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abstract

The focus of this thesis is to determine how the elements of a defined population’s set of unique perceptual experiences can be used to create a specialized building environment that enhances this group’s ability to comprehend, interact with and navigate through the structure that surrounds them. Autism can range in severity from low functioning to high functioning and in most cases its impairments affect social interaction, communication, imagination and sensory perception. Unusual sensory perception often leads to negative perceptual experiences causing children with autism to feel isolated and confused in the world around them; standard school settings can lead to excess stress and anxiety thus making success in education difficult. Methods of intervention, therapy and structuring environments can help children with autism live with significantly less stress. Herein lies the opportunity for architecture to enhance the daily experience of children with autism.
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introduction

The focus of this thesis is to determine how the elements of a defined population’s set of unique perceptual experiences can be used to create a specialized building environment that enhances this group’s ability to comprehend, interact with and navigate through the structure that surrounds them. Because children with autism are so strongly affected by their surroundings they are an ideal group to focus a user-based architectural study on. According to the Autism Society of America, autism affects 1 in 166 births annually and is the fastest growing developmental disability. (Facts and Statistics 2006) Currently, there is no known cause or cure for autism; there are, however, methods of intervention, therapy and structuring environments that can help children with autism live with significantly less stress. Autism can range in severity from low functioning to high functioning; no matter the level of severity, in most cases its impairments affect social interaction, social communication, imagination and sensory perception. Unusual sensory perception can often lead to negative perceptual experiences causing children with autism to feel isolated and confused in the world around them; standard school settings can often lead to excess stress and anxiety thus making success in education difficult. Herein lies the opportunity for architecture to enhance the daily experience of children with autism.

Background knowledge of autism is essential to understanding the unique perceptual experiences associated with the disorder. This document is an exploration into autism. The main body of the document begins with Chapter Two, which includes a study of the history and general characteristics of autism. This chapter traces the development of the definition and diagnostic criteria through time to reveal the broad range of possible characteristics of autism. Although there is currently an accepted definition and a distinct set of diagnostic criteria, the exact cause of autism is still unknown. This fact validates looking to past definitions and diagnostic criteria in order to understand the full spectrum of possible symptoms that could be associated with autism. After the history of autism has been discussed, Chapter Two then expands on four of the most important characteristics of autism. These characteristics include: impairments in social interaction, impairments in social communication, impairments in imagination and, most importantly, symptoms related to unusual sensory perception.

Because the objective of this project is to design an early intervention education center for children with autism, Chapter Three discusses the current methods of teaching children with autism. In the first section, the importance of educating children with autism is emphasized; the chance for independence in adulthood is significantly increased if a child with autism is given the opportunity of education. The second section of Chapter Three discusses eight
early intervention teaching strategies that are generally accepted in the field of special education. The eight methods discussed include: Applied Behavior Analysis, Applied Verbal Behavior, augmentative and alternative communication, token systems or reward based reinforcement, Natural Environment Training, music therapy, occupational therapy, and the Treatment and Education of Autistic and related Communications-handicapped Children (TEACCH). TEACCH is one of the most widely used programs; it has been in existence for over a decade, allowing the time for credible research backing its effectiveness to be developed. Because of the importance and wide use of TEACCH, the third section of Chapter Three describes this method in detail.

Chapter Four culminates the research on autism and discusses the relationship between autism and the built environment. Because there are no precise guidelines for designing spaces for children with autism, this chapter discusses specific elements of the built environment that children with autism are noted as having a strong reaction to. The five topics discussed in detail include: responsive environments, boundaries and space definition, transitions and thresholds, repetition and rhythm, and finally, color.

The final chapter, Chapter Five, discusses the architectural portion of this project; it outlines the specific question and methodology, along with the building program, building site and an overview of the building design process. Design diagrams and preliminary schematic designs serve to illustrate the four most important concepts that have remained a constant link between autism and architecture: the elimination of physical thresholds, the creation of visual boundaries, the importance of repetition and rhythm in form and the construction of a visual part to whole relationship within which students can learn their own specific part in relation to the greater whole. Ultimately, this chapter serves as evidence of a solution to the initial question: How can a specific user group’s set of unique perceptual experiences be used to create a specialized building environment that enhances this group’s ability to comprehend, interact with and navigate through the structure that surrounds them?
2

history and general characteristics of autism

This chapter gives an overview of the history, etiology, and the common characteristics of autism. By following the development of the definition and diagnostic criteria as they have expanded and contracted over time, the range of potential characteristics of autism becomes apparent. The main characteristics discussed in this chapter include: impairments in social interaction, impairments in social communication, impairments in imagination, and the many forms of unusual sensory perception.

According to the U.S. Department of Education, the number of children born with autism is growing at a rate of 10-17 percent per year. (Facts and Statistics 2006) By studying the recent history of autism and the number of times that autism has been redefined, it becomes apparent that the increase is due to an increased focus, a broader understanding, and a more precise definition of autism rather than an actual increase in the amount of children born with autism. Although there has recently been a dedicated focus on autism, its causes and cure are still unknown. Autism can range in severity from low functioning to high functioning; no matter the level of severity, in most cases its impairments affect social interaction, social communication and imagination as well as many symptoms related to unusual sensory perception.

History and the evolution of the diagnostic criteria:

The first scientists to give a name to autism and record its apparent characteristics were Leo Kanner, writing in Baltimore in 1943, and Hans Asperger, writing in Vienna in 1944. (Nadesan 2005, 10) The two never knew of each other’s work, yet both separately chose the word autism to describe similar conditions. The word autism was common in psychiatry at the time, referring to a schizophrenic disturbance that was the narrowing of relationships with people and the outside world to a point that excluded everything but the person’s own self. (Frith 2003, 5) Kanner understood that there was a difference in the schizophrenic meaning of autism and his new definition of autism. He stated:

Autism consists of an inability to relate themselves in the ordinary way to people and situations from the beginning of life. Their parents referred to them as having
| Kanner | difficult time appropriately applying personal pronouns  
|        | strong ability to read  
|        | excellent rote memory  
|        | problems with comprehension  
|        | fear of intrusions from the outside world  
|        | obsessive, anxious desire for the maintenance of sameness  
| DSM-I | listed as a subcategory of schizophrenia  
| DSM-II | a profound lack of affective contact and elaborate, repetitive, ritualistic behavior in the absence of psychotic symptoms  
| DSM-III | listed in the category of pervasive developmental disorders (PDD)  
|        | understood as a spectrum of disorders rather than one disorder  
|        | deficits in social interaction, soical communication, and social/symbolic play  
| DSM-IV | listed in the category of pervasive developmental disorders (PDD)  
|        | 1. impairments in social interaction  
|        | impairments in ability to develop appropriate peer relationships  
|        | impairments in emotional reciprocity  
|        | 2. impairments in communication  
|        | 3. restricted repetitive and stereotyped patterns of behavior, interests, and activities  
|        | onset of delays and/or impairments must occur before age three for a diagnosis of autistic disorder  

Figure 1. The changing diagnostic criteria for autism.

always been “self-sufficient”…This is not, as in schizophrenic children or adults, a departure from an initially present relationship, it is not a “withdrawal” from formerly existing participation. There is from the start an extreme autistic aloneness that, whenever possible, disregards, ignores, shuts out anything that comes to the child from the outside.” (Nadesan 2005, 10)

The diagnostic criteria for autism have changed over time (see Figure 1); Kanner’s first criteria were specific and well defined but later changed to be broad and overarching, the same is the case with the criteria listed in the American Psychiatric Association’s Diagnostic and Statistical Manual (DSM). The first criteria defined by Kanner described children with autism as having a difficult time appropriately applying personal pronouns, a strong ability to read and an excellent rote memory contrasted by problems with comprehension, a fear of intrusions from the outside world and an obsessive, anxious desire for the maintenance of sameness. Kanner also noted that the children he studied tended to take a literal approach to language comprehension and usage, something that is still apparent to autism researchers today. Instead of answering questions logically, children with autism tended to affirm the question with a literal repetition of the question. (Nadesan 2005, 11)

As autism received more psychiatric attention in the mid 1950’s, Kanner contributed to its definition in the DSM-I and DSM-II. Much to Kanner’s dismay, at this time autism was listed as a subcategory under childhood schizophrenia. The criteria listed were brief: “a profound lack of affective contact and elaborate, repetitive, ritualistic behavior in the absence of psychotic
symptoms.” (Nadesan 2005, 11) It wasn’t until the publication of the DSM-III that autism was removed from the category of schizophrenia; it was placed in a new category entitled “Pervasive Developmental Disorders,” or PDD. PDD encompassed disorders relating to deficits in social interaction, social communication, and social/symbolic play. With the development of this new category, autism could be viewed as a spectrum of disorders rather than as one, concrete disorder. (Nadesan 2005, 11) Majia Nadesan takes the point of view that because of the categorical view of autism and because the people within the category share communication practices, they are merely a deviation from expectations of normalcy and are not necessarily disabled. To support this view, she points out that it is possible to codify, standardize and distribute their communication practices. (Nadesan 2005, 9)

**The current diagnostic criteria:**

The most recent publication of the DSM, DSM-IV, has broadened the criteria for autism once again. These criteria are basics for diagnosis and it is important to realize that there are other commonly shared characteristics of autism beyond this list. The current criteria are as follows: “(1) impairments in social interaction, including impairments in non-verbal behaviors (“eye-contact,” “facial expressions,” “body postures,” “gestures to regulate social interaction”) (see Figure 2), impairments in ability to develop appropriate peer relationships, and impairments in emotional reciprocity (e.g., pleasure in other people’s happiness), (2) impairments in communication including delays in expressive language, impairments in conversational competence, use of stereotypic or repetitive language, and lack of spontaneous make-believe play, and (3) restricted repetitive and stereotyped
patterns of behavior interests, and activities. Onset of delays and/or impairments must occur before the age of three for a diagnosis of autistic disorder.” (Nadesan 2005, 15) The category of PDD can be difficult to diagnose; it contains overlapping criteria, no definite etiology, and a definite yet indefinable progression over time. Since autism directly affects development, symptoms tend to present themselves differently at separate stages of development. Some characteristics do not appear until later in life and others will disappear over time; it is possible for one specific child to be diagnosed at a different place on the autism spectrum from one year to the next. (Frith 2003, 1)

Social interaction and social communication:
In understanding the diagnostic criteria, it is helpful to expand the list by studying specific situations in which the symptoms present themselves. Social interaction and social communication are two symptoms that are often the most troubling and hard to come to terms with for children and adults with autism (see Figure 3). Temple Grandin, a spokesperson for autism and an author who has overcome her handicap and completed a Ph.D. in animal science, provides invaluable insight into the mind of an autistic child. In her book, Emergence: Labeled Autistic, she describes her frustration with a teacher in her early years at school. Temple had been given the small task of choosing which in a series of pictures contained things that began with the letter ‘b’:

I marked the suitcase because I thought it was a box. I skipped the picture of the bird and birdbath. They were in the middle of a garden and I thought ‘g’ was the key sound for them. But I couldn’t speak well enough to explain to Mrs. Clark why I had or had not marked certain
pictures. I understood the concept of the ‘b’ sound, and I had a logical reason for every mark I made. Frustration raged within me and I wanted to hit or kick to release the feeling. (Grandin 2005, 33)

In other parts of her book Temple expresses confusion in situations such as summer camp and not understanding why she was unable to make friends and connections with other campers.

**Impairment in imagination:**

Impairment in imagination is another common symptom of autism that is hard to understand based on the criteria in the DSM alone. According to the book, *The Autism Encyclopedia*, imagination is simply defined as “the production of ideas, especially in the form of mental images, of what is not present or has not been experienced.” One use of the imagination involves resurfacing memories from past experiences to solve problems in present situations (see Figure 4). Some other uses include pretend play, storytelling, creative writing, poetry, art, drama, and music composition, all of which are thought to contribute to cognitive and emotional development. An early detection sign of autism is the failure to develop spontaneous pretend play; rather, individuals with autism engage in stereotyped patterns of behavior, interests and activities. This can include obsessing over objects or amassing information about obscure subjects. Another indication of imagination impairment in autism is the inability to recognize and understand mental states in oneself and in others. Mental states include feelings, desires, beliefs or intentions and are known as *theory of mind*. It is possible that this lack of imagination is what makes social situations so difficult for children and adults with autism. (Neisworth and Wolfe 2005, 104)
Unusual sensory perception:

As mentioned previously, the symptoms within the Pervasive Development Disorder category can be difficult to place under the right disability, many of the symptoms within this category can be confused with symptoms of schizophrenia as well. According to the article, “First-hand accounts of sensory perceptual experiences in autism: a qualitative analysis,” unusual sensory perceptual experiences are particular to autism and are not usually thought of as symptoms of other PDD’s or of schizophrenia. Unusual sensory perceptual experiences include “sensory distortions in the perception of physical objects; fluctuating sensory tune-outs or blanking of sound or vision; overload of the senses; multi-channel perceptions, such as when auditory stimulation evokes sensations of colour and smell; difficulties in processing stimulation of more than one of the senses at any given time, as well as difficulties in recognising the channel through which the stimulation is being received.” (Huws, Jones and Quigney 2003, 113) (see Figure 5)

Auditory perception:

Looking at specific examples and case studies of unusual sensory perceptual experiences can help to illustrate the effects of autism on daily life. In her article, “An Inside View of Autism” written for the Center for the Study of Autism, Temple Grandin talks about the oversensitive response she had to loud noise and touch. Grandin relates the experience of this over stimulation to having a hearing aid with the volume stuck on “super loud.” Grandin uses a second analogy when speaking of the classroom situation; “It is impossible for an autistic child to concentrate in a classroom if he is bombarded with noises that blast through his brain like a jet engine.” (see Figure 6) Grandin also talks about the
mechanisms that autistic children usually use to deal with intense sound and the importance of protecting children from their own reactions. Autistic children usually either shut off their senses completely or accept the noise and risk excessive startle reactions that can sometimes be harmful to the child. (Grandin 2006)

In her book *Autism – The Eighth Colour of the Rainbow*, Florica Stone talks about the unnatural responses autistic children tend to have when their senses are stimulated. Some descriptions she uses to describe the reactions to noise are: feeling dizzy, feeling panic, covering ears, rocking oneself, hurting someone, hiding, misunderstanding requests due to lack of ability to distinguish the sound of words from the rest of sounds and a tendency to become distracted by sounds that average people cannot hear. (Stone 2004, 86)

**Sensory personal narratives:**

In the article, “First-hand accounts of sensory perceptual experiences in autism: a qualitative analysis,” researchers gathered personal sensorial experiences from published websites of people living with autism. These short accounts illustrate common phenomena associated with autism. For example, “Jane” was quoted as saying, “It’s disturbing to see a blot of lint disrupting the perfect plane of a rug or bed cover.” This illustrates hypersensitive eyesight that is capable of registering even the smallest detail that others may never notice. Jane preferred perfection and any deviation from this caused distraction. Another example, James, is quoted as saying, “I have trouble processing many things at once…Most people have a mind like a flashlight, with an area of high focus and a larger area of partial awareness; my mind is more like a laser pointer, that highlights only a single small dot.” This
illustrates James’ inability to process stimuli coming from more than one sense at a time. People with autism have a tendency to become engrossed in one aspect of a situation and are often unable to disengage from this aspect. This concept is referred to as stimulus over-selectivity. (Huws, Jones and Quigney 2003, 116)

The above-mentioned participants all spoke about the coping strategies they used to deal with the discomfort and difficulties caused by the unusual sensory perceptions. Some chose to shut their senses off and retreat into a world inside their head, while others chose to accept their condition and find ways to benefit from their sensory perceptions. (Huws, Jones and Quigney 2003, 117) Regardless of their choice of coping strategy, all participants understood that there was something different occurring in their mind than in the minds of others. Much like the coping strategies varied from person to person, the level of acceptance of their condition varied from person to person. Some subjects were extremely positive, thankful and proud of their condition and others were merely able to uneasily accept their condition. (Huws, Jones and Quigney 2003, 119)

**Etiology of autism:**

In her book, *Autism: Explaining the Enigma*, Uta Frith discusses the frustration caused by a lack of a known etiology of autism. She talks about the two main categories of speculative causes: genetic factors and environmental risk factors. Genetic factors have yet to be proven, but twin and family pedigree studies have shown a five to ten percent increase in the probability that a second family member will have autism. Environmental risk factors are also yet to be proven; at this time they include any risk factor that can lead to brain damage such as prenatal factors and birth complications or viral infections and autoimmune disorder. Some studies that support the environmental risk factor theory show that the rate of pregnancy and birth problems is significantly higher in autistic children. This study proves nothing, as genetic abnormality could be the cause rather than the result of complicated pregnancy and birth. (Frith 2003, 70-73)

This chapter is a brief summary of the history, symptoms and theories about the cause of autism. Further chapters will explore the history and current methods of educating children with autism, as well as ways that diagnostic criteria and other symptoms of autism directly relate to the built environment.
Figure 7. Common characteristics of autism.
education and autism

This chapter begins with a discussion on the importance of early intervention and continuing education for children with autism. The sections that follow include:

3.1: Early Intervention Strategies
3.2: TEACCH

These sections focus first on a variety of accepted early intervention strategies and second on TEACCH, the Treatment and Education of Autistic and related Communications-handicapped Children, one of the most researched and widely accepted methods of early intervention. The goal of the chapter is to give an understanding of the types of activities that occur in teaching children with autism and in turn give an understanding of the types of spaces that are needed to house these activities.

Importance of education:

The constant change in the diagnostic criteria paired with the unknown cause of autism makes it difficult to determine effective treatment to alleviate symptoms, let alone determine a cure. Education has been promoted as treatment since the first cases of autism were studied. In 1800 a boy named Victor was found in the woods and taken in by a doctor. The doctor wrote about his personality and problems extensively and researchers today are confident that Victor suffered from autism. In his time spent with Victor, the doctor professed that education was one of the only sources of dramatic improvement in Victor’s personality and problems. (Frith 2003, 41)

Because of the passing of IDEA ‘97 (the Individuals with Disabilities Education Act Amendments of 1997) a free and appropriate public education is guaranteed for all children with disabilities. The passing of this law is of paramount importance, but in many cases the education provided is inclusion in a standard school setting where a special educator aids the child in his learning. Because the setting and pace of standard classes can magnify problems in children with autism, inclusion is proven to be more successful if some form of early intervention outside of a standard school setting precedes it. There is an increasing amount of research that supports an alternative education environment for pre-school age children with autism. (Dawson and Osterling 1997, 307)
3.1 early intervention strategies

In the article, “Early Intervention in Autism” by Geraldine Dawson and Julie Osterling, the time-tested methods of early-intervention are discussed. Early-intervention programs are crucial in providing educational opportunities for children diagnosed with autism at an early age. According to Dawson and Osterling, around fifty percent of children placed in these programs are integrated into mainstream classes and almost all children have a fifteen to twenty point increase in their I.Q. once they have completed their chosen program. (Dawson and Osterling 1997, 314) Dawson and Osterling’s article specifically investigates eight different programs, focusing on their effectiveness, their techniques, the time per week children are expected to participate in the program and after how many years it is expected the child would be able to enter into inclusion in a standard school setting. Although each program differs in its methods, there are obvious similarities between all eight programs. Most programs start out with one on one teaching until the student is ready to progress into small groups, and eventually into groups of around ten children (see Figure 8). (Dawson and Osterling 1997, 310) Many of the programs invite parents to observe or participate in classes with their children and many also offer separate training classes for parents. (Dawson and Osterling 1997, 320) A popular method used in the majority of the programs is the separation of the classroom into different “teaching zones”. Children are taught to follow picture schedules and move from activity zone to activity zone. Teachers assist students in making these transitions, something that is normally difficult for children with autism, until they become independent enough to do it on their own. (Dawson and Osterling 1997, 311)

Amanda Tipkemper Sparks, director of the Cincinnati Center for Autism, suggests
that choosing one specific program as the focus for a center for autism is unwise; she points out that every child has different needs and it is best to craft a specific program for each child out of components of the time-tested programs. After years of experience in teaching children with autism, Tipkemper Sparks suggests the following methods as the most effective teaching strategies:

- **Applied Behavior Analysis (ABA)**
- **Applied Verbal Behavior (AVB)**
- **Augmentative and alternative communication (AAC)**
- **Token systems or reward based reinforcement**
- **Natural Environment Training**
- **Music therapy**
- **Occupational therapy**
- **Treatment and Education of Autistic and related Communication-handicapped Children (TEACCH)**
  (Tipkemper Sparks 2006)

**Applied Behavior Analysis:**

Applied Behavior Analysis, or ABA, is a scientific approach to developing methods to deal with many different behavioral needs. ABA is well respected and is the only therapeutic/educational approach for children with autism that is regarded as effective by the Surgeon General. ABA has practical significance; it determines functional relationships between different behaviors and creates programs based on these. Since ABA is based on a scientific method, procedures are always derived from basic theoretical principles and described in a way that allows for replication. ABA is proven to contain effective and socially valid interventions whose results are evident over time and in different settings. Certified behavior analysts are required to create effective treatment programs. (Neisworth and Wolfe 2005, 12)

**Analysis of Verbal Behavior:**

One type of ABA that is common in the use of treating autism is Analysis of Verbal Behavior, or AVB. Communication is one of the main impairments of autism; AVB teaches communication skills that can become a part of all other aspects of therapy. The procedures of AVB include, but are not limited to: reinforcement, prompting, fading and task analysis. Rather than following the developmentally based language approach to communication, AVB is based on B.F. Skinner’s analysis of the functions of language. These functions, as determined by Skinner, include: to request, to name things, and to refer to things not immediately present. (Neisworth and Wolfe 2005, 7)

**Augmentative and Alternative Communication:**

Augmentative and alternative communication (AAC) techniques are nonverbal communication methods that are used in conjunction with programs like TEACCH to encourage language and
communication development in children who have minimal vocal ability. (Neisworth and Wolfe 2005, 19) According to Tip kemper Sparks, there are many different forms of AAC; three common methods that are used at the Cincinnati Center for Autism are American Sign Language (ASL), Picture Exchange Communications System (PECS) and visual schedules. (Tip kemper Sparks 2006) ASL is a language separate from English and therefore has its own structure, meaning and grammar. ASL is most commonly used among the deaf community but can be used for communication-handicapped children as well. The use of ASL in teaching individuals with autism has decreased due to the increased use of pictures and symbols, although it is still appropriate in some cases. (Neisworth and Wolfe 2005, 5) PECS is a technique that uses picture symbols to initiate communication between two partners. There are six phases to the technique: exchange, distance and persistence, discrimination, building sentences, responding, and commenting. Research has shown that the use of PECS can improve emerging speech and also decrease problem behaviors in children with autism. PECS uses specific communication books that include picture symbols, although some teachers prefer making personalized books that can be modified as the student’s language repertoire increases. (Neisworth and Wolfe 2005, 157)

**Natural environment training:**

Natural environment training is crucial in the development of children with autism; however, it never occurs in places individuals go because they have disabilities, such as clinics, hospitals, special classrooms or professional offices. The key to natural environment training is taking advantage of everyday routines or activities such as mealtime or family interaction and turning them into learning situations and environments. The goal of natural environment training is to reduce stressful issues related to the difficult transition from contrived, educational settings into everyday, natural settings. (Neisworth and Wolfe 2005, 139)

**Music therapy:**

Music therapy was not specifically developed for individuals with autism, but according to Tip kemper Sparks, it is effective in a significant amount of individuals. (Tip kemper Sparks 2006) Board registered music therapists who are certified by the American Music Therapy Association administer music therapy. It is based on the belief that music reduces stress, develops positive interpersonal relationships, provides a distraction from pain and can serve as a focus of attention. The goals of music therapy are to develop expressive behaviors that can facilitate positive changes in communication, social or emotional development, cognition and physical
development. (Neisworth and Wolfe 2005, 137)

**Occupational therapy:**

Occupational therapy is another form of therapy that is provided by a board certified professional. It is described as “a health profession that supports a person’s occupational performance within a specific environment. Occupational performance is viewed in terms of work, play, and self help.” Treatments include “purposeful activities” that promote higher function in sensorimotor, neuromuscular, perceptual, developmental, and/or psychosocial areas. (Neisworth and Wolfe 2005, 146)

Many of the techniques mentioned above are present, in one form or another, in the TEACCH method. TEACCH is a widely accepted strategy for teaching children with autism. It provides specific guidelines for classroom structure and has been proven to be highly effective in teaching children with autism.
3.2 TEACCH

**treatment and education of autistic and related communication-handicapped children**

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*Figure 9. TEACCH.*

The Treatment and Education of Autistic and related Communication-handicapped Children, TEACCH, was developed in the 1990’s after studies on the positive aspects of structured teaching for learning problems most common to autism and related pervasive developmental disorders. (Mesibov and Schopler 1995, 244)

The two main goals of TEACCH are to use a **structured environment to promote skills acquisition and to facilitate independence at all levels of functioning** (see Figure 9). Both of these goals are achieved through the same routines. The basic routine begins with students being taught skills with one-on-one instruction in a specific environment. Once the skill is established, the child is taught the skill in a different environment. Gradually the assistance from the instructor is decreased and the student begins to gain more independence. (Dawson and Osterling 1997, 310) The strict classroom structure mentioned above allows for predictable routines to occur within the classroom. There are four main components to the classroom structure:

- **Physical organization**
- **Visual schedules**
- **Work systems**
- **Task organization**

*Physical organization:*

The first major component, physical organization, calls for boundaries and visually clear areas in which specific activities occur. These areas must remain consistent so that students can understand their environment, identify and remember activities that occur in specific places as well as understand relationships between activities. For example, if a child is always sent to the same area for group activity time, he will understand what is going to happen when he is sent to that area again (see Figure 10).
Structured classrooms should also highlight and focus on the most important activities. Children with autism have a difficult time differentiating between dissimilar events and this will help them understand which tasks are the most important. (Mesibov and Schopler 1995, 247)

**Visual schedules:**

Visual schedules are a major part in directing students to activities in a routine order; they teach the student to follow a sequence of steps, events, activities or routines. The schedule remains in one place and shows pictures of tasks that have been completed and tasks that are yet to be completed, in the order that they are to be done. Schedules can include pictures, icons, symbols, photographs, phrases, and sometimes even sentences (see Figure 11). (Neisworth and Wolfe 2005, 229) As a child starts an activity she or the instructor places an image of the activity in the start box. Once the activity has been completed, or once it is time to move on to another activity, the student or the instructor places the image in the finish box. Visual schedules give the student a focal point to refer to and a routine to follow during activities, they also help students anticipate and predict activities that will occur. (Dawson and Osterling 1997, 310) Eric Schopler and Gary Mesibov outline the benefits of visual schedules as follows: “they minimize problems of impaired memory or attention, they reduce problems with time and organization, they compensate for problems with receptive language, which also cause obstacles to following verbal directions, they foster student independence, especially from negative teacher-interactions over the repeated need to know what comes next, and they increase self-motivation by readily available visual reminder that ‘first comes work, then play’.” (Mesibov and
Schopler 1995, 251)

**Work systems:**

Work systems are set up within the classroom as individual workstations and are meant to foster independent work in the student. Each system consists of workboxes on the right and left side of a desk and a visual task schedule above the desk, telling the student specifically what to do at each station (see Figure 12). Work systems communicate three important pieces of information: “1. The task students are supposed to do, because they can easily see the items in each work-study box. 2. How much there is to be done. The work-study box and its contents are always on the left, with the contents visible. 3. How students will know when they are finished, that is, when the material in the work-study area box has been processed and moved to the finish box, always on the right.” Another goal of the work systems is to calm tension that is usually present in children with autism because of their perception that undesirable tasks can last longer than they actually do. Work systems also provide motivation with closure and rewards when tasks are completed. (Mesibov and Schopler 1995, 255-256)

**Task organization:**

Task organization is the least specific of the four components of the structured classroom. It is simply the thoughtful organization of each component at a work system and the instructions for completing the task, organized in a way that directly relates to the things the student sees in front of them. This type of organization teaches students to look for instructions rather than to instinctively do whatever they want with the objects presented to them. (Mesibov and Schopler 1995, 258)
Although TEACCH is an outlined and specific program, Amanda Tipkemper Sparks pointed out that it is easy to use components of this program as they fit for each student. The most important component used at the Cincinnati Center for Autism is the visual schedule; work systems are used, but not always in the structured way that is specified in the TEACCH outline. (Tipkemper Sparks 2006) TEACCH can be helpful in designing spaces for children with autism because it helps set up an understanding of the importance of defined, structured space and routine activities.
4

autism and the built environment

This chapter addresses the main issues relating autism to the built environment. For a child with autism, the effectiveness of the teaching strategies used is negated if the environment in which they take place is distracting for the child. The amount of time spent on learning activities will be minimized and the time spent focusing the child will be increased. The first section provides basic environmental guidelines that are simple to achieve but that have a strong impact on children with autism. The following sections discuss more complex strategies that could be implemented in the design of a building for early intervention. The strategies include:

4.1: Responsive Environments
4.2: Boundaries and Space Definition
4.3: Transitions, Repetition, and Rhythm
4.4: Color

Specific environmental factors can stimulate children with autism while other factors can cause stress and anxiety; according to Eleanor Young children with autism are strongly affected and excited by things such as strong color and according to Clare Barker children with autism have problems crossing thresholds although they learn better when they are within defined boundaries. (Young 2004, 58 & 60) There are many books that offer advice to parents and teachers about how to help children with autism by adapting their daily lives in a way that best suits their unique needs. These writings often clearly connect the child’s well being to her surroundings, but rarely offer specific advice about designing spaces in which these children can live and learn. There are, however, some valuable building precedents written about by Eleanor Young in the article “Special Deeds” which can offer some insight into the creation of a successful environment for learning. The main points of advice that Young asserts are to: keep spaces clear, apply generous space standards, use hardwearing materials and think about noise. (Young 2004, 60)

According to Young, by keeping spaces clear, calm and ordered it is possible to reduce confusion in autistic children. Toni Flowers, a renowned special education teacher specializing in autism, speaks briefly about the classroom environment in her book, The Color of Autism. On the topic of clear space she makes one, straight-forward statement, “Have the classroom organized. Clutter is distracting for all children, but especially for children with autism, who have a need for order and sameness.” (Flowers 2002, 33) One of the reasons for this distraction resulting from cluttered space could be the child’s inability to look at objects as a whole. Florica Stone speaks of this concept in her book, Autism – The Eighth
Colour of the Rainbow. She describes a conversation she had with an autistic child about the way he looked at things. With a tree in the distance, she asked the child to describe why she could look at the tree quickly and move on, but he could gaze at the tree for hours and not be able to take his mind off of the subject. The child gave a simple answer; he was not looking at the tree but rather studying the leaves and how the rays of light came through them. (Stone 2004, 89) Stone points out that this symptom may be the result of the ability to see more detail. She talks about autistic children’s tendency to inspect small details of the things they are looking at for hours and hours until they can finally grasp the whole picture.

One of the most important points that Young makes, and also the most difficult to precisely define, is to apply generous space standards. Young states that, “Those with autism are more threatened by lack of personal space. Large communal areas and spaces for people to withdraw to can help.” (Young 2004, 60) Aside from spacious classrooms, having withdrawal rooms is extremely important. This allows teachers to remove a child (or a child to remove him or herself) from a stressful situation and place them in a calming environment with as little stimulation as possible.

Donna Williams promotes the idea of having spaces designated for “time out.” She talks about this concept in many of the chapters in her book, Exposure Anxiety – The Invisible Cage: An Exploration of Self-Protection Responses in the Autism Spectrum and Beyond. Williams talks about the tendency for autistic children to overload, or shutdown, when over-stimulated or bothered by a situation; she suggests keeping contact and learning to small doses, leaving the child wanting more. In between planned activities the child should learn self-guided time out activities that will calm him before experiencing overload. She describes situations where the child is being taught as “overload” and experiences where the child is self-guided as “control”. She says it is important to keep a regular mix of overload and control, as many people with autism need processing breaks as often as every ten to twenty minutes. (Williams 2003, 72)

Williams describes some of the activities that could occur during these self-calming sessions. Spaces should be designed to allow for things such as jumping, tapping, rocking, giving oneself a rhythm and then slowing the pace down before gradually getting back into the activity. The ability of teachers or caregivers to monitor these spaces is important as sometimes these activities can grow out of control and “lead from calm into pleasure, into mania, into panic and finally the retaliative self-injurious responses of Exposure Anxiety in which the person gets an adrenaline ‘fix’.” (Williams 2003, 81)

The third point of advice that Young gives is relatively straightforward and easy
to decipher in terms of possible design implications. Because children with autism can be deliberately or accidentally heavy on equipment, she suggests the use of hardwearing materials to protect them from damage. In Young’s article, Simon Humphreys, an architect with a wide range of experience in design for people with autism, bluntly states, “You have to make it clear that these spaces are high cost and high maintenance; if they are cheap they get trashed.” Young touches on an explanation of this while describing children with autism’s relationship to the environment, “They are strongly affected and excited by things such as strong colour but their lack of social awareness means they are often noisy, and hard on their environment.” (Young 2004, 58 & 60)

In summary, there are several easy ways that the classroom can become more efficient for learning. The following are five of these strategies:

- **Keep spaces clear, calm and ordered.**
- **Remove clutter.**
- **Apply generous space standards.**
- **Provide places for children to learn to calm themselves.**
- **Use hardwearing materials.**

Although these strategies are helpful, they are not a complete list in themselves. There are several more complex strategies, most of which should be implemented at the building design phase. The following sections provide insight into more involved strategies.
Another interesting area of research on autism that relates to the built environment is that of virtual reality environments created for children with autism. There have been many different research projects that explore this idea. “MEDIATE: An interactive multisensory environment for children with severe autism and no verbal communication” is one of these research projects. The goals of MEDIATE are not focused on education or therapy, but rather on creating an environment in which children with severe autism can have fun and express themselves. (Pares and others 2004, 1)

The MEDIATE environment generates real-time stimuli, for example floors that react to footsteps and generate sound, screens that project reactions to a child’s movement and touch, walls that react to pressure and emit vibrations and microphones that react to sounds emitted by the child (see Figure 13). (Pares and others 2004, 2) The ideas behind MEDIATE are based on research that proves that children with autism lack a sense of imagination which causes an inability to predict events and leaves them feeling isolated in the unpredictable world around them. Children with autism have a difficult
time processing multiple stimuli at one time, such as the multiple layers of stimuli in the world; this also leaves them with a lack of understanding about why the things around them are occurring. MEDIATE’s goal is to provide clear interaction dialogues that can give the user a sense of control and helps them to feel at ease. (Pares and others 2004, 4)
4.2 **boundaries and space definition**

Boundaries create independence for children with autism and they “are more able to identify and carry out assigned tasks when visually clear boundaries designate the exact space that is available for specific activities.” (Boswell, Decker and Schultheis 2000, 159) Boswell, Decker and Schultheis also point out that boundaries create a sense of emotional security in students who are normally overwhelmed in large, empty spaces such as a classroom. (Boswell, Decker and Schultheis 2000, 160)

The design and philosophy behind Montessori education can provide insight into what classroom shapes and layouts will provide teachers of children with autism the most support for the flexible and ever-changing teaching strategies that they use. Much like the philosophies behind the strategies of teaching children with autism, Montessori education has a philosophy of education that revolves around each individual child’s personal curiosities and level of learning. (De Jesus 1987, 6-8) In the ideal Montessori classroom, an open plan layout is achieved with partial enclosures between activity spaces that provide freedom and privacy for the children. Also important in a Montessori classroom is the ability for teachers and students to have visual connections with every space in the classroom and with spaces in the school as a whole (see Figure 14). Other important aspects of the Montessori classroom that would be important in a classroom for children with autism are having at least 50 square feet of space per child (a generous calculation, compared with traditional schools) and providing comfortable places for children to rest, observe others, or place themselves in time out. (De Jesus 1987, 43-44)

Creating clear boundaries in which specific activities can take place is an
important tool in keeping children with autism focused and comfortable. It is also important to keep the classroom environment flexible while needs change as children progress through their programs. In his “hinged-space” apartments in Fukuoka, Japan, Steven Holl draws from the traditions of Japanese Fusuma (sliding doors) and creates boundaries that seamlessly transform as the needs of the space change. Holl uses pivoting doors, panels and cabinets to reconfigure the apartments to accommodate two different kinds of change. One type of change is diurnal, allowing expansion of living areas during the day and then reclaiming these areas for bedrooms at night (see Figures 15 and 16). The second type of change, episodic, is less routine and develops as the needs of the family change over time. This allows rooms to be added or subtracted to accommodate children leaving the household or elderly family members joining the household. (Holl 1991, 140-149)
4.3 transitions, repetition, rhythm

According to Amanda Tipkemper Sparks, director of the Cincinnati Center for Autism, children with autism often have a difficult time transitioning from one space to another and from one activity to another. For activity transitions, visual clues and schedules are used to keep children on track. (Tipkemper Sparks 2006) For spatial transitions, solutions take many different forms and are often referred to as transition cues. (Neisworth and Wolfe 2005, 222) Some examples of transition cues include: stripes of color that form a path between rooms, a bead of wood hung along the walls at hand-height that allows children to feel their way through different spaces or having a specific sound resonate when it is time to move to a different space (see Figure 17). (Tipkemper Sparks 2006) The primary goal in any of these techniques is to keep some form of understandable consistency from one place to another and from one activity to another. The need for repetition and rhythm in children with autism is obvious in their behavior and should be reinforced in their environment as much as possible. Even if stimuli have been experienced before, to a child with autism they are always different and unexpected. Behaviorally, children act these feelings out by their preference for routine foods, their obsession with rhythmic objects (especially spinning objects), their pleasure in arithmetic and their formation of rituals. (Frith 2003, 169) Gunilla Gerland, an adult with autism, remembers her childhood preference of sameness, “to the world around me, my behavior was utterly incomprehensible. I didn’t feel dull eating the same thing all the time, though should it start to become so, that was nothing compared with the mortal danger of risking unknown food…” (Frith 2003, 170) Smooth transitions, repetition, and rhythm in the school environment can help children avoid stress by providing them with predictable surroundings that they can easily understand.
4.4 color

Color theorists Frank Mahnke and Rudolf Mahnke believe that the color of a person’s surroundings can play a large role in influencing the mood and behaviors of that person; since children with autism can have heightened or minimal response to sensory stimulation, attention to color is extremely important when designing spaces for these children. In school settings Mahnke and Mahnke point to the assumption that children feel most extroverted by nature; they suggest the use of warm bright color schemes that mimic natural settings in order to reduce tension, nervousness and anxiety. (Mahnke and Mahnke 1987, 83) Mahnke and Mahnke also talk about the role color plays in determining the excitement or calmness of a space. They claim “there is a high correlation between the strength (chromaticity) of a color and the perceived excitement of a space. Studies in full-scale rooms indicate that complexity increases as chromatic strength increases (see Figure 18). Strong colors will make a room appear exciting; weak colors give an impression of calmness, regardless of hue. Color contrast also contributes to the apparent excitement of a space.” (Mahnke and Mahnke 1987, 17)

Aside from the strength of colors and the associations they imply (for example, the association with nature), there have been scientific studies that determine general mood categories that are related to specific colors. According to Deborah Sharpe, a trained psychologist, color can enhance mood and color preference is often related to a child’s mood at any given time. Sharpe points to the fact that this is especially true in children of pre-school age when color/form tests show that there is a strong color bias. Color/form tests present children with multiple objects of the same form and different color and multiple objects of the same color and different form. The
children are then asked to place the objects in what they see as reasonable categories. Children of pre-school age and below tend to categorize objects by color, while children older than pre-school age begin to categorize the objects based on form. (Sharpe 1974, 8-9) The color bias is important to understand when designing an environment for pre-school aged children, especially those that might be developmentally behind and continue with a color bias into elementary school years.

The simple fact that these children are color bias is not enough information to design the color for their environment. Sharpe summarizes many scientific tests and draws general conclusions as to which colors will be associated with or promote certain moods. In general, warm colors tend to be exciting and stimulating and cool colors tend to be peaceful, cool and restful. More specific color associations are as follows:

- red, yellow, orange: excitement, stimulation, aggression
- blue, green: calm, security, peace
- black, brown, gray: melancholy, sadness, depression
- yellow: cheer, gaiety, fun
- purple: royalty, dignity, sadness (see Figure 19) (Sharpe 1974, 55)

Sharpe also makes some personality assumptions based on color preference. She believes that warm color preference, such as red, indicated impulsiveness and children with strong emotions. She believes that cool color preference, such as blue, represents reasonable personalities with emotional control. (Sharpe 1974, 14)

Faber Birren, an author who has written many books on the topic of color, talks not only about the affects of color on mood, but also on the capability of colored environments to increase the capacity for children to learn. Birren points to a study
executed by Henner Ertel, the previous
directory of the Institute of Rational
Psychology in Munich, in which Ertel spent
two years following classrooms with low
ceilings that had been painted different
colors. Ertel concluded that rooms that were
light-blue, yellow, yellow-green, or orange
stimulated alertness and creativity and the
children who were occupants of the room
were able to increase their I.Q. by twelve
points over the course of the study. Rooms
that were white, brown, or black caused the
children to act dull and also caused a drop
in children’s I.Q. (Birren 1978, 51) Birren
was careful to point out that color effects
are temporary and immediate reactions to
color wear off over time. He suggests that
“functional” uses of color should be designed
using a variety of colors so that human
responses will continue to be activated.
(Birren 1978, 24)
project description

This chapter provides an overview of the architectural project associated with the preceding research. The building is designed to house The Dayton Center for Autism, an early-intervention education center for pre-school age children with autism. The first section of the chapter describes the specific question that this project attempts to answer, as well as the defined methodology for doing so. The second section describes the building program, including space descriptions, square-footage requirements, and adjacency requirements. The third section of this chapter gives an overview of the chosen site for the project. This overview includes site criteria, site analysis and photographic representations of the site. The final section of this chapter summarizes the final building design.
question and methodology

This project attempts to answer the question: How can a specific user group’s set of unique perceptual experiences be used to create a specialized building environment that enhances this group’s ability to comprehend, interact with and navigate through the structure that surrounds them?

Incidents of unique perceptual experience are a defining characteristic of daily life for children with severe autism. The methodology for this project involves the research and understanding of the most common characteristics of severe autism (the diagnostic criteria) and the determination of specific experiential themes that are present within these characteristics. The experiential themes will then be related to the built environment to create options for specific components of the final building. Overall formal gestures will be derived from the most important experiential themes: the needs for boundaries to define space, the difficulty students with autism have crossing thresholds, the usefulness of repetition and rhythm and the part to whole relationships that exist within the architecture. The next phase of design will examine the program necessary for an early intervention center and use this information to further inform formal gestures. Site analyses will be executed throughout the project and taken into consideration for building design. The final solution will consist of a piece of architecture that is conducive to the early intervention practices used to treat children with severe autism. By using the symptoms of autism as a generator for design this project will result in a space that increases positive perceptual experiences; it will allow children to comprehend, interact with and navigate through the structure that surrounds them.
5.2

Program

The Dayton Center for Autism

The following is a program for an early-intervention center whose goal is to prepare children with severe autism to enter mainstream school. The assumed use of the center includes therapy related activities for 35 children who meet 30 hrs/week as well as seminars and workshops for parents and teachers of children with autism. Development of the program grew from the needs of multiple types of therapy occurring in one center, both individual and group, as well as classrooms designed for natural environment training that will help prepare students for their transition into mainstream schools. Because children with autism have a difficult time with over-stimulation of the senses, the recommended space standards are increased when possible. This section includes a detailed list of spaces, a program summary and a space adjacency diagram.

Detailed List of Spaces:

Early-Intervention Wings:

Drop Off Area:
This space is important in transitioning children from the parking lot to the building. The vast, ever-changing parking lot can cause children with autism extreme anxiety and make their initial daily experience one of stress and hardship. Including a drop-off area will allow students the opportunity to directly enter the building at an inviting location.

Parent Observation Deck
600 sf
This space provides a waiting area for parents while their children are undergoing therapy sessions; it provides the opportunity for them to observe and understand the specific therapy itself. This space is located above therapy spaces and parents are asked to look down on students so as not to cause an eye-level distraction.

Restroom
45 sf

Storage
475 sf
Storage within the therapy room provides the opportunity for materials to be hidden from the view of the students.

Individual Therapy
130 sf
These rooms will be used for one-on-one therapy with a teacher and student. Minimal distraction is optimal in this space. Should have closets or hidden storage for toys, etc., aside from the distraction issue, deprivation is a commonly used tool and children will respond better when they want something. These rooms should be in close proximity
to restrooms and to the sensory and swing room. There should be space outside these rooms that allows parents to observe their children undergoing therapy.

**Time-Out**

*45 sf*

Time-out rooms are very small scale and are used when a teacher or a student themselves feels they are over-stimulated and need time to calm themselves away from all distractions and people.

**Group Therapy**

*500 sf*

Activities in these classrooms will vary so flexibility of space is crucial. It is also important to have hidden storage within the rooms, as clutter is distracting to children with autism.

**Swing/Sensory**

*1400 sf*

This room is extremely important to the Center. Children should have access to this room from all therapy locations. The room can be used as a reward for student’s good work, or as a place for them to go to calm themselves from over-stimulation. This room provides many different swings for the children to choose. Structural consideration should be addressed in this room, as multiple swings will be hung from the ceiling. The room also provides different opportunities for stimulating the senses, such as light play, tables with tactile materials, large comfortable cushions and soft carpeting.

**Computer/Listening Station**

*70 sf*

This room is provided for children who find the computer helpful in their educational activities. This room also provides a small place for children to listen to calming music.

**Speech Language Pathology**

*70 sf*

This room is similar to the small therapy rooms. Professionals outside of the center administer activities relating to speech, language and pathology therapy that take place in this room.

**Occupational Therapy**

*480 sf*

This room is larger than the small therapy rooms as more physical activities take place in this room. Registered occupational therapists who come to the center will use this space to direct activities related to occupational therapy.

**Advanced-Intervention Wing**

**Classroom**

*600 sf*

This classroom is meant to serve as a transitional classroom from the early-intervention spaces into standard school settings.
a place to regain composure if senses (seeing, hearing, taste, touch, smell and proprioception) become over stimulated
a place that is easy on the senses
a place for learning about one’s body
a place away from loud noise, strong smell and bright lights

Figure 20. Sample swing and sensory room.

Classroom Storage
140 sf

Sensory Room
200 sf
This room is similar to the sensory/swing room in the early-intervention wings, but is on a smaller scale. It can be used as a reward for student’s good work, or as a place for them to go to calm themselves from over-stimulation. The room provides different opportunities for stimulating the senses, such as light play, tables with tactile materials, large comfortable cushions and soft carpet.

Sensory Storage
55 sf

Female Restroom
350 sf

Male Restroom
350 sf

Community Resource Wing

Resource Library/Study Lounge
3000 sf
This library serves for educational purposes for parents, teachers and community members. Books, videos and other media will focus on the topic of autism and provide information about support groups and activities related to autism. Study stations are part of the library. The room also provides a space for parents to wait while their children attend intervention programs. Resources in this room also include a lending library toys for parents to browse while waiting and borrow for temporary use at home.

Media Screening Room
75 sf
These small rooms will provide a space for patrons of the library to
preview media present in the library.

**Classroom**
400 sf
These classrooms will not be used for therapy purposes. They will be used for parent, teacher and community autism education and awareness programs.

**Staff Work Station**
40 sf
Staff workstations provide individual desks, computer workspace and storage space for each individual teacher or therapist.

**Conference Room**
250 sf
These small conference rooms provide space for private meetings between staff members or staff members and parents.

**Staff Work Space**
550 sf
This area is designated for copying, cutting, laminating and other things that require a large work surface for teachers.

**Kitchen**
300 sf

**Cafeteria**
900 sf
Will provide space for teachers and therapists to have lunch on a daily basis and will also be capable of holding larger events such as conferences, seminars and workshops.

**Female Restroom**
180 sf

**Male Restroom**
180 sf
**Program Summary**

- **Early-Intervention Wings**
  - 600 sf parent observation deck
  - 45 sf (4) restroom
  - 475 sf storage
  - 130 sf (2) individual therapy
  - 45 sf (2) time-out
  - 500 sf group therapy
  - 1400 sf swing/sensory
  - 70 sf computer/listening station
  - 70 sf speech language pathology
  - 480 sf occupational therapy

- **Parent Observation Deck**
  - 600 sf parent observation deck
  - 45 sf (4) restroom
  - 475 sf storage
  - 130 sf (2) individual therapy
  - 45 sf (2) time-out
  - 500 sf group therapy
  - 1400 sf swing/sensory
  - 70 sf computer/listening station
  - 70 sf speech language pathology
  - 480 sf occupational therapy

- **Advanced-Intervention Wing**
  - 600 sf (4) classroom
  - 140 sf (4) classroom storage
  - 200 sf (2) sensory room
  - 55 sf (2) sensory storage
  - 350 sf (2) female restroom
  - 350 sf (2) male restroom

- **Community Resource Wing**
  - 3000 sf resource library/study lounge
  - 75 sf (4) media screening room
  - 400 sf (2) classroom
  - 40 sf (8) staff work station
  - 250 sf (2) conference room
  - 550 sf staff work space
  - 300 sf kitchen
  - 900 sf cafeteria
  - 180 sf female restroom
  - 180 sf male restroom

**Adjacency Diagram**

- **Resource Library/Study Lounge**
- **Media Screening**
- **Classrooms**
- **Cafeteria**
- **Small Conference Rooms**
- **Staff Office & Workspace**
- **Sensory Room**
- **Swing Room**
- **Drop Off Area**
- **Parking Lot**
- **Entry**

**Groups**
- **Group Classroom**
- **Individual Therapy Room**
- **Individual Therapy Room**

**Time-Out**

**Enter → Therapy → Reward/Play**
5.3 site

site requirements:
central location to area schools

proximity to university of dayton
volunteers from service organizations
could serve as a teaching school for the education
department

proximity to residential area rather than a central city location
path to school is calmer and less disturbing

proximity to highway access
school will service dayton, cincinnati
and surrounding areas
close to I-75, the closest major highway

city of dayton map:
site is a central location to all schools with 600+
students in dayton and the surrounding areas

1 sugarcamp wooded area
2 path from I-75 1.8 miles
3 downtown dayton 2.1 miles
4 proposed site
5 I-75
6 university of dayton .94 miles
7 oakwood residential area
8 proposed site
site analysis

ideal building orientation

noise pollution surrounding site

traffic flow surrounding site

vegetation on site

site photos
5.4 design reflection

The design of the Dayton Center for Autism originated with the question: How can a specific user group’s set of unique perceptual experiences be used to create a specialized building environment that enhances this group’s ability to comprehend, interact with and navigate through the structure that surrounds them? After careful study of the perceptual experiences associated with autism and the possibilities for environmental intervention, the two most important points (the need for visual boundaries to delineate both space and activities and the difficulty children with autism tend to have with crossing physical thresholds) became driving forces of the overall formal design.

The therapy wings of the building are divided into three separate sections, each containing the same programmatic elements and formal characteristics. Visual rhythm and repetition, environmental characteristics that have been known to be helpful to students with autism, are the result of these three similar spaces. The three spaces also give students the opportunity to create a personal ritual upon arrival at the building; rather than arriving and automatically entering at one designated entrance, the student is able to learn his or her routine entrance in comparison to the others. Upon entry into their learning space, the student is visually presented with all rooms he or she might enter during a therapy session; the result of this is a decrease in anxiety normally associated with moving from unknown space to unknown space.

Within each of the three school spaces physical thresholds have been completely eliminated; where a normal room would have four walls and a door the rooms within this building have three walls and a fourth boundary created by a bleeding together of two different floor types (one originating in the hallway and one in the classroom itself). Each room is designated for a certain activity and assigned a specific wall color and floor color. The defined uses and their associated colors are learned as part of the therapy ritual for each child. Because the journey to each room is part of a larger routine, the visual boundary created by floor patterns and color is enough to keep a child focused on the task at hand.

Another architectural element that has been used to help children with the transition from one space to another is a visual and tactile handrail that runs along the walls of each therapy space and turns the corner at the end of each room and wraps around to the exterior, forming a band on the facades of the building. This element gives the children something to focus on. First, when they are in their car approaching the building they can follow this band visually. Children can constantly view this band from all viewpoints outside the building and in. Upon entering the building they can continue to follow the band as it turns into a handrail, providing something consistent to concentrate on.
as they move from space to space. The interior handrail portion of the band has three separate sections: a smooth section to aid in movement, a wavy section to provide a place for self-calming techniques, and a place too wide and too close to the wall to touch that becomes a signifier to the child that they are about to enter into a new space.
5.5

**design process**

**phase 1.1**

goal of this phase:
do directly relate the common characteristics of autism to elements of the built environment by creating “ideal situation” diagrams

focus after this phase:
to expand this diagram set into more three-dimensional ideas and to develop an overall formal concept

<table>
<thead>
<tr>
<th>Characteristic/symptom</th>
<th>Diagram Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unusual sensory perception</td>
<td>A</td>
</tr>
<tr>
<td>Repetition and rhythm in any shape or form</td>
<td>B</td>
</tr>
<tr>
<td>Color stripe, bead of wood, handrail or other things that will keep a level of visual or tactile consistencies while moving from space to space</td>
<td>C</td>
</tr>
<tr>
<td>Space in rooms to “escape” and learn calming techniques</td>
<td>D</td>
</tr>
<tr>
<td>Use of color to define space or to enhance/direct the activities or moods that take place within that space</td>
<td>E</td>
</tr>
<tr>
<td>Environments that react to the people who inhabit them</td>
<td>F</td>
</tr>
<tr>
<td>Clear boundaries define activity space</td>
<td>G</td>
</tr>
<tr>
<td>Environmental cues to activities, location, color, form, etc.</td>
<td>H</td>
</tr>
<tr>
<td>Repetition and rhythm in any shape or form</td>
<td>I</td>
</tr>
<tr>
<td>Visual cues to help with transitions through space</td>
<td>J</td>
</tr>
<tr>
<td>Color stripe, bead of wood, handrail or other things that will keep a level of visual or tactile consistencies while moving from space to space</td>
<td>K</td>
</tr>
<tr>
<td>Clear boundaries define activity space</td>
<td>L</td>
</tr>
<tr>
<td>Environments that react to the people who inhabit them</td>
<td>M</td>
</tr>
<tr>
<td>Use of color to define space or to enhance/direct the activities or moods that take place within that space</td>
<td>N</td>
</tr>
</tbody>
</table>

**Diagram:**

- Generous space standards: D
- Space in rooms to “escape” and learn calming techniques: G
- Environmental cues to activities, by location, color, form, etc.: F
- Clear boundaries define activity space: E
phase 1.1 continued
phase 1.2

goal of this phase:
to develop an overall formal concept based on circulation and connection between spaces. two main issues related to this:

1. trouble crossing thresholds
   possible solution: open plan, “empty space”
   problem: eliminates consistent boundaries, too much overwhelming space

2. need for clear boundaries for specific activities
   possible solution: separate rooms for different activities, hallways between spaces
   problem: long hallways can cause anxiety
   possible solution: partitions or moveable walls
   problem: trouble with day to day consistency of space

1 + 2 = overemphasized thresholds that become easily recognizable and create clear boundaries, “buildings within a building”

focus after this phase:
to turn this diagrammatic study into actual building form

buildings within a building

normal hallway
undistinguishable thresholds cause anxiety

eliminate hallway
thresholds are overemphasized and easily recognizable, gives visual clues stronger than doors possibly can, creates opportunity to aid in routine forming
**phase 2**

**goal of this phase:**
To create a wall section and wall screen system that allows for parents to observe therapy rooms below without interrupting the line of sight for students and also creates a sense of **repetition and rhythm** through space as a way of guiding students through hallways and slowly revealing to them to contents of the spaces which they are about to enter.

**focus after this phase:**
To apply the wall section and wall screen system to an building design that has taken into consideration programmatic and adjacency concerns.

**sphere diagram:** Space defined by a group of spheres that shrink and disappear to create occupied spaces.

**screen system:** Mimics the effects of the sphere diagram.

**wall sections:** Two iterations of wall sections that would take advantage of the developed screen.
**phase 3**

**goal of this phase:**
to develop a building design that focuses on the interior spaces and leads students through the space. Separate rooms are pushed out and others are pushed in, creating rhythm and an opportunity for students to recognize each room as its own separate entity. This design also focuses on the development of site strategies, creating paths for students to follow that begin the moment their car arrives on site and ends once the student is within their therapy space.

**focus after this phase:**
to develop more identifiable therapy spaces and continue to advance the focus on a guided path for each student as they move to their therapy space.
phase 3 continued

**adjacency diagram:** based on an early schematic design plan, adjacencies remain the same for this iteration

- **B:** repetition and rhythm in any shape or form
- **C:** environmental clues to activities: location, color, form, etc.
- **D:** color stripe, bead of wood, handrail or other things that will keep a level of visual or tactile consistencies while moving from space to space
- **E:** generous space standards

**possible methods of modifying a hallway:** based on the “ideal situation” diagrams in phase 1
phase 4.1

goal of this phase:
to create a building where each child has his or her own therapy building that they can recognize upon arrival on the site. Once the student has arrived on site, there is a visual handrail that leads them through their path from on site through each therapy space.

focus after this phase:
to take a step back and focus on a much smaller group of characteristics of autism. Focus will be on more appropriate use of the site and on architectural methods of separating parent/teacher spaces and students spaces.
phase 4.1 continued

north-south section A 1/8" = 1'-0"

north-south section B 1/8" = 1'-0"

sections: not to scale

first floor plan 1/8" = 1'-0"

second floor plan 1/8" = 1'-0"

plan: not to scale

exterior perspective

overview of interior therapy spaces
phase 5.1

goal of this phase:
to break the program into four separate buildings, three of which are used for therapy and one of which is used as a community resource center and is able to provide teacher work space. focus within the therapy buildings is on elimination of thresholds and on creating a consistent element that runs from the exterior of the building and through each interior space.

elimination of thresholds and boundaries achieved by:
1. interior spaces that consist of three walls and a fourth boundary created by a bleeding together of two different floor types (one originating in the hallway and one in the classroom itself) rather than four walls and a door

2. each room is designated for a certain activity and assigned a specific wall color and floor color, helps children learn a routine and have a less difficult time entering spaces

3. visual and tactile handrail that runs along the walls of each therapy space and turns the corner at the end of each room and wraps around to the exterior, forming a band on the facades of the building
   -children can constantly view this band from all viewpoints outside the building and in
   -children can continue to follow the band as it turns into a handrail, providing something consistent to concentrate on as they move from space to space
   -interior handrail has three separate sections:
     1. a smooth section to aid in movement
     2. a wavy section to provide a place for self-calming techniques
     3. a section too wide and too close to the wall to touch, becomes a signifier to the child that they are about to enter into a new space

focus after this phase:
to develop the handrail further and expand on the idea that it changes at specific places to signify different things to the child. to develop the floor patterns and materials in a way that allows each transition to bleed from one space to the next, rather than only selected transitions.
phase 5.1 continued

interior organization
view to therapy rooms and parent observation deck

interior organization
view to swing/sensory room and parent observation deck

group therapy
parent observation deck
individual therapy
entry

-swing/sensory room
restroom/storage
entry
parent observation deck
phase 5.1 continued

handrail detail
not to scale

exterior elevations
not to scale


accessed 26 April 2006.


Tipkemper Sparks, Amanda. Interview by author, 19 October 2006, Cincinnati. Written transcript. Cincinnati Center for Autism, Cincinnati.


Young, Eleanor. “Special deeds.” *RIBA journal* 111, no. 7 (July 2004): 58-60.