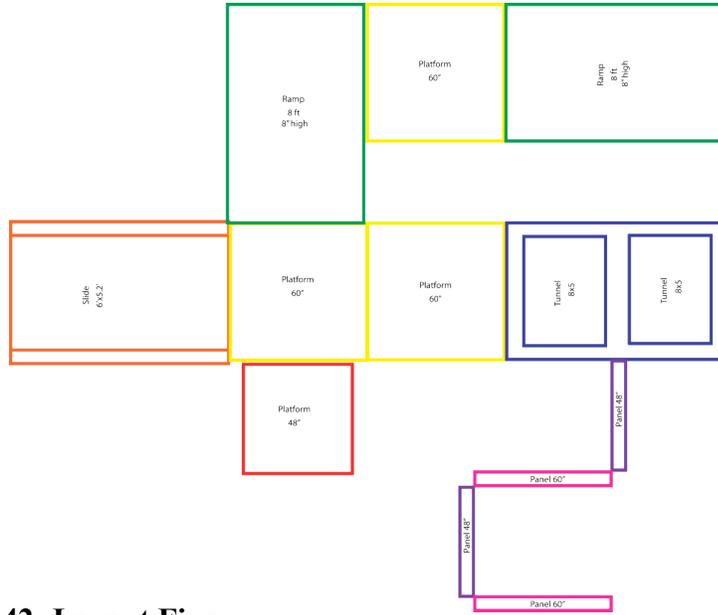


Figure 42: Layout Five

This layout incorporates more components and platform space, while adding a platform to the ramps. However, for the final layout, the flow of the panels and other components will have to be improved. The double tunnel is unnecessary within the given space. The final layout will improve the size and shapes of this layout. Below is the preliminary simple drawing for the final layout.

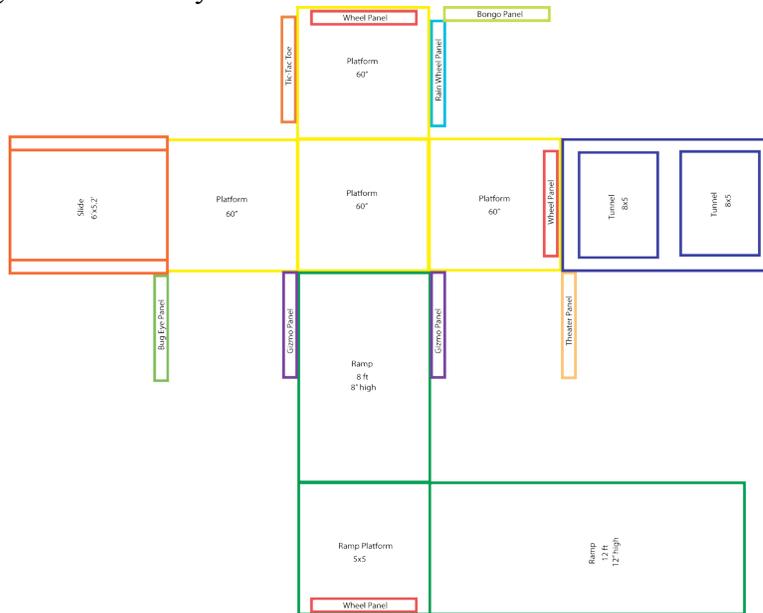


Figure 43: Final Layout Phase One

This is the preliminary layout that will continue to the final design of the play system. The panels are incorporated into the sides of the platform, and there is plenty of raised space for disabled children to freely move on these large platforms. The components were chosen for the play system and placed in a layout that allows activities to be in clusters based on what the activity pertains to. The Music panel, the Rain Wheel, and Bongo panels are placed next to each other because the child can simulate motion with the other panel. This will help the child work with others and aid in their cognitive development by stimulating their brain through sound and motion. The theater panel is placed separately from other because it is an area where children work together but do not require other equipment. The Bug Eye Bubble panel and the Tic Tac Toe are the same as the Theater panel; they stand alone because no other panels complement it. The Wheel panel can be placed anywhere and is frequently placed to maximize activity in specific areas. There were some improvements that needed to be made on the first layout, and then the final layout was produced.

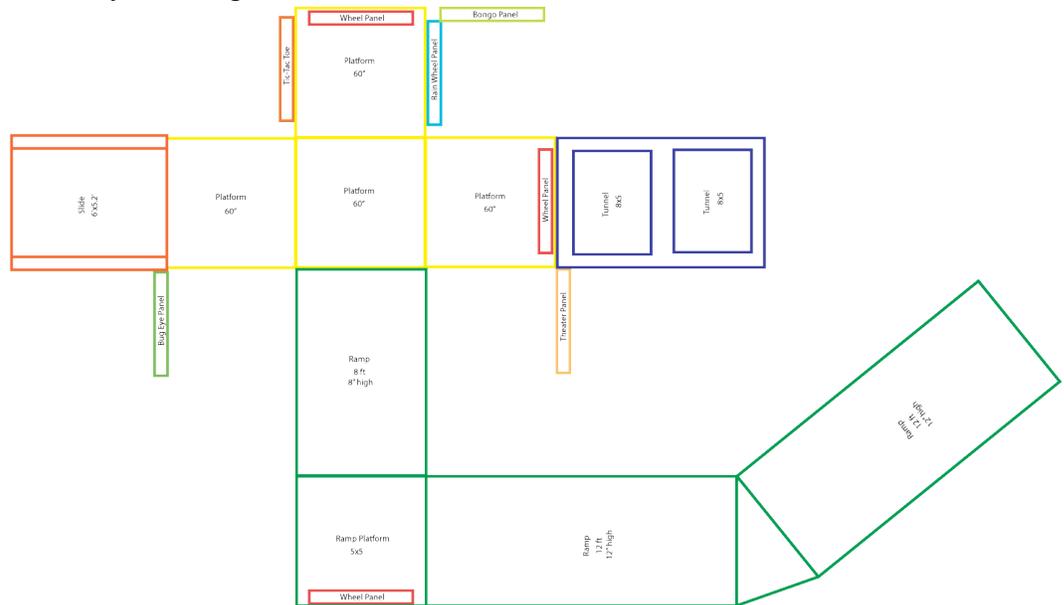


Figure 44: Final Layout

This is the final layout for the example play system using the approach outlined in this thesis. There have been adjustments made from each of the layouts to create what is an ideal layout for this approach. The three criteria, accessibility, development and theme, are all expressed in this layout. The layout is accessible due to the three ramps and transfer stations that are at the end of each ramp. All raised platforms are five feet wide, which is the area required for a person in a wheelchair to do a full turn and for two wheelchairs to be able to pass one another. All of the panels are accessible from both sides and allow for improved movement for children of all abilities.

The second criterion is the development of the child. Each panel chosen in some way stimulates children's minds and creative thinking. There is a music station equipped with bongo drums and a rain wheel. There is a theater panel, which will allow children to creatively express themselves. As was stated in the literature review, creative expression is important for children in hospitals. Creative expression allows children to better understand why they are in the hospital. Most of the space is designated for play except for the ramp which runs along the outside the playground.

For the theme, the layout incorporates many celestial elements in order to enhance the theme of the playground. The layout fits well into the cloud shaped ground cover that is the base of the playground. Below are some drawings of these layouts that developed the theme of the playground into the final design.

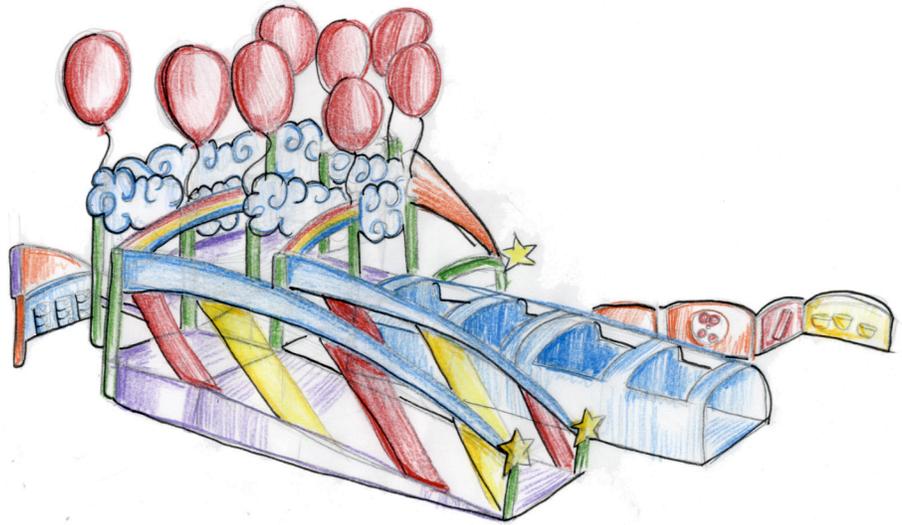


Figure 45: Drawing with Slanted Rails

This sketch was drawn to incorporate the celestial theme into some of the components. The roofing will consist of cloud and balloon pieces to give the feeling that the children are away from the earth and the physical elements that hinder them on a daily basis. The ramps are colorful and slanted; however, there is too large of a gap between the rails, which could be harmful to the children.

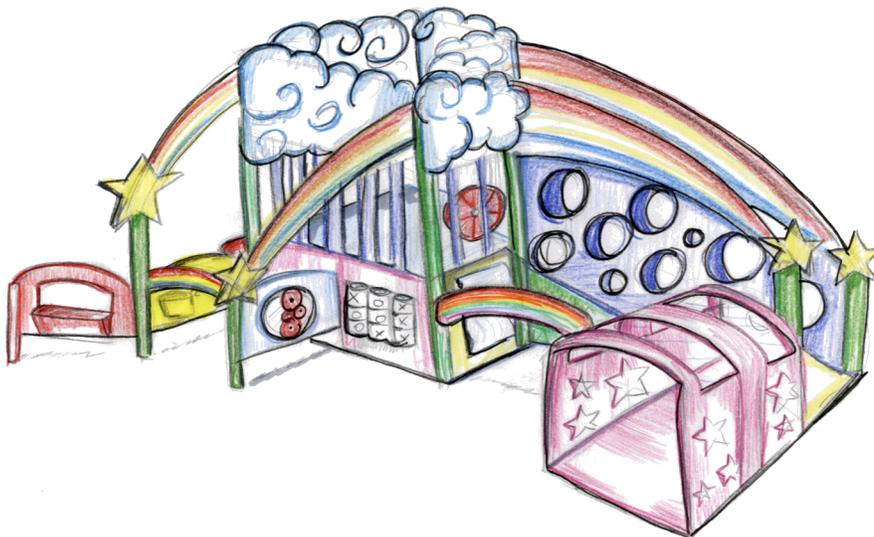


Figure 46: Drawing with Climber Rails and Rainbows

This is another drawing without the use of balloons and incorporates climber rail covered by a rainbow arch. This is a smaller scale of the final layout and the drawing is of one of the first layouts created, but seeing the 3D version of the layout immediately showed the flaws. The cluster of panels and tight spaces will make the play system more difficult to maneuver.



Figure 47: Drawing of the slide with Play System Roof

This image is illustrating the top platform, and the ideas for the slide that will be incorporated in the play system. Some of the other panels can also be seen. The slide will be required to fully touch the ground in order to be accessible and safe for children to use even if they are in a wheelchair. The top platform area will be complete with clouds and balloons as the roofing on the play system.



Figure 48: Final Drawing of The Play System

This is an image that follows the theme of the example play system, but the layout is slightly different. The rainbow arches, balloons and cloud roofing will be incorporated in the final design. These illustrations were to understand the theme of the play system rather than the line drawings that were to understand the precise layout. However, both aspects are important to this particular approach. After the layout was selected, the example play system was built in Solid Edge, a 3D CAD program. The following chapter will discuss in more detail the aspects of the final design.

The following chapter will reveal a computer model and a physical model and discuss the final design in more detail.

CHAPTER SEVEN: FINAL MODEL

7.1 Final Model.

In order to fully display the final outcomes of this approach, the final play system was built in solid edge and rendered in Hypershot. After the model was built in the computer, a physical model was created. The computer model was created to aid in the fabrication of the physical model and to create photorealistic computer renderings. Below are the photos of the areas discussed in the previous chapters.

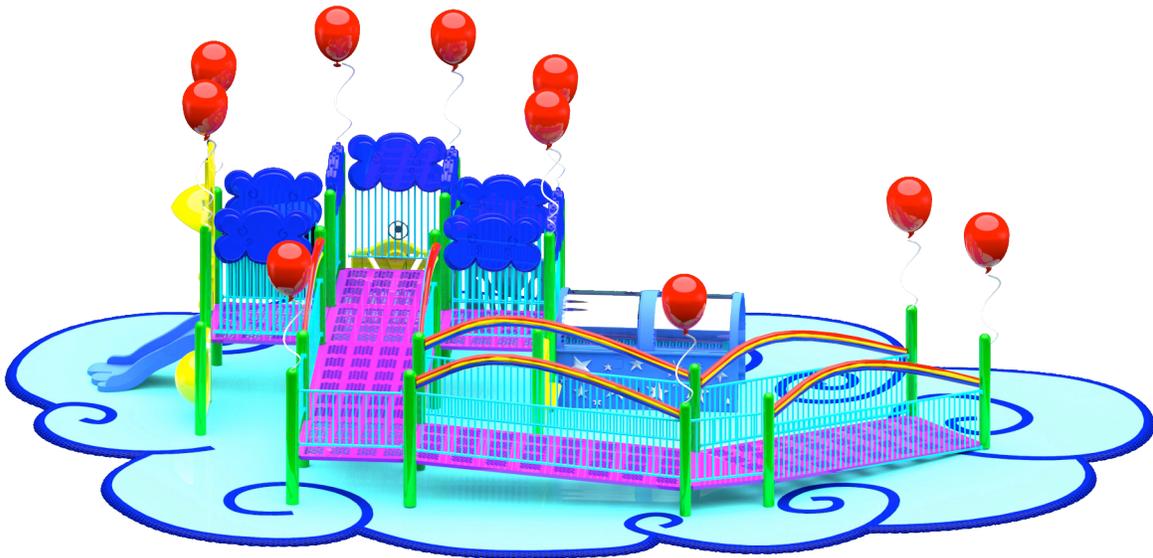


Figure 49: Hypershot Rendering of Play System



Figure 50: Final Model

This is the final model of the play system built with foam plastic wood and other craft pieces.

The final model followed the three overall criteria of the approach given in this thesis. The images and explanations are as follows.

7.2 Universal Accessibility

The first pieces of this play system that involve universal accessibility are the ramps that are incorporated in this play system. The ramps allow universal access to the top platform and slide component of the play system. The images of the ramps are shown below.

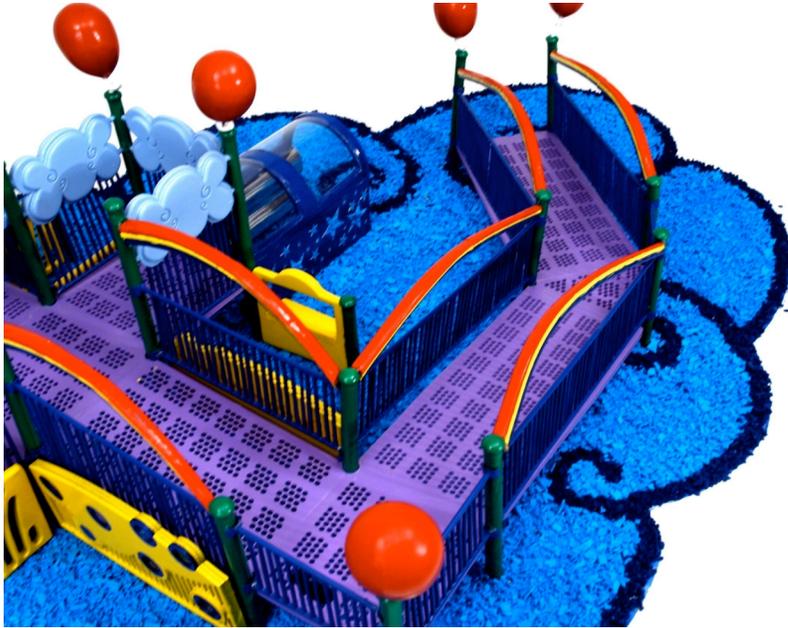


Figure 51: Top View of the Ramps



Figure 52: Ramp Entrance



Figure 53: Side View of Ramps

The next component that incorporates universal accessibility is the slide component. The ramps create access to the slide, and there are platforms on either side of the slide for wheelchairs. For children in a wheelchair to slide, they need parental assistance. The parent would wheel them to the slide, and they would use the handlebars to slide down. The Big Foot slide was chosen because it slides all the way to the ground for a safer landing. Photos of the slide are as follows.



Figure 54: The Big Foot Slide and Sun Roof

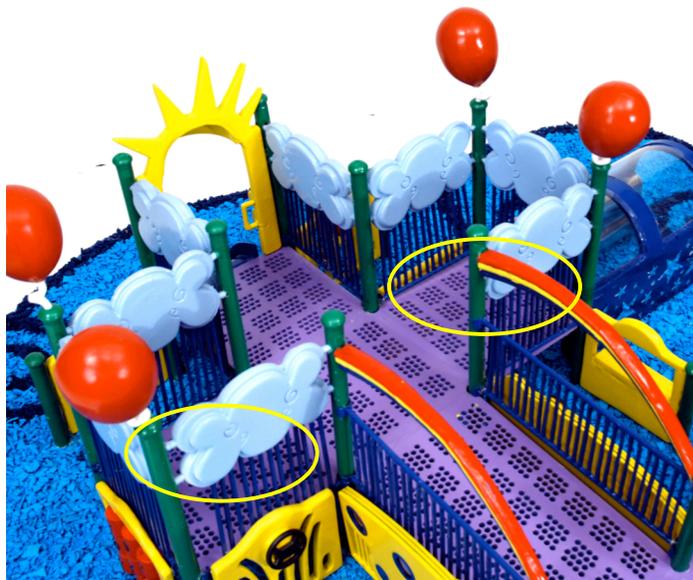


Figure 55: Platforms and Designated Wheelchair Area



Figure 56: Slide Handles



Figure 57: Side View of Slide

The next component for this system is a new design that incorporates both the sky view tunnel and a fun house mirror. There are two sky panel units and four fun house mirror units. They create a secluded tunnel that is universally accessible. The images of the tunnel are as follows.



Figure 58: Mirror Tunnel



Figure 59: Entrance of Tunnel

All of the panel components are also accessible. The components shown were intended for this play system to increase the universal accessibility and make this playground fun and stimulating for all children.

7.3 Child Development

The second criterion outlined in the approach is child development. It is essential that these components all stimulate the child and aid in their development. Through literary research, it was proven earlier in this thesis that play aids in child development, and there are certain stimuli that are essential to include in the play system. The components that aid in a child's development are as follows.



Figure 60: Music Cluster

This music cluster includes both a rain wheel and bongo panel. Each of these components makes noise, and children can work together to create rhythms. Music is a stimulatory activity that aids in both social and cognitive development.



Figure 61: Activity Cluster

This activity cluster includes a Tic Tac Toe panel, a wheel panel and a Gizmo panel. The Tic Tac Toe panel encourages group play and aids in children's development by teaching strategy. The Wheel panel allows for creative role-play. The Gizmo panel not only utilizes ramp space, but also incorporates multiple activities on one panel. Another view of the Gizmo panel is displayed below.



Figure 62: Second Gizmo Panel

This second gizmo panel offers more activities and also helps take up space that was occupied by the ramps. In front of the Gizmo panel is the theater panel, which like the wheel panel inspires creative role-play. An inclusive photo of the theater panel is shown below.



Figure 63: Theater Panel

7.4 Theme

The last criterion for the approach is the theme of the play system. There are many elements that enhance the Whimsical Sky theme that is modeled after the existing architecture of Vanderbilt Children’s Hospital. The name of the play system is the *Hope Heals Playground*. The whimsical sky elements are as follows.



Figure 64: Ground Cover

The Ground Cover was the first component that was inspired by the whimsical sky theme of the playground. The Ground Cover resembles the shape of a cloud in order to make the playground appear as if it is floating in the sky.



Figure 65: Cloud Roofing

The cloud roofing mimics the cloud ground cover on a smaller level. The clouds are to aid the image of a floating playground in the sky. The clouds then attach to both the main poles and railings on the platforms.



Figure 66: Balloon Pole Toppers

The Balloon Pole Toppers add another celestial air to the playground. These balloons are what is supposed to be suspending the play system in the air. They also add a splash of color as well as the rainbow pieces that connect the ramps in the following image.



Figure 67: Ramp Rainbows

The last element that shows the theme of the play system is the sun that hangs over the slide. The sun reflects some of the architectural detail in the play system and adds a bright contrast to the colors of the ramp and platforms.



Figure 68: Sun Roof

This play system successfully followed the approach outlined in this thesis by creating a play system with universally accessible components and activities that stimulate children and aid in their development while abiding by a common theme to inspire children and their families.

CHAPTER EIGHT: CONCLUSIONS

8.1 Closing Summary

Chapter one discussed the importance of play for a child regardless of their environment or health situation, along with the absence of play in hospitals and the individuals in charge of play and how it is implemented in a healthcare environment. Chapter two discussed the importance of child development and two pioneers of child psychology and their theories. Chapter three included research conducted by surveys, tours and interviews to gain a better understanding of play in hospitals and the reality behind playground building. Chapter four summarized playground safety and the ADA requirements that are crucial for the success of the play system approach. Chapter five outlined the approach created for the thesis project. The approach was followed by an example project that is outlined in chapter six. Chapter seven shows the final project in both a computer model and physical model.

8.3 Implications and Application of Study

This approach was created to aid both designers and playground companies to create a play system for a children's hospital. In this thesis there are two different areas of component selection and design. For companies, it is better to focus on existing equipment and themes that have already been produced. For a designer, there is the possibility to create new themes and components as shown in the thesis. This approach

will also aid other health care individuals in creating a play space for children in hospitals.

8.2 Recommendations for Further Study

There are still further studies that can be done with the subject of play systems in children's hospitals. There is a need for further development of components that are one hundred percent universally accessible. Many companies claim that they can incorporate accessible components, but the reality is that there are very few components that are fun for children of all ages and abilities. This is a challenge that is fully encouraged for further study in this subject.

BIBLIOGRAPHY

“All Children Need Children’s Hospitals” NACHRI

<<http://www.childrenshospitals.net/AM/Template.cfm?Section=Homepage&Template=/customSource/homepage/homepage.cfm>>.

American Academy of Pediatrics, Hospital Care of Children and Youth, Elk Grove Village, IL, 1986.

Boss, Bev and Jenny Chapman, Tumbling Over the Edge: A Rant For Children’s Play, Shingle Springs, CA, 2005.

Casey, Theresa, Environments for Outdoor Play: A Practical Guide for Making Space for Children, London, England, 2007.

Callery, Peter, “Caring for parents of hospitalized children: a hidden area of nursing work.” Journal of Advances Nursing 1997.

“Child specialists make hospitals less scary.” The Associated Press July 2004. MSNBC.
<<http://www.msnbc.com/id/5472270/print/1/displaymode/1098/>>

Child Life Council, <<http://www.childlife.org/>>

“Children Learn Through Play.” St. Jude Children’s Research Hospital 2003.

<www.stjude.org>

Children’s Hospital Boston, “Making a child’s (hospital) life a little easier” Children’s News 2004. <http://www.childrenshospital.org/03-16-04/making_p.html>

Davis, Alan G., Children in Clinics, Cambridge, England, 1982.

- Fisher, Marc, "Toys in Hand, Staff Helps Patients through Fear and Pain." The Washington Post October, 2006. <>
- Geist, Harold, A Child Goes to the Hospital. Springfield, IL: Bannerstone House, 1965.
Fort Lauderdale FL: Nachez Publication House.
- Go Fawns Safe Play, <[tp://www.fawns.co.uk/play_themes/home.htm](http://www.fawns.co.uk/play_themes/home.htm)>
- Herwald, Margi, "A Hand To Hold: Child-life specialists strive to make hospitals less scary for kids and parents" Cleveland Jewish News June 2004.
<<http://www.clevelandjewishnews.com/articles/2004/06/10/news/local/acover0611.prt>>
- Isenberg, Joan Packer and Nancy Quisenberry, "Play: Essential For All Children." Association for Childhood Education International 2002.
<<http://www.acei.org/playpaper.htm>>
- Klinzing, Dennis R. and Dene G., The Hospitalized Child: Communication Techniques for Health Professionals. Englewood Cliffs, NJ. 1977.
- Komiske, Bruce King, Designing the Worlds Best Children's Hospitals. Australia: the images publishing group, 2005.
- Komiske, Bruce King, Designing the Worlds Best Children's Hospitals 2. Australia: the images publishing group, 2005.
- Lindheim, Roslyn, Helen H. Glaser and Christie Coffin, Changing Hospital Environments for Children, Cambridge, MA, 1972.
- Longo, Mary F. "Children and Play." Ohio State University Extension Factsheet.
<<http://ohioline.osu.edu/hyg-Fact/500/5297.html>>

MacKinnon, Donna Jean, "There's no place like home but SickKids tries; Dream playroom with TV, Kitchen and computers lets patients just be kids" Toronto Star March 2007. Lexis Nexis. <<http://web.lexis-nexis.com/universe.>>

Oremland, Evelyn K. and Jerome D, The Effects of Hospitalization on Children. Springfield, IL, 1973.

Pelligrini, Anthony, Recess: Its Role in Education and Development. Mawah, NJ, 2005.

Petrillo, Madeline and Sirgay Sanger, Emotional Care of Hospitalized Children. Philadelphia PA 1980.

Rammer, Holly, "Helping Kids Cope With Pain." CBS News June 2004
<www.cbsnews.com/stories/2004/06/28.health.printable626424.shtml>

Schwalenstocker, Ellen, "Transparency for children's Hospitals: What Will It Take?" Children's Hospital's Today Spring 2007: NACHRI

Thompson, Richard H. and Gene Stanford, Child Life in Hospitals, Springfeild, IL, 1950

Vuong, Mary, "A Comfort to the Kids: Making a difference." The Houston Chronicle 2005.

Wadsworth, Barry J., Piaget's Theory of Cognitive and Affective Development. White Plains NY 1996

Wareham, Laura, and Donna Shelton, "What Makes a Relationship Between a Children's Hospital and System Successful?" Children's Hospital's Today Spring 2007: NACHRI. <>

Warner, Laura, "Child-Life specialists ease stress for young patients." Deseret Morning News November 2004.
<<http://deseretnews.com/article/content/mobile/0,5223,595108633,00.html>>

Wilson, Jerriann M, "Child Life Services (POLICY STATEMENT)." Pediatrics October
2007. Expanded Academic ASAP.