"Hitta hörn"
"Finding Corners"

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FINDING CORNERS
- HOW CAN ARCHITECTURE HELP CHILDREN CONCENTRATE BETTER?

Thesis project by
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How can architecture help children concentrate better?

My theory in starting this thesis project was that we as architects are generally quite good at accommodating to the needs of people with physical disabilities (not least because there is a lot of rules and regulations in Sweden regarding this), but when it comes to cognitive disabilities we know very little. My other theory was that when it comes to inclusion in school, it is mostly accomplished through teaching manners, and not so much in the physical environment.

According to Sweden legislation, all children have the right to choose which school they want to attend, regardless if they have physical or cognitive disabilities. The school is required to make the adjustments necessary for the child to succeed academically and socially in school.

My second theory was that when it comes to inclusion in school, most of these adjustments are accomplished through teaching manners, and not so much through changes in the physical environment.

It is my firm belief that if we, as architects, could learn more about cognitive disabilities, and design spaces better adjusted to their conditions, this would result in better learning environments, that would benefit all children.

THESIS QUESTION

How can architecture help children concentrate better?

Neurodevelopmental Disorders or NDD is an umbrella term that includes ADHD (Attention Deficit Hyperactivity Disorder), ASD (Autism Spectrum Disorder), Specific Language Disorder and more. Moreover, many children with these diagnoses also suffer from ODD (Oppositional Defiant Disorder), Anxiety or Depression.

Research shows that this is a very diverse group, which in turn consists of individuals, so the needs of these children is of course varying. However, a few common denominators can be derived which have been concentrated into three guiding principles for the project.
KEYWORDS

This list of important aspects to take into account has been compiled through interviews, study visits and literature studies. The goal and key question has been: how can the physical environment be changed to better help the students succeed, conserve energy, and be content and safe.

- Small separate rooms for rest or individual work
- Many small rooms (group work rooms)
- Small rooms with access directly from the classroom
- No glass between corridor and classroom
- Moderate amounts of glass between corridor and classroom
- No windows toward the school yard
- High windows if possible
- Sense of participation rather than exclusion/separation
- Sensitivity to sensual impressions: sound, light, color, clutter, movement of others
- Sound proofing
- No long corridors/runways
- Lines painted directly on the floor to create "traffic lines" guiding the way ("Follow the red line")
- Spacious cloakrooms
- Safe and quiet corners
- Peaceful (not bright) colors, preferably from nature
- Canteen - divided into smaller rooms, ability to eat lunch alone or in smaller groups
- Good lighting conditions, no fluorescent lights
- Plan that is simple/easy to understand
- Not too much stimulus
- Not too little stimulus
- Toilets, not directly from corridor/cloak room, ante room, attention complex of problems

THREE GUIDING PRINCIPLES

CLEAR ORGANIZATION

A comprehensible structure and order is essential to all spaces and buildings, which need to be clear and easily oriented. This might be accomplished through color coding or differentiating materials. Design so that one “accidentally” does the right thing.

BALANCE LARGE VS SMALL

The division of a larger entity into smaller entities allows for a greater measure of control of the interaction between students and classes, to ensure a balance between the safety of a small group and the possibility to learn and grow from other groups. Nitches, nooks and corners connected to each area allows for a child to withdraw to a safe space, while still feeling connected to the group.

CONTROL SENSUAL IMPRESSIONS

Many children with NDD also have sensual disorders or are hypersensitive to light, sound, touch or other peoples movements. It is important to be able to control light, sound, visual clutter and social interactions. Colors should be kept to a neutral scale and not to bright. Soundproofing should be a priority, ventilation silent, storage hidden.
01 SIMPLIFY ORGANISATION
Imagine that you can not easily find your way, due to cognitive disabilities. Then imagine that your workplace is a maze. And that you need to try and find your way, every single day. Don’t do this.
Simplify organisation, in terms of how buildings are oriented, and how rooms relate to each other. Use shape, color and smart signage to signify different areas and parts of buildings, so that it is easy to orient yourself at a glance, even if you have temporarily forgotten where you are.

02 OFFER A VARIETY OF SPACES
Large rooms, small rooms
Silent rooms, room where speaking, moving around and group work is allowed
Light rooms, dark rooms
Rooms with high ceilings that improve learning, rooms with low ceilings that offer cozy and relaxed spaces.
Rooms within rooms, nooks, corners
Allow space for differences, and connected spaces so that a sense of togetherness is perceived.
Offer enough space for each child. Research suggests that ~3.7 m² per child is optimal for learning.
Program spaces so that a child knows what is expected of him or her in that space

03 PREPARATION THROUGH THRESHOLD ZONES
Many children with NDD, and others too, need clear preparations for what is going to happen next. Schedules, lists, clocks, countdown strategies are examples of how this happens in teaching manners.
In architectural terms, the spaces themselves and the material changes can be part of preparing a child for what is coming next.
Let there be clues in the physical surrounding that helps the child navigate space and time. Some examples are material changes from public spaces to private spaces, threshold zones where there is a soft transition from a large space to a smaller space, it can be as simple as change of direction in a floor material, or a few painted stripes on a wall.

04 CONSIDER WINDOWS AND VIEWS CAREFULLY
Windows of classrooms should be facing away from the schoolyard to avoid disturbing noises and movement.
Windows of classrooms should preferably be facing north, to avoid glare and direct sunlight.
An average of 3-4 windows per room is preferable, each window means another “room” that a child needs to consider before being able to concentrate at tasks at hand, which is energy consuming.
All windows should be placed on the same wall.
Views of built environments is beneficial for concentration for children with ADHD.

05 ACOUSTICS MATTER
A good acoustic environment improves learning and concentration for all children, and noise can be particularly harmful for the learning environment for NDD children.
Carpets are beneficial in classrooms, as well as good sound proofing in walls and ceilings.
Classrooms should face away from disturbing roads etc.
Concrete slab flooring offers better acoustic qualities compared to wood or similar.
Ventilation should be as silent as possible.

06 LIGHT IS ESSENTIAL
Ample daylight is important in the learning environment, as well as for general well being.
Artificial light should be of good quality LED.
LYSRÖR OBS!
The possibility to control light is important.
Classroom windows should face north to avoid glare and reflections. Direct sunlight is harmful for concentration, as much as 50% of all children immediately quit the task at hand if direct sunlight falls on their desk or work space.
07 CONTROL SOCIAL INTERACTION

The optimal school unit size for children with NDD seems to be ~200 children, according to some sources. If it is not possible to build schools of this size for efficiency reasons, then there should be clear divisions of the school into smaller units, where the amount of social interaction can be controlled. Allow for flexible schedules so that all children do not need to arrive at the same time, crowding entrances, and flexible rooms where children and staff can come and go without having to pass too close to each other.

08 CANTEEN - SOCIAL HUB OR NIGHTMARE?

The canteen of a school is often a very stressful environment for children, not only those with cognitive difficulties. When possible the canteen should be divided into smaller rooms or clearly divided areas so that everyone can find a safe space to eat. It is desirable to offer eating spaces within the child’s own unit, to limit stressful events. If every child is offered the choice to eat in their own unit, or to venture out to the larger canteen, then no-one needs to feel singled out.

09 CONNECTION BETWEEN SMALL AND LARGE

If a child cannot concentrate in the classroom it is common that he or she is sent to a group room down the hall, separated from all other children. This creates a sense of failure and does not help the child succeed. If he or she can instead find a corner or secluded space in the classroom this creates a sense of togetherness, but without disturbance in either direction. Niches, chairs with high backs, corners, deep windows etc are optimal.

10 AVOID SENSORY OVERLOAD

Acoustics and light have already been considered, but for children with NDD, it is very common to be overly sensitive so all sensory input must be considered, including visual clutter and color. Most storage should be hidden. At least one wall in each classroom should be kept free from decoration. Colors should not be too bright or artificial. Best colors are those that can be found in nature, muted greens, blues with some accents.

11 LET SPACES BE ALLOWING

In schools, a lot of time is spent to make children behave a certain way, and thus suppressing many of the natural urges children have, especially those that might be hyperactive, introvert, or otherwise challenging the norm. Let spaces be allowing for movement as well as creating spaces that encourage the opposite. Create spaces where children can be children.

12 REMEMBER TEACHERS, STAFF AND PARENTS

The school is there for children's education, but it is also a work space for teachers and staff and a place that is visited daily by parents and others. Physical space is no doubt an important factor in children's education, however it is still less important than the people a child meets every day, and their attitudes towards education, inclusion and pedagogy. All staff who interact with children need continuous education about NDD and how to relate to these children, and ALL children, including how to use the physical space in the best way. Key factors for success: knowledge, curiosity, relationship.
SITE ANALYSIS

Gotland is approximately 176 km long and 52 km wide and has a population of 57,200 people. The municipality has an ambition to grow the population, but despite this it has been more or less constant during the last ten years.

Gotland is located on the island Gotland, just outside the east coast of Sweden (also Sweden’s largest island). Gotland has the largest percentage of children diagnosed with ADHD in Sweden, 7% in relation to national average of 3-5%. Research shows that this is a common situation in islands. Iceland for instance has an average of 9% ADHD diagnoses in boys, ADHD is highly hereditary, and islands, with their limited genetic pool, will show a higher concentration of diagnoses.

Gotland’s main city is Visby, with about 23,600 inhabitants. The city is known for its medieval central parts, named World Heritage by UNESCO in 1995.

The city is expanding and many housing projects are under way (Many apartments are bought as investments by wealthy people living in Stockholm and elsewhere in Sweden. These are then used for a couple of weeks in the summer, and rented the rest of the year)

The city also sees its share of urbanization, with people moving in from other parts of the island so there is a need for a new school in the south part of the city.

The actual site is situated a couple of kilometers south of Visby, in a former military area called Visborg. The area now houses the municipality, a number of industries and businesses and planning work is under way to transform the area into a mixed use area adding housing and commercial premises.

The school planned is for the ages 6-12, and with three parallel classes in each age group. With an average of 23-25 pupils in each class gives approximately 500 pupils.
Trim Castle, Ireland

**Reflection**
Original poché in intricate patterns
Tectonics give way to using the wall thickness as programmed space
One open central room with smaller spaces attached.
Sense of stability, power, age, safety

**Aspects to bring into project**
Multiple uses of deep walls
Connection between large, communal room, and smaller, intimate spaces.
Fredriksborg housing
Jorn Utzon

Reflection
L-shaped buildings connected along a meandering path, surrounded by a grassy landscape. Walls surrounding each house have different heights, allowing for varying amounts of privacy and views.

Aspects to bring into project
Ways to connect L-shaped forms (in my case classrooms, in this case houses)
Walls in different heights
Montessori school
Herman Hertzberger

Reflection
L-shaped classrooms
Each classroom is a self sustaining unit
Principle allows for extension by adding one unit after another
Balance between class spaces, and common spaces, good and bad
Redundancy in some aspects

Aspects to bring into project
L-shaped classrooms
Lighting from several directions, high/low, direct/indirect
Entry directly from outside
School of Architecture
Tham & Videgård

Reflection
Looks smaller from the outside, than it actually is
Fits well in it's surrounding
Great use of materials
Aesthetically pleasing
Confusing and hard to navigate
Bad acoustics
No/small floor signs etc
Every floor is basically one big room, nowhere to withdraw for secluded work

Aspects to bring into project
Poche
Use of materials
Improve organisation and structure
Signs and colors for easier navigation
Division into smaller rooms, rather than large open spaces
BRICK

Brick has excellent acoustic qualities, it conveys a sense of value and stability and it stands the test of time. It’s been commonly used in schools all over Sweden.

Visborgs school will utilise double brick walls, where all external walls are load bearing, and with visible brick to the interior.
MODEL PHOTOS WITH ILLUSTRATIONS
ADHD/ADD
Attention Deficit Hyperactivity Disorder

What is it?
ADHD is a brain disorder marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development.

Inattention means a person wanders off task, lacks persistence, has difficulty sustaining focus, and is disorganized; and these problems are not due to defiance or lack of comprehension.

Hyperactivity means a person seems to move about constantly, including in situations in which it is not appropriate; or excessively fidgets, taps, or talks. In adults, it may be extreme restlessness or wearing others out with constant activity.

Impulsivity means a person makes hasty actions that occur in the moment without first thinking about them and that may have high potential for harm; or a desire for immediate rewards or inability to delay gratification. An impulsive person may be socially intrusive and excessively interrupt others or make important decisions without considering the long-term consequences.

Statistics show that between 3-7% of the population has ADHD, with significant spikes in island dwellers.

Needs in the classroom
A child with ADHD often needs to have their own designated place, preferably close to the teacher. They can sit near a window, but not facing the school yard. They need to have storage nearby, so that focus is not broken by the need to fetch a pen or book. Small study room adjacent to classroom is beneficial at times.

An “SOS-box” can be a life saver, including things like hearing protection, a soft rubber pillow to sit on (allowing children to move about without disturbing their friends) and different tangles and fidget toys. Any student is allowed to use the SOS-box, and no children are singled out or stamped as troublesome.

ASD
Autism Spectrum Disorder

What is it?
Autism spectrum disorder (ASD) is the name for a group of developmental disorders. ASD includes a wide range, “a spectrum,” of symptoms, skills, and levels of disability.

People with ASD often have these characteristics:
- Ongoing social problems that include difficulty communicating and interacting with others
- Repetitive behaviors as well as limited interests or activities
- Symptoms that typically are recognized in the first two years of life
- Symptoms that hurt the individual’s ability to function socially, at school or work, or other areas of life

Some people are mildly impaired by their symptoms, while others are severely disabled. Around 1 in 68 children has been identified with some form of ASD. One form of ASD was previously called Asperger’s syndrome.

Needs in the classroom
The needs of children with autism differ wildly, naturally, and a teacher will have to be flexible.

A child with autism most often has trouble understanding their friend’s feelings and might blurt out things that they find hurtful. They can be both amenable and intelligent, but have trouble filtering information, which causes information overload in their brain, as a ticking clock and a shadow’s movement on pavement will take the same importance as a teacher’s lecture or the book he reads. Silent ventilation, good lighting that is not fluorescent (this can be perceived like strobe lights for someone with extrasensory perception), and protections against direct sunlight into the room.

In the classroom they often need their own place or desk, and their own storage space that he may arrange any way they want. They benefit from sitting close to the teacher so that they may receive help in interpreting social interactions. Patterns may distract and almost hypnotize a person with autism, so keeping decorations to a minimum is imperative, as is good acoustics.
Developmental language disorder

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- Symptoms that typically are recognized in the first two years of life
- Symptoms that hurt the individual’s ability to function socially, at school or work, or other areas of life
- Some people are mildly impaired by their symptoms, while others are severely disabled. Treatment and services can improve a person’s symptoms and ability to function. Families with concerns should talk to their pediatrician about what they’ve observed and the possibility of ASD screening. According to the Centers for Disease Control and Prevention (CDC) around 1 in 68 children has been identified with some form of ASD.

What is the difference between Asperger's syndrome and ASD?
In the past, Asperger's syndrome and Autistic Disorder were separate disorders. They were listed as subcategories within the diagnosis of “Pervasive Developmental Disorders.” However, this separation has changed. The latest edition of the manual from the American Psychiatric Association, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), does not highlight subcategories of a larger disorder. The manual includes the range of characteristics and severity within one category. People whose symptoms were previously diagnosed as Asperger's syndrome or Autistic Disorder are now included as part of the category called Autism Spectrum Disorder (ASD).

ODD, Anxiety and Depression

What is it?
ODD (Oppositional Defiant Disorder) is a childhood disorder that is defined by a pattern of hostile, defiant, and defiant behaviors directed at adults or other authority figures. ODD is also characterized by children displaying angry and irritable moods, as well as argumentative and vindictive behaviors.

Anxiety disorders are a group of mental disorders characterized by feelings of anxiety and fear. Anxiety is a worry about future events and fear is a reaction to current events. These feelings may cause physical symptoms, such as a fast heart rate and shakiness.

Depression is a state of low mood and aversion to activity that can affect a person’s thoughts, behavior, feelings, and sense of well-being.

Needs in the classroom

ODD: (Oppositional Defiant Disorder) and Anxiety and Depression may also be present.[5] Needs in the classroom
Chamfered niche, opening

Vertical niches, engaging edges, exploring depth
Scattered niches, exploring depth

Stepping niche
Cube split into two L-shaped volumes

Cube split by regular L-shape

Skewed L-shape

Cube split by zig zag line
65% of parents of children with NDD work less than full time

43% of parents of children with NDD are, or have been, on sick leave for stress related reasons

Parents of children with NDD have a higher risk of divorce

Children with NDD have a higher risk of suffering from depression

Knowledge about NDD is not taught in teaching colleges, and is taught only since 2017 to special education teachers.

55% of children with autism end school without passing grades

Cost of one child outside school system: 350,000 kr/year

21% of children with Asperger's have stayed home from school for more than a month

21% of children with Asperger's have stayed home from school for more than a month

30-45% of interns in Swedish correctional facilities reach criteria for ADHD