



MASTERS RESEARCH  
(HUMAN AND SOCIAL SCIENCES)

**EXPLORING EARLY DEVELOPMENT WITH CHILDREN DIAGNOSED  
WITH AUTISM AND ITS IMPACT ON THE BUILT FORM:** A proposed  
centre for children with an autism spectrum disorder in eThekweni, South Africa

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A Dissertation Submitted in partial fulfilment of the requirements for the degree of Master of Architecture to The School  
of Built Environment and Development Studies University of KwaZulu-Natal Durban, South Africa, (Month) 2022

# DECLARATION

I hereby declare:

1. The research reported in this thesis, except where otherwise indicated, is my original research.
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5. This dissertation is being submitted for the degree of master's in architecture in the faculty of Humanities in the School of Built Environment & Development Studies, Kwa- Zulu Natal, Durban, South Africa.

July 2023



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- To the teachers and staff of my study sites, thank you for granting me access to your facilities and for being so generous with your time. Your interest and involvement reassured me that my topic was important and relevant.
- To my wife, Chanelle Bosiger, who has been my source of inspiration and constant support.
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# DEDICATION

I would like to express my gratitude to my wonderful and understanding mother, Dale Bosiger, who always inspired me to persevere no matter what obstacles I faced in life. A special thanks goes out to my wife, Chanelle Bosiger, who has been there for me throughout this entire process. Thank you for being able to understand and accept the sacrifices that have been made in order to assist me in accomplishing my long-term goal.

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In conclusion, I would like to dedicate this dissertation to all of the children in South Africa who are in need of early childhood development. The process of gathering and analysing research opened my eyes to the significance of early childhood development, particularly the requirement for specialised facilities to support children who have special needs.

# ABSTRACT

The period of early childhood development, which spans from birth to seven years, is a critical stage of rapid growth and development across mental, physical, emotional, social, and moral domains. This period is especially important for autistic children aged 2 to 7 years, who have various sensitivities that can impact their experiences in the built environment. Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disability that affects 1 in 44 people worldwide and is characterized by developmental deficits. Despite the prevalence of ASD in children, the special needs of these children have not been adequately addressed in the design of environments for early childhood development. Therefore, the aim of this research is to explore and understand the unique needs and sensitivities associated with ASD and investigate their impact on the built environment.

To understand the impact of sensitivities associated with Autism Spectrum Disorder (ASD) on the design of environments, a qualitative interpretive approach was used. Semi-structured interviews were conducted with eleven participants from two facilities, namely Thanda Early Childhood Development Centre (four participants) and Bloom Centre (seven participants). Thematic analysis was applied to identify and extract themes and subthemes from the data. The analysis revealed two overarching themes: Developmental Environment and Social Environment, which related closely to the literature review findings on the impact of sensitivities associated with ASD on the design of environments.

Furthermore, the sensitivities experienced by autistic children have a profound impact on the design of early developmental spaces. Consideration of natural light, neutral colours, and acoustical control is crucial to reducing sensory overload and facilitating ease of perception of the environment. The design of designated spaces for sensory regulation or escape is also of utmost importance to ensure that children feel safe within their environment. Quiet spaces and areas for social activities are equally crucial elements of the design. Additionally, safety measures must be put in place to ensure the well-being of children. Finally, the connection between a child and nature is imperative for their holistic development and exploration of the world around them.

The key findings of this research demonstrate how architecture plays a crucial role in inducing safety and defining a feeling of well-being for children with autism spectrum disorder. The design of positive and efficient environments can significantly impact how children act and feel and is essential to ensuring that they feel safe and nurtured. The study also highlights the importance of a child's perception of their environment in fostering holistic development. In light of these findings, this study will culminate in a design brief for a specialized early childhood development centre in eThekweni, South Africa, catering to the needs of children aged 2 to 7 years with autism spectrum disorder.

To further advance the knowledge in the field, it is recommended to conduct research on how the sensitivities of older children with autism impact the built environment and explore the possibility of providing more inclusive educational settings beyond early childhood development.

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## DEFINITION OF TERMS

**Architecture:** Architecture is responsible for creating environments that address the needs of society.

**ASPECTS™:** Design Index for design guidelines to address built environments for individuals with Autism Spectrum Disorder (Mostafa, 2018).

**Autism spectrum disorder (ASD):** Autism Spectrum Disorders are complex developmental disorders marked by social and communication deficits, repetitive behaviour's, sensory processing difficulties, and cognitive inflexibility (Landrigan, 2010) ASD is referred to as a spectrum disorder because each individual varies in types of symptoms, severity, and level of functioning. (Gaines et al., 2016)

**Biophilia Design:** is the deliberate attempt to translate an understanding of the inherent human affinity with natural systems and processes into the built environment (Kellert et al., 2011)

**Built Environment:** The building's function, shape, and configuration, as well as its relationship to the surrounding environment (Gaines *et al.*, 2016).

**Childhood development:** Process by which a child develops mentally, physically, and cognitively over time (Skweyiya, 2006).

**Early Childhood Development:** A comprehensive approach to developing a child from an early age, specifically from birth to 7 years (Africa, 2015).

**Hyper-Sensitive:** Individuals with ASD that have heightened arousal toward or over-reactive to environmental stimuli pertaining to the five senses. Children that are hyper-sensitive are easily aroused by their surrounding environment and are significantly slower in adjusting to their surroundings than other children (Volkmar et al., 2014).

**Hypo-Sensitive:** Individuals with ASD that have hypo-arousal toward or are under-reactive to stimuli pertaining to the five senses (Volkmar et al., 2014).

**Repetitive Behaviour's:** include stereotypical and repetitive body movements, compulsive behaviour's, insistence on sameness in the environment and routines, strict focus on parts of details (Gabriels *et al.*, 2008).

**Sensory Design:** Sensory design involves the careful consideration to all the senses. Sound, touch, and smell are treated as equally important as sight (Malnar et al., 2004).

**Sensory Overload:** An overwhelming sensory experience that occurs when a child with ASD is trying to process too much sensory stimuli received from one's environment. (Gabriels *et al.*, 2008)

**Sensory Seeking:** the constant attempt to create predictable, repetitive sensory input to block out unpleasant sensory stimuli when over-stimulated or under stimulated. (Ashburner *et al.*, 2008)

**Sensory stimuli:** Any event or object that is received by the senses and elicits a response from a person. The stimulus can come in many forms such as light, heat, sound, touch, as well as from internal factors (Volkmar, 2021).

**Spatial Sequencing:** Zoning or spatial sequencing involves the organization of spaces into different zones or spaces each with its own function or activity based on the user's typical schedule use of such spaces (Mostafa, 2018).

# LIST OF ACRONYMS

ABA: Applied Behaviour Analysis

ADHD: Attention Deficit Hyperactivity Disorder.

AED: Automated External Defibrillator

ASD: Autism Spectrum Disorder

CCTV: Closed Circuit Television

CDC: Centres for Disease Control and Prevention

DIR: Developmental, Individual Difference, Relationship-based

ECD: Early Childhood Development

IQ: Intelligence quotient

LBC: Living building challenge

NDP: National Development Plan

OT: Occupational Therapy

PODD: Pragmatic Organisation Dynamic Display

STEM: Science, Technology, Engineering, Mathematics

TEACCH: Treatment and Education of Autistic and Related Communication-handicapped Children

# **PART ONE**

## **BACKGROUND TO RESEARCH**





Figure 1-1 Figure showing research document word cloud (Author)

## 1.1 INTRODUCTION

Chapter one of this dissertation provides a comprehensive overview of the social needs of early childhood development centres and children with autism. It highlights the importance of the built environment in addressing the needs, drawing on relevant literature to support its findings. Additionally, this chapter introduces the research problem, the study's aims and objectives, and the theoretical and conceptual framework to help readers navigate through the content. It outlines the structure of the thesis and describes the study's methodology.

### 1.1.1 Background

2015 National Integrated Early Childhood Development Policy defines ECD centres as care facilities that provide early learning and development for children from birth to Grade R (Africa, 2015). Its purpose is to assist children in developing complete emotional, cognitive, and social aspects of life, directly impacting their overall development leading to adulthood (Africa, 2021). Understanding the importance of investing in children at a young age is critical, as the development of young children will shape society's future (Mustard, 2010). Early childhood development (ECD) is a worldwide issue, with over 200 million children needing early development interventions (Putcha *et al.*, 2015). ECD centres help protect children from malnutrition, insufficient access to health care, and a lack of education during their formative years (Putcha *et al.*, 2015). The South African government has recognized the need to increase ECD access for children aged 0 to 6, as outlined in the National Development Plan (NDP) - Vision for 2030 (Africa, 2015). Many children in South Africa enter formal school at 6 to 7 years old, with no access to high-quality ECD programs. As a result, the children are ill-prepared for the rigours of school, where they are less likely to perform well academically and are more likely to drop out before reaching matric (Van Niekerk *et al.*, 2017). Understanding the importance of investing in children at a young age is crucial, as the development of young children will shape society's future (Mustard, 2010).

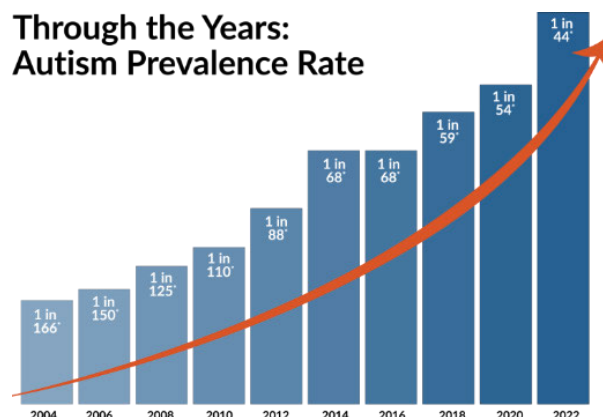
Early childhood development professionals can be crucial in assisting children with autism and other developmental difficulties. While professionals are responsible for diagnosing autism spectrum disorder in young children and providing specialised therapies, early childhood development carers can play a significant role in assisting these children (Office of Early childhood development, 2013). There is insufficient public-sector infrastructure dedicated to the development of children who have autism spectrum disorder (ASD), in particular in South Africa (Naidoo, 2021).

Autism Spectrum Disorder (ASD), as illustrated in Figure 1-1-1, is one of the world's fastest-growing developmental disorders (Li *et al.*, 2019), with health experts estimating that 1 out of every 44

children worldwide suffer from some form of autism (CDC&P, 2022), and is largely overlooked in the design of appropriate spaces (Mostafa, 2008).

In South Africa, more rural areas have a harder time finding adequate schools and other facilities, where some provinces do not have any schools that are designed specifically for children with autism. Juliet from Autism SA was quoted in the article by Tsewu (2022) entitled Inadequate support and facilities for autistic children in South Africa, decried an injustice by experts, *“that in many provinces, autistic children are placed in schools for children with profound intellectual disabilities, which is an injustice on the child”*. The

**Through the Years:  
Autism Prevalence Rate**



\*Centers for Disease Control and Prevention prevalence estimates are for four years prior to the report data.

Figure 1-1-1 Graph showing growth of ASD  
(CDC&P, 2022) [Accessed 11/02/2022]

lack of public schools for children with ASD is concerning; the provinces with dedicated public schools for autistic children are the Western Cape, Gauteng, and Eastern Cape. Provinces with no dedicated schools for Autistic children are Free State, KwaZulu-Natal, Limpopo, Mpumalanga, North West, and the Northern Cape (Naidoo, 2021). Each child is unique, and their needs and support are different. Each province has its own unique sets of challenges, but unfortunately, due to autism not being listed on the national census, there are no reliable statistics (Tsewu, 2022). However, there is no reason to believe they are lower than international statistics (Zeliadt, 2017).

Faras *et al.* (2010) argue that children on the autism spectrum battle with impaired communication, social abilities and repetitive patterns of behaviour or interests. Research by Engelbrecht *et al.* (2016) shows that mainstream schools are not fully educated on providing for autistic children and giving them the support they need. Gaines *et al.* (2016) argue that “individuals on the spectrum are more sensitive to their physical surroundings than the average child”. Research by Helt *et al.* (2008) shows that through early intervention and treatment during child development stages, some children with autism progress so much that they are no longer on the spectrum when they are older, this provides the possibility of developing social ties in the greater community.

### 1.1.2 Motivation/ Justification Of The Study

Given the limited availability of early childhood development centres that cater to children with Autism Spectrum Disorder (ASD), it is imperative to establish early childhood development infrastructure that can support families in providing timely interventions for their child's growth and development. The South African Guidelines for Early Childhood Development Services do not provide explicit design specifications for Early Childhood Development centres catering to children

diagnosed with Autism Spectrum Disorder. The existing guidelines have a general scope covering disabilities but do not directly address the specific needs and sensitivities of ASD children.

Autistic children require specialized care and a tailored approach to their development (Engelbrecht *et al.*, 2016). Early childhood development centres that specialise in the development of autistic children can provide the necessary support, programs and services that are specifically designed to meet their needs (Handleman *et al.*, 2001). Autistic children often struggle with social issues, and specialized centres may provide a structured and supportive environment for children to develop social skills, make friends and form relationships with peers (Faras *et al.*, 2010). Early childhood development centres that specialise in autism can provide an inclusive environment that accommodates children with varying levels of abilities and needs. This creates a supportive and nurturing environment where autistic children can learn and grow alongside their peers. These centres also provide support for parents and families of autistic children. Parents can access resources and guidance on how to support their child's development, manage their challenging behaviours and understand better the sensitivities associated with their child's diagnosis.

## 1.2 DEFINITIONS OF THE PROBLEM, AIMS AND OBJECTIONS

### 1.2.1 Definition of the problem

In South Africa, the impact of the built environments on childhood development is seldom considered. Architecture is responsible for creating environments that address not only society's general needs but also individuals' needs (Mostafa, 2008). From inducing safety, defining well-being, or creating a positive and efficient environment, space can impact how we act or feel; therefore, design and creative measures should be considered according to the occupants' (Harrouk, 2020).

Global Research indicates that children's critical years of development are in their early years. The extract below from the South African Guidelines for Early Childhood development services document reads as follows:

*“From birth to seven years is a period of rapid mental, physical, emotional, social, and moral growth, and development. The early years of a child's life are a time when they acquire concepts, skills and attitudes that lay the foundation for lifelong learning. These include the acquisition of language, perceptual-motor skills required for learning to read and write, basic numeracy concepts and skills, problem-solving skills, a love of learning and the establishment and maintenance of relationships. The early years have been recognized as the ideal phase for the passing on values that are important for the building of a peaceful, prosperous, and democratic society.”* (Skweyiya, 2006)

Globally, health experts estimating that 1 out of every 44 children worldwide have some form of autism (CDC&P, 2022). The onset of ASD in children begins before the age of three years and can last throughout a person's life. Behavioural symptoms of ASD often appear in the early development of children. With early intervention and treatment during the development stages, some children with autism progress so much that they are no longer on the spectrum for autism when they are older.

The number of public schools in South Africa dedicated to autistic children varies by province. Some provinces only provide special needs schools where autistic children may be admitted, leaving the staff unprepared to handle the children's needs (Naidoo, 2021). As a result, parents and children are left with limited support from the current school system, which cannot accommodate children with autism. As a result, establishing appropriate ECD for autistic children is critical.

A study conducted by Human Rights Watch in 2015 elaborates on the issue:

*“Several factors underpin these problems, including undercounting children with disabilities in governmental data, inadequate funding for inclusive education, and lack of adequate information and support services for parents, families, and children with disabilities.”* (Martínez, 2015)

Early childhood development centres that support children with ASD require different environmental design strategies to aid their development and integration into mainstream society. There is a growing consensus that an appropriate classroom environment will aid in the children's performance with ASD (Keith Mcallister, 2012).

### 1.2.2 Aim of the study

The aim of the study is to explore and understand early childhood development in children diagnosed with ASD aged 2 to 7 years and how they are impacted by built form. This exploration will focus on the positive development, learning styles, human sensory receptors & the use of nature through architecture that generates an environment suited to the needs of children diagnosed with ASD.

### 1.2.3 Research Objectives

The objectives of the research are to:

1. Explore and analyse the developmental needs and learning styles of children diagnosed with ASD compared to children without ASD and how they are impacted by built form.
2. Develop an understanding of children diagnosed with ASD and their human sensory receptors and how they are impacted by built form.

3. Explore the impact nature has on children diagnosed with ASD in their early development stages and how they are impacted by built form.
4. Assimilate how early development of children diagnosed with ASD is impacted by built form through a proposed centre for children with an autism spectrum disorder in eThekweni, South Africa.

## 1.3 SETTING OUT THE SCOPE

### 1.3.1 Delimitation of research problem

The study is in the field of architecture. While some understanding of education, developmental psychology, and behavioural psychology is required, the focus will remain within the limits of architecture within the purview of a master's degree in architecture research project.

The research does not suggest that architectural design alone can solve the challenges faced by autistic children between the ages of 2 and 7, nor can it replace traditional therapies and interventions. Rather, the research seeks to comprehend the developmental obstacles that autistic children encounter in their early years and how these challenges impact the design of buildings. Additionally, it outlines specific architectural design principles that can be used to address the issue of designing buildings for specialised early childhood development centres. The study concentrates on centres for early childhood learning and does not involve personal or medical records. Instead, teachers' general observations of how the children experience the built environment are taken into account during primary data collection. This knowledge is then applied to a specific context, namely a specialized centre for autistic children located in eThekweni, South Africa.

### 1.3.2 Stating the assumptions.

The assumption is made that the importance of early development in children shapes the future of society. The role of architecture can play a pivotal role in shaping society when it answers to the specific needs of individuals.

### 1.3.3 Primary Question

How can architecture contribute toward creating positive spaces for the early development of children diagnosed with ASD?

### 1.3.4 Secondary Questions

1. What learning spaces allow for the developmental needs and learning styles of ASD children?

2. How do children aged 2 to 7 years diagnosed with ASD experience their human sensory receptors, and what impact does this have on the space around them?
3. How does nature impact the early development stages of children diagnosed with ASD, and how can this be applied to the built form?
4. What principles can be applied to create positive spaces for the early development of children diagnosed with ASD in eThekweni, South Africa?

## 1.4 THEORETICAL FRAMEWORK

The foundation of this research is investigated from the perspective of various theories and conceptual frameworks. The primary paradigm is phenomenology. Phenomenology is the study of the connection that can be made between a person and their surrounding environment through the use of architecture (Nesbitt, 1996). The theories and concepts are chosen to provide a lens through which the literature will be analysed within the framework of this study. These theories and concepts extend into the built form emphasising the importance of healthy environments for early childhood development (Refer to figure 1-4-1).

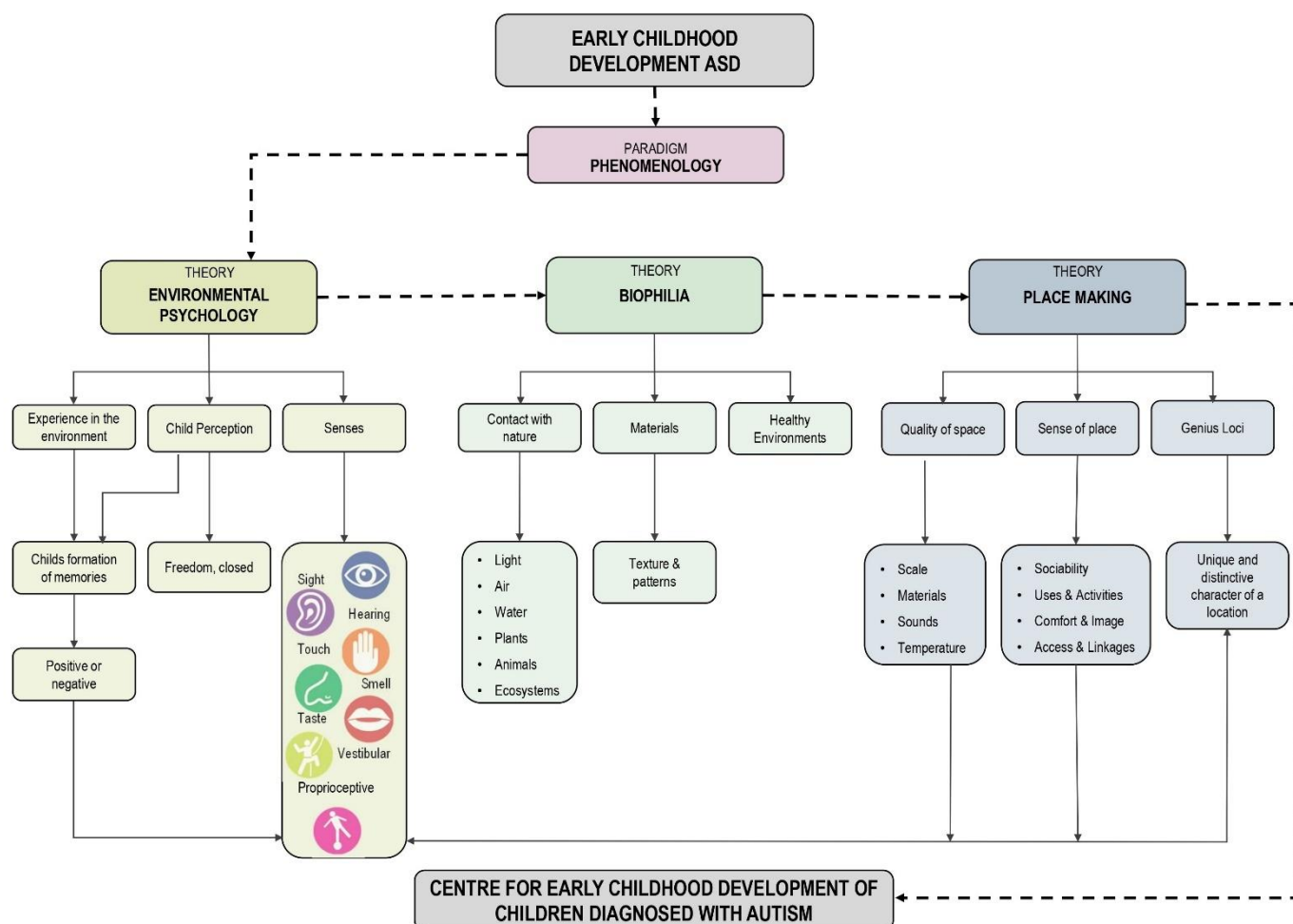


Figure 1-4-1 Theoretical and Conceptual Mind Map presents the theoretical framework (Author, 2021)

## 1.5 RESEARCH METHODOLOGY

### 1.5.1 Introduction

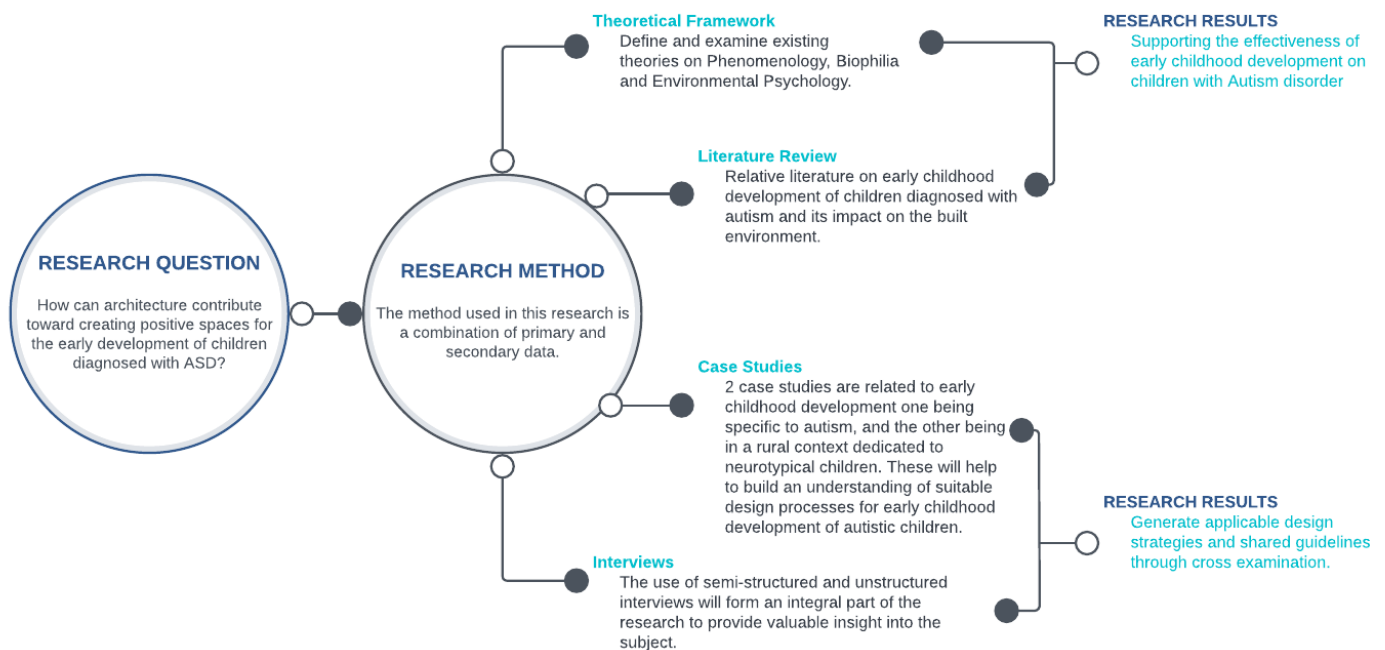


Figure 1-5-1-1 Research methodology Mind Map (Author, 2021)

This research aims to understand how early childhood development impacts the built form, specifically children diagnosed with ASD. The research methodology will make use of primary and secondary data collection strategies. A qualitative approach will be used, as the research will be based on human senses, experience, and perception.

### 1.5.2 Research philosophy and strategy

An interpretive approach will be taken when conducting research. The research will develop from the ground up through an inductive approach linked to qualitative research to understand how children with ASD impact the built environment. Significant research will be collected for primary data and secondary data relating to early childhood development in children and children diagnosed with ASD. The time horizon for this study will be done in a cross-sectional approach due to the limited time constraints of research. The instruments used to collect primary and secondary data for this research paper will consist of Primary Data - interviews,

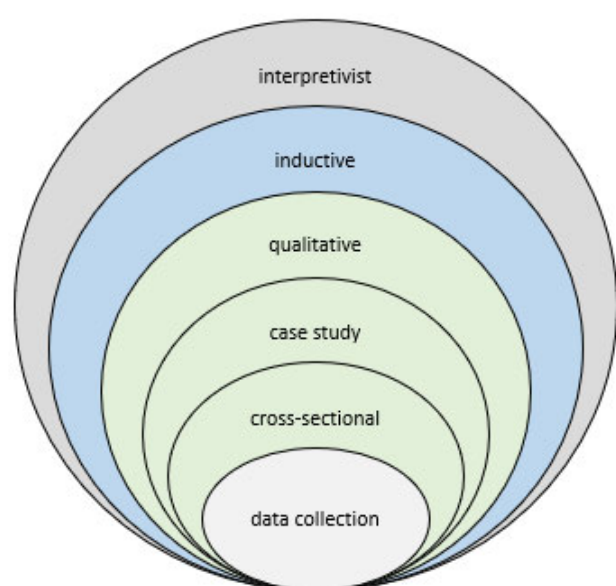


Figure 1-5-2-1 Summary mind map of philosophy and strategy (Author, 2021)

the



participatory observation, case studies, secondary data - literature reviews and precedent studies. All interviews and discussions will be done with the consent of the participants. Data will be analysed will be through a thematic method.

### 1.5.3 Secondary data collection

- Literature review:

The researcher accessed literature from other researchers and experts in the field relating to the topic. The literature review will include sources from published books, journals, search engines and articles including grey literature. Data was sourced and evaluated from a global scale, a national (South Africa), and contextual scale (eThekweni and surrounding areas). The theoretical framework, set out previously, will provide the lens through which the information gained will be analysed using a thematic approach; this helps to inform the response to the research questions and achieve the aim.

- Precedent studies:

Precedents of existing built environments relating to the research topic were explored as examples of how other facilities have been designed and utilized. The precedent studies provided an understanding of how other professionals have addressed issues related to human perception, sensory reception, psychology of the built form, and one's connection to nature in the context of children with ASD. The sample size of precedent studies relating to the topic was restricted to that which can adequately address the research questions.

- New Struan Centre for Autism, a school for children with autism in Alloa, Scotland. The New Struan Centre for Autism is a place where children's educational needs are met. The school serves as a national Autism Centre, with autism advisory services, autism teaching and training, education outreach services, and research, diagnosis, and assessment centre. (<https://www.scottishautism.org/new-struan-school/>)
- The Pears National Centre for Autism Education and Treehouse School is a training and educational facility for autistic children in London, England. The school's design takes into account the school's approach, which is a blend of education and applied behaviour analysis. (<https://treehouseschool.org.uk/>)
- Green School South Africa, located in Paarl, Western Cape, South Africa. Green School South Africa is a school that encourages inquisitiveness, creativity, and innovation. The school provides a nurturing environment for children's developmental needs between the ages of two and six and grades one through five. The school's

learning program embraces and integrates with nature, resulting in a harmonious environment in which children can connect with nature. (<https://greenschoolsa.co.za/>)

#### 1.5.4 Primary data collection

The collection of primary data aided in understanding how early development in children diagnosed with ASD impacted the built form. The use of semi-structured and unstructured interviews formed an integral part of the research as it helped understand the lives of children diagnosed with ASD. While conducting the case studies, the researcher observed the children to see how the environment played a role in their behaviour. Case studies were used to understand the existing conditions which were positive or negative to the child's development.

#### 1.5.5 Research materials

The materials used to gather the information for this research paper will consist of the following:

- Secondary Data
  - Secondary sources such as published literature, reports, and theses will be collected and analysed to extract relevant information about the subject.
- Primary Data
  - Illustrations, sketches, and photographs will be included to further explain the research and to understand the findings better.
  - Notes gathered from case studies.
  - Interviews will be conducted to gather information from relevant selected participants. The questions will be semi-structured to allow for additional information to be gathered in the interview.

#### 1.5.6 Research analysis

A qualitative case study approach is taken to compare primary data and secondary data through a thematic approach. To help analyse the data and concepts collected during the study, different methods will be used, such as images, tables, illustrations, and text.

The collection and organising of data into themes/ subjects are done through a thematic analysis method.

### 1.5.7 Summary (MATRIX)

| No. | Objectives  | Research question  | Data Collection Questions   | Data Sources & Sample sizes   | Data Collection Methods  | Data Analysis Methods   | Data Presentation   |
|-----|---|--|---|---|--|---|---|
| 1   | Explore and analyse the developmental needs and learning styles for children diagnosed with ASD compared to children without ASD and how they are impacted by built form.                       | What learning spaces allow for the developmental needs and learning styles of ASD children?  | <ul style="list-style-type: none"> <li>How are children with ASD taught in early development centres?</li> <li>What are the current approaches to the early development of ASD children, and do they work?</li> <li>How do these learning styles impact the design of spaces?</li> </ul>  | Published literature, case studies and precedent studies.             | Document/ data study from libraries, online resources, interviews with key informants and collect secondary and primary data, explore, and investigate case studies and precedent studies. | Thematic analysis of literature and interviews, discourse analysis of interviews, observation, and case studies.                        | Text/ narrative, illustrations, sketches, and images.     |
| 2   | Develop an understanding of children diagnosed with ASD and their human sensory receptors and how they are impacted by built form   | How do children aged 2 to 7 years diagnosed with ASD experience their human sensory receptors and what impact does this have on the space around them? | <ul style="list-style-type: none"> <li>How does the built form relate to the human senses?</li> <li>What sensory sensitivities do children diagnosed with ASD have?</li> <li>How do the sensory receptors of ASD children affect their behaviour?</li> <li>How can the sensory receptors impact the built form?</li> </ul>  | Published literature, interviews, case studies and precedent studies. | Document/ data study from libraries, online resources, interviews with key informants and collect secondary and primary data, explore, and investigate case studies and precedent studies. | Thematic Content Analysis of literature and interviews, discourse analysis of interviews, observation of case studies                   | Text/ narrative, illustrations, images, maps              |
| 3   | Explore the impact nature has on children diagnosed with ASD in their early development stages and how they are impacted by built form.   | How does nature impact the early development stages of children diagnosed with ASD and how can this be applied to the built form?                      | <ul style="list-style-type: none"> <li>How does incorporating nature in the design of the building affect the human psyche?</li> <li>What, examples relating to the early development of children incorporate nature in the design?</li> <li>How do children with ASD perceive the natural environment?</li> <li>How do children with ASD feel when interacting with nature?</li> </ul> | Published literature, interviews, case studies and precedent studies. | Document/ data study from libraries, online resources, interviews with key informants and collect secondary and primary data, explore, and investigate case studies and precedent studies. | Thematic Content Analysis of literature precedent studies and interviews, discourse analysis of interviews, observation of case studies | Text/ narrative, illustrations, sketches and images, maps |
| 4   | Assimilate how early development of children diagnosed with ASD are impacted by built form, through a proposed centre for children with an autism spectrum disorder in eThekweni, South Africa. | What principles can be applied to create positive spaces for early development of children diagnosed with ASD in eThekweni, South Africa?              | <ul style="list-style-type: none"> <li>What is the role of an early development centre for children diagnosed with ASD in eThekweni?</li> <li>What impact does early development centres have on society?</li> <li>Will an early development centre for children diagnosed with ASD positively impact eThekweni?</li> </ul>   | Published literature, interviews, case studies and precedent studies. | Document/ data study from libraries, online resources, interviews with key informants and collect secondary and primary data, explore, and investigate case studies and precedent studies. | Thematic Content Analysis of literature precedent studies and interviews, discourse analysis of interviews, observation of case studies | Text/ narrative, illustrations, sketches, and images.     |

## 1.6 CONCLUSION

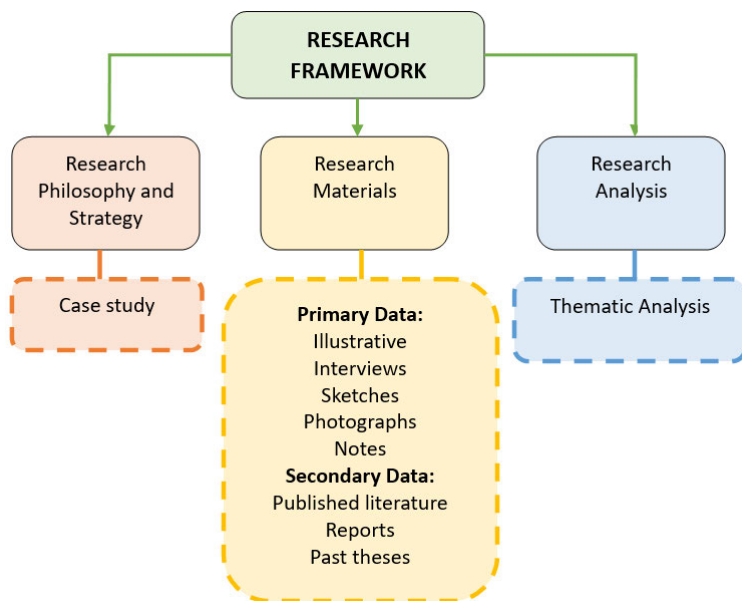


Figure 1-6-1 Summary mind map showing research framework  
(Author, 2021)

Using the research framework as stipulated in the above sections, the research will shed light on answering the questions set out and show how these relate to the theories that have been presented. Through a qualitative approach, a better understanding will be presented of the research to show how the children with ASD in early development impact the built form.

### 1.5.8 SUMMARY

#### Part 1

##### Chapter1:

This section provides an overview of the literature that led to the justification for the study, as well as the research problem, questions, and objectives that are required to address the main research question. It introduces the theoretical foundation that supports the study and outlines the research methodology used. This includes the process of selecting participants, collecting, and analyzing data, ensuring the reliability and validity of the findings, ethical considerations for participants, data management, and sharing of the results.

##### Chapter 2:

The literature reviewed in chapter 2 discussed autism spectrum disorder (ASD) in children between the ages of 2 and 7, offering an overview of the condition and exploring the complex learning requirements of these young learners. Additionally, the chapter analyzed how the unique needs of children with ASD should be considered when designing educational environments.

##### Chapter 3:

The theoretical framework of this study is based on the theories and concepts presented in chapter one, which provide a comprehensive understanding of how children with autism engage both positively and negatively with their environment during their formative years. These ideas facilitate a base to critically examine different design aspects that promote positive development and cater to

the diverse learning styles of children with autism. The literature review also sheds light on the sensory sensitivities of children with autism and their implications for architectural design.

#### **Chapter 4:**

Literature analyzed in chapter 2 and 3, places the design guidelines presented in chapter 4 into context. Chapter 4 focuses on crucial architectural design considerations that play a critical role in enhancing the quality of life of both neurotypical and autistic children, as highlighted in the reviewed literature.

#### **Chapter 5:**

The literature reviewed in the previous chapters facilitated in a comprehensive analysis of the precedent studies considering the selected concepts and theories, Furthermore, the precedents were not all directly related to children with autism but relate to ideas and concepts that aid children with autism develop.

#### **Chapter 6:**

Thanda community-based organisation for early childhood development and Bloom Centre for children with special needs are explored as case studies to develop a better understanding of early childhood development facilities in the local context of South Africa KwaZulu-Natal. In order to gain a deeper understanding of the requirements of early childhood development of both neurotypical and autistic children's both facilities were analysed, interviews were conducted with staff members of the facilities. The findings from the interviews were thematically analysed through a deductive approach by identifying patterns across the data to derive meaning by grouping information into codes, and themes. These themes were then discussed and analysed further.

#### **Chapter 7:**

The Case Study themes and subthemes are analyzed in the context of the literature reviewed in the Scoping Review, as well as other pertinent sources of information, including the precedent studies.

#### **Chapter 8:**

The researcher provides reflections, a summary of the dissertation, the limitations of the study, and recommendations based on the research, as well as suggestions for future research on the topic.

### **Part Two:**

#### **Chapter 1:**

This chapter describes the process of developing a hypothetical site for a specialized early childhood development centre for children diagnosed with ASD within the eThekweni Municipality, KwaZulu-

Natal, South Africa, exploring and developing a design brief, the project client, project requirements, schedule of accommodation and site analysis.

## **Chapter 2:**

This chapter describes the design process of developing a hypothetical site for a specialized early childhood development centre for children diagnosed with ASD within the eThekweni Municipality, KwaZulu-Natal, South Africa.

## **Chapter 3:**

This chapter presents the final design drawings of a hypothetical specialized early childhood development centre for children diagnosed with ASD within the eThekweni Municipality, KwaZulu-Natal, South Africa.

## CHAPTER 2 - UNDERSTANDING AUTISM AND ITS IMPACT ON LEARNING SPACES



Figure 2-1 Figure showing chapter 2-word cloud (Author)

## 2.1 INTRODUCTION

Chapter 2 provides an overview of autism spectrum disorder in children between the ages of 2 and 7. Furthermore, the literature will aid in understanding how autism and the built environment affect these children and their varied and intricate learning needs. The reviewed literature will assist in understanding these learning needs, which will help answer question 1 in chapter 1 (see 1.3.4). At the end of chapter 2, an analysis of the analysed literature shows the importance of the different learning environments that aid in the early childhood development of children diagnosed with autism.

Autism spectrum disorder is, in the vast majority of cases, a lifelong disorder that frequently has a severe impact on the quality of life of children and their families. The environments that autistic children grow up in have an impact on their behaviours and experiences later in life, both positively and negatively. In the majority of cases, during the planning stages of early childhood development environments, autistic children are not given adequate consideration (Mostafa, 2008). According to Engelbrecht *et al.* (2016), regular schools lack the necessary resources to provide care and support to students with autism spectrum disorders. Therefore, it is necessary to gain a deeper understanding of autism in children in order to comprehend the types of environments being researched and provide a solution to the research problem. This chapter provides a critical analysis of research conducted by academics and authors in an effort to comprehend the effects of autism on children and the role the built environment plays in the lives of these individuals.

## 2.2 OVERVIEW OF AUTISM SPECTRUM DISORDER (ASD)

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disability characterised by developmental deficits (American Psychiatric Association, 2013). Neurodevelopment is associated with the brain and nervous system; in autism, these may be positively and negatively affected. Autism spectrum disorder is a broad social disorder affecting how a person communicates and interacts with others. Autism affects everybody differently, and no two people are the same (Flannery *et al.*, 2020). People with autism fall along a spectrum with different symptoms, challenges, and abilities which vary in severity

and requires different types and levels of support (American Psychiatric Association, 2013). (Refer to figure 2-2-1) Across the spectrum, there are key signs among people with autism that help identify the diagnosis, such as impaired communication, social abilities, and repetitive patterns of behaviour or interests (Faras *et al.*, 2010).

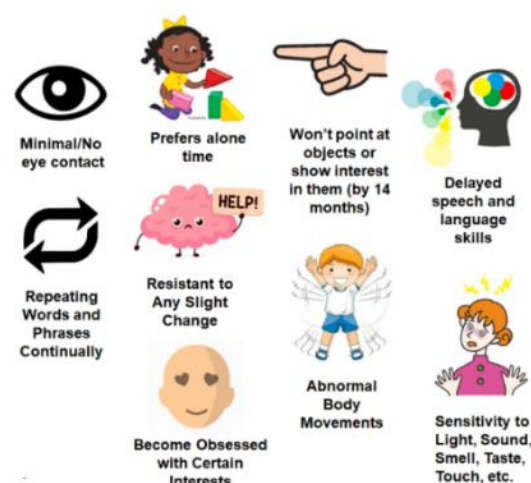


Figure 2-2-1 Key signs among people with autism (Usman, 2020) [Accessed 12/08/2022]



Autism usually presents symptoms from around 18 months to 2 years of age. At the latest, within the first three years of life. Symptoms may not be evident in the early years but become more apparent as the child becomes more mobile, and neurotypical children in the same social environment continue to develop. Children with autism will refrain from social interaction, including showing and pointing to objects in their environment. Young children with autism will develop symptoms where the child will start to develop repetitive and restrictive behaviour (Lord *et al.*, 2000).

Autism is a broad and complex disorder, and there is no single treatment that is effective for all cases; in addition, there is no cure for autism, nor is there any medication to treat it; instead, one can only treat the conditions that the affected child experiences (Autism SA, 2015). However, research conducted by Helt *et al.* (2008) demonstrates that early intervention and treatment during the preschool age, as early as 2 or 3 years of age, is extremely beneficial to the development of the child. During this period, a child's brain is more capable of undergoing transformation, which means the brain can be moulded and have long-term growth. As was mentioned earlier, early intervention could be beneficial to the child to the point where the child would no longer be considered to be on the autism spectrum (Helt *et al.*, 2008).

Early intervention helps lay the groundwork for life by developing the basic architecture and function of the brain, which impacts the child as they grow older (McCain, 2007). Experiences mould the architecture and functioning of the brain during the different stages of life, which help shape learning, behaviour, and health throughout the life cycle

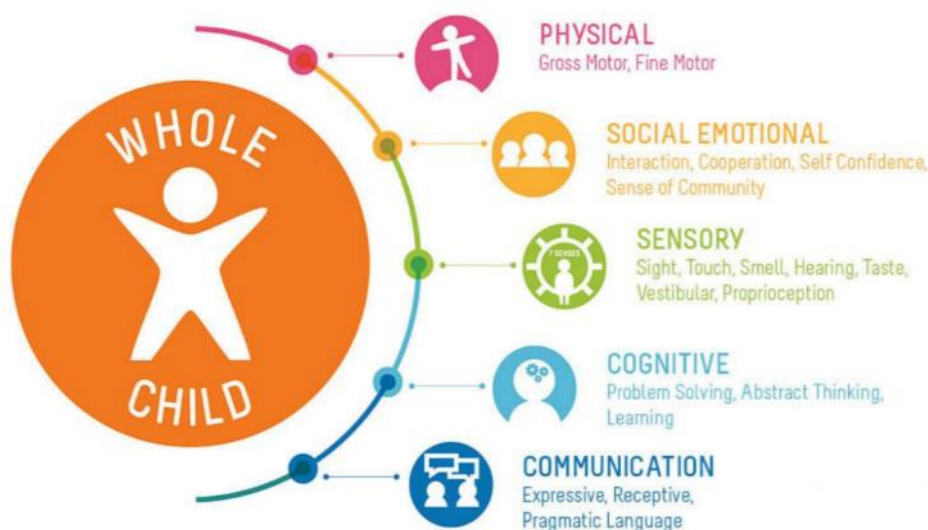


Figure 2-2-2 Early Development (PlayCore, 2022) [Accessed 12/08/2022]

(Mustard, 2010) (Refer to figure 2-2-2). Teaching children with autism must be based on a firm understanding of the conditions experienced by autistic children, an understanding of how autism may disrupt the child's learning capabilities, and how autism affects a particular individual on the spectrum (Chennat, 2020). Gaines *et al.* (2016) argue that "individuals on the spectrum are more sensitive to their physical surroundings than the neurotypical child".

Buildings are designed by adults and used by children; however, design considerations for young children differ from those for older children (Day *et al.*, 2007). According to Mostafa (2008), architecture is responsible for creating environments that address not only society's general needs

but also individuals' needs. When considering the needs of children with ASD, the built environment can have a far more significant impact in creating a more conducive and suitable environment for ASD children's development and social ties to the community providing children with a sense of belonging (Mostafa, 2008).

## **2.3 DEVELOPMENTAL NEEDS AND LEARNING STYLES OF NEUROTYPICAL CHILDREN AND CHILDREN WITH ASD**

Early childhood development encompasses all aspects of children's social, emotional, physical and cognitive development from conception until age nine (Skeyiya, 2006). Specialised early childhood development centres play a vital role in the communities in which they are established. Research shows that the first 1000 days prove to be the most crucial period for development as the child is particularly sensitive and at a stage for rapid physical and mental growth (Hall et al., 2016). Educators' main goals are to provide children with the knowledge that supports their independence and social responsibility. At the root of these goals are social desires and expectations about the benefits of educating all young children and the assumptions of what is essential and what is teachable to children with ASD (Kavale et al., 1999).

Thus, most programs for autistic children have similar goals across various areas (Handleman et al., 2001) with the end goal being an improvement in the key signs that are seen in people who have autism, as discussed in the overview of autism, which can be found in chapter 2.2. These areas include social and cognitive development, verbal and non-verbal communication, adaptive skills, improved competency in motor activities, and improvement of behaviour difficulties (Council, 2001). There are many behavioural traits that neurotypical children may not need, but children with autism may require guidance and teaching to overcome some of these behavioural challenges (Klin, 1992).

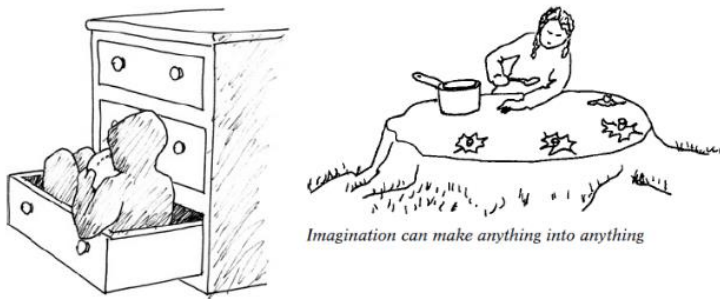


Figure 2-3-1 Fantasy play (Day and Midbjer, 2007, p 15) [Accessed 14/08/2022]

Children learn through lived experiences by engaging in activities, not by following commands (Day et al., 2007). By investigating the environment around them, children start to learn and understand the world they live in. Children use the natural world as the basis of their imaginary world, using spaces to create the scene to live out their fantasies through playing (Day et al.,

2007) (Refer to figure 2-3-1). Physical play for children is essential, as it teaches them fundamental skills linked to their physical, social, and cognitive development. Overall, play aids in the development of children's nervous systems by connecting the body to the brain (Delaney, 2010). Children learn language concepts and reinforce their intuitive understanding of others through social play (Delaney, 2010). Therefore, creating classroom environments that foster peer interaction not only supports the typical developmental path toward group play but also increases possibilities for role-playing experiences and, as a result, prosocial conduct (Weinstein et al., 1987). However, autistic children struggle to engage in symbolic or make-belief play (i.e., using objects in pretend play) and functional play (i.e., functionally using objects), resulting in poor social and communication (American Psychiatric Association, 2013, Dawson et al., 1984). These impairments and restrictions necessitate a different learning approach and setting.



Figure 2-3-2 showing different learning styles (LearnBuddy, 2019) [Accessed 14/08/2022]

As each autistic person is unique, teaching and using the appropriate learning styles significantly impacts whether the child can process the presented information. The goal is to identify the child's common characteristics and frequent behavioural aspects. This can have an impact on a child's school performance and behaviour. Therefore, teachers or carers need to identify the correct teaching

method for each child and apply it to ensure more significant learning outcomes in children with autism (Edelson, 2016). Once the child's learning style is identified, it becomes easier to teach and for the child to understand what is being taught (Edelson, 2016). Neurotypical children may be able to learn in multiple ways, but most autistic children rely on one type of learning. Observing the child may identify which category the autistic child falls into (Refer to figure 2-3-2).

Many children on the spectrum are highly visual thinkers (Gaines *et al.*, 2016). However, teachers need to understand how each child prefers to learn (Refer to figure 2-3-1) and be able to present learning materials in novel ways to assist children in understanding what is being taught (Heaton *et al.*, 1998). This can also be accomplished if the environment's design aids the teachers in achieving the required learning styles. The use of visual techniques can be used to strengthen a child's understanding of communication within their environment (Peeters, 1997). Children's comprehension increases significantly when visual support gives information and direction (Hodgdon, 1995) (Refer to figure 2-3-3). Children on the spectrum have specific cognitive difficulties and find it easier to communicate using visual stimuli (Quill, 1998); therefore, graphic materials or displays must be incorporated into the design of learning spaces.



Figure 2-3-3 shows visual supports to communicate behavioural expectations (Iris Center, n.d).

When it comes to a child's imagination, impersonal structures and rectangular spaces have little concept of fantasy and do not inspire children to play freely (Refer to figure 2-3-4) (Day *et al.*, 2007). Adaptable buildings and outdoor spaces expand the possibilities for imaginative play, which in turn develops a child's ability to engage

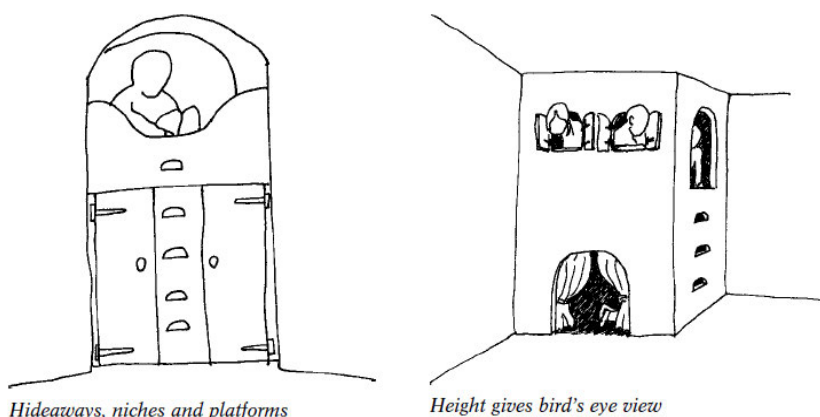


Figure 2-3-4 Hideaways and lookout points aid children's fantasy play (Day and Midbjer, 2007, p 18) [Accessed 14/08/2022]

in fantasy play, this is essential to a child's intellectual and emotional development. According to Day *et al.* (2007), the more magical an environment is, the more the child engages with it, and the longer the child engages, the better they begin to understand the unfamiliar world. With private sanctuaries such as window-seats, hideaways, recesses, and platforms, solid buildings can accentuate a sense of security in young children. This stability is easily provided by masonry and earthen buildings, whereas lightweight steel buildings are better suited for teenagers (Day *et al.*, 2007).

Day *et al.* (2007), argue that children at different developmental stages relate in different ways to their physical environment (Refer to table 2-3-1). When infants become conscious of their individuality, they occupy a realm between themselves and their surroundings, between reality and fantasy, and it is here that the planned environment may help shape creative, flexible thinking and individual identity. Creative fantasies support children in organising their ideas and feelings; imagination is rich in symbolic significance, which is essential for children's intellectual and emotional development (Day *et al.*, 2007).








| DEVELOPMENT STAGES AND EXPERIENCE OF SPACE |  |   |  |  |   |  |   |
|--|--|---|--|--|---|--|---|
| AGE  | <br>1-2 Years | <br>3-5 Years                  | <br>4-7 Years   | <br>8-9 Years   | <br>7-11 Years | <br>12-15 Years   | <br>13-15 Years  |
| DEVELOPMENT                                | <ul style="list-style-type: none"> <li>• Oneness. Objects are recognized as theirs.</li> </ul> | <ul style="list-style-type: none"> <li>• Distinguishes place, mood, and meaning from their own mood.</li> </ul> | <ul style="list-style-type: none"> <li>• Become interested in how places can be used.</li> <li>• Create places with objects in their environment.</li> <li>• Moved on from 'oneness'.</li> </ul> | <ul style="list-style-type: none"> <li>• Sense of space emerges.</li> <li>• Can now model space and move around places in their thoughts.</li> </ul> | <ul style="list-style-type: none"> <li>• Relate to environment through their senses.</li> </ul>   | <ul style="list-style-type: none"> <li>• Reflective of their environment.</li> <li>• Judgmental, developing awareness of themselves as individuals.</li> </ul> | <ul style="list-style-type: none"> <li>• Aesthetics of their surroundings are given value.</li> <li>• Develop abstract thinking.</li> </ul> |

Table 2-3-1 Shows different stages of development from one years old to 15 years old and how they relate to their environment (Author) (Day and Midbjer, 2007, p 12-13).

However, as mentioned previously in the overview of autism, no two cases are alike. Children who find themselves on the spectrum may differ in severity of symptoms being mild to severe (American Psychiatric Association, 2013). Children with autism may struggle with a lack of enthusiasm or drive in academics and learning. Academic assignments might become difficult or tedious for autistic children, and they may exhibit disruptive behaviour to avoid academic tasks (Koegel *et al.*, 2010). Additionally, children with autism may experience stress and anxiety and become inattentive due to sensory overload.

Children with autism may face challenges due to their inability to process sensory information (Ashburner *et al.*, 2008). Environments created with autistic children in mind will help the child learn and focus more effectively (Gaines *et al.*, 2016). Background noises, glare, open storage compartments, disorganized spaces, and overcrowded classrooms are all environmental factors that can distract an autistic child and cause an adverse reaction (Gaines *et al.*, 2016). According to Gaines *et al.* (2016), children on the spectrum become easily distracted when there is too much going on in their environment. This can be avoided by minimizing distractions. Shifting attention is another challenge children with autism face; it makes it difficult to follow conversations or understand what is being said in a social setting. They struggle with the ability to assess and integrate information cohesively. Their ability to remember nonverbal material is better than verbal material (Quill, 1998).



One strategy for fulfilling the different educational requirements of children with autism mentioned above is the TEACCH method, which stands for 'Treatment and Education of Autistic and Related Communication-handicapped Children' and was established by Eric Schopler in the 1970s. (Mesibov *et al.*, 2005). The principles of the therapeutic environment may be seen in this teaching method, as it strives to provide an optimal learning environment geared for children with autism by considering each child's sensory and psychological differences (Gaines *et al.*, 2016). TEACCH assesses each child's strengths and skills to help determine whether the child should attend regular educational programs or would be better off in special classrooms where the environment and curriculum are geared more toward individual needs (Mesibov *et al.*, 2005). Various skills, such as visual skills, recognizing details and memory, are assessed, and considered when developing a child's education path. Additionally, to make learning easier, TEACCH focuses on the individual child's interests and talents and finds ways to incorporate these into the child's learning program (Mesibov *et al.*, 2005). The TEACCH method also includes methods such as organization of the physical environment (Refer to figure 2-3-5), predictable sequence of activities, visual schedules, flexible routines, work/activity systems, and visually structured activities (Mesibov *et al.*, 2005).

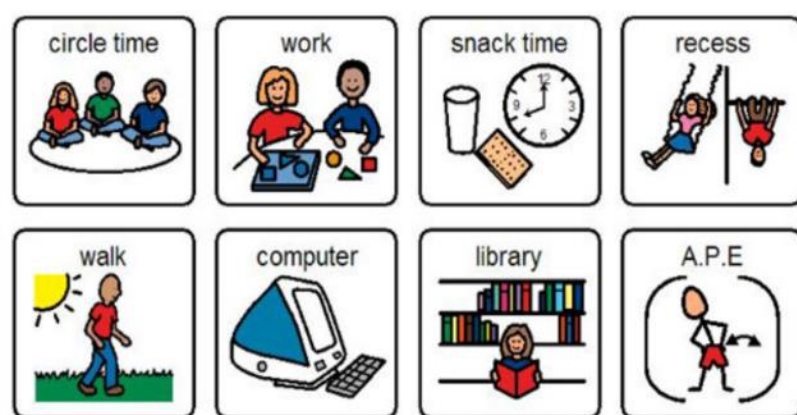


Figure 2-3-5 showing Visual Supports for Students with ASD (Indiana Resource Center for Autism, 2018) [Accessed 21/08/2022]

## 2.4 THE IMPACT OF AUTISM AND THE BUILT ENVIRONMENT

Visual stimuli and organization are essential in the classroom when teaching children with autism (Paron-Wildes, 2013). One must consider the physical layout to achieve a visually pleasing and organized space (Refer to figure 2-4-1 and 2-4-2). The furniture placement must be done to "reduce stimulation, limit distractions, reduce anxiety and promote independence and more consistent and effective work" (Gaines *et al.*, 2016).

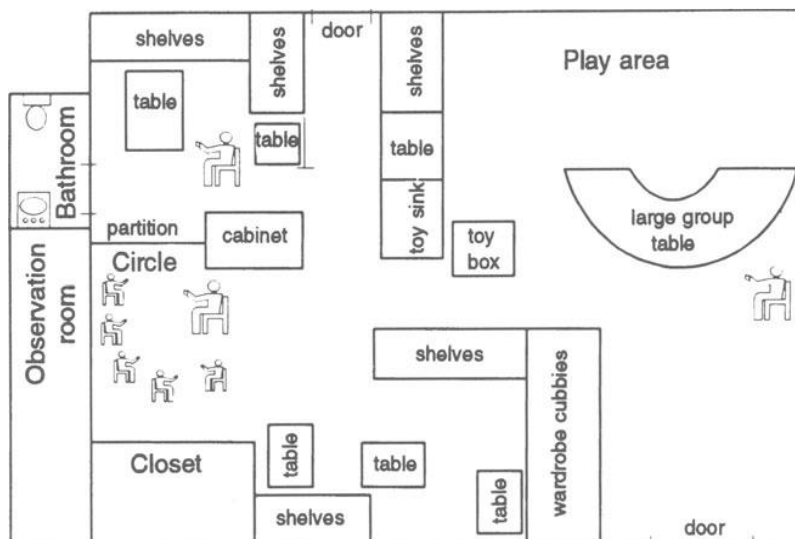


Figure 2-4-2 shows spatial sequencing within a classroom environment, Source: Author

Figure 2-4-1 showing Sample floor plan for preschool demonstration classroom (Schopler *et al.*, 1993) [Accessed 21/08/2022]

Visual cues and physical boundaries help children identify certain activities in particular microenvironments within the classroom (Delaney, 2010). Different physical environments need to be designed for different age groups. Younger children require areas for play, feeding, and individual or group sessions. In contrast, older children require areas for vocational skill development, individual and group work activities, and pursuit of interests. No matter the age group, all learning material used in the activity must be nearby and clearly labelled to promote independence (Gaines *et al.*, 2016).

The TEACCH approach suggests several questions be asked to ensure the learning environment is set out for children with ASD (Staff, 2010).

- Does the classroom provide space for individual and group work?
- Has consideration been taken when placing work areas to ensure it is in the least distractable place?
- Are all work areas marked to ensure children can navigate clearly?
- Does the teacher have clear visual access to move around the work areas?
- Are materials for children easily accessible?
- Are play areas large enough and the location safe for children not to wander off unsupervised?
- Are zones marked out to ensure the child understands what activities take place?
- Does the teacher or supervisor have a clear view of the entire room?

When children interact, visual guidance and spatial organisation are paramount to help the child understand the different functions and expected activities associated with the occupied space. Creating clear visual boundaries helps minimise visual and auditory distractions for the child. In contrast, large, wide-open environments should be avoided, as some children with autism find it difficult to segment their environments. This may interfere with the child's understanding of what activity will occur in the occupied space (Vogel, 2008) (Refer to figure 2-4-3).



Figure 2-4-3 showing classroom layout with furniture dividers (Sproutlings, 2019) [Accessed 20/08/2022]

When designing for children with autism, it is crucial to consider space zoning, as children with autism tend to organise their environment by sensations rather than functions (Mostafa, 2008). One way to accommodate these differences is to design spaces into zones by grouping certain activities, such as areas of physical activity and high-volume acoustics, and less active, quieter spaces together. This helps children relate to spaces and their expected behaviours (Tola *et al.*, 2021).



Figure 2-4-4 showing neat structured classroom with little distraction (Muscat, 2020) [Accessed 21/08/2022]

One way to provide order within the learning environment is to incorporate stations where activities are held. In these areas, visual distractions should be limited. Any unnecessary equipment and material not associated with the activity should be removed and stored in a different area (Refer to figure 2-4-4) (McAllister *et al.*, 2012). Children may find themselves wandering around in the classroom setting where

there is a lack of physical structure (Gaines *et al.*, 2016). Environments must be clearly defined using muted colour, furniture placement, or screens (Mostafa, 2014). Classroom layouts should be designed in such a way as to allow for individual or group work to commence within a particular space. In proximity, a break-out space should be provided where the child can escape should they experience sensory overload (Tola *et al.*, 2021).



Structured therapy may be offered to address social interaction concerns since many children with autism find socialising and playing with others challenging. According to Herbert (2003), play therapy refers to various treatment modalities that use the therapeutic advantages of play. It is distinct from typical play in that it is intended to assist each child in confronting their unique issues and limitations. Play



Figure 2-4-5 showing play therapy where children learn social play (Sensation Station, 2017) [Accessed 20/08/2022]

therapies are designed to assist children with Autism to communicate and engage with others, express their feelings, adjust their behaviour, and develop problem-solving abilities (Hebert, 2003). The therapies associated with helping children develop confidence in interaction and playing with others require plenty of floor space (Refer to figure 2-4-5) and modular tables to accommodate small group play sessions (Paron-Wildes, 2013). The spatial design must also consider proprioception and vestibular senses experienced by children with autism. These children may find themselves experiencing symptoms of bodily movement from sensory overload. A more personal space where they can expel energy and comfort themselves may be required (Gaines *et al.*, 2016). Children with autism may feel overwhelmed in their learning environments. Hyper-sensitivity with heightened senses is frequent among autistic children, and they may require a place to escape and regroup their senses before continuing their task (Mostafa, 2014). As mentioned before, in the zoning of spaces, having a breakaway area is beneficial when children with autism are overwhelmed with sensory overload. The quiet breakaway spaces help them escape the noise and visual stimulation when it becomes too much to handle (Tola *et al.*, 2021).

Children need to be able to learn both indoors and outdoors, so therapeutic environments should provide access to outdoor play areas (Refer to figure 2-4-6) and sensory gardens (Refer to figure 2-4-7). The outdoor learning environment aids in developing children's nervous systems and helps develop the child's identity, place identity and emotional security (Delaney, 2010, Day *et al.*, 2007). Outdoor spaces must provide recreational, physical, educational, and social opportunities for children to run around, kick the ball, and find quiet places to hide and have conversations (Day *et al.*, 2007). Learning occurs in various settings for children, and providing pathways, gardens, seating, covered patios, and areas for children to run around aids their development (Gaines *et al.*, 2016).



Figure 2-4-6 showing outdoor play area for children to run around and learn (Timotay Playscapes, n.d) [Accessed 20/08/2022]



Figure 2-4-7 showing outdoor sensory garden where children learn about the environment and interact with their senses (Holmes, 2017) [Accessed 20/08/2022]

## 2.5 SENSORY INTEGRATION THERAPY

A. Jean Ayres established sensory integration therapy (SIT) in the 1970s to develop interventions to help the nervous system gain the ability to integrate sensory input in a more "common" manner by treating individuals with sensory processing disorders (Emmons *et al.*, 2005). Sensory-focused treatments address aversions/challengers by addressing sensory inputs within adaptive frameworks to strengthen people's abilities to engage with their environments. Every meaningful interaction in architecture is multi-sensory since it engages all of the body's senses, whether positive or negative. One of the characteristics of autism is the inability to integrate and make sense of sensory inputs (Larkey, 2007). According to Paron-Wildes (2005), children with autism who have difficulties with sensory integration may have a sensory deficit associated with one of their senses while having no problems with their other senses; however, problems in one sensory modality frequently affect the functioning of other sensory modalities, resulting in sensory dysfunction. All of these difficulties impede the child's development (Emmons *et al.*, 2005).

## 2.6 CONCLUSION

The research presented in chapter 2 provided an overview of autism as well as the impact on the built environment of individuals with autism and their learning needs. It is evident that the built environment has the potential to be an important factor in the overall quality of life of people whose lives are affected by autism spectrum disorder. This potential has been shown to be important in a number of studies (ASD). According to the findings of Tola *et al.* (2021), the complexity of autism spectrum disorder (ASD) and the special considerations related to it are the primary drivers of the requirements for the built environment. One example of these requirements is the need for specialised school settings. The findings of the study highlighted the critical role that early childhood education and care play in a child's overall development. The information learned from chapter 2 assists in providing an answer to question 1 in chapter 1 (see 1.3.4).

Due to the numerous developmental, emotional, and behavioural obstacles faced by children with autism spectrum disorders, a greater proportion of their developmental needs in terms of therapy and resources remain unmet. The research presented in chapter 2 demonstrates that children with autism make up a distinct subpopulation that requires additional support and treatment to address specific behavioural and emotional issues. Children will feel more at ease and will benefit significantly from developing their social, emotional, and cognitive skills if the learning environment is adapted to meet their needs and if a well-balanced environment is provided to them. This, in turn, may contribute to the development of well-rounded individuals who are prepared for the challenges of life and aid in the formation of community bonds. Additionally, this may help individuals become more connected to their communities.

The next chapter of this dissertation will discuss the function of the built environment in relation to the requirements of children who have autism. Ideas and theories of phenomenology, biophilia, and environmental psychology will be introduced. The capacity of architecture to enhance one's quality of life while simultaneously engaging with one's emotions will contribute to the development of a greater understanding of the impact that built environments have on children, particularly autism.



Figure 3-1 Figure showing chapter 3-word cloud (Author)

### 3.1 INTRODUCTION

In Chapter Three, the literature will be examined through the use of theories and concepts such as PLACE, GENUS LOCI' AND 'DWELLING', Environmental psychology and Biophilia, these theories and concepts will help establish a deeper understanding of how children with autism interact with spaces pertaining to the built environment and early childhood development (Refer to figure 3-1-1). This chapter seeks to understand how the built environment and the discussed theories may positively influence children's perception and experience of their surroundings, which will help to answer question 2 and 3 in chapter 1 (see 1.3.4)

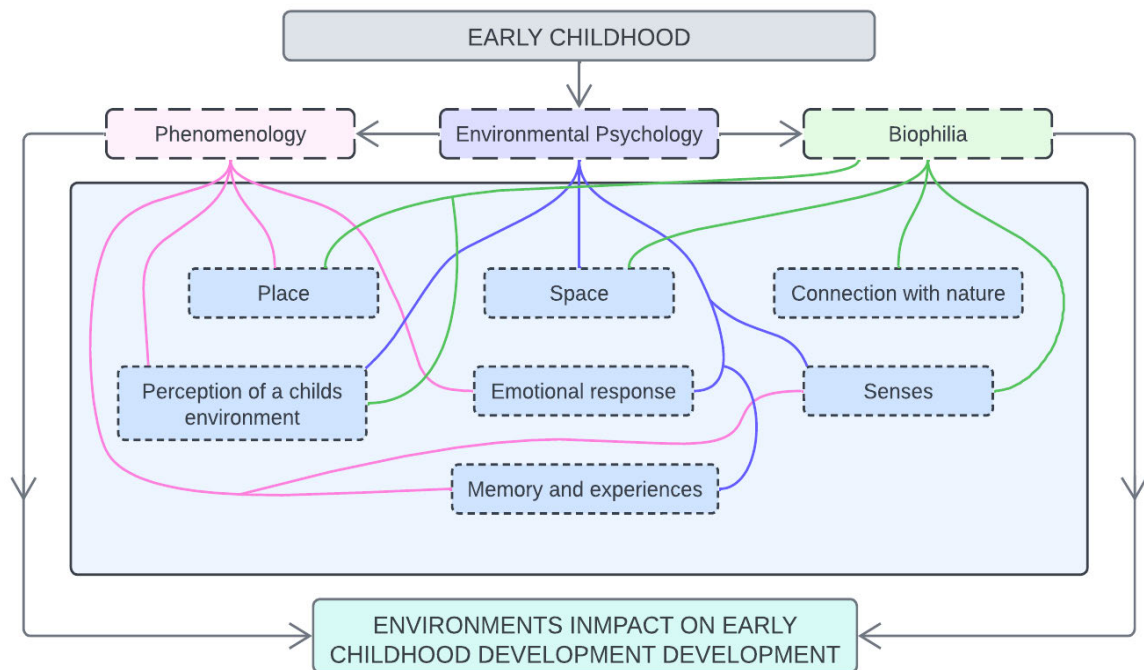


Figure 3-1-1 showing theoretical mind map (Author)

### 3.2 A CHILDS INTERACTION WITH SPACES

The environment to which humans are exposed has a profound impact on their development from a young age. Children investigate their surroundings to better understand and connect with them, indoors or outdoors (Day *et al.*, 2007); how a child's environment communicates and encourages interaction significantly impacts their ability to imagine and create memories, this promotes the healthy development of children (Strong-Wilson *et al.*, 2007). Flexible and responsive environments (Refer to figure 3-2-1)



Figure 3-2-1 showing obstacle course, where children interact with each obstacle to overcome it (Muscat, 2020) [Accessed 28/01/2023]

encourage a child's large muscle movement (gross motor), smaller muscle movement (fine motor),



cognitive skills (brain development), and developing skills to help navigate life's obstacles through problem-solving (Golding *et al.*, 2014, Atmodiwirjo, 2014).

Children's daily routines occur in various settings, including homes, day-care centres, and public parks; the environments children explore, and their experiences will form an essential part of their early childhood development. According to Bronfenbrenner *et al.* (2000), these environments are the foundation for how children develop as individuals, interact with their environments, and develop lifelong skills. Understanding the role of the physical environment in young children's development and learning processes necessitates understanding how children interact with their surroundings. Tuan (1977) proposes that different modes of experience guide humans' spatial experience: sensorimotor, tactile, visual, and conceptual. These various sensory processes become the modes by which we experience our surroundings throughout our lives (Atmodiwirjo, 2014).

The Reggio Emilia approach to education is based on the idea that there are three teachers to a child in the classroom at any time: the teacher, the child, and the environment (Strong-Wilson *et al.*, 2007). Strong-Wilson *et al.* (2007), explains by seeing the environment as a third teacher, we can begin to notice how our surrounding contribute to a child's development. This approach revolves around the various senses of a child to assist in their development (Flavin, 2020). Environments are seen as spaces that provide visually rich settings where possibilities are discovered through interaction with objects and people, which are essential in developing young children (Strong-Wilson *et al.*, 2007). Opportunities for different learning experiences are created by providing a variety of stimuli through other materials, textures, and forms relating to the child's senses (Strong-Wilson *et al.*, 2007). Carter (2007) contends that it is not the decoration of spaces that makes the environment the third teacher but rather how the environment communicates the messages and values expected of children.



Figure 3-2-2 showing the children interacting with the classroom environment, the design and elements become the third teacher. (Ozuna, 2020) [Accessed 28/01/2023]

Brosterman (2001) believed that young children's educational development begins with channelling their constant exposure and interaction with their physical world. By interacting with various components of the environment, children can explore different objects and discover their uses. This interaction allows children to understand how the body performs to different objects (vestibular and proprioceptive senses); (Atmodiwirjo, 2014) (Refer to figure



Figure 3-2-2 showing breakdown of proprioception (Pathways) [Accessed 27/08/2022]



Figure 3-2-3 showing breakdown of vestibular (Pathways) [Accessed 27/08/2022]

3-2-2 & 3-2-3). Cognitive functioning occurs at various levels; therefore, the built form should incorporate various types of play and engagement within the spaces to ensure that learning occurs in a meaningful and memorable manner (Kerich *et al.*, 2015). Children's understanding of the world is still developing, so play areas must consider the child's desire to explore and the environment's safety, comfort, and sensory stimulation to promote higher levels of learning (Day *et al.*, 2007).

Children experience the world differently than adults do (Refer to figure 3-2-4); it is, therefore, essential to make childhood development spaces with children in mind (Day *et al.*, 2007). Spaces must encourage social interaction and play-based

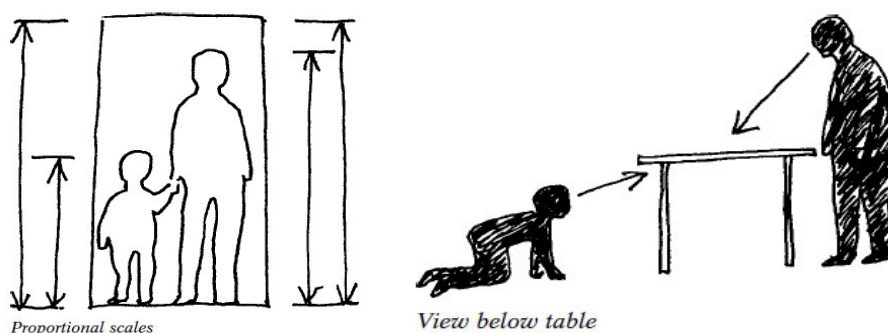


Figure 3-2-4 showing different proportion of adult and child which gives different perspectives of one's environment (Day and Midbjer, 2007, p 5) [Accessed 27/08/2022]

learning while providing a rich environment where children may feel a sense of belonging (Shackell *et al.*, 2008). Play promotes children's social, cognitive, physical, and emotional development while also teaching self-control, environmental awareness, coordination, and, most significantly, imaginative free play. According to studies, outdoor play helps children learn and develop cognitively, physically, emotionally, and socially (Day *et al.*, 2007). Day *et al.* (2007) discuss the importance of children engaging in imaginative/ fantasy play in organizing their thoughts and learning to manage their emotions. As a result, fantasy has a rich symbolic meaning and is essential for children's intellectual and emotional development.

Shapes and forms create the physical environment around us, which we call spaces. There are two types of spaces, interior space, and outside space, with which we interact daily and which, in turn, influences how we experience and understand life. Floors, walls, ceilings, doors, windows, and furniture all contribute to various shapes and forms of ‘interior space’ (Mostafa, 2014). The outdoor space comprises gardens, playgrounds, pathways, and open areas to gather or be free (Gaines et al., 2016). Careful consideration must be made when developing spaces for children to interact with as the environment has the ability to evoke a sense of place and authenticity allowing the child to experience their environment as meaningful (Seamon et al., 1985).

### 3.3 ‘PLACE, GENUS LOCI’ AND ‘DWELLING’

Phenomenology goes back to the 18th century when Swiss German mathematician and philosopher Johaan Heinrich Lambert applied it to his theory of identifying truth from illusion and error (Husserl, 1997). In the 19th century, Hegel published *Phenomenology of Mind*, where he linked humans’ experiences to knowledge. It was not until the 20th century that the phenomenology movement gained traction with work published by famous phenomenologists Husserl, Heidegger (Smith, 2018). Heidegger’s work offered a new approach to communicating and supporting our human nature and environment. Heidegger’s ideas were influential in helping to produce and identify things through a process that allows them to come into the world as they are (Seamon et al., 1985).

#### 3.3.1 Place

The concept of place in Architecture is a person's physical and psychological interaction with a particular location. The quality of place and people’s relation to it and their mental health, or well-being in general, are undeniably linked to the connection humans have to the built environment. Seamon *et al.* (2008) identifies three components as elements of place: the place’s physical setting, its activities, and the individual and group meanings that arrive from human experiences (Refer to figure 3-3-1-1).

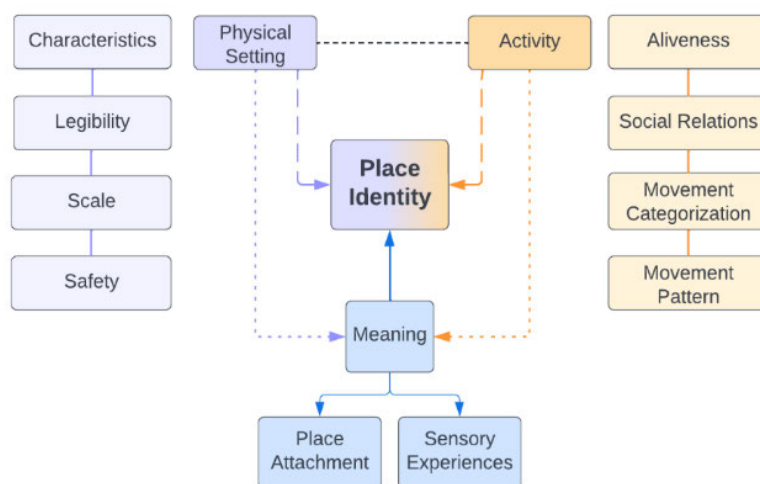


Figure 3-3-1-1 showing process of place identity (Author)



Place and sense of place are complex environments comprising of material, social, and individually interpreted domains that act independently and in a mutually dependent manner. The sense of place is related to the feeling of belonging, the bond people form with their environment, and where they find meaning (Kudryavtsev *et al.*, 2012). According to Relph (1985) depicted in Seamon *et al.* (1985) '*Dwelling, Place and Environment Towards a Phenomenology of Person and World*', a place is a construct of our memories and emotions made up of connected experiences and intricate associations. Day *et al.* (2007) argument relates to Relph's ideas, on how children learn not by what is taught but rather through 'finding out' by investigating their surroundings, and by doing so, children learn how to solve problems. Memories are formed while exploring the environment (Refer to figure 3-3-1-2) in which they find themselves; if the experience is positive, it allows for the formation of memories and promotes mental growth in processing information. Navickienė (2015) identifies an individual's perception of a particular place is perceived through engagement with the environment and their senses, interpreted through cognitive assumptions, and what emotions are felt. When people find meaning in a place through exploration, they relate to the perceptual and psychological aspects of their experience within a specific environment. This speaks to Pallasmaa (1996), where he describes phenomenology as the study of how humans perceive their surroundings through the multisensory properties of space, furthermore, Pallasmaa, contends that phenomenology in architecture emphasises the role of the architect in creating a multi-sensory experience rather than a visual or activity driven environment. It aims to observe and examine human situations, events, meaning, and experiences as they occur in daily life (Eckartsberg, 1998), as well as study humans' understanding of place: place being space as well as character and having an identity (Larice *et al.*, 2013). Pallasmaa (1996: p45) describes architecture as a means to "*strengthen the existential experience, one's senses of being in the world*".



Figure 3-3-1-2 showing children exploring nature and forming memories through experience (Longhine, 2022) [Accessed 28/01/2023]

According to Norberg-Schulz (1971, p11), the relationship between people and their environment is formed by existential space, which is divided into *character* and *space* according to the purpose of *orientation* and *identification* within space. As a result, perception, existential, cognitive, orientation, and identification are all inextricably linked to the psychology of the environment. Identification serves as the foundation for feeling a sense of belonging, whereas orientation is the function that permits one to explore (Norberg-Schulz, 1980). Norberg-Schulz (1971: 19), argues that a lack of identification or orientation in the structure causes a person to become disoriented or lost. As a

result, the character of space is negatively portrayed, which compromises the environment's existential significance. *“Humans, dwells when they can orientate themselves within and identify himself with an environment, or, in short, when he experiences the environment as meaningful”* (Norberg-Schulz (1980: 5) Therefore, one could argue that in order for a child with autism to truly belong somewhere, orientation and identification must take place (Refer to figure 3-3-1-3).



Figure 3-3-1-3 showing structure in the classroom forming a good orientation and identification of activities (Love, 2019) [Accessed 28/01/2023]

Phenomenology not only emphasises the site but also the tectonics of the building and the detail that is manifested. In Norberg-Schulz (1980), seminal writings on phenomenology and existential space, he contends that we should go back to a qualitative phenomenological understanding of architecture and that existential space is the fundamental interaction between people and their environment. He further argues that this relationship is divided up into complementary terms, “space,” and “character.” According to Schultz, there are five concepts of space which are, pragmatic space, perceptual space, existential space, cognitive space, and abstract space. These concepts all relate to how we interact with the outside world. First, pragmatic space is defined as that which integrates people with the natural world; second, perceptual space is crucial for the development of a person's identity; and third, existential space forges connections between individuals and sociocultural totalities. These three are significant since they pertain to an individual's first-hand encounter with the environment. The three types of space mentioned above combine to create cognitive space, which enables one to think about space. Lastly, logical space gives one the means to describe the other types of spaces (Norberg-Schulz, 1971).

### 3.3.2 Genius loci and dwelling

According to Norberg-Schulz (1980), phenomenology has the power to create meaningful places by utilising the Roman concept of "genius loci," also known as the "spirit of place". For this to occur, the fundamental building blocks of architecture are known as the floor, wall, and ceiling. These are experienced similarly to the boundaries found in landscapes, which are represented by the ground, horizon, and sky (Refer to figure 3-3-2-1). According to Norberg-Schulz (1980), the similarity between artificial and natural environments in terms of structural simplicity is of the utmost significance. Seamon *et al.* (1985), describes genius loci as sense that can be invoked by a variety of things, such as **spatial structures**, **topographical patterns, textures, natural and climatic conditions like light, wind, and sound**, as well as **individuals and the sequence of human events**. In order to understand "genius loci;" the underlining environmental character and space must be respected (Refer to figure 3-3-2-2). Schulz explains:

**"space** denotes the three-dimensional organization of the elements which make up a place, **character** denotes the general "atmosphere" which is the most comprehensive property of any place." Norberg-Schulz (1980 :11)

The meaning of place is much more than a geographical location, it is the entirety of concrete things, having "material substance, shape, texture, and colour," Norberg-Schulz (1980: 6). These work together to define an "environments character," which captures the essence of place (Norberg-Schulz, 1980). For a person to truly feel a sense of belonging in a place, orientation and identification are essential to a person's manifestation of dwelling. The objects of identification are characteristics of the environment that are concrete in their existence, and relationships between people and these

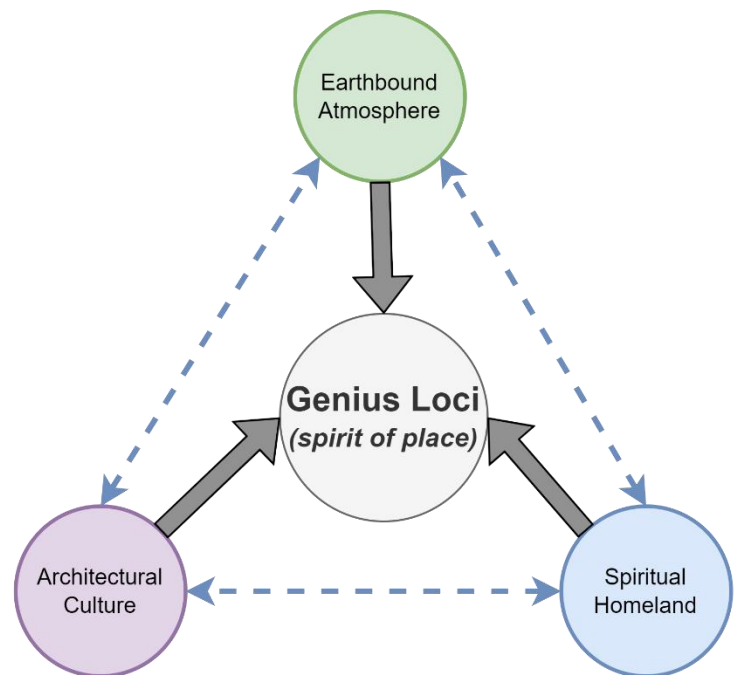


Figure 3-3-2-1 shows "Genius Loci" (Author)



Figure 3-3-2-2 shows the boundaries in landscape (Maps, 2010)  
[Accessed 27/08/2022]



objects typically start in childhood (Norberg-Schulz, 1980). As a child explores their environment, their emotional side develops ties to objects and places Day *et al.* (2007). According to Day *et al.* (2007), children lack sophistication and need to experience things with their entire body because the world is unfamiliar to them and therefore exciting and difficult at the same time. This relates to Piaget's theory, which holds that children use their senses to identify with their surroundings, aiding in the development of their perceptual schemata, which aids future experiences in life (McLeod, 2007). Likewise, a child becomes familiar with their surroundings and forms perceptual schemata that shape all of their experiences in life (Norberg-Schulz, 1980). According to Strong-Wilson and Ellis (2007: 43), planning for teaching rather than place-making may impede the child's productivity and development. Curiosity, independence, resilience, and perseverance are all essential attributes for a child to develop during their early years. These dispositions promote the development of cognitive and social skills, critical thinking, and creative problem-solving abilities (Aistear Siolta, 2017).

Norberg-Schulz (1980), acknowledged that phenomenology has the ability to create distinctive places in architecture and make the environment significant. He believed architectural design had shifted away from emphasising the cognitive and emotional aspects of how people interact with the built environment and more towards emphasising the physical, aesthetic, and functional aspects. He believed that architecture should return to place-based design (Larice *et al.*, 2013). Seamon (1985: 1), argues that over time our world has become a “*domination of homelessness*”, this relates to Norberg-Schulz (1980), argument different environments necessitate different design aspects and distinct characteristics, such as a home being "protective," a dance hall being "festive", and a place of worship being "solemn," implying that schools where children develop must be "safe" and "nurturing" by nature (Refer to figure 3-3-2-3). This speaks to Bogdashina (2016) argument that children require 'nurturing' and 'inspiring' environments that engage their senses in a way that promotes development. Through this understanding, one can find true meaning in architecture.

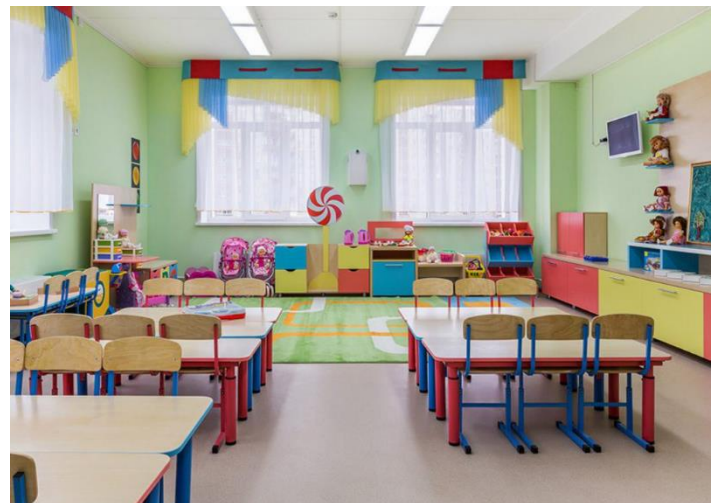


Figure 3-3-2-3 showing nurturing classroom for young children (Muscat, 2020) [Accessed 21/08/2022]

From a phenomenological perspective, dwelling is viewed as primarily an active human urge that consists of a desire to contribute creatively to the experiences of the built environment - an act by which humans create their own existence (Seamon *et al.*, 1985). According to Seamon *et al.* (1985), “the basic character of being” is defined as dwelling and includes a person’s desire to belong to the

environment, to feel part of a place and to be comfortable as if it were home, this implies one finds meaning within their environment. Norberg-Schulz (1980: 23) argues that in order for humans to dwell, the environment must be meaningful, "*when the environment is meaningful people feel at home*". Heidegger's (2006: 76) argues that "*dwelling is the basic character of being*" in *Building Dwelling Thinking*, where he describes dwelling as a place to be at peace in a safe environment, our existence in the world, and a place to nurture things, whether they be artificially or naturally made. In terms of early childhood development, this relates to the idea of nurturing environments for young children.

For many people with sensory processing disorders, such as those with ASD, the built environment can be frightening or even distracting due to their sensitive hearing or eyesight, making their experiences of the environment unpleasant (Gaines *et al.*, 2016). In order for an individual to develop a stronger identity and self-esteem, Gaines *et al.* (2016) argues that the environment must be attuned to the users background and disposition. This is in line with Norberg-Schulz (1971 :25), "*Identity, thus, is closely connected with the experience of place*", especially in a child's formative years when personalities are formed. He goes on to say that we can only truly say that a person "dwells" when they have defined their environments character (Norberg-Schulz, 1971).

### 3.4 ENVIRONMENTAL PSYCHOLOGY

Perceptual theory is a strong foundation for the research in the field of architecture, and it will be used to examine the literature in the broad field of environmental psychology, which investigates how people perceive and interact with their environment.

#### 3.4.1 Perceptual theory

Perception is the interpretation of incoming sensory information and is impacted by several elements, including the type and intensity of input, a person's previous experiences, level of attention to detail, readiness to respond, level of motivation, and present emotional state (May, 2009). To perceive the spaces or objects around them, the sensory organs gather stimuli, and the brain interprets this information through a process called perception (Kopec, 2018) (Refer to figure 3-4-1-1). Nanda (2012: 45) explains that “*Senses are the gateway to our perception*”, meaning that we perceive our environment based on our engagement with the environment through our senses.

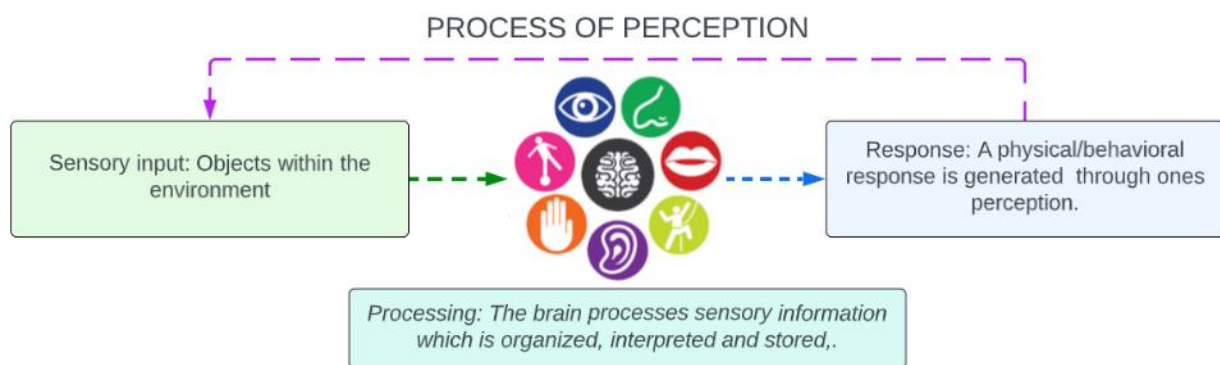


Figure 3-4-1-1 shows process of perception for one's environment (Author)

By engaging with one's immediate surroundings, a person's senses are heightened, and perception is improved. As a result, creating environments that are supportive requires knowledge of how individuals with ASD interpret their surroundings. One's lived experiences, memories, and cognitive processes all contribute to how they interpret their surroundings (Bogdashina, 2016). Children in their developing stages rely heavily on sensory input; allowing children to engage with their sensory receptors improves their cognitive functioning skills, which helps them better navigate obstacles encountered later in life (Saieh, 2010). However, autistic children have different cognitive processing difficulties and sensory sensitivities than neurotypical children, causing them to perceive their surroundings differently (Kranowitz, 2005). These difficulties in adjusting to their surroundings negatively impact a child's development and, consequently, the child's ability to socially develop, inhibiting their learning ability (Ruble and Robson, 2007). Due to difficulties in processing sensory input, they may struggle with self-injury, self-stimulation, and stereotypical behaviours (Ayres, 1972).

According to psychologists, sociologists, and educators' environmental adaptation issues are common amongst individuals with ASD, this results in disengagement which is a trait of adaptation and prevents a child's cognitive processing which hinders their ability to develop socially, which is essential for learning (Ruble *et al.*, 2007, American Psychiatric Association, 2013).

Heidegger (1970), explains that people receive sensory stimuli about their physical world and consciously process this to find meaning. Sensory perception, when integrated into the built environment, allows an individual to connect more spiritually, creating a bond with their environment, which becomes a more prosperous and invigorating encounter (Pallasmaa, 1996). Pallasmaa (1996) argues that architecture has the ability to mould people's experiences, where they establish a sense of being and a connection to the world. When a person bonds with a particular environment, Norberg-Schulz (1980:21) says they begin to identify with it and become "*friends*". As previously discussed in [chapter 3.3.2](#), a frightening environment for individuals with autism creates an unpleasant experience that hinders the ability to form a positive relationship; therefore, this hinders the ability to form a friendship with the environment, which Schulz depicts as important to identify with a specific environment. It is, therefore, crucial to design settings that are sensitive to the needs of people with autism.

Hearing the ice-cream truck tune play, for example, stimulates the sensory nerves in the ear, but one's ears do not recognise it as an ice-cream truck. The tune's sound is recognised through previous experiences of sound or similar sounds, and the cognitive process this relates to is phenomenology. For most neurotypical children, this comes easily; however, for children with autism, this may be difficult due to their cognitive impairment. Likewise, spaces, finishes, and materials may elicit perceptions that improve memory and comprehension. However, unlike neurotypical children, children with autism struggle to recall a single moment due to the gestalt perception they experience. According to Bogdashina (2016), "*autistic memory is frequently described as associative memory*" (Refer to figure 3-4-1-2); this may be why individuals with autism may act out when environmental stimuli is connected to unpleasant or painful memories (Gaines *et al.*, 2016).

One can understand how the environment around them is structured through spatial perception. Spatial perception is made up of two processes; exteroceptive, which creates representations about

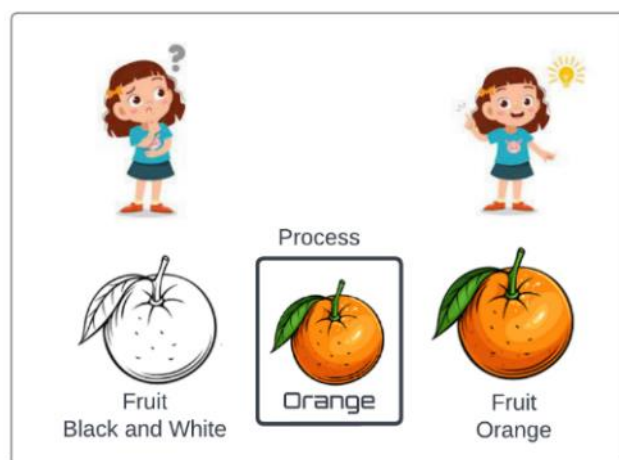


Figure 3-4-1-2 shows that the fruit is unknown at first, but after being taught that an orange looks a certain way and is a certain colour, the child recognises that particular fruit as an orange through associative memory. (Author)

our spaces through our emotions and feelings, and proprioception, which creates representations about our body, such as orientation and position within the environment (Proff *et al.*, 2021). Children with ASD display poor body awareness and battle to regulate their sense of balance and body control (Kern *et al.*, 2007).

Pallasmaa (1996), refers to architecture as an extension of nature into the artificial world, it should be a means of relating, mediating, and projecting meaning beyond the built environment, and constantly interacting with all the sense modalities. Gathering and processing information about the world is complex, it entails the constant engagement of the senses, assessing, re-assessing, and filtering stimuli from one's environment. When receiving information, one needs to organize and process it to develop an understanding of a specific situation, known as cognition (Gaines *et al.*, 2016). Most children absorb knowledge through interacting with objects in their environment from an early age using their sensory receptors. Young children spend hours exploring their environment by touching and placing objects and toys in their mouths (Larkey, 2007). Children with autism gather information using all their senses: visual, auditory, tactile, olfactory, gustatory, vestibular, and proprioceptive to investigate their surroundings and record impressions that neurotypical children take for granted (O'Neill, 1998). All of these senses are necessary for healthy daily functioning; if a child's senses are unable to function effectively, whether separately or collectively, it has a direct influence on his or her ability to successfully interact within themselves and with others in their surroundings (Emmons *et al.*, 2005).

Sensory integration is defined as the neurological process of receiving and integrating sensory information from the body and the environment, which contributes to an individual's emotional control, learning, behaviour, and engagement (Ayres, 1972). Children with autism who struggle with sensory integration often have *hyper-sensitive* (heightened) or *hypo-sensitive* (decreased) to stimuli in their surroundings (Mueller *et al.*, 2020). If the child is *hyper-sensitive*, they tend to experience over-stimulation from the environment. If the child is *hypo-sensitive*, they tend to have abnormally decreased sensitivity to sensory input. In the same sense, children with autism may experience both extremes: they may overreact to stimuli or under-react to the sensory stimuli around them (Refer to figure 3-4-1-3). These sensory processing issues are common amongst children with autism because they interact differently with their surroundings, and their unusual way of processing

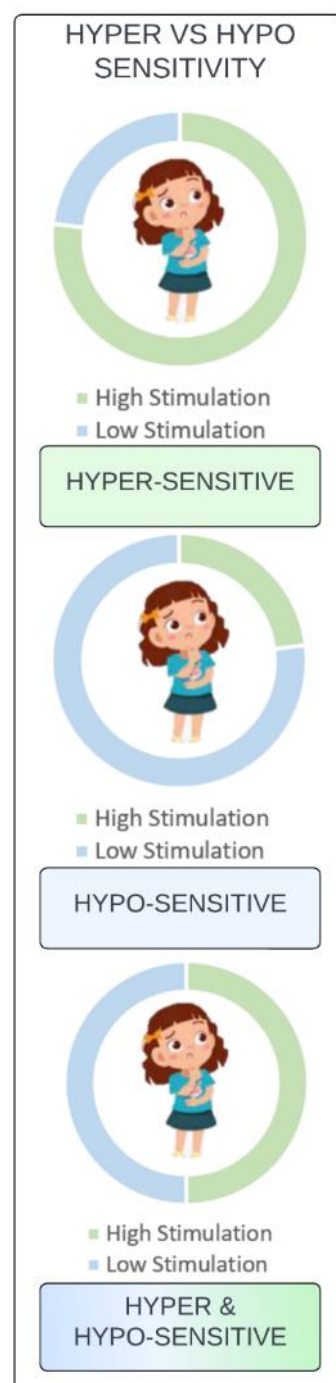


Figure 3-4-1-3 shows hyper vs hypo vs both extremes of sensitivity to one's environment. (Author)



information modifies their spatial experience, affecting their behaviour and life abilities. Mueller *et al.* (2020) describes how difficulties in managing sensory input hinder the child's ability to perceive the environment and develop spatial relationships to orientate themselves relative to the environment. As previously discussed, the sensory input children with autism experience can make the built environment distressing, distracting and often terrifying which contribute to atypical behaviours in individuals with autism (Gaines *et al.*, 2016). Weitlauf *et al.* (2017) argues that sensory symptoms in children with autism can include both strong attractions and aversions and how certain events, may cause a reaction in a child with autism, causing their behaviour to change as they try cope with their body's reaction to sensory input. According to Norberg-Schulz (1980), a "*dwelling*" should be "*protective*". However, research shows that people with autism who are impacted negatively from environmental stimuli experience anxiety and insecurity (Griswold, 2016). This is the opposite of what Schulz meant by a *dwelling*.

Gestalt principles of psychology, founded in Austria and Germany in the twentieth century, are principles that an individual uses to organise information into patterns of meaning, which are then used to understand the environment more easily. Gestalt psychology established that the entirety of something is more significant than its parts (Cherry, 2018). The assumption is that the brain creates perceptions of the environment based on the available sensory input. The ideas explored by Wertheimer, Köhler, and Koffka in the 20th century established the groundwork for the modern study of perception (Wertheimer, 1938). This relates to Norberg-Schulz (1980) observation that spatial consciousness is based on one's experiences with objects.

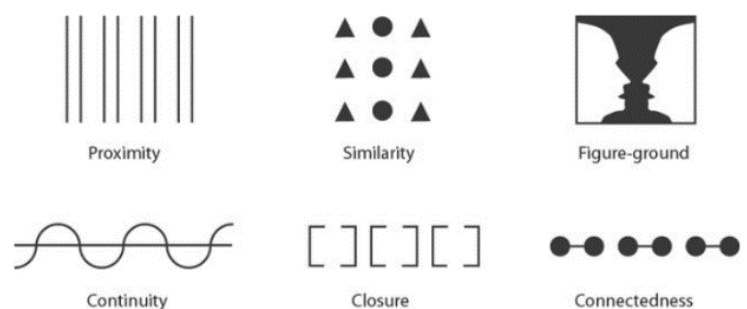


Figure 3-4-1-4 Figure showing Gestalt Principles (Burkhard, 2005)  
[Accessed 27/08/2022]

The Gestalt Theory is broken down into six principles (Refer to figure 3-4-1-4):

*Proximity – Objects which are close together often go together.*

*Similarity – Similar objects often go together rather than dissimilar objects.*

*Continuity – We follow objects that are visually aligned until they are interrupted.*

*Closure – The idea of organising perceptions of things into complete objects rather than separate parts.*

*Symmetry – Symmetrical Objects are more likely arranged as a whole than non-symmetrical objects.*

*Figure-ground – Organization is a type of perceptual grouping necessary for recognizing objects through vision by identifying figures from the background. We often focus on what we perceive as the central figure and ignore what we believe to be the background.*

The six principles help us understand how an individual organises stimuli from their environment (Gaines *et al.*, 2016). As previously discussed, individuals with autism battle with cognitive processing; for example, their ability to look at an object in its entirety rather than its parts poses an issue. For example Gaines *et al.* (2016) describe how people with autism "*may not see the forest of trees*" but will see many individual trees (Refer to figure 3-4-1-5). This demonstrates how individuals with autism struggle with central coherence, the ability to derive overall meaning from a mass of details such as facial expressions, and identifying one's emotions (Burnette *et al.*, 2005).

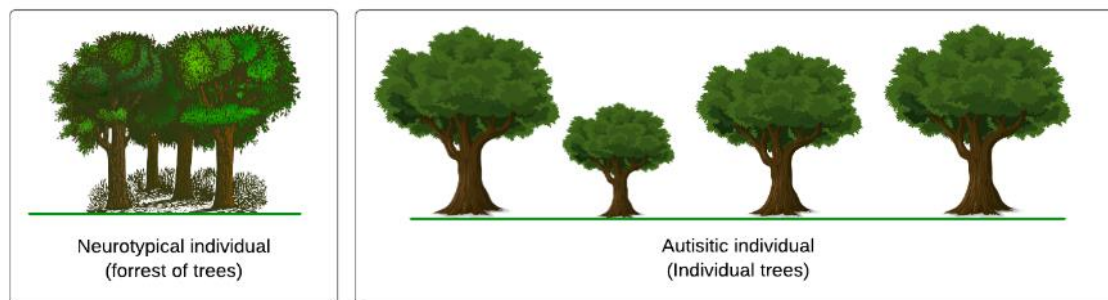


Figure 3-4-1-5 showing forest of trees and individual trees (Author)

Hall's Proximity theories (1959), describe how an individual perceives space concerning specific activities. A play area may contain toys or climbing structures, whereas a classroom where children learn may contain learning activities. These are all based on proximity and are related to how people perceive their surroundings and give



Figure 3-4-1-6 shows two environments one where children are sitting and playing in the class, the other children are running in the playground, the different environments allow for different levels of activities 1 - (Tootris, 2022) 2- (Playworld, n.d) [Accessed 23/10/2022]

areas meaning and identity (Refer to figure 3-4-1-6). Hall's proximity theories are related to Norberg-Schulz (1980) argument in that different environments necessitate different design aspects. A school's spatial layout differs from that of a hospital, and a shopping centre differs from that of an office building. The environment in which one finds themselves is perceived based on various factors related to proximity (Hall, 1959).

### 3.4.2 Senses of the body

The previous literature has discussed the importance of environmental stimuli and their effect on an individual's ability to perceive their environment. Here, we will examine how the individual senses of visual (*sight*), auditory (*hearing*), tactile (*touch*), olfactory (*smell*), gustatory (*taste*), vestibular (*bodies position and movement*), and proprioceptive (*body awareness*) relate to children with autism.

#### 3.4.2.1 Sense modality – SIGHT



One of the most relied-upon senses is one's sight. Sight is the sensory system that allows people to perceive their surroundings, such as nature, objects, and people. By interacting with our environment, we strengthen our understanding of our surroundings by receiving, interpreting, and responding to visual input through visual processing (Farbstein *et al.*, 1978).

Like other sensory disorders, visual sensitivities can be classed as hyper-sensitive or hypo-sensitive (Watling *et al.*, 2001). Colour, light, and spatial organization are three visual factors that impact behaviour in hypersensitive persons with autism (refer to figure 3-4-2-1-1) (Gaines *et al.*, 2014b). A person with visual hypersensitivity is likely to be irritated by bright lights, easily distracted by

movement, and fixate on specific individuals or things. According to Bogdashina (2016), people with visual hyposensitivity may struggle to recognize people and objects in their environment to the point where they perceive them as either non-existent or as outlines. This is related to the gestalt theory, where people with autism struggle to process large amounts of stimuli simultaneously and have trouble breaking the whole image or situation down into meaningful parts (Gaines *et al.*, 2016).

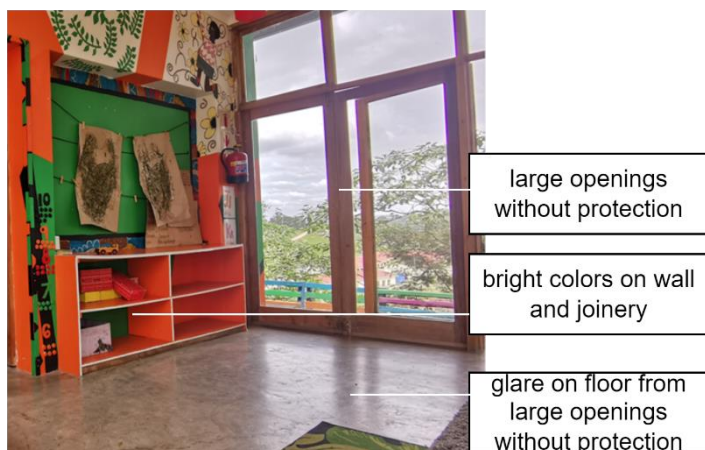


Figure 3-4-2-1-1 Figure showing glare on floor and bright walls with busy graphics Source: Author [Taken 04/11/2022]

According to Nielson *et al.* (2001), the principles of design are abstract concepts that encompass design theory; these concepts include size, proportion, balance, rhythm, and harmony; they are widely regarded as techniques for evaluating design features such as space, shape, form, and mass; they also include line, texture, pattern, light, and colour. These design components and principles are essentially visual characteristics that can be experienced through more than one

sense, such as touch and sight; this is consistent with Pallasmaa (1996:13) writings below, which argue that architecture is not experienced in singular objects but rather as a whole.

*“An architectural work is not experienced as a series of isolated retinal pictures, but in its fully integrated material, embodied and spiritual essence. It offers pleasurable shapes and surfaces moulded for the touch of the eye and other senses, but also incorporates and integrates physical and mental structures giving our existential experience a strengthened coherence and significance.”*

(Pallasmaa, 1996: p13)

#### 3.4.2.2 Sense modality – HEARING



Neurotypical individuals can often adjust to varying amounts of noise by blocking it out or ignoring it, but minor changes in sound level can cause anxiety and distraction in individuals with neurological differences, such as individuals diagnosed with autism (Hall



Figure 3-4-2-2-1 Figure showing autistic child blocking out noise (Wilkinson, 2018) [Accessed 28/01/2023]

*et al.*, 2001) (Refer to figure 3-4-2-2-1). Multiple studies have identified auditory processing issues as the most common sensory trigger for a large number of children with autism (Bogdashina, 2016). The degree and prevalence of particular symptoms however varies from person to person with autism (Gaines *et al.*, 2016).

Noise reduction should begin with the design and planning of spaces. Materials are an important aspect of the overall design that can significantly improve sound absorption, Manlove *et al.* (2001) argues that hard surfaces should be avoided on walls and floors to reduce reverberation within a classroom environment. Acoustic ceilings, soft floors, and furniture can lower noise levels, echo, and reverberation, making children's settings cosier. Shiny and reflecting materials, on the other hand, should be avoided since they have the potential to assist in loud and unpleasant environments (Beaver, 2010).

Gaines *et al.* (2016), argues that it is crucial to consider one's sensitivity to sound when designing spaces for individuals with autism. According to Ashburner *et al.* (2008), it may be difficult for young children to understand and learn speech in a loud environment. Studies show that, children with learning disabilities are more adversely affected by noise than children without similar cognitive impairments (Ashburner *et al.*, 2008). Hodgson (1999), argues that sufficient evidence supports the



idea that excessive noise levels or prolonged reverberation periods alone can impair speech comprehension in a classroom. In addition to raising the overall noise level in a classroom, long reverberation durations also make it harder to understand what is being said because voice levels may be low and drop significantly from front to back (Hodgson, 1999).

Individuals with autism tend to hear all sounds with similar intensity, and while attempting to shut out surrounding noises to listen to the person they want to hear, they tend to block out their voices, too (Bogdashina, 2016). Furthermore, in crowded environments, their brains try to understand the noises around them, including what other people are saying and what other sounds from all directions signify (Bogdashina, 2016); this may be mitigated by creating smaller classrooms where there are fewer individuals.

When children are in particular surroundings, environmental factors might make it harder for them to concentrate. It is crucial to consider the zoning of various contexts; high-acoustic areas should not be located next to low-acoustic environments, such as classrooms where children need to concentrate, since this may hinder the child's ability to focus (Gaines *et al.*, 2016). Windows within the classroom have the potential to promote sound transmission across areas; careful consideration must be taken in the placement of windows to limit the transmission of sound from external sources such as traffic, loud voices from play areas and zones which produce high levels of acoustics (Gaines *et al.*, 2016). Simple strategies can limit sound transmission from areas such as, vegetative screens and sound-masking elements such as running water (Hebert, 2003), (Refer to image 3-4-2-2-2 & 3-4-2-2-3).



Figure 3-4-2-2-2 showing Vegetative screen masking unwanted sounds from a certain zone, Source: Author



Figure 3-4-2-2-3 showing running water which can mask unwanted sounds (Garden Yards, n.d) [Accessed 04/10/2022]

Mostafa (2014), argues that the environment's acoustical design must be controlled to lessen background noise, echo, and reverberation in spaces used often by autistic persons. However, the degree of attention required for the activity in a particular setting must be considered and modified in accordance with the degrees of acoustical management. In order for children to proceed from one level of acoustics to the next and eventually acclimate to the various levels of sound found in a typical setting, Mostafa (2014) asserts that the designer must provide options for multiple degrees of acoustical management.

### 3.4.2.3 Sense modality – TOUCH



After heightened hearing, the most common sensory trait described in children with sensory impairment is hypersensitivity to touch. The tactile sense explains the sensual characteristics of seen objects and environments (Pallasmaa, 1996). According to Chow (2009), touch may offer information about textures, weight, density, and warmth, increasing one's comprehension of their surroundings. This relates to Gaines *et al.* (2016) argument that individuals who interact with their surroundings through touch better understand the world in which they live (Refer to figure 3-4-2-3-1). Konkle *et al.* (2009) argues how



Figure 3-4-2-3-1 showing children exploring texture with their feet (Thayer, n.d) [Accessed 28/01/2023]

tactile sensations are evaluated alongside other sensory interactions and how the senses of touch and sight influence each other. Pallasmaa (1996: p45-46) writings state, "*Vision reveals what touch already knows*". People usually know how something will feel by just looking at it, and the feelings associated with that sensory experience follow. When a child sees a steamy bath, they already know that the water is warm due to the steam rising from the water, and this knowledge evokes feelings of warmth, comfort, and cleanliness. This relates to Norberg-Schulz (1980:21), where in individual gets acquainted to environmental stimuli forming *perceptual schemata*.

Individuals with autism may have a condition known as tactile defensiveness, which causes their touch system to malfunction. Individuals suffering from this disorder exhibit a dislike for human contact through touch, such as hugging or holding hands, and wearing specific clothes made of materials that feel uncomfortable (Hatch-Rasmussen, 1995). Therefore it is important when selecting materials in the classroom or breakout rooms, that one considers the different preferences of children diagnosed with autism. Mostafa (2008), suggests in her writings that sensory stimuli are to be added to compensate for hypo-sensitive persons by making them available to those who require them; this idea is based on the concept that introducing additional stimuli is simpler than removing stimuli from a setting hence a simplified environment may be more conducive.

#### 3.4.2.4 Sense modality – SMELL



Olfaction, or the sense of smell, is the particular sense that allows us to recognize scents (or odours). The sense of smell can differentiate hundreds of fragrances, it help us determine whether odours are harmful, powerful, faint, delightful, or disgusting, and have



Figure 3-4-2-4-1 showing smell evoking a childhood memory (Khamsi, 2022) [Accessed 28/01/2023]

a big influence the sense of taste (Wolfe *et al.*, 2006). Sensory receptors in the nose collect information about the scents around us and deliver it to the brain. The human olfactory system does more than only process smells; Day *et al.* (2007) describe how it is also in control of emotions and memories, which is important to the way we identify with spaces and perceive our environment as previously discussed in

Phenomenology and Environmental Psychology. According to Herz *et al.* (2004), the olfactory sense generates more emotional memories than any other (Refer to figure 3-4-2-4-1). When dealing with odours, what one person finds unpleasant may not be so for another; these preferences are subjective and can vary significantly among individuals. Although people's tolerance for odours varies greatly, some odours are unpleasant to everyone. When smells are overpowering, they can cause physiological and psychological discomfort by altering one's mood, anxiety, and stress level which can impede on the one ability to dwell with a space.

Furfaro (2018), argue that individuals with autism use distinct areas of the brain than neurotypical individuals when identifying known and unknown odours in the air; it is said that they use almost half of their right side of the brain, implying they are looking for scents even when non-existent. In trying to augment their sensory input, children with autism may display a need to smell everything, a behaviour known as "hyposmell" (Bogdashina, 2016) ; this is assumed to be connected to a desire to learn more through sensory pathways that are more comfortable for them. According to Playgroup NSW (2015), some autistic children seek out odours they are acquainted with to help them relax when they are distressed or experiencing sensory overload.

To help in the purification of air within the environment, highly effective approaches (Refer to figure 3-4-2-4-2) such as natural ventilation replacing stale indoor air (Day *et al.*, 2007), additionally the inclusion of plants that have a high intake of CO<sub>2</sub> may be beneficial in the purification of indoor air (Wolverton *et*

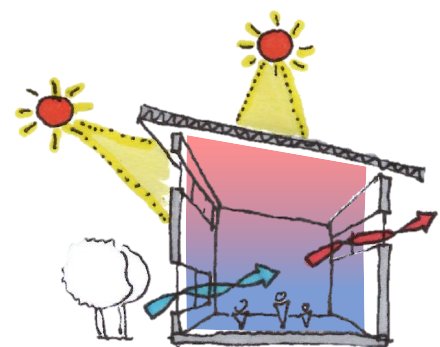


Figure 3-4-2-4-2 shows windows allowing fresh outside air into the space pushing out stale and warm air. Source: Author

*al.*, 1989). The occupants' thermal and olfactory comfort is increased by incorporating air circulation solutions into the design.

Wolverton *et al.* (1989) demonstrated for NASA in their research report "*Interior Landscape Plants for Indoor Air Pollution Abatement*" that incorporating certain plants into the design of spaces improves air quality. The plants in their study removed organic chemicals from the indoor air, leaving a healthier environment for occupants (Wolverton *et al.*, 1989). By implementing plans in the classroom, not only does the air get purified but it too enhances the child's biophilia (Refer to figure 3-4-2-4-3).



Figure 3-4-2-4-3 showing plant in class room which purifies the air and enhances children's biophilia (Home & Garden Information Center, 2019) [Accessed 06/10/2022]

Because odours vary in nature and everyone's tolerance is different, creating neutral-smelling environments may be the answer to accommodating people who are sensitive to smells, consideration must still be exercised to allow people to explore their olfactory senses. Certain Reggio Emilia preschools and nature schools worldwide have created different zones within the buildings and gardens where they smell different to other areas; they utilize specific plants, building materials, and furniture to create "smellscapes," as described by (Day *et al.*, 2007). This limits the number of unpleasant smells within the child's environment but allows them to explore and develop their olfactory senses.



### 3.4.2.5 Sense modality – TASTE



Taste may not be physically incorporated into the design as the other senses may, but well-known philosophers have written about the importance of taste in architecture in a

more psychological aspect rather than a physical one.

Pallasmaa (1996) speaks about the relationship between tactile, vision, and taste sensations; she further depicts how certain architectural design features and colours may trigger oral sensations. Mahnke (1996) relates to Pallasmaa's writings by explaining how specific colours trigger different tastes (Refer to table 3-4-2-5-1).

| COLOUR | TASTE             | COLOUR         | TASTE          |
|--------|-------------------|----------------|----------------|
| RED    | sweet and strong  | GREEN & BLUE   | fresh or salty |
| PINK   | sweetish and mild | GREEN          | sour and juicy |
| ORANGE | strong            | YELLOW & GREEN | sour and tangy |
| BROWN  | musty             | VIOLET         | narcotic       |
| YELLOW | sour              | LIGHT PURPLE   | sweetly tang   |
| BLUE   | odourless         |                |                |

Table 3-4-2-5-1 Figure showing taste associated with colours (Author).

Young children put nearly everything in their mouths; this is normal during the developing stages of a child's

life. A baby's lips and mouth are full of sensory nerves that allow them to understand what something feels like as they explore the objects in their environment (Larkey, 2007). By placing objects in their mouths at a young age, they begin to understand whether something is hard, soft, warm, or cool. They also begin to understand their sense of taste and build a more robust immune system (Iftikhar, 2020).



Figure 3-4-2-5-1 Children engaging with edible garden (Beach, 2018). [Accessed 04/09/2022]

Our ability to select palatable, nutrient-dense foods and to reject unhealthy or decaying foods depends on our ability to taste. Children may connect with their biophilia by utilizing edible landscapes, which also helps them develop their preferences, knowledge, and culinary abilities (Kellert *et al.*, 2011). People with autism are known to have eating preferences, and many avoid fruits and vegetables, according to Kushner (Kushner, 2018). Unfortunately, if exercise is not a regular part of the child's

routine, this may result in nutritional deficiencies and affect the child's weight gain. Kushner (2018) argues that persons with autism appreciate routine, including their culinary preferences. Children may develop a stronger love of eating if edible landscapes are incorporated into their daily lives (Refer to figure 3-4-2-5-1).

#### 3.4.2.6 Sense modality - VESTIBULAR & PROPRIOCEPTIVE



Our vestibular and proprioception senses form our perception of the environment (Gaines et al., 2016). The Dire, often known as our balance centre, helps with movement, posture, vision, balance and one's coordination of the body; it is responsible



Figure 3-4-2-6-1 children playing hopscotch which improves balance, physical coordination, and cognitive development (Therapytree, n.d). [Accessed 28/01/2023]



Figure 3-4-2-6-2 showing children on a trampoline which develops one's proprioceptive senses (Child Therapy: Proprioceptive Sensory Activities, 2017). [Accessed 28/01/2023]

for collecting information about our bodies' movement in space as well as one's acceleration and deceleration (Myles, 2000) (Refer to figure 3-4-2-6-1). The Proprioception system is the ability to sense where our bodies are in space and is required to develop body awareness and achieve motor milestones such as picking up objects (Bogdashina, 2005). Bogdashina (2005) argues that the vestibular and proprioceptive systems impact one's visual and spatial perception.

The proprioceptive system is in charge of spatial cognitive processing development and is controlled by muscles, joints, ligaments, tendons, and connective tissues (Kranowitz, 2005) (Refer to figure 3-4-2-6-2). The ability to touch, see, and hear can be compromised without a well-developed proprioceptive system. Because of the distortion, a person with autism may find it difficult to perceive their world similarly to neurotypical individuals. Koomar et al. (2001) argue that in order to coordinate all of the sense's proprioception is required.

The impaired vestibular and proprioceptive systems must be considered when designing the physical environment. Proprioception deficiencies can be accommodated by careful space planning, which

includes using materials, patterns, and textures that allow for differential sense engagement (Gaines et al., 2016). Autism sensory seekers, "vestibular hypo-sensitivity," require frequent mobility. They need to keep moving in order for their brain to recognize where their body is (Bogdashina, 2016, Hall, 1959); therefore, it is beneficial to provide spacious pathways that can accommodate spinning, arm flapping, and general body movements (Gaines et al., 2016). Additionally, transition spaces discussed further in section 4.4.5 can help individuals who battle with their sense modality vestibular and proprioception. Additionally, providing amenities such as

treatment rooms and play spaces help address the needs mentioned above of individuals with autism (Mostafa, 2015).

## 3.5 BIOPHILIA

Edward O. Wilson (1984a: 85) suggested the theory that humans seek connections with nature and other life forms in his 1984 book, *Biophilia*. It was then that the idea of biophilia was integrated into architecture and physiology, creating a new way to think about built environments and their effects on our physical, social, intellectual, and physiological well-being. Wilson (1984), argued that children are genetically predisposed to explore and bond with nature.

### 3.5.1 Importance of children's access to nature

Moore *et al.* (2008), argues that children as young as 2-years-old exhibit "biophilia," or a love of nature (Refer to figure 3-5-1). For children's natural biophilia to grow, they need developmentally appropriate opportunities to learn about the natural world based on sound child development and learning principles (Chawla, 2006, Kellert, 2003, Kellert *et al.*, 2011). Unnatural environments frequently obstruct children's independent mobility and, consequently, their experience of nature. One of these barriers is a lack of direct engagement with natural processes and materials during early childhood when the sensory impact is the dominant learning mode (Kellert *et al.*, 2011). Gaines *et al.* (2016), argues that direct exposure to nature improves behaviour management, learning, and well-being in autistic children. Li *et al.* (2019), research shows that children with autism improve their sensory-motor and emotional skills when having direct access to nature. According to Crain (2003), barriers to children's access to nature now exist, potentially



Figure 3-5-1-1 Child smelling flowers and developing a love for nature through exploring their senses (Tetyana, 2019) [Accessed 27/08/2022]

| Eight Key benefits for children aged 0 to 6yrs when exposed to nature: |   |
|--|---|
| improved balance and motor coordination                                | Improved health                                   |
| increased physical activity  | fewer behavioural and social difficulties         |
| better sleep   | lower risk of psychiatric illnesses later in life |
| lower levels of depression   | lower risk of near-sightedness                    |

Table 3-5-1-1 showing Key benefits for children aged 0 to 6yrs old having access to green spaces (Sugar, 2021) [Accessed 14/08/2022]

preventing them from growing up with a love and respect for the earth and a desire to conserve it. This speaks to Kellert, Heerwagen and Mador (2011: 168) argument, "*Childhood experiences with nature influence adult sensitiveness to trees,*" which suggest that early exposure to nature creates a set of moral principles for a caring and nurturing adult. Recent research has shown that access to green spaces can benefit children's physical, cognitive, mental, and social health development (Sugar, 2021). Sugar (2021) identifies eight benefits of daily nature exposure for 0-6-year-olds (Refer to table 3-5-1-1).



Crace (2006), argues that children are 2-3-years behind where they should have been 15 years ago in cognitive and conceptual development. The lack of exposure to the natural environment is most likely to blame for their poor cognitive development. According to Day *et al.* (2007), children are now exposed to more TV shows and video games, and a lack of outdoor play leads to poor cognitive development from a young age. In contrast, children exposed to a more natural outdoor environment benefit from enhanced motor development, physical fitness, imaginative and social play (Kellert *et al.*, 2011). This supports Day *et al.* (2007) claim that children perceive the outdoor environment as a place to engage in activities, as opposed to simply sitting and staring out the window. Having the *freedom, curiosity, interest, wonder, excitement*, and joy of having their own space enables children to develop good behaviour, social skills, and mutual respect through imaginative and outdoor play (Refer to figure 3-5-1-2). Norberg-Schulz (1980:22) contends that in order to have genuine freedom, one must also belong, and that "*to dwell*" means to be a part of a particular location. Seamon (1985: p.80) views social spaces as including two elements: first, a protective routine that serves to protect people from the destructive intrusion of novelty; and second, an openness that permits and also promotes freedom and its results. Children are drawn to the natural outdoors because it is enjoyable and provides them with a sense of well-being, expanded freedom, and agency or control over events.

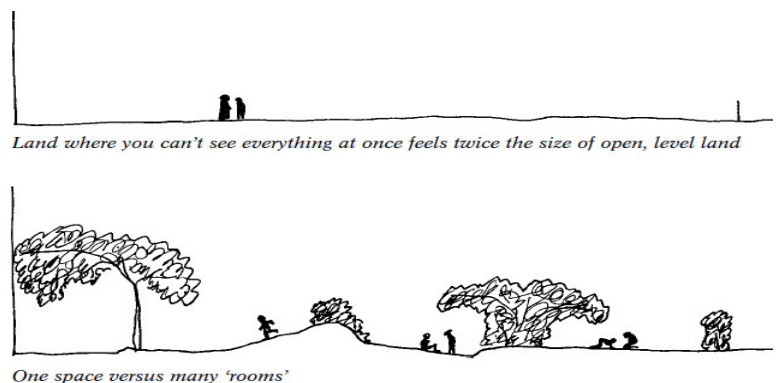


Figure 3-5-1-2 shows two environments one open and bare while the other is landscaped the landscaped environment allows children to explore, and participate in fantasy play where zones are created according to their world and how they perceive it (Day and Midbjer, 2007, p 15) [Accessed

### 3.5.2 Outdoor play areas

According to Fjørtoft (2001), early childhood is crucial for developing a child's physical and cognitive ability. In his paper, "*The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children*", Fjørtoft discovered that children who played regularly in a natural environment with varying landscapes and greenery, such as trees and rivers, rather than a typical playground, performed significantly



Figure 3-5-2-1 showing combination of static playground mixed with natural playground affording the opportunity for fresh experiences everyday (Holly Henriksen, 2016) [Accessed 27/08/2022]

better on balance and motor coordination assessments. Kellert *et al.* (2011) argued that outdoor landscaped environments can positively impact a child's development through engagement (Refer to figure 3-5-2-1). Unfortunately, many outdoor areas are fitted with traditional playground equipment rather than a dynamic natural learning environment that allows fresh experiences every day through play activities rather than the repetition of static settings (Kellert *et al.*, 2011). According to Yarrow *et al.* (1975), children's attention is drawn to responsive settings, particularly diverse and complex ones. It is, therefore, vital that outdoor play areas are seen as essential components of a child's education rather than just as a play area.

Sallis *et al.* (2000) argues that the levels of exercise and energy expenditure required for good physical development are not possible when restricted to indoor conditions, she further argues that outside activities prove to be the best predictor of children's physical activity. The loss of a "*free-range childhood*" significantly contributes to an unhealthy lifestyle. This relates to Louv (2008) research which contends that a disconnect from nature has severe consequences for human health and childhood development (Refer to figure 3-5-2-2). Children with access to local green areas are more likely to exercise Chawla (2015) argues. As a result, they get the physical and mental health benefits commonly linked with constant movement (Janssen *et al.*, 2010). According to the World Health Organization (2016), green spaces may give space for play, escape, and health restoration, significantly enhancing mental well-being and decreasing anxiety and despair. Sugar (2021) research found that children who live closer to parks with a more natural setting had fewer behavioural and social issues in their early years. Kellert *et al.* (2011) argue that outdoor engagement with nature must be offered as part of daily life, interwoven with children's increasing



Figure 3-5-2-2 showing child looking out of window connecting with nature (Shlomaster, 2016) [Accessed 23/08/2022]

developmental needs, to fully benefit from being outside. This is especially important for young children, whose brain and physical development occurs rapidly in the first few years of life (Kellert *et al.*, 2011).

### 3.5.3 Biotic and abiotic

When considering outdoor spaces for children, one must be cognitive of biotic and abiotic elements. Biotic elements such as ponds, streams, trees/shrubs, flowers, dirt, and gravel are preferred by children over "abiotic" features such as playground equipment and pavement (Moore, 1986) (Refer to figure 3-5-4-1). This is not to say that playgrounds with built-in equipment are bad for kids; incorporating elements of the natural world into the playground enhances a child's development. Whether tossing a stone into the water or floating leaves in the puddles formed

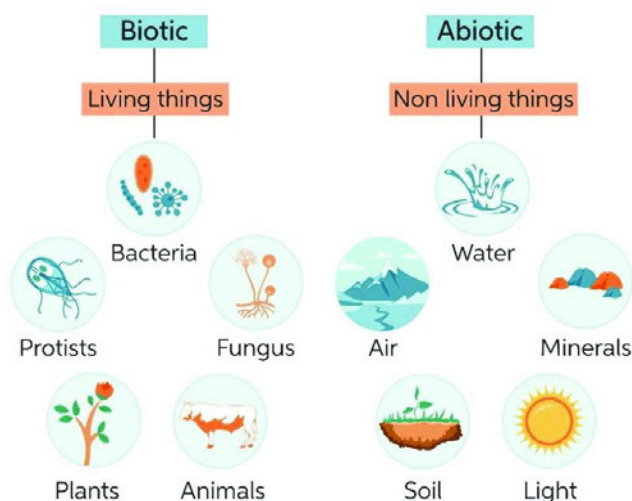


Figure 3-5-3-1 shows Biotic vs Abiotic elements (Guerreiro *et al.*, 2022) [Accessed 23/08/2022]

along the paths after a night's rain, biotic elements play an essential role in a child's development. Trees and shrubs provide opportunities for climbing and the construction of dens in which adventures can take place (Refer to figure 3-5-4-2 & 3-5-4-3). Little gaps in the bushes provide a sheltered area for the child's imagination to run wild (Day *et al.*, 2007). Cave-like environments are relaxing for persons with autism because they minimize sensory input and allow them to relax and escape from over-stimulated experiences. These might be built beneath a low-hanging tree or within a rock enclosure (Gaines *et al.*, 2016). Although the child's purpose in connecting with these parts of nature is to play, they are nevertheless gaining essential information that benefits their growth (Day *et al.*, 2007).



Figure 3-5-3-2 shows children climbing a tree (Day and Midbjer, 2007, p 34) [Accessed 27/08/2022]



Figure 3-5-3-3 shows child seeking shelter in bush (Day and Midbjer, 2007, p 104) [Accessed 27/08/2022]

### 3.5.4 Natures emotional benefits for children with autism

Children with autism often feel unpleasant emotions such as tension and anxiety. Access to nature allows for relaxation, stress reduction, and healing (Kellert *et al.*, 2011). Gardens can also be used for social support, pleasant escapism, or a sense of control (Ulrich, 2002). A well-designed garden will foster regular, constant connections with nature and bring measurable therapeutic benefits to people with autism (Li *et al.*, 2019). Li *et al.* (2019) research revealed that children were happier and more energetic when exposed to nature. Creating considerate therapeutic gardens and outdoor play settings, will inspire children with autism to pay attention to nature's inherent healing qualities. Connecting people to nature, regardless of age or stage, has been shown to lower heart rate and blood pressure, relieve anxiety, and improve neurologic brain activity (Gaines *et al.*, 2016). According to the literature, nature is an antidote that stimulates growth and cognitive power, enhances the efficacy of exercise and physical rehabilitation, and reconnects us to our innate connection with nature. Supportive surroundings and therapeutic gardens designed mainly for autistic children can help them develop more effectively (Refer to figure 3-5-4-1 & table 3-5-4-1). According to Gaines *et al.* (2016), exposure to outdoor environments, particularly in educational settings, helps children improve their learning abilities and social situations outside the classroom.



Figure 3-5-4-1 showing garden for children to engage with their senses (Barakat *et al.*, 2019) [Accessed 27/08/2022]

| GARDEN FOR CHILDREN WITH AUTISM TO ENGAGE WITH THEIR SENSES |  |                       |  |
|---|--|-----------------------|--|
| <b>Entrance zone</b>  | Orientation map<br>Well defined landmark with three round circles<br>Well defined routes<br>Large open spaces<br>Vivid colors  | <b>Bird area</b>      | Restorative therapy<br>Flower beds attracting birds with bird feeders  |
| <b>Becoming the animal</b>                                  | Pet therapy<br>Plants to attract butterflies and birds<br>Introduce animals to overcome sensory integration issues.  | <b>Natural trails</b> | Integrated spaces that allow elements of nature to help with balancing, climbing elevating using boulders and rocks, tree stumps and logs. Providing opportunities to learn and discover new things. |
| <b>3 Sensory zones</b>                                      | <b>Sensory play zone:</b><br>Aroma and acoustic zone<br>Tactile zone<br>Relaxation zone<br>Light and color zone<br><b>Fine and gross motor skills zone:</b><br>Climbing and balancing elements integrating movement activities<br>Swings, and hammocks<br><b>Vestibular and proprioception:</b><br>Equipment to assist in sensory development such as swinging, spinning, sliding, climbing, and balancing | <b>Gardening zone</b> | Gardening activities provide therapy proving additional opportunities for children to connect with nature and each other.  |
| <b>Water world</b>  | <b>Aquatic therapy</b><br>Using different water features such as waterfalls, water fountains, swimming pools and running zones with spray nozzles.   |                       |  |

Table 3-5-4-1 showing different zones and their purpose (Barakat *et al.*, 2019) [Accessed 27/08/2022]



### 3.6 CONCLUSION

In conclusion the literature in Chapter 3, shows that designing with children in mind is essential when designing spaces for early childhood development especially children with autism. Children have unique perspectives on the world; as a result, the environments we create for them may have a profound effect on their development and on their future life. Nature has been mentioned as being a fundamental connection point for the psychological benefit and well-being of children, and it is yet another aspect that is crucial to a child's development. Seamon (1985: p8) unpacks Heidegger's concept of dwelling which involves the process by "*which a place in which we exist becomes a personal world and home*". A home is a safe place where nurturing take place. Children require spaces that have been specifically designed for them, as well as an environment that fosters and encourages their development in accordance with their age. To better prepare children for the issues they will face later in life, spaces should be shaped by the children themselves rather than the other way around (Day *et al.*, 2007). The provision of special education services to young children with autism requires spaces to be designed with flexibility as a primary concern. This is necessary to ensure that the ever-evolving and expanding requirements of children with autism may be met in an acceptable manner. It is clear that cultivating a sense of place in people or appropriately responding to the genius loci of a location can have a bearing on the psyches of individuals in a variety of different ways. The development of a child's identity is essential to their overall growth, and personal identity is inextricably linked to place identity, which is a component of an environment's character. In order for children to perceive and comprehend their environment in its entirety, the place's character needs to be concrete in its nature (Norberg-Schulz, 1980).

The connection and undeniable relationship that a person has with their environment in order to form their perception and sense of self-identity is dependent on the design elements that form the spaces that a person finds themselves in. As a result, the elements of architectural design will be broken down in the following chapter in order to provide an understanding of how to create environments that are conducive for children who have autism.



Figure 4-1 Figure showing chapter 4-word cloud (Author)

## 4.1 INTRODUCTION

In his seminal work, *Towards a New Architecture*, Le Corbusier (1986: p88) stated, "...man sees architectural things with eyes that are 1 meter 70 from the ground." When designing for children, this particular standard is especially irrelevant because children are not adults, and therefore the adult-centric assumptions that are made in architecture should not apply. While there are many factors that shape the kind of adults we become, our encounter with architecture as children – be it the door handles children stretch to turn or the tables which are too high to grab something needed - can have a significant impact on one's perspective of the world. When designing spaces intended specifically for children, we are, in a sense, shaping these future perspectives; as a result, it is extremely important that we approach the process with both thoroughness and compassion. It is therefore practical to consider that a young child's eyes are 1.06 metres from the ground on average (Dobbins, 2018). With this in mind as was previously discussed in [chapter 2](#), design considerations must be centred around children and not adults when designing for early childhood development.

The primary objective of the built environment is to support individuals in relation to the activities that they engage in while occupying a particular place. Designers need to be aware of the behavioural characteristics of children with autism in order to create environments that are welcoming. A person with autism will have a differentiated sensory sensitivity as well as cognitive awareness as discussed in chapter 3. There is evidence to suggest that individuals with autism perceive the structures and environments around them in a manner that is distinct from neurotypical individuals. Autistic individual's challenges in processing sensory information frequently leads to unproductive behaviours, which can be mitigated through better designed spaces. The design recommendations presented in this chapter are placed into context by the literature presented in chapters 2 and 3, which detail the various characteristics exhibited by individuals with autism. This will help answer question 4 in chapter 1 of the literature (see 1.3.4).

## 4.2 DESIGN TO PROMOTE ROUTINE & PREDICTABILITY

Increasing the independence of people with autism by improving their ability to navigate spaces in well-organized and easy-to-navigate environments fosters empowerment and independence. Individuals with autism have a strong aversion to change; they require structure and routine in their lives and must be able to pre-empt what is coming next. In response to autistic people's preference for routine and predictability, the concept of spatial sequencing was developed (Mostafa, 2014).

#### 4.2.1 Spatial sequencing:

The idea behind spatial sequencing is to capitalize on the fact that autistic people gravitate more toward predictability and routine in their daily lives. The implementation of spatial sequencing calls for the areas to be arranged in a manner that is consistent with logic, taking into account the typical scheduled uses of such spaces as well as the sensory flow (Refer to figure 4-2-1-1).

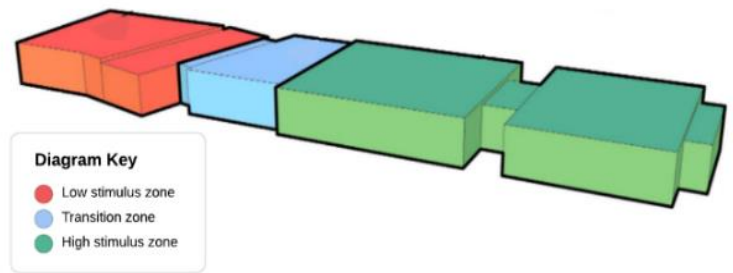


Figure 4-2-1-1 shows a how different zones are separated to their sensory requirement, this could be a hall separated from the classroom where different activities take place (DeLine, 2017). [Accessed 27/08/2022]

Spatial sequencing benefits children with autism because the logical order, based on the individual's usage schedule, helps predict expected behaviour (Mostafa, 2014); by implementing clear sight lines, distinguishable architectural forms and surfaces where activities take place help the individual learn independently (Gaines *et al.*, 2014a). When transitioning from one activity to another in a space, there should be as little disruption and distraction as possible, preferably through the use of one-way circulation whenever possible. Transition Zones discussed in chapter 4.6 should be utilised only when absolutely necessary to capitalize on free flow (Mostafa, 2014). The creation of consistency is facilitated by spatial sequencing, which also has the potential to contribute to the alleviation of anxiety in users by relieving them of the stress of anticipating unanticipated events or activities (Gaines *et al.*, 2016). The creation of consistency is facilitated by spatial sequencing, which also has the potential to contribute to the alleviation of anxiety in users by relieving them of the stress of anticipating unanticipated events or activities. Even though it is difficult to implement it broadly across a facility, it should be applied with particular attention in general use spaces such as classrooms (refer to figure 4-2-1-2), as well as across the facility from building to building. This should be done in order to minimise disruptions to students and staff as they move from one building to the next.

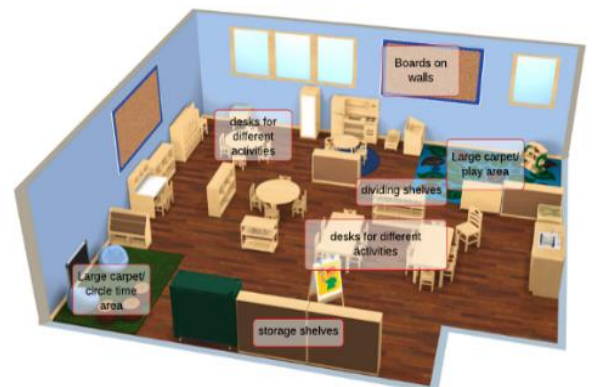


Figure 4-2-1-2 shows a structured classroom where different activities would take place (Complete Classrooms, n.d) with author labels.

#### 4.2.2 Compartmentalization:

Compartmentalization is accomplished by restricting the sensory environment for each activity, articulating classrooms, or dividing an entire building into smaller spaces (Mostafa, 2014). Individuals on the autism spectrum benefit from compartmentalizing environments for specific tasks to maintain daily routines (Refer to figure 4-2-2-1). This is because persons on the autism spectrum have difficulties forming mental maps of the spaces they enter (Pellicano *et al.*, 2011).



Figure 4-2-2-1 shows compartmentalization of spaces using different furniture (AHRC New York City, 2022)

The sensory input that must be processed is limited by compartmentalizing spaces where activities are consistently completed in the same way, encouraging concentration on completing tasks. This enables children to form routines and predictability by relating to spaces and their appropriate behaviours (Tola *et al.*, 2021). Various methods, such as room dividers, changes in levels from ceiling to floor, natural and artificial light, and the careful placement of furniture, including the use of subtle differences in muted colours, all contribute to the creation of compartmentalized environments. Mostafa (2015) describes how compartmentalized spaces attempt to reduce the sensory and social input that an individual with autism must deal with while also improving predictability and communicating the purpose of spaces.

### 4.3 COMMUNICATION OF PURPOSE

According to research, the arrangement of classroom settings influences children with ASD (Hurtb *et al.*, 1999). Children on the autism spectrum are easily distracted by too much incoming environmental stimuli. Sensory overload is a common cause of inattention and distractibility, where a disorganized classroom can negatively impact a child's attention to irrelevant details (Mostafa, 2008). A child's development may be severely impacted by their inability to process sensory information; poorly designed spaces that are too loud, bright, and unstructured will be confusing to a child with autism, and they will gain very little from attending early development (Hume, 2018).



Furthermore, studies have shown that children in well-structured settings exhibit greater on-task behaviour and higher academic achievements (Heflin *et al.*, 2001), which depicts what is where, this can help a child with autism understand that games are for play time and books are for reading (refer to figure 4-3-1). Children with autism may struggle to make sense of their surroundings; as a result, participation may be limited due to the child not understanding what is expected of him/her in a specific area of the classroom. A well-organised and well-structured environment can help a child anticipate the needs within a specific environment, which helps a person with autism fit in and participate in a more productive and meaningful way (refer to figure 4-3-2). When the layout of built forms such as furniture, finishes, and equipment are carefully considered, individuals with autism can experience and navigate their environment with greater cognitive clarity and less distraction (Gaines *et al.*, 2016).



Figure 4-3-1 shows visual supports to communicate behavioural expectations (Iris Center, n.d).

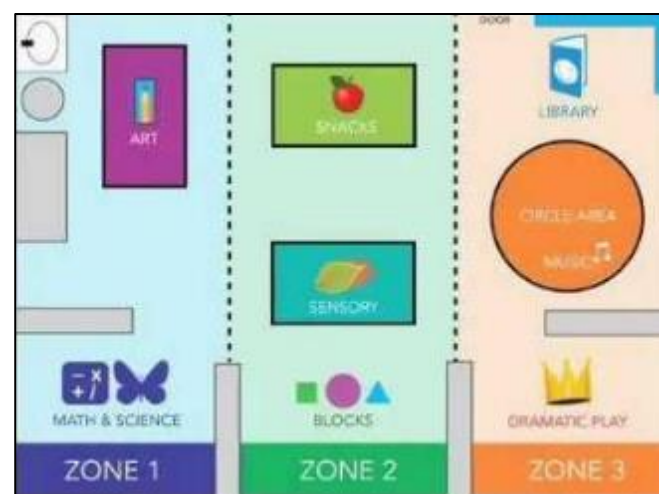


Figure 4-3-2 shows a classroom setting broken into zones, where certain activities take place this helps children identify different areas where different activities take place (usgovACF, 2015)

According to Hume (2018), learning environments that communicate purpose improves a child's early development, negative behaviour, and attention span. This is consistent with the findings of Pellicano *et al.* (2011), who argues that when spaces are compartmentalized for specific activities, individuals on the autism spectrum find it easier to navigate their environment and maintain daily routines.

## 4.4 WAY-FINDING AND NAVIGATION

Mostafa (2008), asserts that when combined with sensory zoning, conducive wayfinding considerably assists individuals with autism in easily navigating their environment. Regardless of one's abilities, the physical environment can be confusing and difficult to read and understand for everyone (Refer to figure 4-4-1). In most cases, engaging the senses can reveal a wealth of information (Gaines *et al.*, 2016). Norberg-Schulz (1980) defines the meaning and sense of place when an individual connects with their environment through recognizable and memorable characteristics. To aid orientation, the design should include well-defined pathways to destinations and predictable and permanent landmarks (Refer to figure 4-4-2).



Figure 4-4-1 shows a child looking at a maze trying to navigate the path to the central location (Brandculture, 2022)

### 4.4.1 Landmarks:

Landmarks that are thoughtfully designed, such as archways and views into gardens, leave an indelible impression on not only autistic people but also neurotypical people (Gaines *et al.*, 2016) (Refer to figure 4-4-1-1). Specific zones within the built environment can be distinguished using landmarks and sensory integration techniques, which serve two purposes: first, it provides comfort to the child by providing a sense of orientation, and second, it may allow an individual to navigate these environments independently, freeing up staff members who would otherwise have to guide children throughout the day (Mostafa, 2008).



Figure 4-4-1-1 shows a large glass window in the circulation corridor, this creates a central landmark which can assist in navigating the hall ways of facilities (Behance, 2017).

### 4.4.2 Decision making:

Decision-making along the travel route should be kept to a minimum, and the designer should provide simple environmental information to aid navigation (Arthur *et al.*, 1992). Although some individuals with autism struggle to communicate using language and written words, they tend

to communicate well using sensory input (Grandin *et al.*, 1996). Sensory integration techniques like colour systems, texture variations and pictorial signage can aid in the establishment of a clear, ordered environment that children can easily grasp and navigate (Scott, 2009) (Refer to figure 4-4-2-1). For example, when travelling to a foreign country and someone does not understand the native language, a simple image of a restroom with an arrow can help a person find their way; therefore, pictorial signage gives a person confidence to navigate their surroundings independently.



Figure 4-4-2-1 shows colours being used to identify different rooms which can be used to remember which door you came from or going too (Brandculture, 2022)

To avoid visual overstimulation, visual aids such as colour and patterns to communicate circulation routes must be done discreetly (Mostafa, 2014); additionally, to help navigate an area, the use of an orientation map that shows the layout of the school grounds, garden or playground area helps an individual know where they are and what to expect next.

## 4.5 DESIGNING FOR SOCIAL INTERACTION

Daily, children with autism face challenges (Gaines *et al.*, 2016), one of which is social interactions with others, which can harm their development, and social interaction, both these allow a child to develop confidence through interaction and play with others, as discussed in chapter 2. When a child comprehends their surroundings, their emotional confidence grows, and they begin to feel more in control and independent, making them feel more comfortable and less likely to act out in negative ways (Gaines *et al.*, 2016).

Neurotypical children may feel at ease in close quarters with others, whereas autistic children may find it challenging to have someone in their personal space (Humphreys, 2005). Children with autism benefit from reasonably sized environments because they can move around more freely without feeling threatened by other people in close proximity (Humphreys, 2005); this also helps with behavioural issues because children are less likely to retreat and act out negatively in crowded spaces (Gaines *et al.*, 2016). However, as discussed in section 4.3.2 - Hearing, poorly designed large open spaces create reverberation and can negatively impact a child with autism.

Individuals with autism may experience social inhibitions when approaching and manoeuvring within their environment. This difficulty is primarily due to a compromised vestibular and proprioceptive system, as discussed in section 4.3.5 (Weimer *et al.*, 2001).



Should a child become over-stimulated in a social or more intimate environment, they may act out negatively; providing withdrawal/escape spaces (Refer to figure 4-5-1) is essential as they offer a sense of retreat; a good withdraw space feels separated or unique from its surroundings; its spatial characteristics can feel contemplative, embracing, and protective without being disengaging; these spaces must offer a safe haven for children experiencing sensory overload (Vogel, 2008, Ryan *et al.*, 2014). Escape spaces that give sanctuary also foster social interaction because they allow people to look about and assess their surroundings before engaging in them (Hildebrand, 1999).

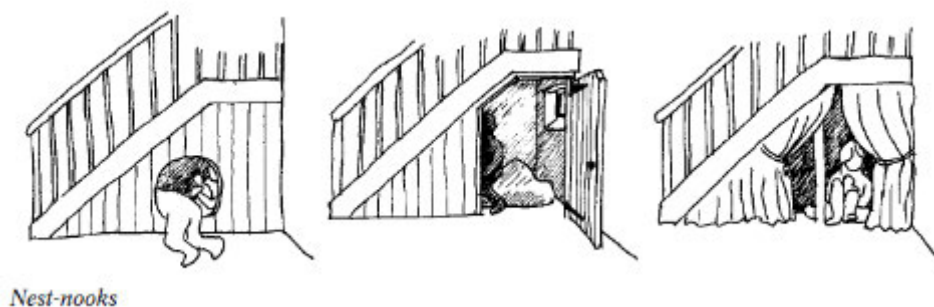


Figure 4-5-1 Figure showing a safe place for children to escape too when over stimulated from certain activities (Day and Midbjer, 2007, p 124) [Accessed 04/08/2022]

## 4.6 TRANSITIONS AND ZONES

Many individuals with autism struggle with transitions and change, both in terms of moving from one location to another and with new scenarios. Transitional zones, in conjunction with spatial sequencing and sensory zoning discussed in [chapter 4.2](#), assist autistic individuals in recalibrating their senses as they transition from one stimulus to the next. The need for repetition is evident in the repetitive behaviours seen in children with autism; however, Paron-Wildes (2013) argues that it is imperative not to make the environment too rigid that it aids in encouraging obsessive-compulsive behaviours. According to Mostafa (2015), transitioning from one area to another should be seamless and consistent with the individual's daily activities to help avoid overstimulation. It should allow for a smooth transition with minimal stimulus and sensory disruption, avoiding abrupt changes in the function and stimulation of an autistic individual (Refer to figure 4.6.1).

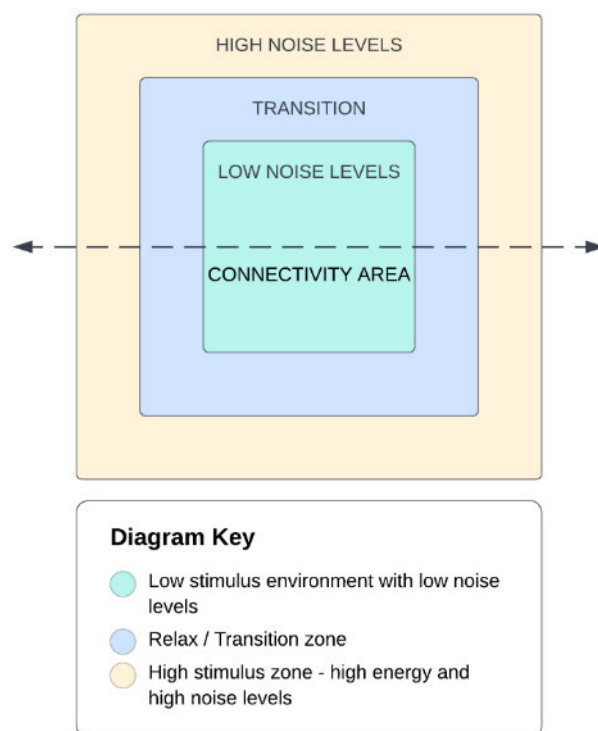


Figure 4-6-1 shows relation between low stimulus and high stimulus zones (Author)

Transparent walls and doors within transitional spaces assist people in a smooth adjustment to unfamiliar situations by allowing them to look beyond their immediate surroundings before thoroughly engaging with them (Gaines *et al.*, 2016, Vogel, 2008). Zones separated by transitional spaces can be constructed as a portion of a hallway, a discrete node signifying a shift, or a whole room, such as a sensory room (Mostafa, 2015).

As previously discussed in [section 3.4.2.2 hearing](#), zones should be grouped according to their permissible stimulation level, with high stimulus zones such as music rooms, dining areas, or play areas requiring low concentration and thus low acoustical control, and low stimulus zones such as classrooms and therapy offices requiring high concentration and thus high acoustical control (Walczak, 2020). Transitions may be utilized to aid children in moving from one zone to the next and help distinguish different zones.

According to Southerington (2007), children with autism frequently struggle with transitioning from one environment to another and from one activity to another. As previously stated in [chapter 2.4](#), visual cues and schedules are helpful for activity transitions and aid children in staying focused and on track when participating in activities. Different strategies, known as transition cues, can be utilized for spatial transitions. Transition signals include colour stripes that establish a route between rooms or inside a specific location, leading the user through different activities or daily routines (Refer to figure 4-6-2).

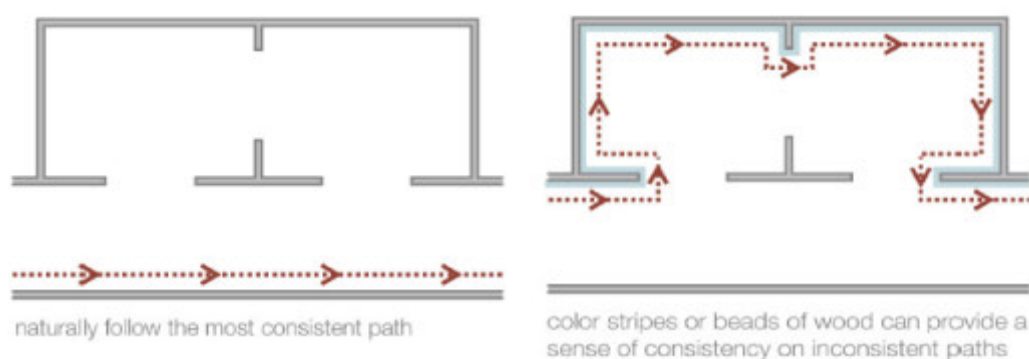


Figure 4-6-2 Assisting transition through space (Southerington, 2007) [Accessed 2022/06/21]

## 4.7 COLOUR

Colour is one of the most significant components of an environment; children perceive colour in everything they see since nothing is colourless. A child's physical and psychological reaction to an environment is significantly impacted by the use of colour (Day *et al.*, 2007). According to research, children with autism are frequently more sensitive to colour than neurotypical (Paron-Wildes, 2013). This is supported by studies conducted where 85% of autistic children sense colours more strongly than neurotypical children (Sinha, 2019). For children who are more sensitive to colour, it is critical to choose colours in their environment that are appropriate for the child rather than the adult.

Changes in mood, mental clarity, and energy levels are all examples of psychological reactions to colour. Woodcock *et al.* (2006) observed differences between "lower functioning" and "higher functioning" children on the autism spectrum; children with lower functioning preferred the colour **red**, while children with higher functioning preferred the colour **blue**. This corresponds to Michael Wilson's activities, as Day *et al.* (2007) recounted, in which children in a pool were exposed to either **red** or **blue** lights, with **red** stimulating lower-functioning children and **blue** calming higher-functioning children.

Day *et al.* (2007) assert that colour must completely occupy one's visual field in order for it to have an impact on one's mood. Colours can be categorized as rich, fresh, warm, and calm. Rich hues are the most saturated, bold, and powerful. Fresh colours include no black and hence seem pure and clean. Warm colours are soft and soothing, making them easy on the eyes.

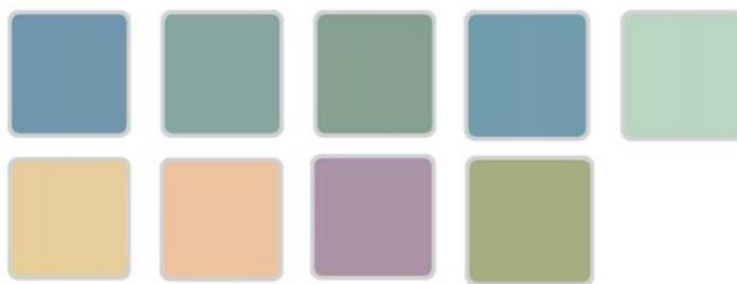


Figure 4-7-1 Although colour preferences are individual, with some colours triggering certain responses in some but not others, a natural tone, minimal contrast palette is suggested for autism-friendly spaces.(Mostafa, 2021) [Accessed 2022/11/20]

Calm is subtle, with grey-muted off-whites (Day *et al.*, 2007). Mahnke (1996) research on colour and its relationship to psychology prompted him to develop a colour pyramid that depicts the many degrees of reactions to colour and how they relate to one another. Day summarizes the substantial studies on the impacts of colours, describing various colours and mood effects as depicted in (refer to figure -4-7-1).

Colour can be used successfully when designing environments for people with autism; however, colours should be used for function rather than aesthetics (Gaines *et al.*, 2016). Jones (2021), provides an overview of the usage of autism-friendly colours for children with autism and their moods (Refer to figure 4-7-2). For safe, peaceful, and tranquil settings, **PINKS** and **LILACS** are often used in sensory rooms, providing a relaxing environment to the mind. When using subdued **GREENS** and **BLUES**, the feeling of chaos is reduced, and a calming environment is created that soothes various sensory conditions. When soft and subdued, **ORANGES** can be an autism-friendly



Figure 4-7-2 Colours and their associated emotions (Source: Author)

colour, offering a sense of warmth and comfort; when used in dining spaces, it can boost one's appetite and make mealtimes run more smoothly. Neutral shades such as **BEIGE**, **GREYS** and **CREAM** tones are appropriate colours for children with autism; they do not distract, and so create a calming effect. On the other hand, **WHITE** is inappropriate for children with autism since it can be overly bright and straining for the eyes.

Colours that are inappropriate for children with autism are **REDS** and **YELLOW**. **RED** can strongly affect those with autism, increasing blood pressure and causing tension or hyperactivity, triggering meltdowns and general upset. **YELLOW**, like **RED**, can overstimulate and cause an adverse reaction in someone diagnosed with autism (Jones, 2021).

It can therefore be argued that the choice of colour directly impacts children with autism. Consideration must be made when choosing colours to have a positive or neutral impact in all circumstances. Even if it benefits the majority, any detrimental impact colour may have on the sensory processing of a single child must be avoided in the design.

## 4.8 MATERIALS AND THE SENSES

Children with autism struggle with sensory processing issues, which causes them to have difficulty handling sensory input (Tola *et al.*, 2021). When designing for children with autism, material selection is critical because they provide a variety of sensory inputs, including how they look, feel, sound, and smell. Materials should be chosen not just for their aesthetic value in an environment but also to balance sensory input for children who are hyper and hyposensitive, as well as for the intended usage of a particular zone. Gaines *et al.* (2016) discuss how materials may aid in communicating the shift from one zone to another (Refer to figure 4-8-1) and elicit sensations that promote memory and understanding. This relates to Mostafa (2014) research on how materials and textures may be utilized to communicate purpose and indicate different circulation zones, changes in levels, and the creation of engaging sensory experiences, particularly in outdoor learning spaces such as sensory gardens (Refer to figure 4-8-2).



Figure 4-8-1 Classroom with different floor textures depicting different areas for different activities (Coral Reef Academy, n.d) [Accessed 2022/11/26]



Figure 4-8-2 Outdoor area with different sensory textures for children (Red Monkey Play, n.d) [Accessed 2022/11/21]



Tola et al. (2021) emphasize the necessity of selecting a limited number of basic materials with less texture and glare for low-arousal surroundings; this aids those with hypersensitivity who may be highly sensitive to stimuli received from various materials. Mostafa (2008) contends that a sensory-neutral space should be designed with hypersensitive people in mind (Refer to figure 4-8-3). Sensory stimulation elements can then be introduced to compensate those requiring additional stimuli. This concept is based on the idea that adding stimulation is easier than removing built-in stimuli (Mostafa, 2008) (Refer to figure 4-8-4).



Figure 4-8-3 Neutral tones in classroom provide a neutral environment for autistic individuals (Furnas, 2022) [Accessed 2022/11/20]



Figure 4-8-4 Sensory room provides colourful tones and equipment provide a sensory rich environment for the autistic child who is seeking additional sensory stimuli (Fun & Function, n.d) [Accessed 2022/11/20]

The various materials used in a building can produce unpleasant odours for people with autism and neurotypical children. Odours can sometimes cause meltdowns or distress; hence selecting paints, varnishes, floor finishes, walling systems, and adhesives with low odour levels will create a calmer environment for those sensitive to smells. The use of natural materials have far fewer odours than synthetic materials, and when they do have an odour, they are far less toxic to an individual than synthetic ones (Zitzman, 2019). The above literature shows that selecting materials is significant in establishing a comfortable environment for its occupants.

## 4.9 VENTILATION AND LIGHTING

When creating any setting, human comfort is vital; ventilation and lighting are two aspects that strongly impact people's comfort and well-being. Natural ventilation and illumination are best achieved by the number and location of window openings; however, care must be taken to ensure safety in facilities with young children, particularly children with autism. Some autistic children need stimulation in an atmosphere where the child enjoys the sound of hitting or breaking glass (Nguyen, 2011), other children may attempt to escape via low window openings (Paron-Wildes, 2013), posing a safety concern for children who may harm themselves or go missing.

Mechanical ventilation is one method of ventilating a structure when openings are a concern; however, mechanical ventilation must be carefully considered. According to Gaines *et al.* (2016),

mechanical ventilation is the most common source of unpleasant sounds because the systems generate either mechanical noises or noises transferred from one room to the next. When routing mechanical ventilation, the primary duct should be positioned in the circulation spaces where the acoustics are not so important, with branch-offs into the various classrooms or areas where children

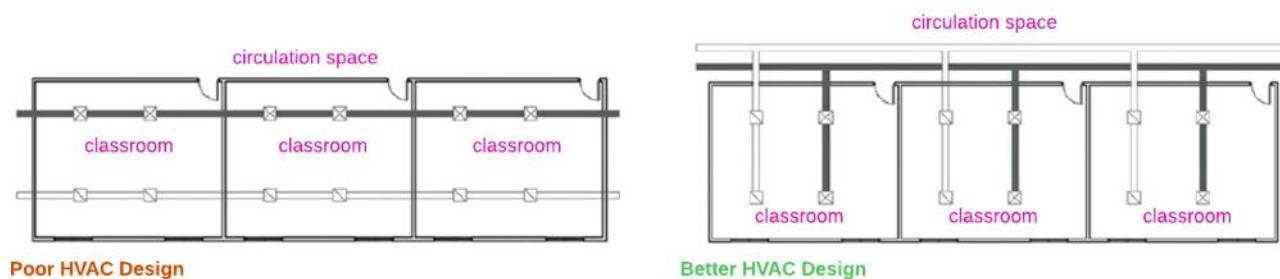


Figure 4-9-1 showing good and bad design for mechanical ventilation in schools. Good practice is to position the main ducts outside of the classrooms (Gaines *et al.*, 2016) edited by (Author) [Accessed 2022/11/21]

require a quieter atmosphere (Gaines *et al.*, 2016) (Refer to figure 4-9-1). Day *et al.* (2007) argue that building-related illnesses such as respiratory problems, headaches, and common colds are caused by bacteria that can multiply in ducting and create dangerous circumstances. Since natural ventilation is healthier, less expensive, and more ecologically friendly, it may be the better choice (Day *et al.*, 2007).

Strategically placed and configured windows allow the environment to be naturally ventilated while providing natural illumination without endangering children (Refer to figure 4-9-2). With this in mind, the River Street School design (Refer to figure 4-9-3) maximized daylighting by placing high-level windows with extensive overhangs, offering natural light and reducing harsh shadows projected into classroom rooms and restricting distractions from outside locations (Henry, 2011).

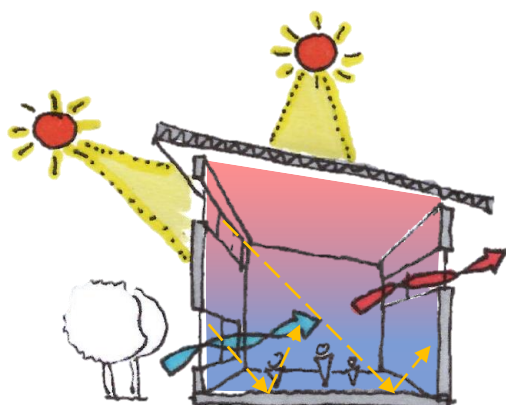


Figure 4-9-2 shows windows allowing fresh outside air into the space pushing out stale and warm air. Source: Author



Figure 4-9-3 River Street School, Windsor, by James Vance and Associates, provide large high level windows and overhangs to eliminate contrast and glare (Henry, 2011) [Accessed 2022/04/06]



Lighting is one of the most significant design elements and impacts how a space is perceived. Pallasmaa (1996) describes how light gives form and life to objects, and how it creates a sense of fantasy and dreams; this echoes Norberg-Schulz (1980), who describes how light shapes a place's fundamental personality. According to Day *et al.* (2007), for younger children, the centre of a room is where activities are completed and must be well-lit, whereas slightly darker play corners are more conducive to imaginative play. Natural or artificial lighting can be used to categorise all lighting types. For a person with autism; studies suggest that they are more sensitive to light output than neurotypical people, and repetitive behaviours can sometimes become more severe when exposed to fluorescent light sources (Boyce, 2010). Stress levels rise in environments that use only artificial illumination and lack natural light (Kuller *et al.*, 1998). When it comes to artificial lighting, most classrooms have fluorescent light sources that flicker and hum which children are more susceptible to than adults (Winterbottom *et al.*, 2009). According to studies, children with autism are more prone to visual hypersensitivities and repetitive behaviour in environments with fluorescent lights (Gabriels *et al.*, 2008). Although not everyone notices fluorescent lighting flicker, it can cause headaches, eye strain, and poor performance (Boyce, 2010).

An article by Migliani (2021), recommends that natural light be prioritized when designing spaces for children. Natural lighting in schools benefits children more than artificial lighting; studies show it can relieve stress, lift spirits, and improve people's well-being and cognitive abilities, (Henry, 2011), McFadden (2022) explains how natural light has been linked to physical growth and positive moods throughout the day where children are more alert and have a higher desire to participate in activities. However, while most people value a lot of natural light in a space,



Figure 4-9-4 Shows Pankalo Education Centre in Lake Elmo, where window were designed to optimize natural light in a classroom, the use of high level windows also helps with distractions being limited while still allowing natural light to filter into the classroom (Bernhard, 2018) [Accessed 2022/11/21]

control is unquestionably the most crucial aspect of lighting design. A room with numerous untreated windows is ineffective and unpleasant as it can increase glare and heat gain (McFadden, 2022). Distracting views must too be considered when placing windows (Refer to figure 4-9-4), as this can reduce a child's concentration in the classroom (Paron-Wildes, 2013). As seen in the design of Netley School ASD Resource Base, Haverstock Associates, where the designers opted for wall-to-wall and floor-to-ceiling windows allowing maximum natural daylight into the learning spaces, which,

while the intentions were good, proved to be distracting for the children with autism, and thus the school covered the windows with paper (Henry, 2012) (Refer to figure 4-9-5).



Figure 4-9-5 Netley School ASD Resource Base, Haverstock Associates, Large windows with paper to block distracting views (Henry, 2012) [Accessed 2022/06/10]

Glare can be caused by either artificial or natural sources reflecting off surfaces. Excessive lighting can cause glare, reflections, and unpleasant intensity in autistic children, leading to distractions and meltdowns in which children may act out (Paron-Wildes, 2013); hallways that produce glare and blur the lines of definition in the building's form and finishes disorienting individuals with autism. Window treatments such as blinds and glazed or frosted glass (Refer to Figure 4-9-6) can assist in enabling natural light into the area while reducing visually disturbing glares and views. Another technique to reduce glare in an area is to choose materials with a matt finish, which reduces the amount of reflection off the surface (Gaines *et al.*, 2016).



Figure 4-9-6 Young child classroom with window treatment and high level openable windows for ventilation (Hawkins *et al.*, 2008)

## 4.10 SAFETY, SECURITY AND SUPERVISION

Safety should never be overlooked when designing environments for children; it is especially important for autistic children who may have an altered sense of their surroundings and face sensory and mobility challenges (Mostafa, 2021). Children are naturally inquisitive; by exploring their surroundings with their senses, they gain an understanding of the environment in which they find themselves in (Day *et al.*, 2007). When it comes to the safety, supervision, and security of children, the materials utilized, observation locations, and the hierarchy of control zones for children must all be considered.

### 4.10.1 Choice of materials:

In chapter 4.8 the literature showed the importance of materials to one's perception of their environment however when selecting materials, one's safety must too be considered. The durability and robustness of materials will ensure the environment ages well, creating an environment less prone to injury. As discussed in chapter 4.8, children who are hypersensitive to sensory input benefit more from neutral classroom materials. Including a



Figure 4-10-1-1 shows the use of sand and grass for the playground surface, should a child fall they are less likely to injure themselves (Natural Playgrounds, n.d) [Accessed 27/08/2022]

breakout space, such as a sensory room, where children can interact with various stimuli reducing the likelihood of meltdowns in which a child may injure themselves. In line with Mostafa (2021), Day *et al.* (2007) argues that playgrounds require soft materials for children to run and play on, and that natural surfaces such as grass, bark-mulch, and sand are just as effective and cheaper than environmentally hazardous rubber matting (Refer to figure 4-10-1-1).

Tree climbing is beneficial to a child's development because it not only connects them with nature, but as discussed in Chapter 3.5 Biophilia, natural landscapes with rocks and trees are more beneficial to children's free play than traditional man-made playgrounds. However, Day *et al.* (2007) notes that children climb first and look down later, so the lower branches of tall trees should be cut back to restrict climbing where a child may fall from a high level (Refer to figure 4-10-1-2). Trees that are lower to the ground and spread out are easier and safer to climb, and in the event that a child does fall, the distance from the branches to the ground is much less dangerous than a tall tree (Refer to figure 4-10-1-3).

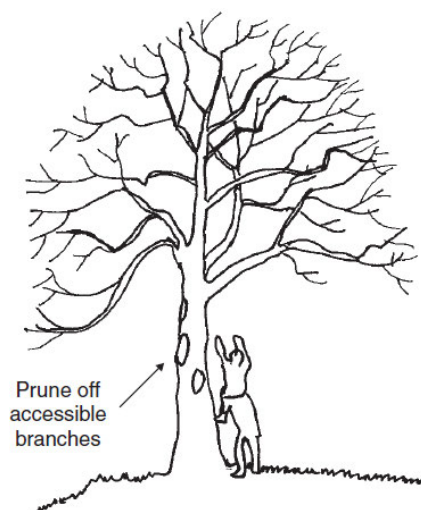


Figure 4-10-1-2 shows tree with low level branches cut to restrict children climbing up and falling from a high level and injuring themselves (Day and Midbjer, 2007, p 34) [Accessed 24/11/2022]



Figure 4-10-1-3 shows a tree with lower spread-out branches which are safer for children to climb as the distance to fall is much less than a taller tree (Day and Midbjer, 2007, p 34) [Accessed 24/11/2022]



#### 4.10.2 Observation:

It is critical to keep an eye on children without making them feel uncomfortable or stressed by constantly feeling watched. The child must be imbued with self-assurance and independence within their environment. Observation through good lines of sight is paramount to ensuring the well-being of both staff and children (Scott, 2009). Children require space to play and run around as discussed in previously; outside play areas are critical to children's health and well-being; with this in mind and the possibility of wandering, these spaces must be enclosed to ensure children do not wander to unsafe areas (Day *et al.*, 2007) (Refer to figure 4-10-2-1). Paron-Wildes (2013) identifies safety concerns to be considered (Refer to table 4.10-2-1) with the researcher's possible response to be explored in the design.



Figure 4-10-2-1 Shows an extract from a video where Aspect Western Sydney school playground is enclosed with a fence to restrict children from wandering (Aspects Schools, n.d) [Accessed 2022/11/26]

| CONCERN                                       | RESPONSE  |
|---|---|
| Out of cars and streets into buildings.       | Secured on site drop off area away from parking.  |
| Running out of school into busy streets       | Secured grounds, with building separated from street edge.  |
| Wandering and going missing                   | Secured areas with non-invasive mechanisms to stop wandering  |
| Locking themselves in rooms                   | Out of reach handles and locks  |
| Escaping classrooms because of too many doors | Out of reach handles and locks, minimizing doors which too helps with identifying circulation routes.                             |
| Dangers in exposure to water                  | Ensuring water is not accessible without supervision.   |
| Child abuse or sexual abuse                   | Ensuring clear sight lines of children and staff from multiple spaces and secluded areas from public people passing by.           |
| Hazardous areas                               | Out of reach handles and locks to ensure materials are secured in cupboards or storerooms.  |
| Way finding difficulties                      | Ensure clear and easily navigational routes are established with clear wayfinding tools as identified in the way finding section. |

Table 4-10-2-1 Safety concerns identified by (Paron-Wildes, 2013) with responses by the author.

#### 4.10.3 Hierarchy of control zones:

As previously discussed wandering is common among children with autism and occurs when an individual leaves the safety of their environment, it is necessary to design and implement mechanisms and warning systems that make it difficult for unobserved individuals to leave spaces or facilities without being spotted (Nguyen, 2011, Rastall, 2012, Altenmüller-Lewis, 2017). Mostafa

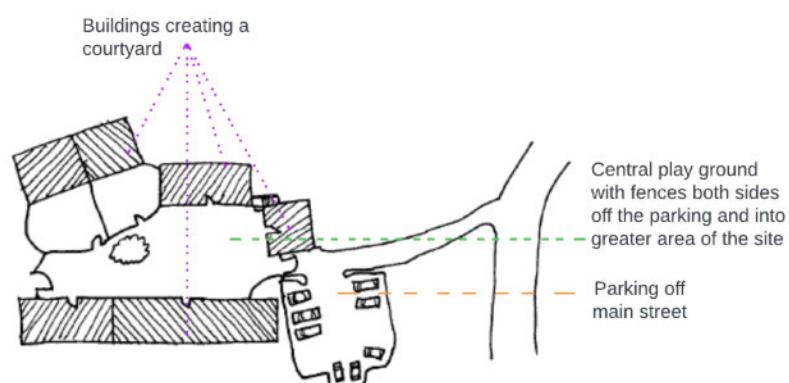


Figure 4-10-3-1 shows a courtyard formed by surrounding buildings, these building hug the outer limits of the play area forming a sense of comfort, the openness on either side allow for views outside of the courtyard ensuring a sense of openness while still secure (Day and Midbjer, 2007, p 26) [Accessed 24/11/2022]

(2021) argues that in order to ensure children's safety between different zones, accessibility must be carefully considered (Refer to figure 4-10-3-1), where the buildings and minimal fence lines form the boundary of a courtyard that can be observed from the surrounding buildings. Altenmüller-Lewis (2017) argue that the layout and organisation of the facilities as well as the intention behind the design should be to allow the greatest possible freedom and independence for all users while simultaneously minimising the hazards, security risks, or behavioural triggers for those who have autism spectrum disorder.

## 4.11 ACOUSTICS

Individuals with autism frequently struggle to filter out noises that others can simply block out or ignore (Nguyen, 2011). Mostafa (2008), found that the most significant architectural component negatively impacting autistic behaviour is acoustics; research has shown that decreasing noise levels and echo in educational areas for children with autism improves their attention span, response time, and behavioural disposition. Noise pollution must be examined in both a macro and micro context, with the macro representing sources of noise pollution from outside the site and the micro representing noise pollution from within the site. As discussed previously in [chapter 3.4.2.2](#), noise buffers can significantly reduce noise pollution from outside the site. To help reduce noise pollution at a micro level, grouping activity in accordance with their permissible stimulation level will assist in managing sound levels transmitting different zones which require a quieter and more relaxed atmosphere (Refer to figure 4-11-1).

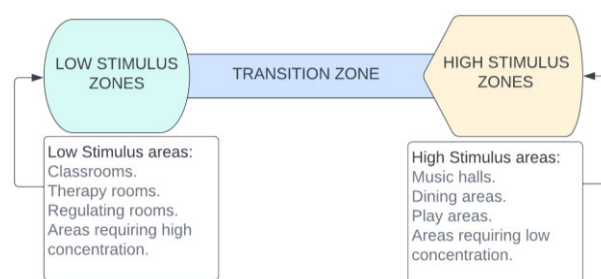


Figure 4-11-1 shows zones separated depending on their stimulus levels, high noise areas are separated from low stimulus areas which require higher concentration. (Author)

Noise, echo, and reverberation may be reduced using carefully chosen materials such as acoustic ceilings, soft carpeting, and furniture (Refer to figure 4-11-2). These, too, may be managed by modifying classroom internal layouts and footprints; doors and windows must be properly located to reduce sound (Gaines *et al.*, 2016) as discussed in [chapter 3.4.2](#) Senses of the body under hearing windows and doors can play a significant role in transmitting sound near certain activity zones. Mostafa (2014), suggests that activities requiring high focus and low stimulus should have greater acoustical control to

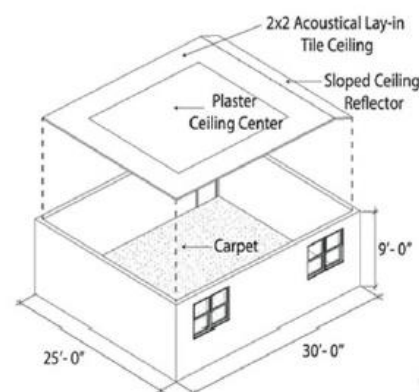


Figure 4-11-2 shows a room with carpeted floor with a combination of acoustic ceiling tiles and a sloped ceiling to reflect sound. (Gaines *et al.*, 2016, p 129) [Accessed 26/11/2022]



reduce background noise, echo, and reverberation, allowing children to concentrate on the tasks at hand. Research shows that plants and shrubbery reflect sound more evenly around a room reducing echo and sound intensity (Luscombe, 2017), by adding plants to the immediate environment sound absorption is not the only benefit, discussed in chapter 3.6 air quality also improves, and a child's biophilia is enhanced. Gaines *et al.* (2016) and Siebein *et al.* (2000) argue that windows are an architectural aspect of structure that allows sound transfer between outdoor and indoor spaces. Windows near busy play areas, parking lots, and busy streets may negatively impact a child's concentration; noise levels can be decreased by installing noise buffer zones such as plants and shrubs or selecting windows with appropriate sound transmission ratings.

Including a garden or outdoor space for someone with autism should be done with caution. The various sensitivities that children with autism face, such as textures, light, and sound, should be considered when selecting materials, plants, and elements. However, the garden design should include elements that reduce outside noises, such as traffic. Including items such as movement-simulated noises allow children with ASD to mimic aspects of real-world sounds in a safe environment (Gaines *et al.*, 2016).

## 4.12 CONCLUSION

It is clear from the extensive research presented in chapter 4 that the design of the built environment can be regarded as a highly influential factor in the quality of life for children with autism. Furthermore, the research indicates that effective design elements within the built environment can play an important role in the developmental stages of children who are diagnosed with autism, both positively and negatively. Designers need to carefully consider the various design strategies and its impact on children to ensure the child feels a sense of comfort and security within the various environments. Numerous academics and professionals have demonstrated that buildings can be designed to positively affect people with autism, resulting in long-term positive development of individuals. This is possible by understanding the effects of space on an individual's psyche. Understanding how these spaces and places need to be structured in order to benefit the personal development and sense of self-identity of the individual children requires an understanding of the impact of phenomenology, environmental psychology, and biophilia, all of which are integral parts to developing an environment that is conducive to young children with autism in their early years.

As a result, it is clear that architectural design has a direct impact on the way autistic children experience their surroundings.



Figure 5-1 Figure showing chapter 5-word cloud (Author)

## 5.1 INTRODUCTION

In Chapter 5, we will look at precedents that demonstrate key features of environments that promote early childhood development in both autistic and neurotypical children. The precedents will be discussed in line with the previous chapters' literature, concepts, and theories to understand better the challenges, opportunities, and considerations in establishing a more conducive environment for children aged 2 to 7 years. The precedent studies in this chapter address various design approaches relevant to the many aspects of early childhood development previously discussed. The assessment will focus on children's interactions with the built environment in accordance with the theories of phenomenology, biophilia, and environmental psychology that were previously discussed. The assessment is to establish a deeper understanding of how specific early childhood development requirements of autistic children can be met in order to create an environment that is conducive to **developmental learning spaces**, **human sensory experience**, and one's **connection with nature**.

Furthermore, the precedents may not be directly related to children with autism but relate to ideas and concepts that help children with autism develop. The findings from these precedent studies will aid in the conceptual and functional design of a proposed early childhood development centre for autistic children in eThekweni, South Africa.

## 5.2 PRECEDENT STUDY 01

|                   |   |
|-------------------|---|
| Name:             | New Struan Centre for Autism                                  |
| Location:         | Alloa, Scotland   |
| Architect:        | Aitken Turnbull architecture                                  |
| Completion Year:  | 2005  |
| Type of Building: | National Autism Centre for education, research, and diagnosis |
| Age range:        | Years – Three to Eighteen                                     |



Figure 5-2-1 Entrance to New Struan Centre for Autism. (Wardell Armstrong F. Hendriksen, 2005)

New Struan Centre for Autism is located on the outskirts of Alloa, a residential neighbourhood along the River Fourth (Refer to figure 5-2-2). The site is easily accessible by means of roads linking it to the main town centre. The New Struan Centre for Autism is a school for children diagnosed with autism administered by the Scottish Autism Society. The school fulfils a number of important functions, including those of a national centre for autism, a teaching and training facility specialising in autism, an educational outreach and exploration facility, and a diagnosis and evaluation centre for the local community (New Struan School, 2022).



Figure 5-2-2 figure showing locality of New Struan Centre for Autism. (Google Earth, 2018) [Accessed 26/11/2022]

### 5.2.1 Justification for the precedent study

Many of the theories and concepts discussed in chapters 3 and 4 are reflected in the design of the school. This is evident in the design of the classrooms, corridors, break-out spaces, and numerous other design elements, which will be discussed and analysed in greater detail later in this chapter. Despite its location in Scotland, which is outside of South Africa, the Centre for Autism will add

significate knowledge and understanding in certain design elements that are conducive to autistic children.

The building will be analysed using “*The Autism ASPECTSS™ Design Index*” (Mostafa, 2018), which helps designers consider spatial sequencing, acoustics, escape areas, compartmentalization, transitions, sensory zoning, and safety.

### 5.2.2 Theories and concepts

The school’s design approach was to provide a purpose-built facility for children with autism who require more complex and intensive support to achieve their maximum potential. The use of a single central corridor that is directed by an overhead atrium makes it simple to navigate the entirety of the building (Refer to figure 5-2-2-1), which helps to ensure that the learners are always aware of their location. The placement of the building on the site as well as its orientation have been given thoughtful consideration. The architects and designers of the building took into account all of the different aspects of design, from the practicality of the spaces to the aesthetics, in order to create an atmosphere that is supportive of the children's growth and development. Aesthetically, the building is muted in colour, this is to ensure the children feel safe within their environment. The utilisation of natural light is an essential component of the design. This is demonstrated by the utilisation of a clear story atrium that extends the length of the building, as well as the utilisation of large windows with light shelves in the classrooms and other rooms that border the external facade. However, treatment to the windows provides protection from distracting views and harsh sun light, which will be discussed further in this chapter. The children are given the opportunity to broaden their horizons and further develop their senses as a result of the classrooms leading to play areas located outside. The connection children make with the various parts of the building, allows the space to become a place.

### 5.2.3 Spatial sequencing

Spatial sequencing is based on the idea of autistic people's preference for routine and predictability. Spatial Sequencing necessitates the organization of areas in a logical order based on the typical scheduled use of such spaces; the use of one-way circulation is beneficial and should be used wherever possible. Spaces, too, should flow as smoothly as possible from one activity to the next,

with minimal disruption and distraction by using transition zones, discussed further below (Mostafa, 2018).

The building plan depicts a characteristic 'T' shaped layout where different activity zones are structured. The administrative and public zones for the centre are contained in the upper half of the 'T.' Whereas the diagnosis evaluation and classrooms are located beyond locked doors within the spine of the 'T' (Refer to figure 5-2-3-1). The single-story building shaped with a central circulation street spans the length of the building and holds the continuation of the atrium from the front door, with classrooms on either side facing out onto enclosed safe external play spaces. The atrium acts as the children's primary circulation zone and assists in orientation giving a sense of place and identity within the building (Refer to figure 5-3-2).

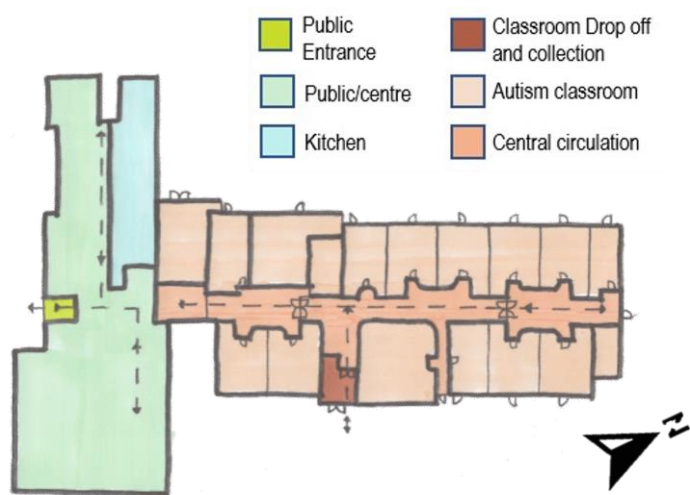


Figure 5-2-3-1 Plan showing T-shape layout for New Struan Centre for Autism Source: Author

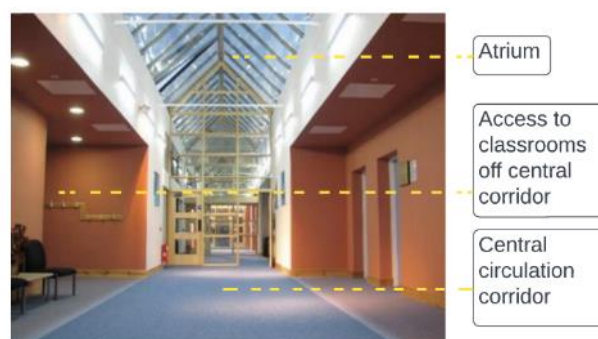


Figure 5-2-2-2 Central continuous atrium (Wardell Armstrong F. Hendriksen, 2005) with Author notes. [Accessed 10/08/2022]



## 5.2.4 Acoustics

Acoustical environments should be controlled to minimize background noise, echo, and reverberation (Mostafa, 2018).

The design team for New Struan Centre for Autism achieved this by employing different design elements. The building is set back from the municipal road, with a driveway leading up to the parking areas on the building's front (southwest) and side (northeast) facades. A screen of trees along the north, east, and western boundaries helps to reduce external sounds from neighbouring elements (Refer to figure 5-2-4-1). The interior carpeted floors of the building assist by reducing noise levels and reverberation within the main circulation street and classroom areas (Refer to figures 5-2-4-2 and 5-2-4-3).








|   |   |   |
|---|---|---|
|  |  |  |
| Sound broken by trees and setback from road                                       | Trafficable routes on site by vehicle   | Main road   |
|  |  |   |
| Vegetation buffer zone  | Railroad line   |   |

Figure 5-2-4-1 Aerial view showing sources of noise and buffer created by vegetation (Google Earth, 2018) edited by Author. [Accessed 10/08/2022]



Figure 5-2-4-2 main circulation corridor with carpeted floors help reduce sound (Wardell Armstrong F. Hendriksen, 2005) [Accessed 10/08/2022]



Figure 5-2-4-3 Classrooms with carpeted flooring and angles ceiling help reduce reverberation and echo (Scottish Autism, 2005) [Accessed 10/08/2022]

## 5.2.5 Escape spaces

Escape spaces are places where children who are overstimulated can reduce their reactivity to the stimuli in their environment (Mostafa, 2018).

The main street corridor in the horizontal 'T' section of the building, with classrooms on either side, has both transitional spaces and escape spaces for occupants who become overwhelmed and require an area to calm down. Additionally, the use of carpeted floors to reduce noise, earthy tones to promote a sense of calm, and a lower ceiling from the high atrium create a sense of refuge; all these elements help provide a space for the occupants experiencing over stimulation to retreat and regroup their senses (Refer to figure 5-2-5-1).

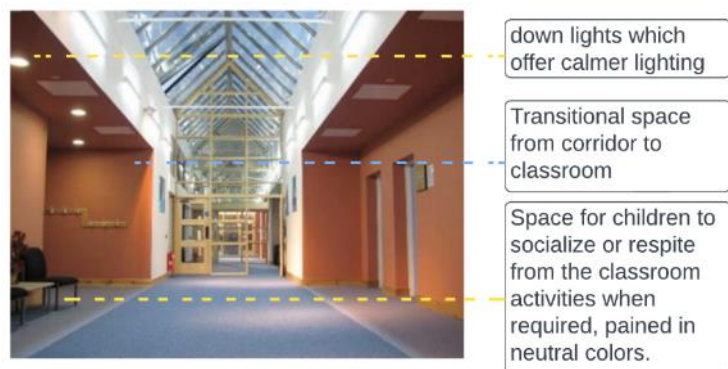


Figure 5-2-5-1 Central continuous atrium (Wardell Armstrong F. Hendriksen, 2005) [Accessed 10/08/2022]

## 5.2.6 Compartmentalization

Compartmentalization is achieved by limiting the sensory environment of each activity, the arrangement of classrooms, and the building's layout. Environments should be clearly defined by their function, allowing individuals to understand the intended activity within a specific zone (Mostafa, 2018).

A number of learning spaces are accessible from the building's main circulation spine on its more private side (Refer to figure 5-2-6-1 white arrows). The fact that the main corridor is a straight line with views from one side to the other which relates to Arthur *et al.* (1992) argument mentioned in chapter 4.4 where decisions should be limited which inspires confidence in



Figure 5-2-6-1 Plan access off main corridor into learning spaces (Reeves, 2013) [Accessed 10/08/2022]

children's navigational abilities, with wide passages allowing children to move without fear of collision or invasion of personal space. By incorporating lobbies off the main hallway various zones are separated communicating a transition from one environment to another. Lobbies located before entering the learning spaces aid children in transitioning between zones more easily and help the child anticipate an environment before entering.

The design makes use of a variety of materials and textures, each of which plays a significant role in the compartmentalization of the various spaces. As previously discussed in [chapter 4.2](#), individuals with autism battle to form mental maps of their environment, by utilizing differentiated ceiling heights and varying tones of colour environments become compartmentalized aiding in the communication of different zones (Pellicano *et al.*, 2011, Mostafa, 2008). At New Struan Centre for Autism the variations in colour and texture contribute to the established order within the space. The outer walls of the main corridor are painted white, the natural light that filters down from the atrium above highlighting the walls and making the corridors feel more open and airier. The carpeted floor being two-toned, with a darker blue tone in the main central corridor defining clear lines for circulation and a lighter blue tone defining the threshold spaces with the walls and lowered ceiling painted with an earthy brown-red colour clearly communicating a separate zone. By creating a hierarchy through the use of visual cues such as texture and colour, the children gain a sense of independence when navigating the building. The learning spaces all have a single door that leads to the playground, and the use of varying door colours (Refer to figure 5-2-6-2) helps to identify the various classrooms along the building's facade. In turn, this facilitates the children's navigation back to their respective classrooms with ease instilling independence and confidence.



Figure 5-2-6-2 shows different coloured doors to the learning spaces from the playground (New Struan School).

### 5.2.7 TRANSITION SPACES

Transitional zones promote both spatial sequencing and sensory zoning; the usage of transzonal zones helps individuals reset their senses as they transition from one zone to the next (Mostafa, 2018).

The shift in ceiling heights and the use of various coloured walls and carpet flooring on the major public circulation street assist persons in transitioning from the main corridor to the classrooms. The carpet colour in the bays outside each room flows inside the classroom, guiding children from one zone to the next (Refer to figure 5-2-7-1). Before entering, the children may absorb and integrate essential



Figure 5-2-7-1 Transition zones off main circulation zone (Wardell Armstrong F. Hendriksen, 2005) [Accessed 10/08/2022]

environmental cues through glass panels in the door leading into the classrooms. The curving outward walls lead the children naturally from one area to the next aiding in the transition between zones by assisting the children in their visuospatial processing (Scottish Autism, 2005).



### 5.2.8 Sensory zoning

Certain design elements help children with autism manage their senses and become more comfortable in their surroundings. Zones should be divided according to their acceptable, high, and low stimulus, with transition zones in between to help transition from one stimulus zone to the next (Mostafa, 2018).

Children with autism are susceptible to sensory stimuli, and many experience extreme anxiety when exposed to fluorescent lighting. Thus, bringing natural light into the classroom is vital for fostering growth in a safe and stimulating environment. Floor-to-ceiling windows with louvres disperse direct sunlight onto the ceilings and help limit outside distractions; the high-level windows are openable, allowing for safe, natural ventilation into the classroom space (Refer to figure 5-2-8-1). The use of the atrium roof allows maximum natural light to enter a space with no external walls other than the end façade of the passage. Where artificial lighting is used, care has been taken not to install fluorescent lighting due to the humming and flickering being unpleasant for people with autism. Instead, wall uplighters were used since there is no noticeable hum or flickering, resulting in a well-lit space without the drawbacks of artificial fluorescent lighting. The pitched atrium runs the entire building length, allowing natural light to flood the interior space (Scottish Autism, 2005) (Refer to figure 5-2-8-2).

Colour-neutral classrooms allow teachers to add stimuli as needed. As previously discussed, the use of subtle differences in the carpets colour support the spatial hierarchy. To promote a sense of calm throughout the building, the architects used muted earthy colours where the children's artwork is placed, adding a sense of belonging and ownership to their environment (Refer to figure 5-2-8-2).

On the northeast façade of the building, a calm and well-structured arrival space is located; this provides a good sense of routine and calmness for children diagnosed with autism. The different

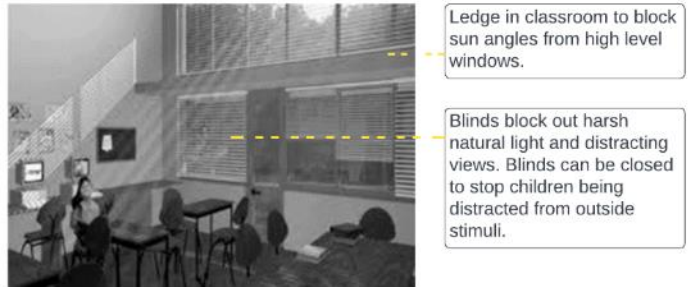


Figure 5-2-8-1 Internal classroom showing light shelf (Scott, 2009) [Accessed 10/08/2022]



Figure 5-2-8-2 shows naturally lit corridor with high level lights and students art work on the wall (Wardell Armstrong F. Hendriksen, 2005) [Accessed 10/08/2022]



Figure 5-2-8-3 Well-structured drop-off for children (Scottish Autism, 2005) [Accessed 10/08/2022]

materials used to separate the walkway from the area where cars travel also help the children understand that there are different zones for different uses (Refer to figure 5-2-8-3).

### 5.2.9 Safety

Safety should never be overlooked when designing environments for children; this is especially important for autistic children who may have an altered sense of their surroundings (Mostafa, 2018). When designing for safety, all aspects mentioned above need to be considered, as children diagnosed with autism are sensitive to their environment and react to stimuli around them which may prove dangerous. A continuous spine that runs the length of the structure connects the facility's two separate zones. A pair of access control doors are positioned to maintain safety



Figure 5-2-9-1 Collage of images showing safe outdoor play area with fence to restrict wandering (New Struan School).

by separating the two zones. The classrooms on either side of the circulation corridor lead into secure outside gardens where children play and connect with nature (Refer to figure 5-2-9-1). Low aesthetically pleasing perimeter fencing creates clear boundaries that are not overly restrictive. The use of curved walls and clear views of the passage aid in the smooth circulation of children from one zone to the next; this also helps build independence, allowing pupils to move independently and without much supervision.

### 5.2.10 Conclusion

From the analysis of the New Struan Centre, it is evident that the designers took special notice of the users' needs and incorporated them into the design of the building. The wide corridor that spans the entire length of the building allows the children to navigate with confidence instilling a sense of belonging. The transition between spaces is carefully thought out with lobbies situated before entering the learning spaces for either transitioning, socializing, or retreating from certain activities. the use of natural light is evident, and the direct access to the outside play area instils a sense of being connected to the outside ensuring one's connection with nature when transitioning though the building. The simple yet decisive design has clearly shown that consideration has been made for the users of the building being autistic children.

## 5.3 PRECEDENT STUDY 02

|                   |  |
|-------------------|--|
| Name:             | The Pears National Centre for Autism Education (TreeHouse School)        |
| Location:         | London, England  |
| Architect:        | Penoyre & Prasad   |
| Completion Year:  | 2008   |
| Type of Building: | Educational facility for children diagnosed with autism, Training centre |
| Age range:        | Years – Three to Eighteen  |



Figure 5-3-1 Entrance to The Pears National Centre for Autism Education (Penoyre & Prasad, n.d)



Figure 5-3-2 figure showing locality of The Pears National Centre for Autism Education (Treehouse school) (Google Earth, 2018) [Accessed 26/11/2022]

The Pears National Centre for Autism Education and Treehouse School has been designed to be in complete sympathy with their surroundings in the Muswell Hill conservation area in London, where they are situated (Refer to figure 5-3-2).

The combination of the autism centres and the facilities of TreeHouse School results in an extremely specialised educational environment that caters to the various requirements students with autism and training of individuals who interact with autistic individuals.



### 5.3.1 Justification for the precedent study

Pears Nation Centre for Autism Education was developed over the course of several years in collaboration with The Treehouse Trust, a charity that was founded by parents (Penoyre & Prasad, n.d). It is the belief of the Pears National Centre for Autism that the lives of autistic children, as well as the lives of their families, can be improved through education (TreeHouse School, n.d). The philosophy, teaching staff, and organisational structure of Treehouse School work together to produce a highly specialised educational atmosphere that caters to the diverse requirements of the students enrolled at the school. Due to the establishment of administrative and research departments at the institution, there are more adults available, bringing the student-to-teacher ratio down to 'one-to-one' (Alsane *et al.*, 2013).

The architects used an inclusive design approach, involving the client, staff, and parents in the brainstorming process; they, too, visited other autistic schools in the UK and the US to examine effective teaching techniques. They looked into the effects of environmental factors on children's wellbeing, such as lighting and ventilation, to provide a well-designed environment for the occupants of buildings (Amy, 2011).

### 5.3.2 Theories and concepts

The school's Phenomenological approach was the children's interaction with various spaces, The objective of the design team was to create spaces that were straightforward, adaptable, and repetitive, and included small work rooms and environments geared toward teaching the children life skills (TreeHouse School, n.d). To ensure that the children have a meaningful experience of the surrounding environment, one of the most important considerations in the design of the facility was maintaining a delicate balance between real world sensory stimulus and calm sensory stimulus (World Architecture News, 2011). This philosophy of balance in design relates to Mostafa (2014), need to gradually acclimate themselves to the various levels of stimuli that they may encounter in their day-to-day lives. The building's character of space is emphasised by the straightforward orientation of the various zones; one side of the building is designated for training, and the other side is designated for children, which will be discussed further in this chapter. By ensuring orientation and identification in the design the children feel a sense of belonging.

In addition, the use of design elements and materials helps to reinforce the building's sense of place. For example, the roof has large punchouts that allow natural light to filter through (Refer to figure 5-3-2-1). These punchouts give the building character by casting shadows in the hallways and open spaces. In order to provide a calming environment, the design team used subtle materials which were not overbearing, as a result, one gets a sense of calm and order as they move through the different areas of the building. Additionally the hallways are wide with breakout spaces allowing children to move freely without impeding on each other's personal space (Refer to figure 5-3-2-2) with quiet rooms for children to escape too when experiencing meltdown, this allows children to feel comfortable and safe within their environment giving them a sense of “dwelling” (Norberg-Schulz, 1980).



Figure 5-3-2-1 showing light filtering from above adding sensory stimuli to the hallways (Fordham, 2011) [Accessed 26/08/2022]



Figure 5-3-2-2 circulation spaces where children may socialize, or travel between zones (Fordham, 2011) [Accessed 26/08/2022]

Throughout the building one is constantly connected to the outside world. In the classroom windows provide views of the outside with blinds to restrict distraction, or in the hallways punchouts in the roof provide views up to the sky (Refer to figure 5-3-2-3). Additionally outdoor play areas allow children to interact with nature in a more personal manner, where they can develop their sensory receptors by exploring the natural environment.



Figure 5-3-2-3 circulation spaces where children may socialize, or travel between zones (Fordham, 2011) [Accessed 26/08/2022]

### 5.3.3 Program break down

The Pears National Centre for Autism Education is divided between the national charity Ambitious about Autism and the Treehouse School for Autism. The charity's activities are housed under one roof, including the training centre, a workplace for campaigning and outreach teams, and an area for 80 children aged three to eighteen.

The school develops individual curriculums based on Applied Behaviour Analysis (ABA) to assist positive behaviour while minimizing undesirable behaviour in children with autism. The architects thoroughly examined the building's design to provide design supports and approaches supporting the school's teaching methods in a specialised setting that achieves the correct balance between the familiar and the stimulating (Penoyre & Prasad, n.d).

To better zone the building, the designers divided it into two halves, one for students and the other for staff. The building layout is examined from the central core outward, with shared spaces located in the centre, then one-on-one speciality rooms and classes around the perimeter connect to secure outdoor play spaces. The remaining half of the facility houses visitors, parents, employees, and teachers, as well as conference, meeting, and training facilities utilized as assembly halls.

The first story of the building is organized similarly to the ground floor, with children on one side and staff on the other. There are areas for training rooms on the staff side, with a central void visually connecting the ground level to the first floor (Refer to figure 5-3-3-1).



Figure 5-3-3-1 figure showing breakdown of ground and first floor (Alsane *et al.*, 2013) [Accessed 20/08/2022]

### 5.3.4 Scale & form

The school building is centred on the property, with a drop-off point set back from the municipal roadway to the south and play areas located on the southwest and northern sides of the site (Refer to figure 5-3-4-1). The internal layouts of the school are structured on a longitudinal axis with a central core serving as transitional spaces for children and adults with classrooms and support rooms for staff on the outer perimeter.



Figure 5-3-4-1 figure breakdown of site (Alsane *et al.*, 2013) [Accessed 20/08/2022]

When viewed from the outside, the building's structure is read in a rectangular form (Refer to figure 5-3-4-2) ; the designers altered the building's external facades and inner areas by recognizing the school's demands and incorporated varying ceiling heights and skylights for natural daylighting (Alsane *et al.*, 2013). The ground floor receives natural daylight through a shared double-volume atrium-like design between the ground and first floors via a series of skylights penetrating the roof structure in the building's main circulation areas (Refer to figure 5-3-4-3 & 5-3-4-4).



Figure 5-3-4-2 showing school set back into the site with a drop off area (Penoyre & Prasad, n.d) [Accessed 20/08/2022]



Skylights on roof allowing light to penetrate the buildings spaces and double volume corridors

Figure 5-3-4-3 Skylights on roof (Penoyre & Prasad, n.d) [Accessed 24/08/2022]



Figure 5-3-4-4 Internal image showing scale (Penoyre & Prasad, n.d) [Accessed 24/08/2022]



### 5.3.5 Flow and circulation of the school



Figure 5-3-5-1 Photo showing timber screen curved wall by drop off area (Fordham, 2011) [Accessed 26/08/2022]



Figure 5-3-5-2 Photo showing timber screen curved wall by drop off area Fordham (2011) [Accessed 26/08/2022]

Occupants are led by a curving timber screen wall from the drop-off area to the main building entrance (Refer to figure 5-3-5-1 & 5-3-5-2). Once inside, visitors are guided through the building along a linear axis to the many functions available.

The primary circulation occurs within the building's core, which separates the children's areas, such as classrooms and treatment rooms, from the adult spaces (Refer to figure 5-3-5-3). The adult spaces on the ground floor are primarily for visitors, parents, and board members, while the facility includes places for instructors and staff members on the first floor (Alsane *et al.*, 2013). Secondary paths move people from major circulation routes to particular spaces for different occupants. The educational spaces allow for mobility inside the rooms, with a well-articulated classroom environment tailored to the requirements of the children.

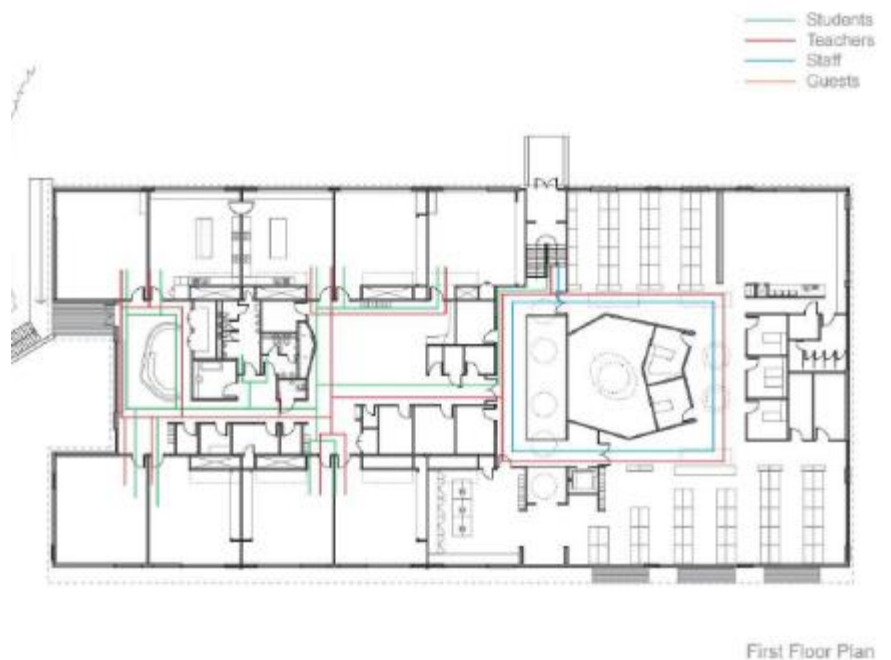


Figure 5-3-5-3 Layout showing circulation routes first floor (Alsane *et al.*, 2013) [Accessed 20/08/2022]

The facility's circulation spaces provide a high degree of flexibility, allowing learning to spill out into the various school sections, whether outside in the gardens or within the building's core public spaces. The open-plan multi-purpose hall, located on the ground level close to the main entrance, is one such space that has been created to maximize flexibility. The space is easily accessible with a large open-plan design, allowing performances, gatherings, and group sessions to take place (Refer to figure 5-3-5-4 & 5-3-5-5).



Figure 5-3-4-4 Ground Floor layout to The Pears National Centre for Autism Education showing areas for learning (Penoyre & Prasad, n.d) [Accessed 20/08/2022]



Figure 5-3-5-5 First Floor layout to The Pears National Centre for Autism Education showing areas for learning (Penoyre & Prasad, n.d) [Accessed 20/08/2022]



### 5.3.6 Light & view

By utilizing architectural strategies such as skylights, large windows and doors, overhangs, and high ceilings, the building's architecture allows natural light into various rooms. Skylights of various sizes and shapes strategically positioned on the roof allow natural daylight to fill various spaces within the building, depending on the program's demands. High-level ceilings create double-volume voids allowing natural light to flow to the floor below, where spaces have no access to external façade walls (Refer to figure 5-3-6-1 & 5-3-6-2).

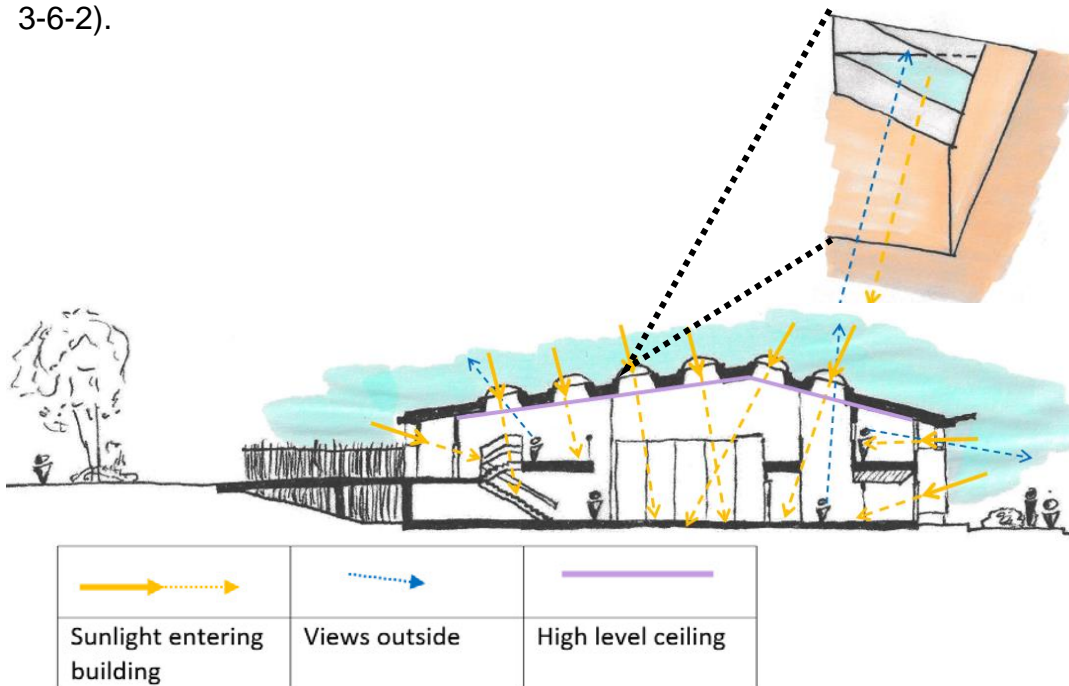


Figure 5-3-6-1 Section showing views and natural lighting Source Author



Figure 5-3-6-2 showing natural lighting (Fordham, 2011) [Accessed 26/08/2022]

To shield the building from harsh sunlight, the designers opted for a continuous set of louvres where wide window openings fill the upper first-floor façade. Along the southern ground floor façade, where large openings are found, the designers opted to install solid glass louvres that cast a full shadow onto the doors and windows. Because the north façade of the building receives little direct light, the designers chose to leave it without louvres (Refer to figure 5-3-6-3).

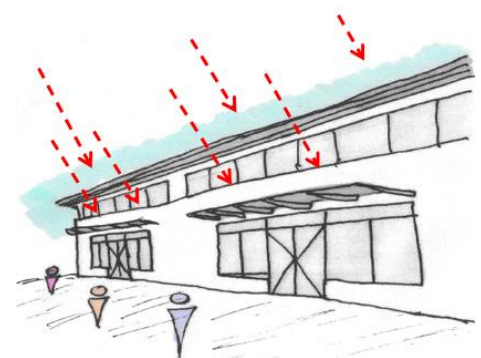


Figure 5-3-6-3 showing continuous solar shading over windows on first and ground floor. Source: Author

The windows that wrap the building's façade allow it to be open to the outside world. Occupants in the spaces can see out into the gardens and play areas, which is extremely important for people with autism because it allows them to pause and assess their surroundings before engaging in them. To reduce distractions, roller blinds can be rolled down, limiting views into the playgrounds and street.

### 5.3.7 Material & colour

The facility is surrounded by residential buildings, open areas, and woodlands that are all part of a conservation park. The client asked that the architects choose a composition of natural materials where possible (TreeHouse School, n.d). The colour scheme is complementary to the building's materials (Refer to figure 5-3-7-1) the use of glass creates transparency, red clay bricks and timber façade cladding give the building earthiness, the neutral tones appeal to the needs of autistic children. Additionally, the earthy colours of the timber and warm orange face brick on the façade anchor the building to the site (Refer to figure 5-3-7-2).



Figure 5-3-7-1 shows the use of timber and glass (Fordham, 2011) [Accessed 26/08/2022]



Figure 5-3-7-2 Choice of materials are earthy allowing the building to sit comfortably on the site (Penoyre & Prasad, n.d) [Accessed 26/08/2022]



Figure 5-3-6-3 shows neutral hallways, and doors with glass panels allowing children to view zones before entering (TreeHouse School, n.d) [Accessed 30/11/2022]

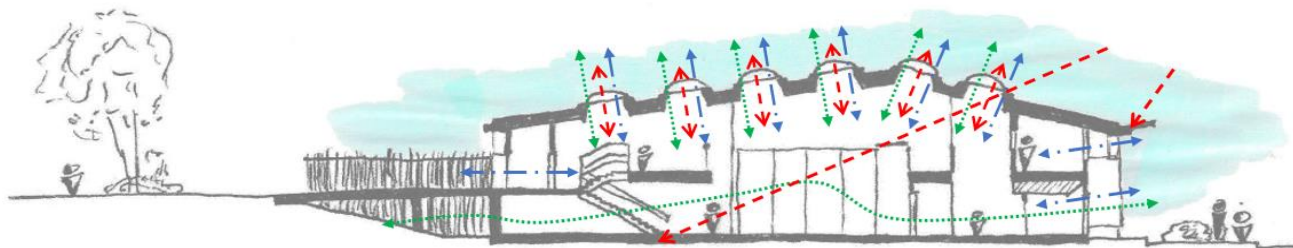
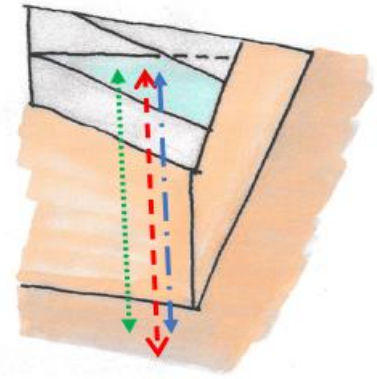


Figure 5-3-6-4 Showing classroom with roller blinds over large window opening (Penoyre & Prasad, n.d) [Accessed 26/08/2022]

Internally, in the classrooms the neutral-coloured walls with glass doors flowing from one zone to the next create a peaceful atmosphere in the areas, allowing the children to feel at ease while using the facility. The exterior cladding is connected to the interior by the timber flooring and grey tiled entrance, giving the interior a sense of being outside while inside. The designers achieve a balance of sensory stimulation by keeping the walls white or grey, and the ceiling bare concrete (Refer to figure 5-3-7-3 & 5-3-7-4), which aligns with Mostafa (2008) belief discussed in chapter 4.7 where colours should be of a neutral tone with minimal contrast and that spaces should be sensory neutral and if required stimuli added.

### 5.3.8 Building system

The building mainly relies on passive design principles; heat gain warms the structure throughout the day via continuous windows and carefully positioned skylights on the sloped roof (Refer to figure 5-3-7-1). The skylights may be opened to provide high-level ventilation, allowing heat gain to exit the building after being absorbed by the concrete roof and windows. Windows and doors lower down are opened, fresh air enters the building, pushing stale and hot air out through the openings, providing a more comfortable environment for the occupants.



|   |   |   |
|---|---|---|
|  |  |  |
| Ventilation   | Heating   | Cooling   |

Figure 5-3-8-1 shows how cooling, heating and ventilation happens through the use of high-level skylights, with cross ventilation on the lower levels through the use of doors and windows which push the hot air out the buildings. Source Author

### 5.3.9 Conclusion

It is clear from the analysis of the Pears National Centre for Autism Education and Treehouse School in London that the design team adopted an inclusive methodology at the beginning stages of the project in order to take into account the requirements of both the staff training centre and the children who would be attending the school. This was done in order to meet the requirements of the Pears National Centre for Autism Education and the Treehouse School.

Because the training facility is located next to the school, it helps to lower the teacher-to-student ratio. This is extremely beneficial for the students, as it enables a more hands-on method in teaching, and it is also extremely beneficial for the training of staff, as they gain practical experience in the classroom with students who have autism.

Visitors, parents, and professionals have all commented on the calmness experienced in the facility (World Architecture News, 2011). This is due to the design considerations made for the children, as young people with severe autism frequently have challenging behaviour. The design of the facility provides quiet rooms for children to access when experiencing sensory overload from their environment, this is greatly beneficial as it ensures the child can calm down and regroup their emotions.

Speak of sensory design – Muted colours, textures, natural day light, passive cooling, access to outdoor play areas.

Integration into the community is an essential part of the Treehouse programme; not only does it help neurotypical children develop, but it also helps autistic children. Integration sessions, which involve children from mainstream schools coming to the Pears Centre to participate in activities such as sports and music, have benefited from the building's design, which has made it easier for the children to interact with one another.

The principles of phenomenology, environmental psychology, and biophilia, which were introduced in earlier chapters, have all been put into practise by the architects in their effort to create a space that is more than just a place for academic pursuits. The construction of the facility that is geared toward children with autism has taken into account a wide variety of factors, ideas, and theories that contribute to the development of favourable environments for the growth of children who have been diagnosed with autism.



## 5.4 PRECEDENT STUDY 03

|                   |  |
|-------------------|--|
| Name:             | Green School South Africa                                |
| Location:         | Paarl, Western Cape, South Africa                        |
| Architect:        | GASS Architecture Studios                                |
| Completion Year:  | 2021   |
| Type of Building: | Educational facility for children in the local community |
| Age range:        | Years – Two to six & and grades one to five              |



Figure 5-4-1 Photo of grouped classrooms photo by Wieland Gleich sourced by (Abdel, 2022)



Figure 5-4-2 figure showing locality of Green School South Africa (Google Earth, 2018) [Accessed 26/11/2022]

### 5.4.1 Justification for the precedent study

Green School South Africa is a school that encourages creativity, innovation and inspires learners and the community to thrive with purpose (Green School South Africa, 2021). The school's campus is designed to ignite the senses and create a sense of wonder in both adults and children alike, the educates for sustainability through a progressive learner cantered approach. Therefore, focussing on preparing the future generation to thrive in an ever-changing world (Green School South Africa, 2021). The school's grounds surrounded by mountains and farmlands host a diver's plant life creating a natural wonderland for young children to explore and learn (Green School South Africa, 2021). Despite the school being directed to neurotypical individuals, and not autistic children the design principles will add significant knowledge and understanding in certain design elements that are conducive to early childhood development.



The school's learning program consists of learning objectives, 21st-century skills and iRESPECT values. The school aims to build a community of learners focused on making the world more sustainable. “Rather than being contained within four walls, our learning environment embraces nature and integrates with the outdoors, inspiring students to create bonds with their environment and think more expansively about it” (Vivier, 2020).

| FRAMES       |            |   |
|--------------|------------|---|
| Thematic     | "Practise" | "Where we practise and improve discrete intellectual competencies".   |
| Proficiency  | "Apply"    | "When we can apply the skills we have been practising and developing through exciting and engaging thematics".    |
| Experiential | "Try"      | "Where we can have-a-go at new, exciting, challenging and risky activities through hands-on, active experiences". |

Table 5-4-1-3 Table showing Green Schools Frames of learning (Green School South Africa, 2021) (created by Author)

The school provides three "Frames of Learning," strengthened by their natural surroundings and serves as a living classroom for many subjects (Green School South Africa, 2021) (Refer to Table 5-4-1-3). The school's design creates an environment where children interact with their environment in a way that makes learning fun this in turn can make children look forward to going to school daily (Ahuja, 2022). By applying the frames of learning it creates a structured environment where the children gain an existential foot hold into the real world, this relates to Norberg-Schulz (1980) depiction of man’s existence of space, although not related to architecture a link is still created where space is the world we live and the children gain valuable knowledge to help them in their developmental stages.

### 5.4.2 Site & context

The school is situated on 8 hectares of land outside Paarl in the Western Cape, in a low-lying valley surrounded by Paarl Rock, the Drakenstein Mountains, and the Simonsberg (Refer to figure 5-4-2-1). The school grounds are located away from urban sounds and pollution, nestled amongst the local farmland, in a serene and peaceful environment where children can flourish and grow as individuals (Refer to figure 5-4-2-2).

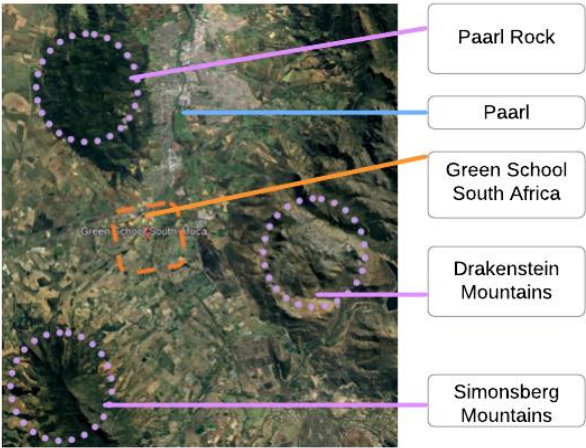


Figure 5-4-2-1 Google Earth image showing the three mountains that for the valley in which the school is situated (Google Earth, 2018) [Accessed 26/11/2022]

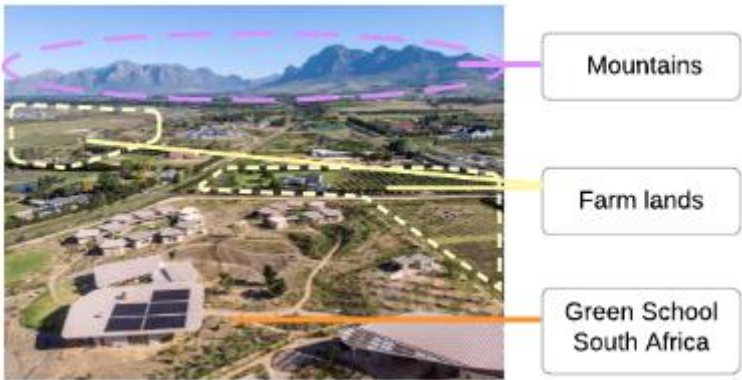


Figure 5-4-2-2 Photo of school layout with Paarl Berg in the back drop, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]

The Green School in South Africa has been designed to encourage children's regular mobility throughout the campus, which boosts their oxygen intake and provides an opportunity for safe interaction with the flora and fauna on the school grounds. The seasons are distinct: cold, wet winters or dry, hot summers, where the flowers showcase their distinctive display of colour in spring and autumn (Green School South Africa, 2021).

#### 5.4.3 Theories and concepts

The phenomenological approach taken in the school's design is evident by the decisions made by the design team to allow the children and teachers to interact fully with the school's environment on a daily basis, this in turn allows the children to form a relationship with their environment through experiences, which gives the school character and identity in space rather than been seen as an object (Refer to figure 5-4-3-1). Furthermore, the



Figure 5-4-3-1 shows children painting onto windows forms of nature (Green School South Africa, 2021) [Accessed 05/11/2022]

design team has considered the school grounds as an overall whole instead of just a place to learn, aesthetically, materials are celebrated in their authenticity (Abdel, 2022). The buildings emerge from the ground made from ram packed earth, and plastered lime, meandering walkways transverse children over and between the berms guided by pathways leading children through the site (Abdel, 2022) (Refer to figure 5-4-3-2). The use of materials from within the site give the school grounds a sense of belonging forming place and giving identity to the school while respecting the environment in which it occupies.

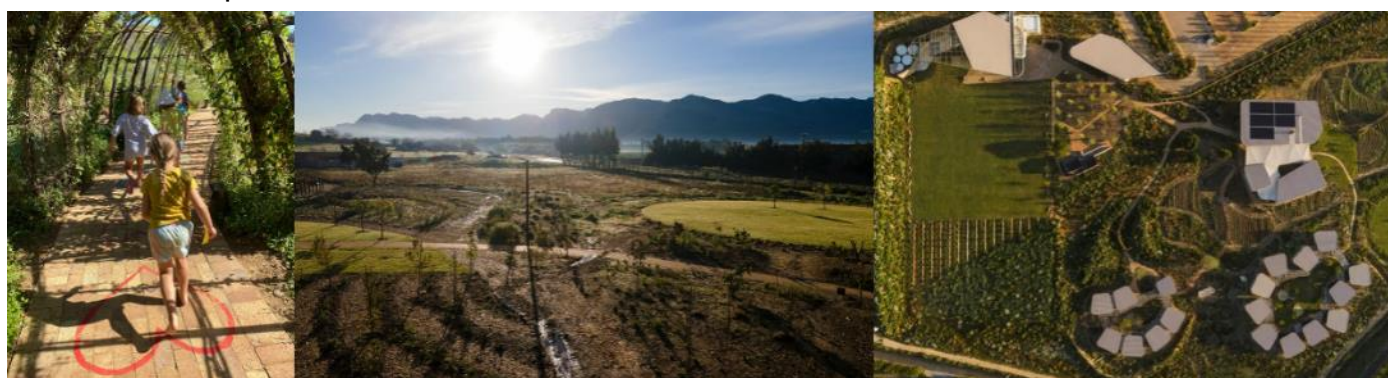


Figure 5-4-3-2 shows children painting under the sapling covered pathway, and the meandering pathways through the site (Green School South Africa, 2021) [Accessed 05/11/2022]

Through the design of the school grounds and buildings it is evident that careful consideration has been made to encourage children to engage with their environment (Green School South Africa, 2021). Through this engagement children are able to forge memories and experiences which give



them a sense of being and connection to the school, this in turn provides a sense of security which is important for children as it helps them identify with a specific environment. Inspiration to the buildings design and spatial layout was drawn from the surrounding mountains which one can argue forms an extension of nature, this is taken further by the careful use of materials previously discussed.

The connection the school has with nature is evident from the teaching approach taken by the school to the design of the buildings and school grounds. The school’s philosophy is that learning takes place both outdoors and, in the classrooms (Green School South Africa, 2021). Children are encouraged to develop their love of nature through exploring during outdoor class activities or on their own traveling between buildings, furthermore the large outdoor play areas expose children to a more natural environment which promote motor development, fitness, and imaginative social play (Kellert *et al.*, 2011) (Refer to figure 5-4-3-3). The buildings design takes on a responsibility to educate children in respecting the natural environment through passive design elements, this instils one’s responsibility to conserve and look after nature.



Figure 5-4-3-3 shows children interacting with nature both playing and learning at the same time (Green School South Africa, 2021) [Accessed 05/11/2022]

#### 5.4.4 Program breakdown

The Green School's spatial program includes 16 classroom facilities for children ranging from kindergarten to grade eight, a multipurpose space, an administrative building, and the heart of the school, which is located centrally and houses the dining hall, life lab, and kitchen on one side and a library, art, and music studio on the other, as well as ablution facilities (Green School South Africa, 2021) (Refer to figure 5-4-4-1).

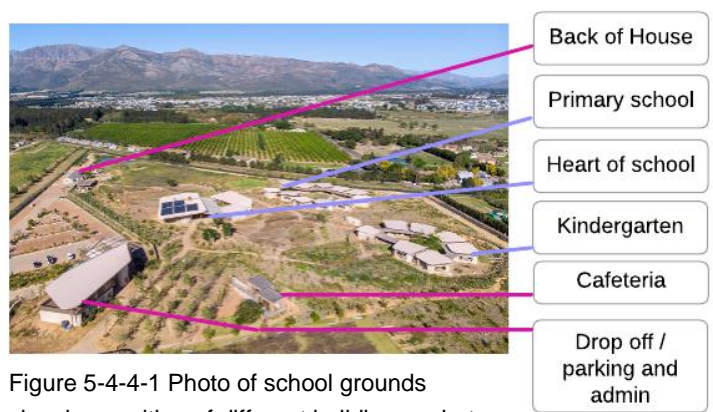


Figure 5-4-4-1 Photo of school grounds showing position of different buildings, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/10/2022]

Classrooms are not limited to indoors at Green School South Africa, when weather permits learning is taken outside amongst the orchards, vegetable gardens, landscaped terraces, and various spaces to pause and engage with nature providing a well-balanced education that incorporates nature (Green School South Africa, 2021) (Refer to figure 5-4-4-2).



Figure 5-4-2-2 shows child stopping to engage with his natural surroundings, (Green School South Africa, 2021) [Accessed 01/08/2022]

The positions of the various zones and buildings were carefully considered, taking into account *passive design* principles, *feng shui*, and the *Living Building Challenge's seven petals* (Garg, 2022) (Refer to figure 5-4-4-3). The building's design allows for a tranquil, harmonious, grounded setting in which children are always visually and emotionally connected to the surrounding natural environment. As a result, there are areas where children and nature may reconnect, reinstating one's biophilia.

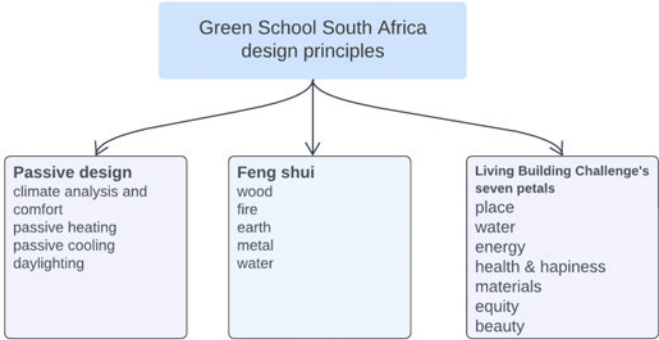


Figure 5-4-4-3 Showing breakdown of the schools the design principles (Author)

#### 5.4.5 Scale & form

The site layout and the buildings' positioning were influenced by the spatial arrangement of the mountains, giving them an organic feel (Abdel, 2022) (Refer to figure 5-4-5-1 & 5-4-5-2). The position of the buildings among flora and fauna of the site's landscapes creates a natural, holistic environment that encourages play, discovery, curiosity, and creative expression; it encourages children to seek new experiences and interact with one another (Refer to figure 5-4-3-3) (Abdel, 2022). The building's walls are kept to a minimum to further the notion of the design, allowing for expansive, open areas that reinforce the connection between inside and outside while one is still within the building.

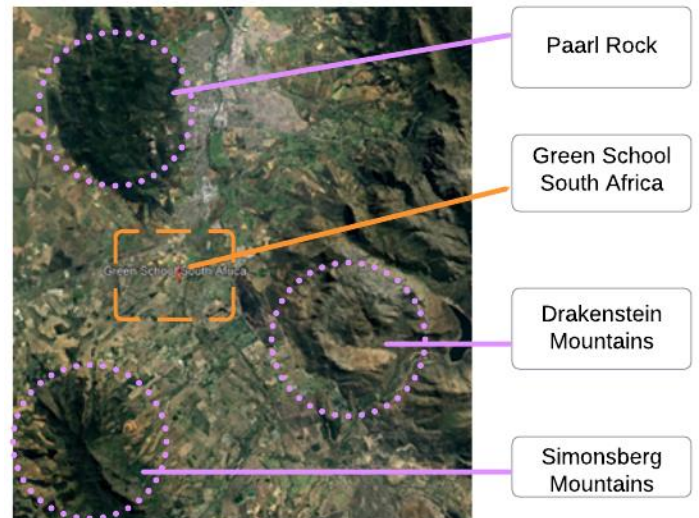


Figure 5-4-5-1 Google Earth image showing the three mountains that form the valley in which the school is situated (Google Earth, 2018) [Accessed 26/11/2022]

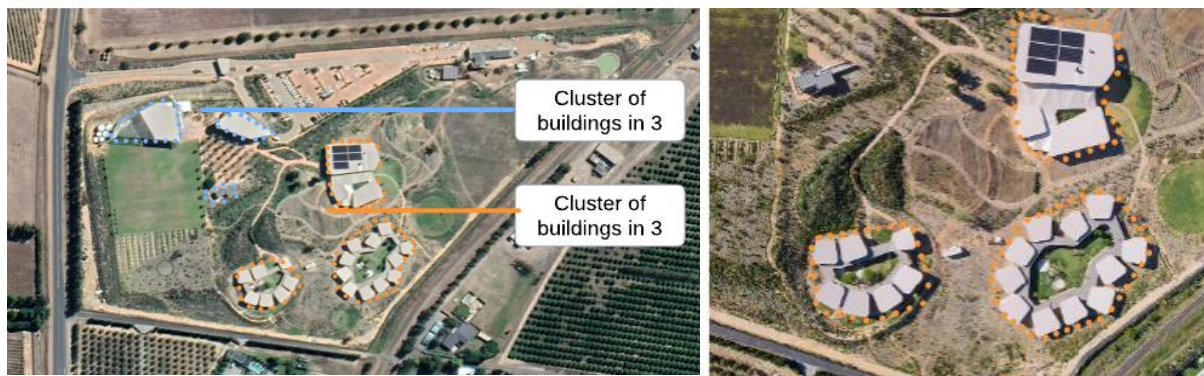


Figure 5-4-5-2 Google Earth image and site photo showing the buildings arrangement in threes which speak to the spatial layout of the three mountains in image 5-4-5-1 (Google Earth, 2018, Gleich, 2021) [Accessed 26/11/2022]



In section:

The building in section shows large oversailing leaf-like roof structures, allowing rainwater harvesting and providing solar shading to the windows below by casting shadows restricting direct sunlight (Refer to figure 5-4-5-3 & 5-4-5-4) (WA Contents, 2022). High-level openable windows in the clear-storey classrooms flood the learning areas with naturally filtered light and allow fresh air to enter (Ahuja, 2022). Extensive, covered walkways surround the centrally located courtyards providing shelter from the sun and weather experienced in the Western Cape.

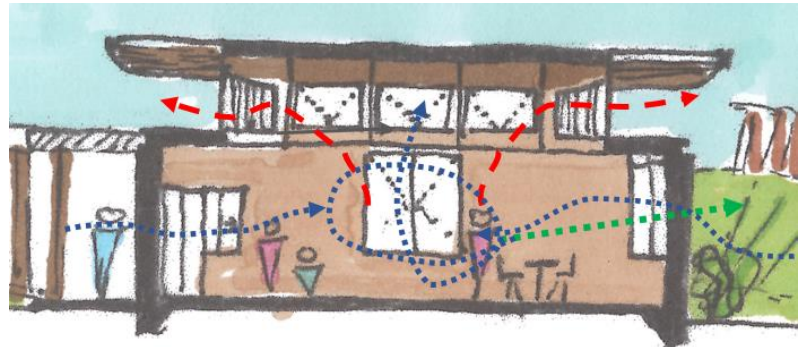


Figure 5-4-5-3 Sectional view of the classroom showing passive cooling and views onto nature Sourced: Author

#### Diagram Key

- Roof sheeting
- SAP roof structure
- Acoustisorb insulation
- Dekriet ceiling
- Clearstory windows
- Reclaimed timber doors
- Rammed earth & lime plaster
- Lime plaster floor

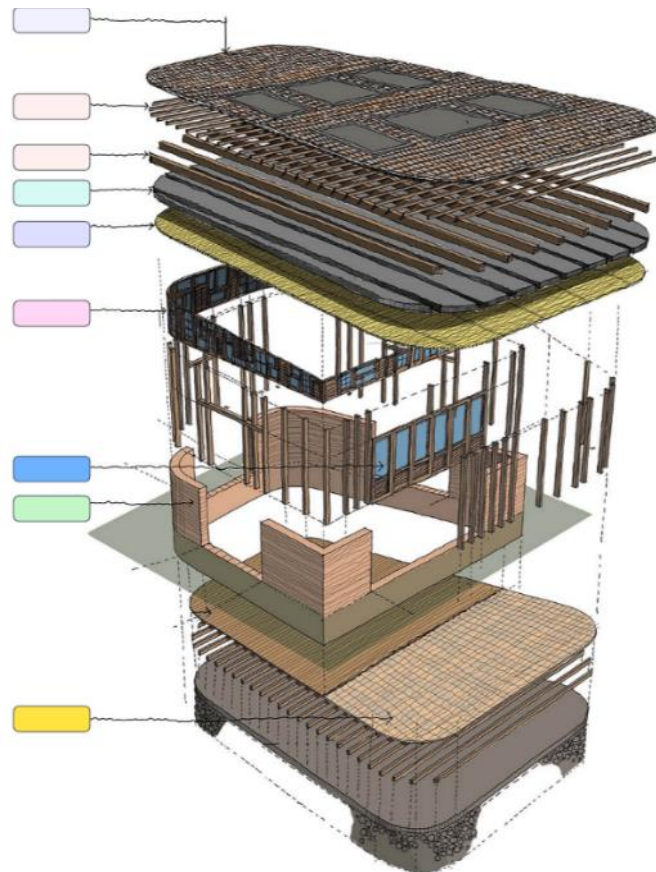


Figure 5-4-5-4 Showing Architects three dimensional view of structural composition of individual buildings done by GASS Architecture Studios sourced from (Ahuja, 2022) [Accessed 01/08/2022]

Form: The buildings softly curved walls resembling organically shaped boulder-like formations are inspired by natural patterns derived from the surrounding Paarl Berg Boulders constructed to meet the programmatic demands of each of the distinct structures (Ahuja, 2022). Its architecture, with its village-like clusters of individual buildings, fosters a strong sense of community and connection which aligns with the schools’ values of building a community (Ahuja, 2022). The primary school and kindergarten, cocooned by surrounding classrooms, have a central courtyard where children can play and circulate among the different classrooms (Refer to figure 5-4-5-5 & 5-4-5-6).



Figure 5-4-5-5 shows covered walkways which wrap a central courtyard providing refuge from the sun and weather experienced in the Western Cape, photos by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]



Figure 5-4-5-6 showing ramped earth walls to building and timber fence securing kindergarten area, cluster of classrooms resembling a village layout with both a central safe courtyard and zones between buildings for children to explore, photo by Wieland Gleich sourced by (Abdel, 2022)



#### 5.4.6 Flow and circulation of the school

The school's entrance is set back from the main road, where parents enter through a secure access gate. The drop-off zone is located near the school's administrative area, where children transition from zone to zone via a series of carefully shaped access routes that create exciting moments of discovery within the landscape (Ahuja, 2022). Hand-woven tunnels with saplings set behind the berms are positioned along the walkways leading to the various clusters of buildings, creating a majestic, exciting transition from the drop-off area and heart of the school (Refer to image 5-4-6-1); while in transit between zones, children interact with nature and learn more about their surroundings (Green School South Africa, 2021) (Refer to figure 5-4-6-2).

The classrooms are arranged in a manner resembling a village, with a covered walkway encircling a central courtyard that not only serves as a circulation and pause area for the children, but also provides places for them to sit and observe activities from a distance, allowing them to leave an activity if they so choose (Refer to figure 5-4-6-3) (Green School South Africa, 2021).



Figure 5-4-6-1 Shows the circulation routes both inside the school grounds and outside (Google Earth, 2018) [Accessed 26/11/2022]

##### Diagram Key

- Site boundary
- Main road
- Circulation routes
- Car route in
- Car route after drop off
- Railway line
- Drop-off zone
- Cafeteria
- Sankep
- Heart of school
- Kindergarten
- Primary
- Back of house



Figure 5-4-6-2 Sapling tunnel for children to run through. Source: Author



Figure 5-4-6-3 Photos internal courtyard spaces where children can play with seating on the on the outskirts for children to recuse themselves when they no longer want to be part of the activity but rather observe from a distance, photos by Wieland Gleich sourced by (Abdel, 2022)

#### 5.4.7 Light & view

Although artificial LED lighting has been used, strategically placed high-level and low-level windows allow rooms to be flooded with natural daylight (Abdel, 2022), while framing the landscaped gardens that connect the classrooms to the outside world (Refer to figure 5-4-7-1). The glass windows and doors allow children who occupy the spaces to see their surroundings before entering a different zone. The building's large roof overhangs extend over high-level openable windows, offering protection from the harsh sun. By enabling fresh air to enter while forcing hot air out through the high-level windows, low-level windows with openable parts promote natural cooling and provide occupants with a more comfortable environment (Refer to figure 5-4-7-2).

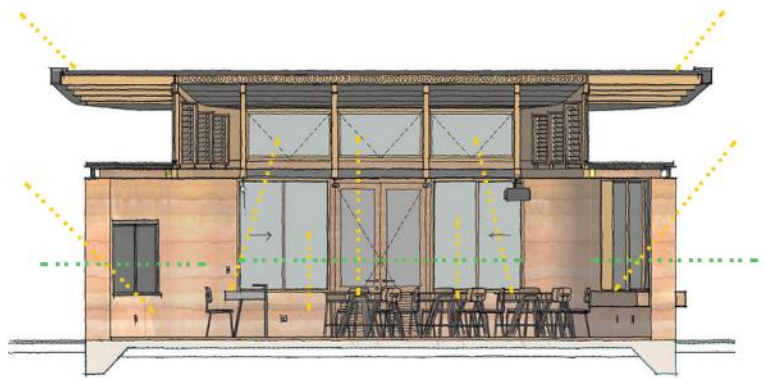
Despite the classrooms having sizable windows that look out onto gardens and are covered by substantial overhangs, there is no treatment on the windows to prevent children from becoming distracted by the views outside, distractions may be limited however by the fact that the children would have set play times and set learning times, when in the class there would be no children playing outside, with the building set back away from the road, distracting views of cars and people are of no concern.

#### 5.4.8 Material & colour

The building integrates local materials and craftsmanship by utilising rammed earth and clay brick walls harvested from the site (Abdel, 2022). Furthermore, the high-level dek-riet ceiling, lime-plastered walls, and floors, and 'werf' walls constructed from stones sourced from the site all



Figure 5-4-7-1 Photo showing large glass windows allowing natural light to fill the classroom windows have no way of blocking distracting views from outside (Green School South Africa, 2021) [Accessed 01/08/2022]



#### Diagram Key

- Large overhangs restrict harsh sunlight
- Windows allow not only light into the space but views out into the garden

Figure 5-4-7-2 Sectional view showing natural light entering windows including the views out from within the classroom done by GASS Architecture Studios sourced from (Ahuja, 2022) [Accessed 01/08/2022]



contribute to the overall design of the school grounds, fostering an innate connection with nature and land (WA Contents, 2022). The natural raw material walls of the building are neutral in colour, lending to the buildings' appearance of being formed from the landscape (Refer to figure 5-4-8-1).



Figure 5-4-8-1 Shows different materials used in the buildings design to tie into the local surroundings, photos by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]

Although the classroom walls are mostly bare in nature, small, rounded windows with different coloured glass add magical pops of colour (Refer to figure 5-4-8-2 & 5-4-8-3). The simple use of materials in the classrooms and other spaces allows for dematerialization in the transition from inside to outside, resulting in a calming environment.



Figure 5-4-8-2 Photo showing coloured class windows and escape pods for children to read, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]



Figure 5-4-8-3 Photo showing pods for children to escape to and read, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]



#### 5.4.9 Building system

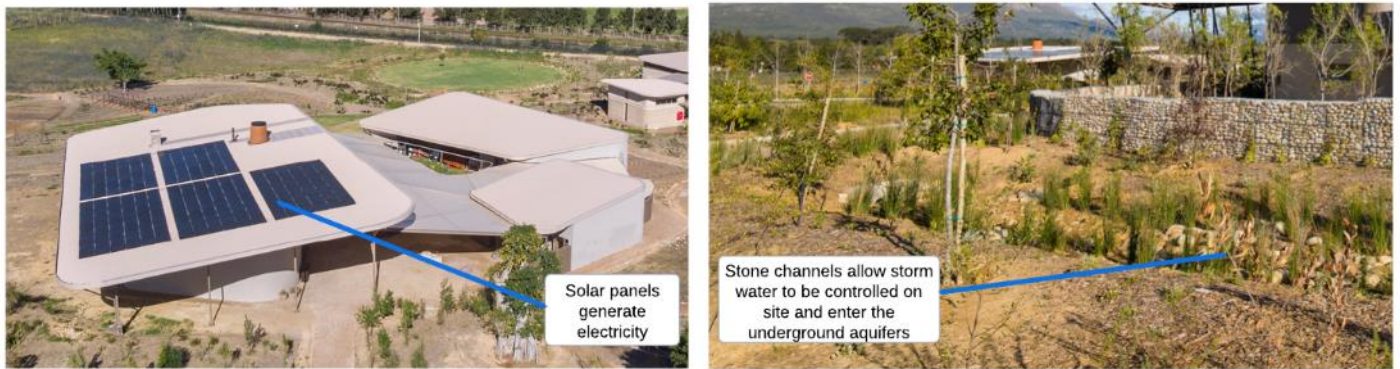


Figure 5-4-9-1 Photo showing solar panels and storm water channels, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]

The school was designed and built following the Living Building Challenge (LBC), which states that a building must have a zero footprint and be regenerative. The building achieves these requirements by generating 105 % of its electricity, contributing more to the power grid than it consumes (Green School South Africa, 2021). With the use of large openings allowing natural light to flood the learning spaces reducing the need for artificial lighting, passive cooling is achieved through the use of window openings and high-level vents which naturally help regulate the various buildings temperature and air quality. The water consumption from the underground aquifers is less than that of the site's yearly rainfall (Green School South Africa, 2021), by using of storm water channels made from onsite rocks, the storm water is slowed down to have time to seep back into the site's underground aquifers (Refer to figure 5-4-9-1).

Building materials and supplies are strictly monitored to ensure no harmful chemicals are used, resulting in a healthy environment for the children and other occupants on the school grounds (Green School South Africa, 2021). The endemic flora and fauna (Refer to figure 5-4-9-2) contribute to the site's biodiversity by providing a home for bees and butterflies that pollinate the orchards and vegetable gardens on the school grounds and surrounding farmlands (Green School South Africa, 2021).

Because the vast majority of the site is covered in vegetation, the reflective heat gain from hard surfaces is kept to a minimum, resulting in a comfortable environment for children to inhabit and explore (Refer to figure 5-4-9-3).

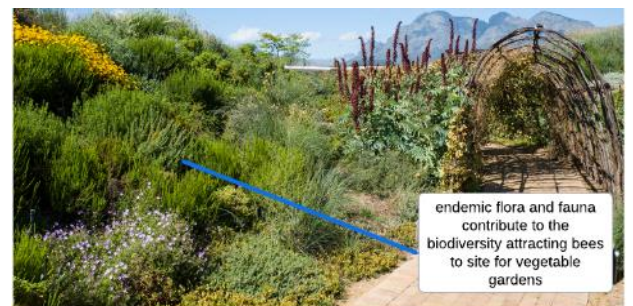


Figure 5-4-9-2 showing the endemic flora and fauna, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]



Figure 5-4-9-3 showing soft landscaped areas reducing heat gain, photo by Wieland Gleich sourced by (Abdel, 2022) [Accessed 01/08/2022]

#### 5.4.10 Conclusion

The learning environment, academic programme, and extracurricular activities at the Green School South Africa have all been developed with the goal of minimising the school's impact on the environment (Architect and Builder, 2022). The challenge that the school faced was to design a campus that is part of the global Green School community, but that is defined by its local context, climate, and heritage. The surrounding mountains inspire the space making not only at a site-specific scale, but also down to the individual buildings and spaces between them. The spatial arrangement of the school gives its occupants a sense of ownership and enhanced community spirit through place identity. The design team took into account the theories of phenomenology, environmental psychology, and biophilia, which were introduced in earlier chapters. Their goal was to create a space that was more than just a building; rather, it was a setting in which children could learn, grow, and ultimately develop.

The Green School South Africa adopted the living building challenge as the framework to guide and inform all decision-making. The significance of place, water, energy, health and happiness, materials, equity, and aesthetics guided the design of the school grounds and buildings (Architect and Builder, 2022). The development is self-sufficient and makes responsible use of the site's and the community's resources, all while having a beneficial effect on the people who use it and the natural environment it interacts with. The selection of materials not only speaks to the larger, more comprehensive context of the site, but also to the more specific, micro context, in which the building takes on a personality and creates an identity that contributes to the formation of 'place' (Norberg-Schulz, 1980). Phenomenology is evident in the extent of the detail and choice of materials, this relates to Pallasmaa (1996, p.99), who indicates that phenomenology in architecture requires purposeful consideration of how things are made, such as material, structure, light, and space. It is also clear that the spaces created make it possible for children to "dwell," giving them the a sense of belonging in a safe environment (Norberg-Schulz, 1980).

Solar panels, natural ventilation, thermal massing, maximisation of natural day light, and the careful orientation and placement of the buildings all contribute to a very low energy demand for the day-to-day operations of the school, thanks to the environmentally conscious and successful design strategies that were implemented. Rainwater harvesting achieved through landscaping and roof structures guarantees that storm water will replenish the ground water, making it possible for the school to return more water to the environment than it consumes (Green School South Africa, 2021).

In spite of the fact that the design was not specifically conceived with the requirements of autistic children in mind, it took into account a wide variety of other aspects, ideas, and theories, all of which will contribute to the creation of a favourable environment for autistic children. Children who have

autism will see a significant improvement in their quality of life as a result of these design considerations, which will have a beneficial effect on the growth of these children.



Figure 6-1 Figure showing chapter 6-word cloud (Author)

## 6.1 INTRODUCTION

In this chapter, two case studies within the context of KwaZulu-Natal are utilized to evaluate current early childhood development facilities in line with the literature discussed in the previous chapters. Both the Thanda community-based organisation for early childhood development and the Bloom Centre for children with special needs have been selected to serve as case studies in order to gain a better understanding of early childhood development facilities in the local context of South Africa KwaZulu-Natal.

Thanda is a community-based facility that is geared more towards the early childhood development of neuro-typical children. Whereas Bloom Centre is an establishment that specialises in providing services that are geared toward the early development of children with special needs such as autism. The two case studies provided an opportunity to evaluate specific contextual and environmental aspects discussed in the previous chapters and how the two different facilities cater for early childhood development of both neurotypical children and children diagnosed with autism. The case studies have been broken down and analysed with the help of in-depth observations and evaluations of the built environment.

In order to gain a deeper understanding of the requirements of early childhood development of both neurotypical and autistic children's interviews were conducted with staff members of the facilities. The questions for the interviews were carefully constructed to ensure that they addressed the objectives ([refer to section 1.2.3](#)), as well as the secondary and primary questions presented in ([chapter 1.3.3](#)). The findings from the interviews will be thematically analysed through a deductive approach by identifying patterns across the data and derive meaning by grouping information into codes, and themes (Maguire *et al.*, 2017). These themes will be discussed and analysed later in this chapter.

**Advantages of thematic analysis:** Thematic analysis is a versatile method of qualitative analysis that gives researchers the ability to develop new ideas and perspectives based on the data they have gathered (Delve, 2020).

**Disadvantages of Thematic analysis:** Because thematic analysis is such a flexible method, it implies that there are a great number of distinct ways to derive meaning from a given data set (Delve, 2020).



## 6.2 EARLY CHILDHOOD DEVELOPMENT: THANDA EARLY CHILDHOOD DEVELOPMENT

### 6.2.1 Introduction

Thanda community centre (refer to figure 6-2-1-1) is a community-based organisation that provides children and the surrounding community with innovative solutions for sustainable development (Thanda, 2021). Angela Larkan and Tyler Howard co-founded Thanda community centre in rural



Figure 6-2-1-1 shows external view of classroom from young child's eye level, (Sustainable Design, 2019) [Accessed 09/11/2022]

KwaZulu-Natal in 2008 after two years of on-the-ground research to provide support for the community through various programmes and services such as agriculture development and after-school education. In 2016, the facility identified that an early childhood development centre was required to support the children's development from an early age (Refer to figure 6-2-1-2) (GlobalGiving, 2022). Thanda's aim is to create a safe and strong community by providing education and skills building opportunities to individual's to empower and create positive change within their community (Thanda, 2021).

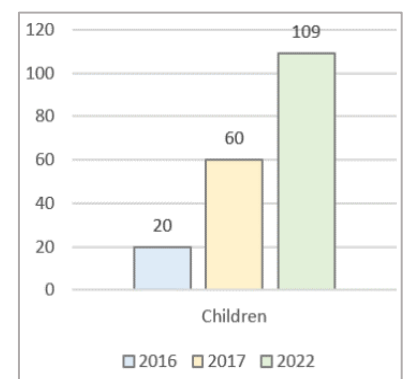


Figure 6-2-1-2 shows the number of children attending Thanda over the years data source (GlobalGiving,

Thanda's various programmes work in tandem to foster the development of rural communities that are self-reliant, healthy, and where individuals respect one another and live sustainably (Even Ground, 2021). The after-school education programme, held in the facility's classrooms and library, aims to cultivate motivated, lifelong learners with the confidence, knowledge, and skills to better their own lives and those of their communities. In addition, the agricultural development program works toward the reduction of food insecurity and malnutrition, the building of self-sufficiency among cash-dependent communities, and the promotion of the development of local businesses (GlobalGiving, 2022) (Refer to figure 6-2-1-3).



Figure 6-2-1-3 shows 1 & 2 - young children in the ECD program, 3 – Afterschool program and 4- Agricultural program (Even Ground, 2021) [Accessed 09/11/2022]

### 6.2.2 Justification of case study

Thanda community centre was selected as a case study for various reasons although it is not a facility for children with autism. Firstly, the centre offers early childhood development in a rural setting within KwaZulu-Natal. Secondly the facility is involved in community upliftment by offering various programs to older children from surrounding schools and agricultural programs to adults in the surrounding village's as discussed in the chapter 6.2.1. Thirdly, the school will offer a comparison with the second case study, which is autism specific. Lastly, the centre's location will give an understanding of the design features that meet the social, economic, and climatic conditions of rural KwaZulu-Natal.

### 6.2.3 Location

Thanda Community Centre located in the Nyagwini district, 109 kilometres from Durban, the capital of KwaZulu-Natal (Refer to figure 6-2-3-1). KwaZulu-Natal, situated on South Africa's east coast, has a warm coastal climate with sunshine and high levels of humidity in the summer months with a considerable amount of rain, in the winter months temperatures are milder with little rain.



Figure 6-2-3-1 showing locality of Thanda Community Centre (Google Earth, 2018) [Accessed 09/11/2022]

The community centre is located inland among the farmlands, and it is perched on top of a hill. As a result, there are expansive views of the surrounding natural landscape, which create a truly majestic atmosphere. Thanda Community Centre is one of the facilities that cater for upliftment of lives within the Nyagwini district, other buildings such as a church, convent for nuns and sisters, boys, and girls home with administrative building and a high school all help uplift the individual lives of the community (Refer to figure 6-2-3-2).

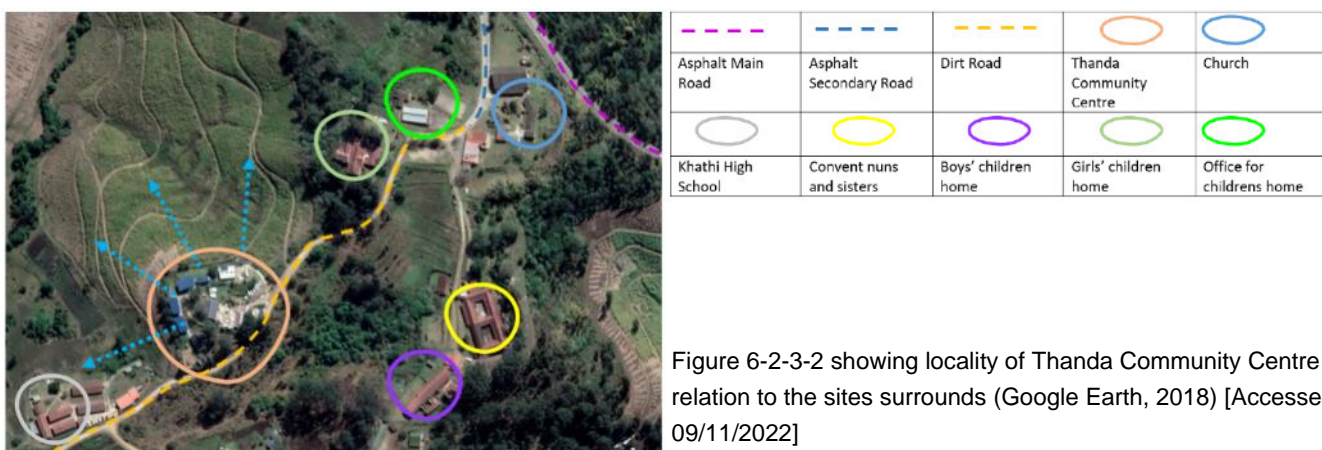


Figure 6-2-3-2 showing locality of Thanda Community Centre in relation to the sites surrounds (Google Earth, 2018) [Accessed 09/11/2022]



## 6.2.4 Empirical data

When one approaches the Thanda Community Centre, there are two entrance gates; one leads to the community agricultural centre area, and the other leads to the facility's early childhood development (Refer to figure 6-2-4-1). Within Thanda early childhood development, there are a number of buildings that cater to various activities. On top of the hill is a building that houses the library, administrative office, and kitchen for preparing children's meals. The children's classrooms, restrooms, and play areas are all situated in the lower portion of the site. In addition, there is a building that serves as a home for both marketing and administrative staff (Refer to figure 6-2-4-2).



Figure 6-2-4-1 showing photo of front entrance to Thanda Community Centre Source: Author [Taken 04/11/2022]



Figure 6-2-4-2 showing layout of Thanda Community Centre. Source: Author

When visiting Thanda community centre, it was observed that children attending Thanda start arriving around 7 a.m., either dropped off by Thanda vehicles that pick them up from the surrounding communities or accompanied by older children walking to Khathi Highschool. When vehicles drop off children at Thanda, they do so on the property's grounds to ensure the children's safety (Refer to figure 6-2-4-2 & 6-2-4-3).



Figure 6-2-4-3 showing photo of drop off area by skate park  
Source: Author [Taken 04/11/2022]



Figure 6-2-4-4 showing photo of pathway down to classrooms and play area from drop off area  
Source: Author [Taken 04/11/2022]

Referring to figure 6-2-4-4, the children are led along a gently curving pathway with views of the valley from the area where they are dropped off through the skate park and down to the classroom area. This pathway helps the kids feel connected to their surroundings by providing.

Children can explore and engage in social play in a variety of play areas that are close to the classrooms. The availability of a variety of play options on the playgrounds aids in keeping the children's interest. In order to give each child an equal chance to participate in the different types of play, the facilitators ask the children to rotate from the play equipment during free play (Refer to figures 6-2-4-5 & 6-2-4-6). This teaches the children to share and engage in other prosocial behaviours, which are crucial for their development as discussed in [chapter 2.3](#), "Developmental needs and learning styles of neurotypical children and children with ASD."



Figure 6-2-4-5 showing photos of the different play areas  
Source: Author [Taken 04/11/2022]



Figure 6-2-4-6 showing photos of the slide and tyres for play and adventure, including the skatepark at the entrance to the facility  
Source: Author [Taken 04/11/2022]



Children engage in a variety of activities throughout the day that are intended to promote and support their early development (refer to figure 6-2-4-7). Since there are typically +/-18 children in each class, the supervisors break the class up into smaller groups and rotates them into different areas on a regular. This helps to keep the children's attention span and ensures that each group gets the proper amount of attention from the activity as a whole basis (see figure 6-2-4-8 & 6-2-4-9).

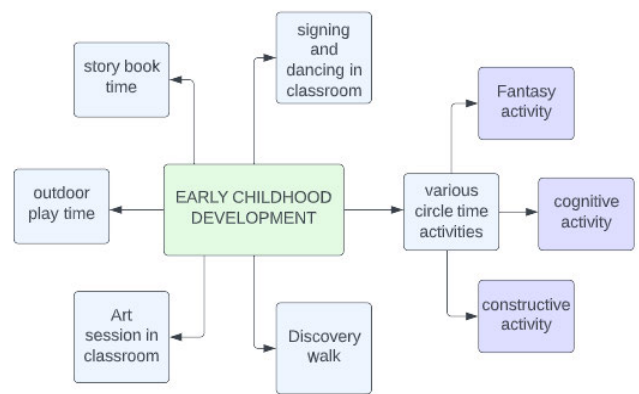


Figure 6-2-4-7 showing the various activities a child partakes in during a typical day at Thanda Early Childhood development Source: Author [witnessed 04/11/2022]



Figure 6-2-4-8 showing photos of the classroom zones Source: Author [Taken 04/11/2022]

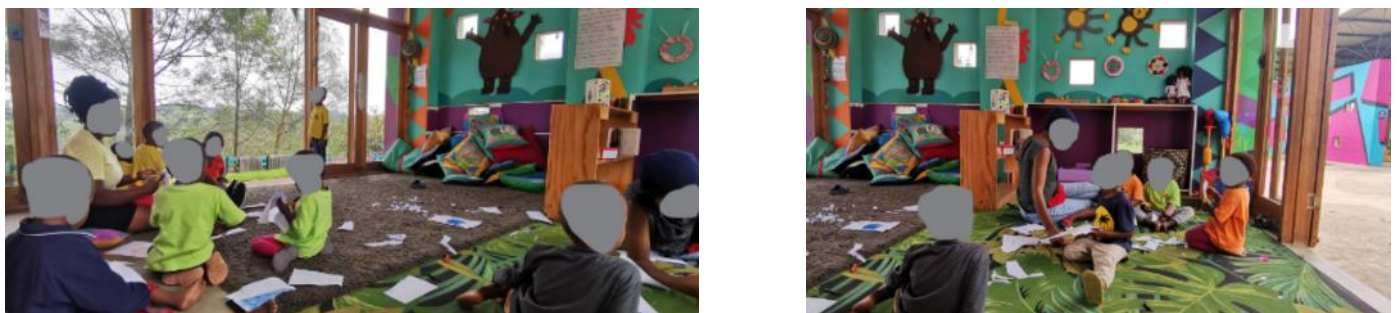


Figure 6-2-4-9 showing photos children participating in art class within the classroom Source: Author [Taken 04/11/2022]



As discussed previously Thanda Community Centre strives to uplift the community by providing agricultural assistance, which aims to reduce food insecurity and malnutrition, build self-reliance among poorer communities, and promote local development by assisting communities in preparing their own gardens to farm produce (Even Ground, 2021). This in turn helps parents that may not have jobs to provide for their family and provide nutritious meals for their children. For example, Bawinile from Mswilili farm said that *“Having more access to food has changed our lives at home. We don’t buy from shops and in that way, we save money. We also eat fresh vegetables which is good for our bodies”* (Carter, 2018). Additionally After school programmes that utilise the playgrounds/skate park or library (refer to figure 6-2-4-10, 6-2-4-11) contribute to the development of self-directed, lifelong learners with the confidence, knowledge, and skills to better their own lives and those of their communities (Even Ground, 2021).



Figure 6-2-4-10 showing photo of older children skateboarding after attending a nearby school Source: Author [Taken 04/11/2022]

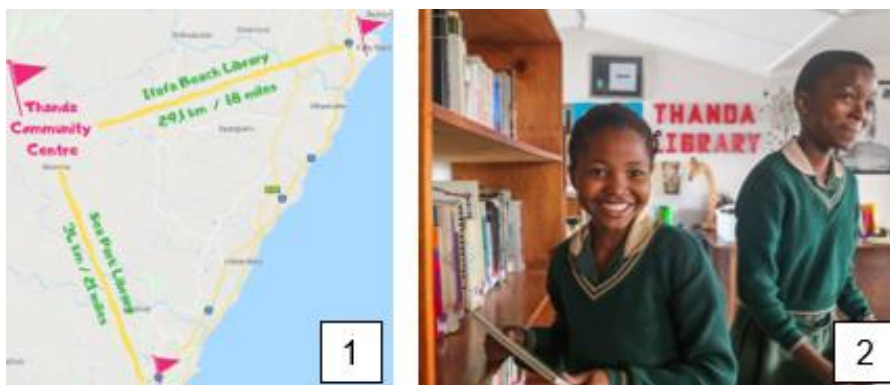


Figure 6-2-4-11 (1) shows the distance children would need to travel to a library to read books if Thanda did not provide one, (2) shows after school children utilizing the library(Hicks, 2019) [Accessed 09/11/2022]

The buildings at Thanda, which are located on top of a hill, are visible from a distance within the community, serving as a beacon of hope. The community centres' buildings are arranged taking into consideration the site's contour lines. Buildings at the top of the site are easily accessible to the general public, whereas classrooms on the lower level of the site are more private for the younger children (Refer to figure 6-2-4-12). The positioning of the classrooms on the lower levels of the site separates the more public facilities of the centre to the more private facilities ensuring a quieter environment for the children, additionally the positioning of the classrooms creates an atmosphere in which the children transition from a high point to a low point, thus ensuring the buildings are less intimidating to the young children (Refer to figure 6-2-4-13).

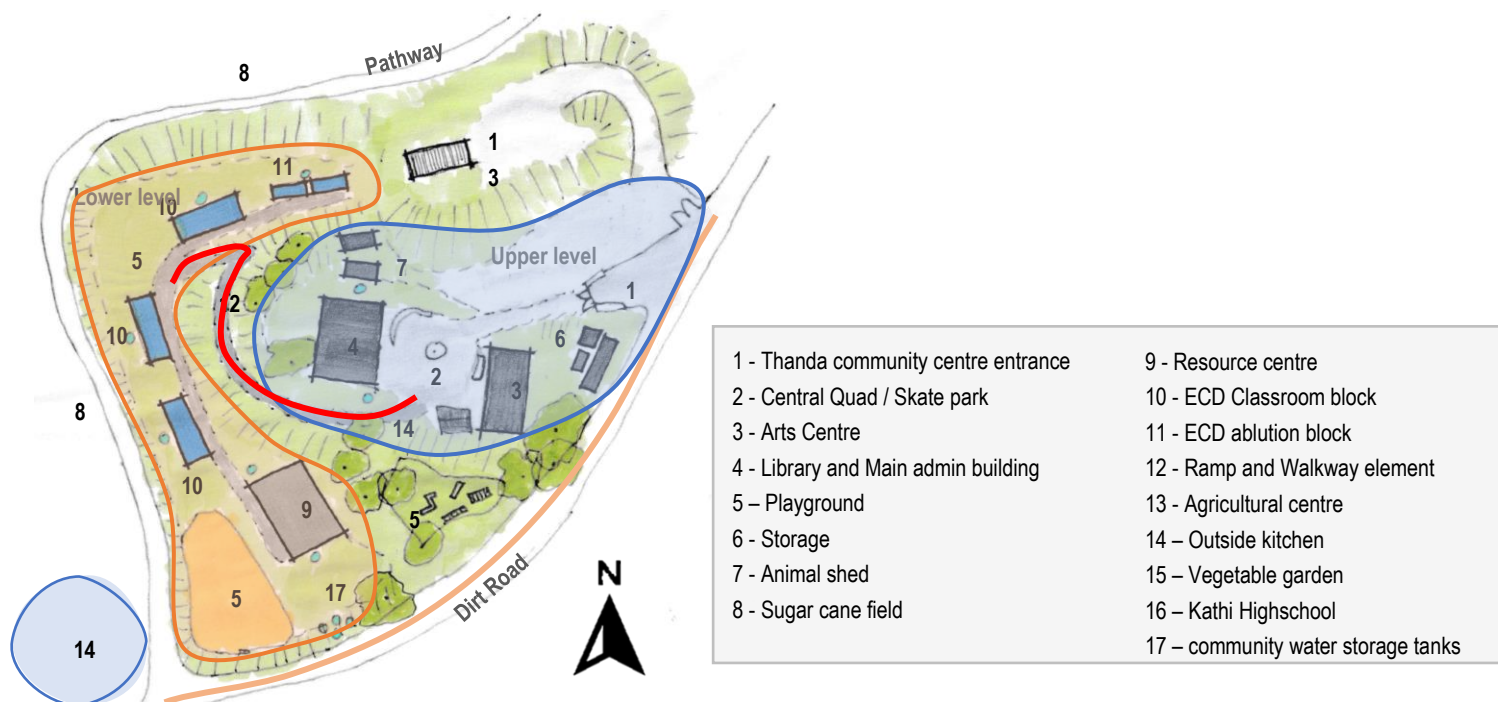


Figure 6-2-4-12 showing site layout for Thanda Community Centre, **blue** area is the upper level of site whereas **orange** is the lower level of the site with **red line** showing pathway providing transition route between the two levels. Source: Author



Figure 6-2-4-13 showing level different between upper level of site and lower level of site. Source: Author [Taken 04/11/2022]

In keeping with sustainable principles (Refer to figure 6-2-4-14), the facility recycles water on-site and has installed a community tap, which serves as an important lifeline to the community which also connects the facility to the community in more ways than one (Sustainable Design, 2019). Additionally, rainwater harvesting tanks are positioned by individual buildings to catch rainwater that falls onto the roofs and are used for washing and drinking.

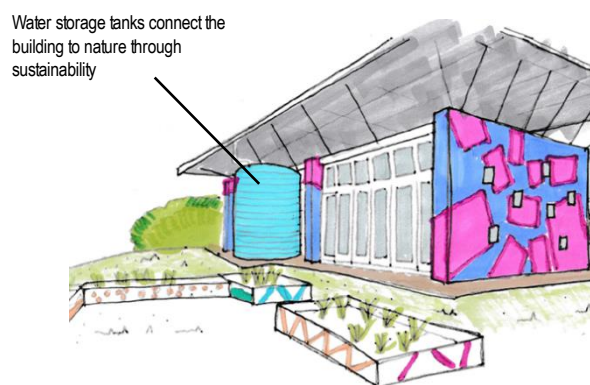


Figure 6-2-4-14 showing photo of tanks on the outer boundary of the facility providing water to the community through a community tap, additionally water storage tanks collect rainwater from the roof and is utilized for washing and drinking within the facility. Source: Author [Taken 04/11/2022]

The classrooms at Thanda Community centre are constructed out of brick and mortar, finished with plaster and paint. On the external façade the classrooms have large openings which allow the internal spaces to receive natural light reducing the need for artificial lighting, additionally the large openings allow for natural ventilation to pass through the classrooms creating a cooler environment with fresh air for the children. The classrooms, have 2 roofs, the lower roof annotated as roof 1 has no overhangs whereas roof 2 provides a large overhang to the sides of the buildings protecting the openings from direct sun. The gap between roof 1 and roof 2 provides a route for wind to pass through cooling the roof directly above the classrooms reducing heat gain passing into the classrooms reducing the need for artificial cooling. Additionally, the large surface area of Roof 2, helps maximise rainwater harvesting as previously discussed. The classrooms are square, with large openings providing access on both sides. A storeroom that is shared by two classrooms is provided to free up space inside the classrooms. In these storerooms, educational materials and the



kids' bags are stored. By doing this, the classrooms are kept tidy and the distraction level for young children is lower (Refer to figure 6-2-4-15 to 6-2-4-17).

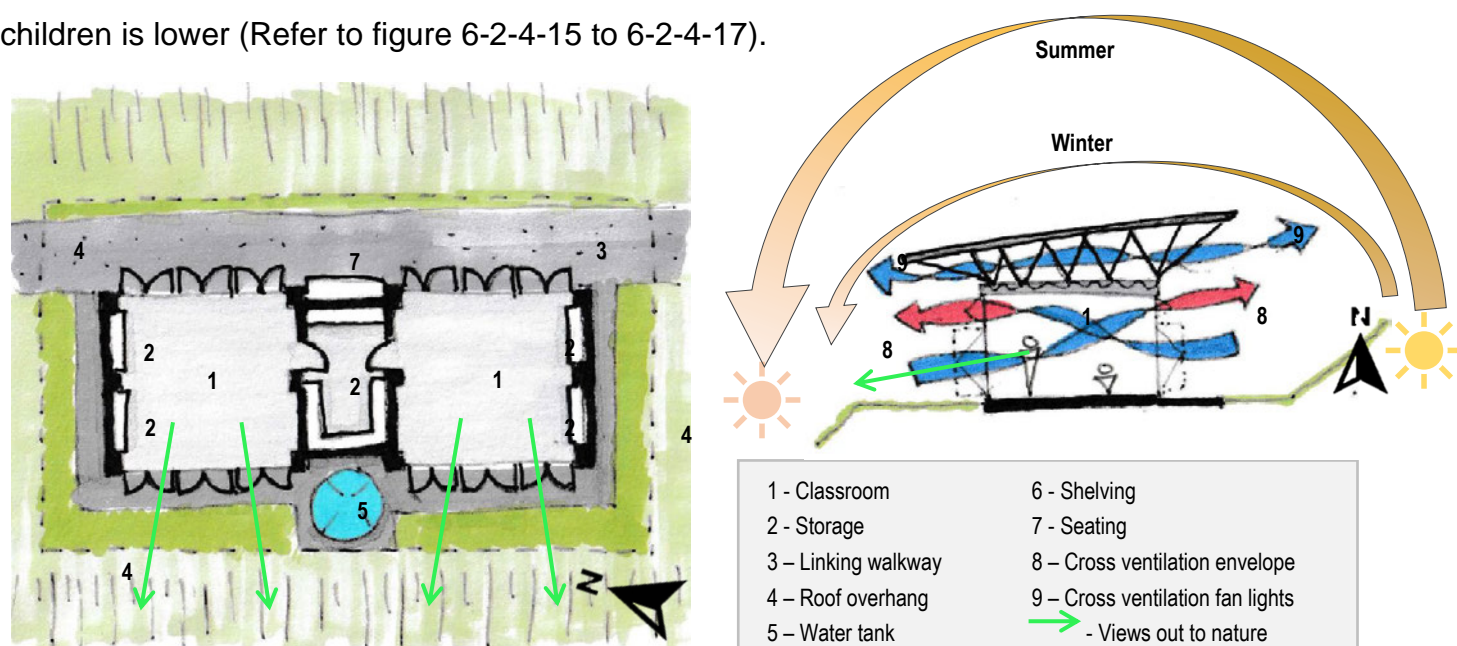


Figure 6-2-4-15 showing depicting roof overhang and large openings for natural light and ventilation. Source: Author



Figure 6-2-4-16 showing photo of internal classroom shelves and walls. Source: Author [Taken 04/11/2022]



Figure 6-2-4-17 showing photo of internal classroom shelves and walls. Source: Author [Taken 04/11/2022]

The buildings at Thanda are brightly painted with patterns, which helps to create a vibrant and energetic environment for the children who attend the school. However, these bright colours would not be appropriate for children with autism, as was covered in [chapter 4. 7](#). Children with autism may experience sensory overload when exposed to bright colours, hence muted colour schemes are preferred when designing spaces with children with autism (Refer to figure 6-2-4-18).



Figure 6-2-4-18 showing photos of brightly coloured walls to classroom exterior and interior. Source: Author [Taken 04/11/2022]



## 6.2.5 Research findings from interviews

The thematic analysis of the transcribed participant audio-recorded interviews entails highlighting various sections and passages to generate qualitative codes for identifying research-related themes and patterns. The codes will be created in accordance with the research objectives and questions (see chapter 1 – 1.2.3 Objectives and 1.3.4 Key Questions). The codes will then be grouped according to themes and patterns. In the table below, these codes, themes, and patterns are illustrated. This inductive process requires the researcher to move back and forth between the collected data until a complete list of themes is compiled (Creswell *et al.*, 2016). The final research is presented in a narrative format relating to the understanding and explanations of the participants in the study.

6.2.5.1 Table showing thematic data analysis process.

| <b>Codes</b><br><br><i>Codes that were used to identify and summarise essential concepts within the interview transcripts</i>  | <b>Sub-Themes</b><br><br><i>Condensed codes into sub themes</i> | <b>Themes</b><br><br><i>Identified themes from sub-themes</i> |
|--|---|---|
| <ul style="list-style-type: none"> <li>• <i>Learning needs of Neuro-typical and Autistic children</i></li> <li>• <i>Expectation of parents</i></li> <li>• <i>Academic staff support</i></li> <li>• <i>Observation of children</i></li> </ul> | Learning needs of Neuro-typical and Autistic children           | <b>Developmental Environment</b>                              |
| <ul style="list-style-type: none"> <li>• <i>Classroom layout</i></li> <li>• <i>Design considerations</i></li> <li>• <i>Safety</i></li> <li>• <i>Signage</i></li> <li>• <i>Distractions</i></li> </ul>  | Classroom layout and design                                     |   |
| <ul style="list-style-type: none"> <li>• <i>Sensory System</i></li> <li>• <i>Rooms and equipment for regulation</i></li> </ul>   | Sensory Environment   |   |
| <ul style="list-style-type: none"> <li>• <i>Community involvement</i></li> <li>• <i>Community programs</i></li> <li>• <i>Covid 19</i></li> <li>• <i>Awareness of other children</i></li> </ul>   | Community   | <b>Social Environment</b>                                     |
| <ul style="list-style-type: none"> <li>• <i>Contact with nature.</i></li> <li>• <i>Playground and equipment</i></li> </ul>   | Outdoor environment   |   |

Table 6-2-5-1 showing thematic data analysis process for Thanda Source: Author

After conducting a thematic analysis on the transcribed interviews, the researcher identified two primary themes: 1. Developmental Environment, and 2. Social Environment. The questions, aims, and objectives of the research are all connected to these themes.

## 6.2.5.2 Developmental environment

### 6.2.5.2.1 Learning needs of neurotypical and autistic children

Participants described how, because classroom equipment is limited, children are divided into smaller groups and rotate to each activity, which helps reduce behavioural issues.

*"It is groups of three. You start in this group; you are playing with the puzzles. After 10 minutes you freeze, and you move to the other. They all going to get a turn as they rotate. It makes our life easier because if you say we're all playing one thing, which means there will be more fighting because where you can get all that? Pg 7 (Principle)*

*"If you have 20 children in the classroom, we don't have 20 same toys. It's like they know, we do have a five-minute rule. You need to wait for five minutes for the other one to play. When your five minute is over, you must give it back." Pg 7 (Principle)*

Participants described how the children are educated after school days at home.

*"Our kids here, we want to develop that love of reading early. We give them books to lend to the guardians and they read for them." Pg 16 (Principle)*

*"And every second month we've got the learning-at-home pack that goes home with the children... We give the children a book, discussion questions, and the activities so they can colour in and do whatever. Then we give them crayons, scissors, and LEGOS for them to do activities at home." Pg 16 & 17 (Principle)*

Participants described the expectations of the parents and how they help with the development of the children.

*"We were working closely with the guardians because sometimes they have a mindset that educating kids is for the teachers. For them it's to provide. But, during COVID they can educate their children." Pg 18 (Principle)*

Participants described the number of support staff in the classrooms.

*"There is a class teacher and the assistant teacher... we do have first run interns... it adds two or three people. It's the class teacher, assistant teacher, and then sometimes it's the inclusion assistant because we've got three inclusion children here... not all need the assistant. But the autism one need assistant." Pg 8 (Principle)*

Participants explained how they observe the children and identify areas of concern.

*"they play in the fantasy area where they role play. They role play their home environment... That means we can observe many things, such as where their behaviour is coming from. Sometimes you can observe, you as a teacher because one of them can say, 'I'm the teacher'." Pg 6 (Principle)*

Participants describe how Thanda develop children by using a theme (Refer to figure 6-2-5-2-1-1), in the classrooms they participate in activities to develop as a child in line with the theme. At the time of visiting Thanda the theme was generosity.

*“Here at Thanda we don’t just teach children, we are organising themes like generosity. On the walls we display the themes and also the book we are reading is concerned with the theme that we are doing.” Pg 1 (Teacher 1)*



Figure 6-2-5-2-1-1 showing photo the current theme Generosity displayed on the wall in the classroom Source: Author [Taken 04/11/2022]

Participants explained the importance of showing the children’s artwork to instil confidence, pride, and commitment to come to school (Refer to figure 6-2-5-2-1-2).

*“The work of the children, displayed on the wall so that they are always being encouraged to do their work. And also, to be present at school.” Pg2 (Teacher 1)*



Figure 6-2-5-2-1-2 showing children’s artwork on the walls Source: Author [Taken 04/11/2022]

Participants describe how the child with autism is easily distracted, struggles to concentrate for long periods of time, and occasionally leaves the classroom.

*“If we’re doing activities, we tell them to concentrate, sometimes the one with inclusion (Autism), takes the LEGOS and throws it at the door. He used to take anything. If he comes outside, he takes a stone and throws it. We used to work with an inclusion assistant to keep an eye on him. Always keep an eye. If he is walking down there, one of us must go and follow him because our classroom is surrounded by other classes.” Pg2 & Pg 3 (Teacher 3)*

*“If you take him to sit in front of you and read the story, he tries to concentrate. But he always like to see the other children who is walking up and down. But he tries to concentrate at least 15 minutes.” Pg 3 (Teacher 2)*

Participants describe how the children are distracted by various activities happening across the valley, the teachers then change the distraction into an educational activity before going back to their current activity (Refer to figure 6-2-5-2-1-3).

*“Because you can see the sugar cane all around here. Sometimes there is a distraction. Especially when there are tractors, there's a distraction. But we do have the time just to... We need to give children time to explore their interest. We'll read them the story if you see, oh, there's four cows there. So, as a teacher, you need to wait, “Let's count them, one, two, three, four.” And then go back to the lesson. Pg 4 (Principle)*



Figure 6-2-5-2-1-3 showing children's view from classroom Source: Author [Taken 04/11/2022]

#### 6.2.5.2.2 Classroom layout and design

Participants explain the ease of access to resources for the children to participate in classroom activities (Refer to figure 6-2-5-2-2-1).

*“Everything in our class is there, the toys and the resources are on the level of the kids.” Pg 2 (Principle)*



Figure 6-2-5-2-2-1 showing ease of access to items in the class Source: Author [Taken 04/11/2022]

Participants describe the floor space and how it is divided into four areas for activities, this helps create smaller groups in the class for the children to each have a turn with the limited material, the smaller groups also help with children concentrating (Refer to figure 6-2-5-2-2-2).

*“Even in the classes, we sit on the floor with the children. The classes are divided into four different areas.” Pg 2 (Principle)*

*” We have the area for calming where we use activities that are calm” Pg 1 (Teacher 1)*



*“So, we have a fantasy area, constructive area. We’re using dolls in fantasy area. Dolls, kitchen things, and food, et cetera. In construction, we use trucks, farm animals, and wild animals. The other area is*



Figure 6-2-5-2-2-2 showing zones within the classroom Source: Author [Taken 04/11/2022]

*cognitive used to put puzzles and LEGOS. Puzzles help our children develop their cognitive and also fine motor skill because they put with their fingers. LEGOS help them to differentiate colours and also making patterns and different shapes because we have LEGOS that have squares, circles” Pg 3 (Teacher 2)*

Participants describe the large open windows and doors and how natural lighting and ventilation is addressed in the classrooms (Refer to figure 6-2-5-2-2-3).

*“Our classrooms are having lots of those (windows). It’s clear even if you walk outside, it’s visible, everything inside.... it’s always open, as you see. When we’re arriving in the morning, we open all the doors.... Ya, we close them but not all, we only open maybe one door” Pg 2 (Teacher1)*



Figure 6-2-5-2-2-3 showing photos of large glass doors to classrooms Source: Author [Taken 04/11/2022]



Participants describe how signage is limited around the school, children are shown around in the beginning of the year, and they understand where to go. The researcher observed how the children are escorted to the various areas during the day's activities (Refer to figure 6-2-5-2-2-4).

*“At the beginning of the year, they come with no idea what is happening and don't even know their classes, which class they belong. So, we are teaching them since the beginning of the year that this is your class, and you have to remain here as we have two different grades. We have 000 and 00.” Pg3 (Teacher 1)*

*“If we are going outside, like we were reading the story now we're going outside to the sandpit or playground, we first explain to them, “Friends, now we are going to playground.” So, we are trying to make them understand first before we're doing the activities. “Because if someone has come and ask them, “Where are you going?” They must tell them.” Pg 4 (Teacher 2)*

*“Our kids they know if it's time to play, which side they need to go to. There are no signs to show that.” Pg 5 (Principle)*



Figure 6-2-5-2-2-4 showing children on the playgrounds Source: Author [Taken 04/11/2022]

Participants describe how the children are distracted with the large openings in the building's façade.

*“they can see everything. They can see when there's someone coming in here, just to walk down to them. “There's someone coming, Miss!”... “And you can see that tractor there.” Pg 3 & 4 (Principle)*

#### 6.2.5.2.3 Sensory environment

Participants describe how the children learn about touch by playing in the sand pits (Refer to figure 6-2-5-2-3-1).

*“we've got sandpits here where they play with sand. ...they feel the texture, they learn about smooth, fine, and rough.” Pg 9 (Principle)*



Figure 6-2-5-2-3-1 showing sandpit for sensory exploration Source: Author [Taken 04/11/2022]

Participants describe how the buildings colours and shapes help educate the children where they identify the different colours and shapes (Refer to figure 6-2-5-2-3-2).

*“Sometimes they look at the colours and learn about the shapes. Because we can see the design in all the colours. There's a lot of shapes, you can look around, and a lot of colours” Pg 11 (Principal)*

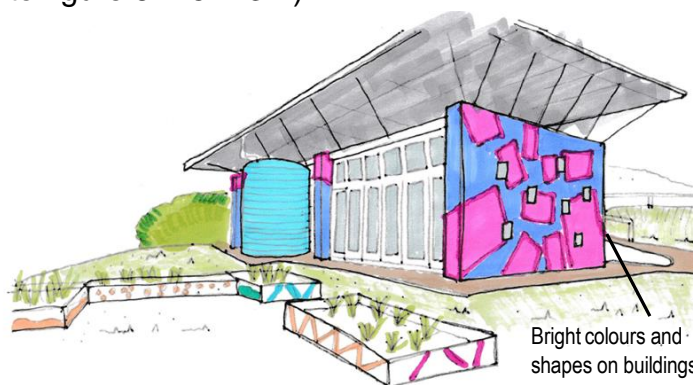


Figure 6-2-5-2-3-2 showing colours and shapes on buildings Source: Author [Taken 04/11/2022]

Participants describe how the children are able to regulate when feeling overwhelmed with emotions.

*“we've got a closed area, a big area. A child can go and sit there and just take one of the teddies and sleep until he's comfortable to talk what is going on. Sometimes you say, "What is going on? What happened?" and they just cry. So, okay, we need to give him space. We have a blanket area where they can sit comfortably and a bookshelf there, they can take whatever book they want.” Pg 6 (Principle)*

### 6.2.5.3 Social environments

#### 6.2.5.3.1 Community

Participants explained how Thanda is involved in the community and how this creates a safe place for the children (Refer to figure 6-2-5-3-1-1).

*“...the children, they come back Saturday and Sunday and in school holidays. They use the skate park... they play because it is free for everyone... After hours it's locked... during the day it is open because it is safe here... They look after Thanda. Our children here are safer because every weekend they come here to Thanda. That means they have no time to learn cigarettes or whoonga because they know they come here, and we feed them.” We do not have security here.” Pg 14 & 15 (Principle)*



Figure 6-2-5-3-1-1 showing colours and shapes on buildings Source: Author [Taken 04/11/2022]

*“The site is open to anyone and everyone. Even if you're not part of the Thanda programs, you can come to site and play.” Pg 3 (Staff member 1)*

The participants explained how the community is allowed to use the facilities library creating a link with the surrounding villages (Refer to figure 6-2-5-3-1-2).

*“even the community are allowed to come and borrow books.” Pg 15 (Principle)*



Figure 6-2-5-3-1-2 library for children and community to use  
Source: Author [Taken 04/11/2022]

The participants explain how they have limited budget for toys, and how they ask the guardians to keep recycled material to help make toys for the children to play with.

*“We have toys, Thanda buy us some toys, but we used to make waste toys... like 2L milk and other things that will help us. It's very important to make those toys because we do work with guardians. So, other guardians have no money to buy some toys, so we always teach the guardians to collect everything that will help us to make toys.” Pg 4 (Teacher 2)*

Participants explain how working out in the community has benefited the program after Covid.

*“As compared to the school where we would have one facilitator and 20 kids, 20 to 30 kids with one person. COVID-19 brought in some brighter or positive change to the kids.” Pg 2 (Staff Member 1)*

*“Now that we are working out in the community, it would be a group of kids from that community even if they're in Grade 1, Grade 2, Grade R, Grade 3, they would all be together in one space. That also had us changing our curriculum because we had to cater for broader range of grades or different age groups as compared to when we were at school... it's one facilitator with 10 kids. It's not just the facilitator, we also have a community volunteer with the facilitator. So, it's two people with 10 kids. They can now focus more on the kids specific or individually.” Pg 1 & 2 (Staff member 1)*

Participants explained how the community program allows the children to extend their education time as they do not have to walk so far after the after-school program. The staff member says this lets children return to their village earlier in the day, which is safer.

*“When we were working at school, we would end at half past four and the kids would have to travel from school to home for like 30 minutes to an hour for some... now, they come straight from school to home and then go to the program. That would mean that the program can extend up to five o'clock because the kids are closer to home now... It's safer for them instead of travelling longer distances alone, especially during winter it gets darker early. The facilitators can also see them, okay, so-and-so got home safely.” Pg 2 (Staff member 1)*

Participants explain how the children react to having an autistic child in their classroom.



*"sometimes they feel like, "Oh no, what is going on now?" It can have a good impact or a bad impact to the others. Sometimes they have the anger, how can we make the other children understand what is going on with that child?... Sometimes the children don't understand what is happening. They just act out, because for them it's like a play." Pg 12 (Principle)*

#### 6.2.5.3.2 Outdoor environments

Participants explain the vegetable gardens, and how groups of children will water the gardens as part of their routine and connect with nature (Refer to figure 6-2-5-3-2-1).

*"It's their routine every Monday. ...they water their garden. It's six wooden plots for the six classrooms... They know that today it's our turn to go and water the garden with their teacher." Pg 9 (Principle)*

*If they arrive, it's in the morning, they used to water there, also in the afternoon." Pg 3 (Teacher 1)*



Figure 6-2-5-3-2-1 showing colours and shapes on buildings Source: Author [Taken 04/11/2022]

Participants explained that the children go on discovery walks and learn about their environment.

*"When they're doing the discovery walks, sometimes they go and talk about the trees. There are long and short trees, they're talking about the colours. Maybe they're looking at the hill. If we're reading books, they're looking at the hill and they saw the birds and all these things. And they're playing games like you're lying down, looking up at the clouds and trying to draw your own clouds. When they're doing the discovery walk, they look around." Pg 9 (Principle)*

*"it's in the curriculum. Two times per week depending on the book that we are doing. Sometimes it talks about nature whereby we walk around looking for insects and telling them that you don't kill insects, instead you're protecting them as well the flowers and the importance of the whole nature, we are also gaining in the nature. They're also gaining from us. Pg 4 (Teacher 1)*

*"In collect with nature, we collect the material like grass, leaves, and flowers. Maybe I can draw the dog and then they will take those materials that they collected from our walk and then make some dog to make them different colours." Pg 4 (Teacher 2)*

Participant explains how the young children use the skate park.

*“For my children, they are only using the scooters on the skate park because they are young. Pg 13 (Principle)*



Figure 6-2-5-3-2-2 showing skate park where the younger children play with scooters Source: Author [Taken 04/11/2022]

#### 6.2.5.3.3 Communication

Participants described the learning material provided to help the one autistic child at the school.

*“they gave us charts to practice like an animal walk. The child that I’m talking about has autism and a speech problem, so they also gave us the chart with mouth exercises to encourage the pronunciation of words.” Pg 1 (Teacher 1)*

#### 6.2.6 Conclusion

The Thanda community centre is based on the principles of community sustainability. The care and assistance provided by those involved in the centre’s operations demonstrate this. The establishment of the Early Childhood Development Centre in Thanda not only provides a variety of developmental and social environments that connect to the larger community, but also facilitates the development of learners who will become resilient and innovative in their future community. The expansive greenery of the centre not only provides the children with opportunities to connect with nature on a more personal level, but also creates a feeling of openness within the centre. The discovery walks educate the children about the natural environment and allow them to explore their senses. The vegetable gardens assigned to each class provide opportunities to connect with nature on a more personal level and enhance the children's ability to work in groups. Although Thanda is limited by its funding initiatives, it is very much part of the community by establishing after school programs and small-scale farming assistance. By doing this Thanda is able to provide a safe place where children in the immediate and distant areas feel a sense of belonging.



## 6.3 EARLY CHILDHOOD DEVELOPMENT: BLOOM CENTRE - FOR CHILDREN WITH SPECIAL NEEDS

### 6.3.1 Introduction

Bloom Centre (refer to figure 6-3-1-1) is a facility that offers assistance to children with special needs. Bloom seeks to provide a space of hope and support where children can feel loved, safe, and accepted for who they are. Nicola Stirton, an occupational therapist, recognised the need for a facility to assist children with special needs when she began treating a



Figure 6-3-1-1 shows external view of Bloom classrooms, Source: Author [Taken 11/11/2022]

child with Down syndrome. In 2013, Nicola, Eric, and Carolyn began exploring various options by arranging meetings with local schools and parents to determine remediation and special needs. Bloom Centre opened its doors in 2014 shortly after it was determined that the area required a middle to long-term special needs school.

When the opportunity arose at the end of 2014, Bloom Centre, a non-profit organisation, relocated to their new location in Eden Village in Salt Rock, KwaZulu-Natal. Members of the community came together to offer aid in the form of equipment, tools, labour, and time. The support continues to this day as infrastructure is constructed to aid the children's development.

Kingdom Kids, a small mainstream pre-primary school, was introduced to Bloom Centre in 2015, where mainstream and special needs children interact to create learning opportunities that help eliminate the stigma associated with difference.

In 2019, Bloom Centre began the year with three fully functional classrooms containing 20 students with special needs, while kingdom kids have 9 students. Bloom relocated to their own facility in Umhlali in 2022. The new facility has more space for children to run and engage in free play. The Bloom team is comprised of specialised therapists, teachers, assistants, and facilitators. Bloom's staff receives regular training that enables them to assist with the developmental stages of the children in their care.

### 6.3.2 Justification of case study

Bloom Centre was chosen as a case study for a number of reasons. Firstly, Bloom provides support for a range of diagnoses, including Down Syndrome, Autism, Low IQ, non-specified learning difficulties, and children who are unable to cope in mainstream schools (Bloom, 2023). In addition, Bloom offers a fully functional mainstream Pre-School programme for children with typical development to aid in integration and overcome the stigma of differences (Bloom, 2023). Second, the school provides a comparison between the first case study, which was set in a rural environment and focused on the early childhood development of children with typical development, whereas Bloom, focuses on early childhood development in an affluent suburb for children with special needs. Lastly, Blooms location will give an understanding of the design features that meet the social, and climatic conditions of KwaZulu-Natal.

### 6.3.3 Location

Bloom Centre is located in Umhlali district, 50 kilometres from Durban, the capital of KwaZulu-Natal (Refer to figure 6-3-3-1). KwaZulu-Natal, situated on South Africa's east coast, has a warm coastal climate with sunshine and high levels of humidity in the summer months with a considerable amount of rain, in the winter months temperatures are milder with little rain.



Figure 6-3-3-1 showing locality of Bloom Centre for children with special needs (Google Earth, 2018) [Accessed 09/12/2022]

Bloom is located 4km inland from the East Coast of South Africa. Along the northern boundary of Bloom, Umhlali Preparatory School is located with smaller buildings bordering the fence separating the field from the fence line. Along the Eastern, Southern and Western boundary of the site trees and shrubs line the fence blocking out noise pollution from outside the facilities boundary.

### 6.3.4 Empirical data

The Bloom Centre, located off the R102 in Umhlali, is accessible through a controlled security gate manned by a security guard throughout the day. The entrance driveway divides, directing parents to three separate drop-off locations, each with a locked gate that is opened by a staff member for the safety of the children. The Bloom Centre comprises three buildings that serve distinct purposes (Refer figure 6-3-4-1). The Bloom building houses the three classrooms for young children with special needs. Maple Tree for Autism Introductory, Willow Tree for Autism Pre-Primary, and Oak Tree for Autism Primary. There are administrative, kitchen, and break-out spaces in the same building. In the adjacent building the mainstream classroom for Kingdom Kids, the Baobab Tree class for children with varying disabilities, and multiple therapy rooms. In block C and D, there are additional therapy rooms operated by various organisations, as well as an arts and crafts room operated by Bloom where children work with their hands.

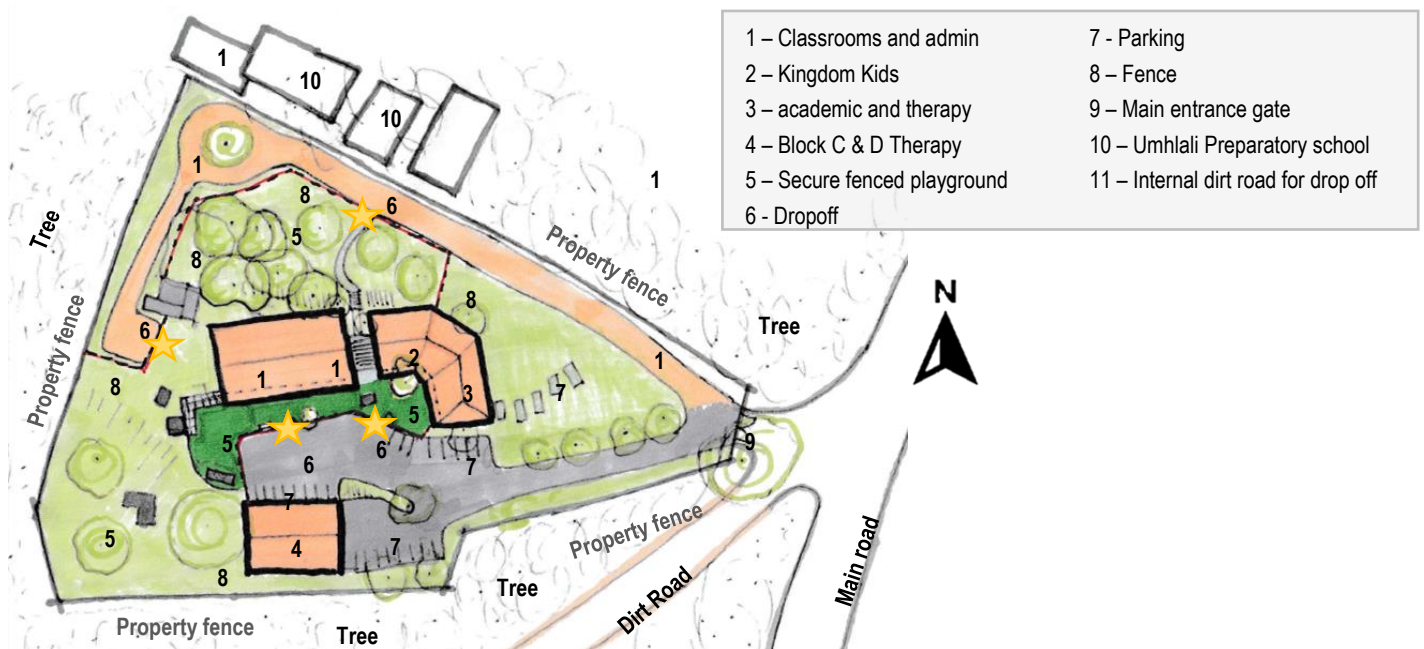


Figure 6-3-4-2 shows layout of Bloom Village. Source: Author

It was observed during a visit to Bloom Village that both children and staff members begin to arrive at 7am. All children are dropped off by vehicle, and almost all children are dropped off in front of the Bloom building, adjacent to the parking lot (refer to figure 6-3-4-2); however, one of the young girls prefers to be dropped off in the back of the school, where it is much quieter and less chaotic. The children are accompanied by their parents to a secure pedestrian gate, which is opened by Bloom staff members to ensure the safety of the children (Refer to figure 6-3-4-3).

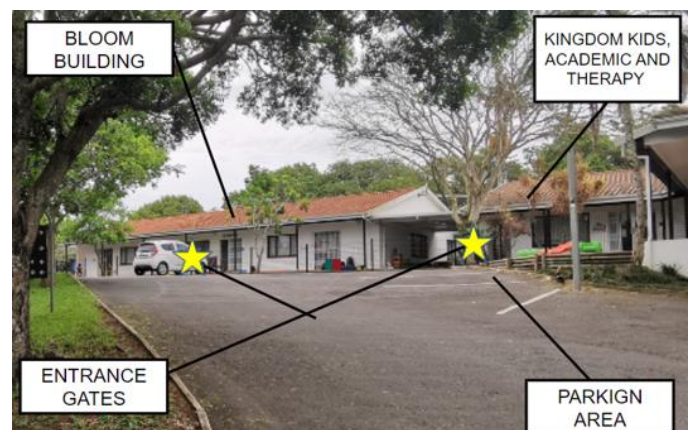


Figure 6-3-4-2 shows external view of Bloom classrooms with entry points, Source: Author [Taken 11/11/2022]



During drop-off time children are greeted with music playing from a speaker placed in the secure fenced off play area. The 3 different play areas are located around the two main buildings which house the classrooms, admin, and therapy rooms. In the outdoors play area children are able to participate in a variety of free play activities which aid in their development, jungle gyms (Refer to figure 6-3-4-3), racetracks for scooter motorbikes, playhouses for fantasy play and a trampoline (Refer to figure 6-3-4-4) are a few of the activity's children can participate in during free play.



Figure 6-3-4-3 shows photos of external play equipment for children to climb and develop their vestibular processing, Source: Author [Taken 11/11/2022]



Figure 6-3-4-4 shows photos of external play equipment for children either race around with a toy bike, participate in fantasy play in the playhouse or release energy by jumping on the trampoline, Source: Author [Taken 11/11/2022]

When playtime is over, children are directed to their classrooms to view the daily schedule. The children prepare their schedules the night before, which facilitates their daily routine and understanding of when one activity begins and ends, thereby minimising disruptions during the transition to new activities. All students examine their schedules upon entering the classroom and are aware that the current activity is regulating time. Regulating time consists of the teacher playing calming music and closing the curtains to help the students unwind. Once regulating time is over, the children pull out their schedules to identify and prepare for the upcoming activity. Observing this, one child asked that the music continues, but the teacher directed the child to the schedule, and the child understood that it was time to move on to the next activity. The use of a schedule appears to be an effective means of transitioning to other activities.

Maple class age 3-5 yrs. layout is square 4600mm x 4245mm, with a whiteboard, desks, and storage space. In reference to figure 6-3-4-5, figure 6-3-4-6, figure 6-3-4-7 & figure 6-3-4-8, the floors are carpeted, and the ceiling is of standard height made up of flush plaster. Windows are located on one of the walls with blinds should they need to be closed to limit distractions, or sun glare.

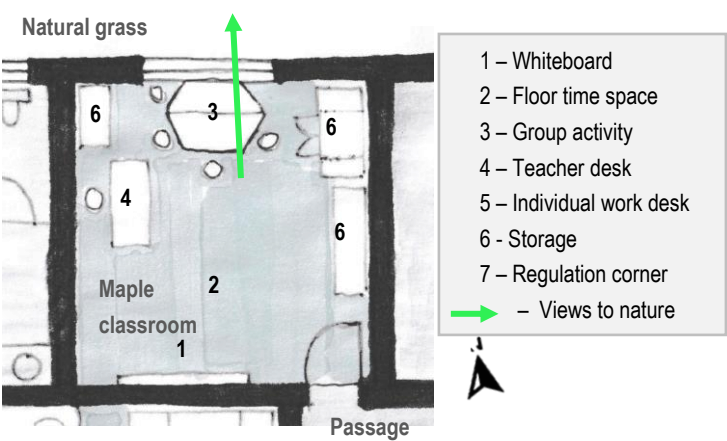


Figure 6-3-4-5 shows layout of maple classroom. Source: Author

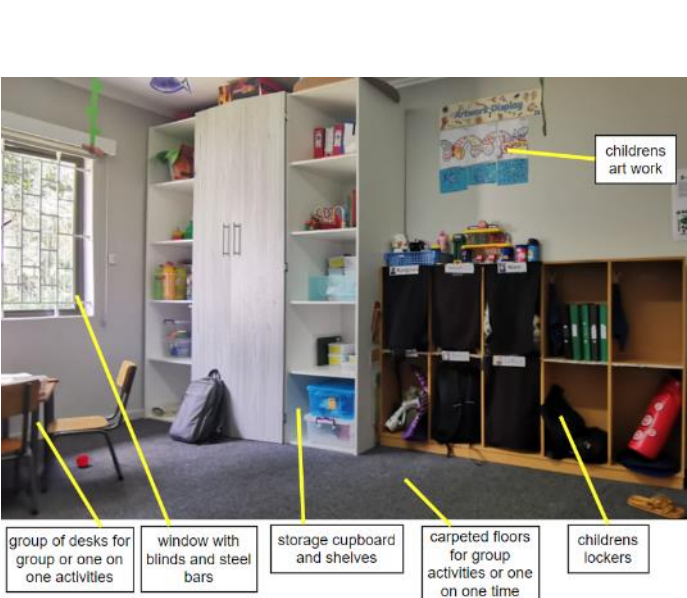


Figure 6-3-4-6 shows photos of Maple Class, Source: Author [Taken 11/11/2022]

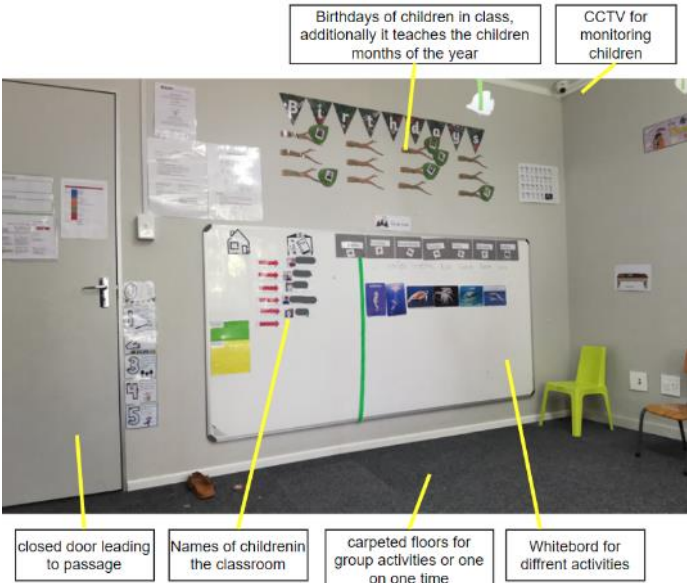


Figure 6-3-4-7 shows photos of Maple Class, Source: Author [Taken 11/11/2022]

Doors are closed when children are in the classrooms to stop wandering, additionally windows are fitted with bars to reduce the risk of children climbing on tables and out the windows. In the classrooms there are CCTV cameras for observation (Refer to figure 6-3-4-7), all these measures aid in the children's safety. Lockers with the children's names are provided where children's belongings are kept with their schedules (Refer to figure 6-3-5-4-6) The walls of

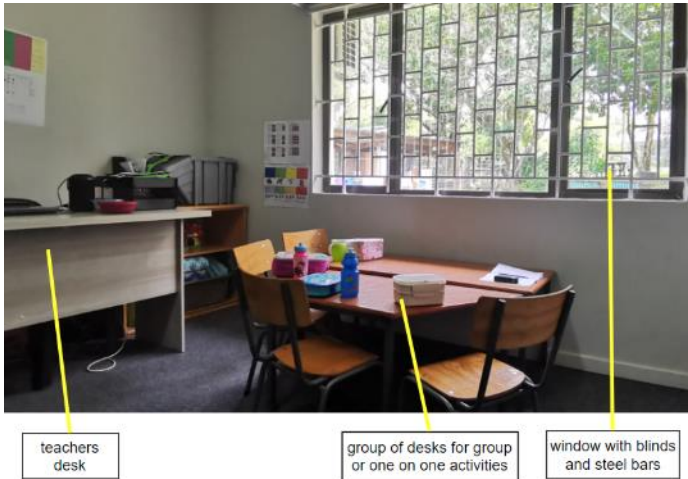


Figure 6-3-4-8 shows photos of Maple Class, Source: Author [Taken 11/11/2022]

the classroom are smooth and painted an off-white colour, with minimal distractions items laced on the walls comprise of various learning material, months of the year showing the children's birthdays and artwork (Refer to figure 6-3-4-7 & figure 6-3-4-8), by placing the children's artwork on the walls a sense of pride and ownership is created allowing the children to see the classroom as their space and giving the environment a sense of identity. In the classroom there is space on the floor for group



activities including a group of desks, where children may participate in various activities such as one on one time or group sessions (Refer to figure 6-3-4-7 & figure 6-3-4-8). Through the timber door is a passage with is the only exit and entry point, directly opposite this is a regulating room where children may regulate when over or under stimulated. Regulating room will be discussed in more detail further on.

The Willow class is similar to the Maple class; however, the age range is between 6 and 12 years. The classroom size is rectangular measuring 5745mm x 6315mm. The classroom is equipped with a whiteboard, desks for children to complete activities on and cupboards for storage (Refer to images 6-3-4-9, 6-3-4-10, 6-3-4-11 & 6-3-4-12). The walls are plaster and painted and kept bare, however located around the whiteboard on the walls is learning materials and a themed poster with a caterpillar showing each child's birthday month. The classroom environment is kept bare in nature to reduce over stimulation, walls are painted in a neutral off-white colour (Refer to images 6-3-4-10 & 6-3-4-11). The floors are carpeted with beanbags for children to relax on while participating in group floor time activities.

The ceiling is made up of flush plaster ceiling board and is painted white. In the Maple classroom there is too a CCTV camera to monitor the children during the course of the day. External windows and doors are placed on two of the exterior walls, equipped with blinds to reduce glare and distractions from the outside spaces. One of the walls has a large double leaf door with security gates to help control kids from wandering when the doors are kept open, and a window with a sill height of 1000mm (Refer to images 6-3-4-11 & 6-3-4-

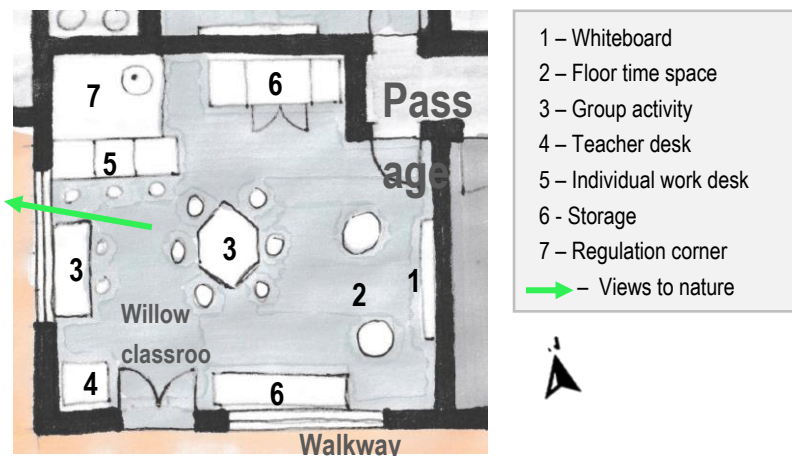


Figure 6-3-4-9 shows layout of maple classroom. Source: Author



Figure 6-3-4-10 shows photos of Willow Class, Source: Author  
[Taken 11/11/2022]

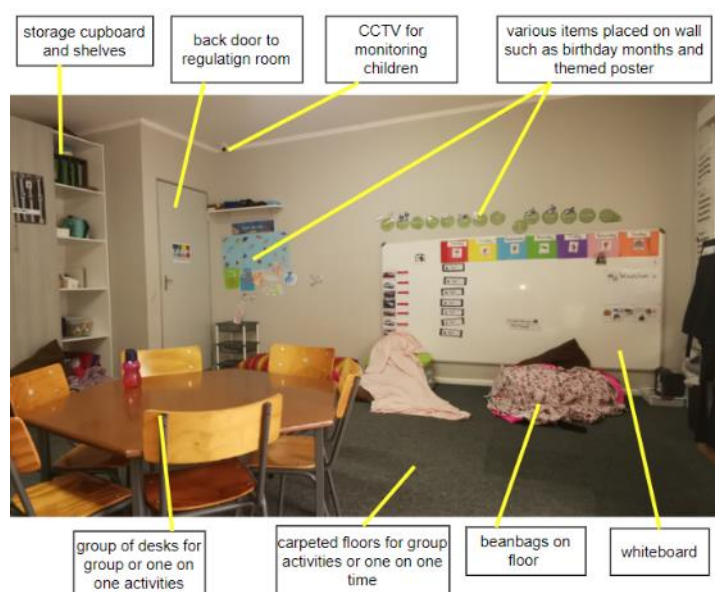


Figure 6-3-4-11 shows photos of Willow Class, Source: Author  
[Taken 11/11/2022]

12). On the adjacent wall, a large window with a sill height of 1000mm as well allows for cross ventilation and natural light to fill the space. In the corner of the room is a cool down space for children to escape too when overwhelmed (Refer to image 6-3-4-12), if the space proves to be insufficient for the child there is a back door that leads to the same passage as the maple class to access the regulating room where there are additional items that may assist in calming the children.

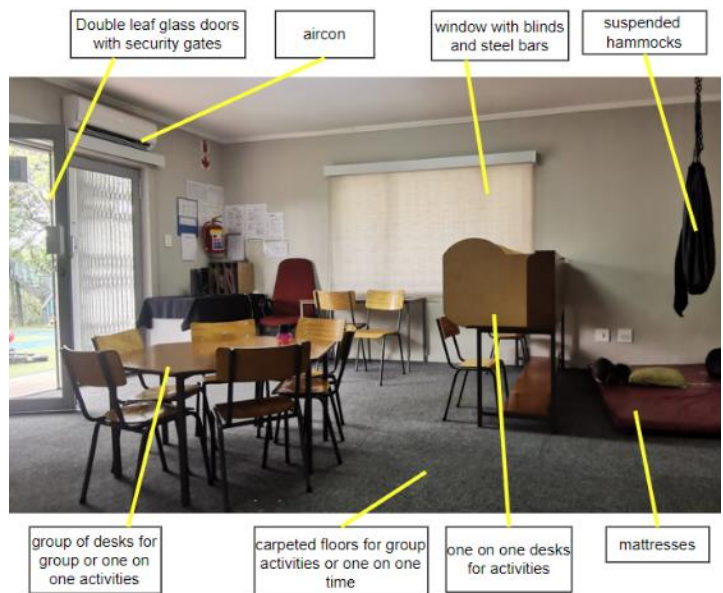


Figure 6-3-4-12 shows photos of Willow Class, Source: Author [Taken 11/11/2022]

Separate from the classrooms, but connected

by a passage, is a regulation room. This room is used when children have been exposed to excessive sensory stimuli and require time to calm down before reengaging a particular activity or environment. In the regulating room, suspended from the ceiling is lay-down beds and hammocks, mattresses, and cushions that may be scattered across an interlocking rubber mat floor. In the same room a wall-mounted air conditioner provides air conditioning while a window provides natural light and ventilation when opened. There is LED strip lighting mounted to the ceiling which provides artificial light without the hum and flicker that fluorescent lights produce that may affects sensitive children (Refer to figure 6-3-4-13).



Figure 6-3-4-13 shows photos of Regulation room for children to regulate when over stimulated from sensory input from a particular activity or environment, Source: Author [Taken 11/11/2022]

### 6.3.5 Research findings from interviewers

The thematic analysis of the transcribed participant audio-recorded interviews entails highlighting various sections and passages to generate qualitative codes for identifying research-related themes and patterns. The codes will be created in accordance with the research objectives and questions (see chapter 1 – 1.2.3 Objectives and 1.3.4 Key Questions). The codes will then be grouped according to themes and patterns. In the table below, these codes, themes, and patterns are illustrated. This inductive process requires the researcher to move back and forth between the collected data until a complete list of themes is compiled (Creswell *et al.*, 2016). The final research is presented in a narrative format relating to the understanding and explanations of the participants in the study.

#### 6.3.5.1 Table showing thematic data analysis process.

| <b>Codes</b><br><i>Codes that were used to identify and summarise essential concepts within the interview transcripts</i>  | <b>Sub-Themes</b><br><i>Condensed codes into sub themes</i> | <b>Themes</b><br><i>Identified themes from sub-themes</i> |
|--|---|---|
| <ul style="list-style-type: none"> <li>• <i>Learning needs of Neuro-typical and Autistic children</i></li> <li>• <i>Expectation of parents</i></li> <li>• <i>Shortfalls of Mainstream schools and special needs schools</i></li> <li>• <i>Academic staff support</i></li> <li>• <i>Differences in autistic children</i></li> <li>• <i>Observation of children</i></li> </ul> | Learning needs of Neuro-typical and Autistic children       | <b>Developmental Environment</b>                          |
| <ul style="list-style-type: none"> <li>• <i>Classroom layout</i></li> <li>• <i>Design considerations</i></li> <li>• <i>Safety</i></li> <li>• <i>Signage</i></li> <li>• <i>Distractions</i></li> </ul>  | Classroom layout and design                                 |   |
| <ul style="list-style-type: none"> <li>• <i>Sensory System</i></li> <li>• <i>Excess stimulation</i></li> <li>• <i>Rooms and equipment for regulation</i></li> </ul>  | Sensory Environment   |   |
| <ul style="list-style-type: none"> <li>• <i>Awareness of other children</i></li> </ul>   | Community   | <b>Social Environment</b>                                 |
| <ul style="list-style-type: none"> <li>• <i>Contact with nature.</i></li> <li>• <i>Playground and equipment</i></li> </ul>   | Outdoor environment   |   |
| <ul style="list-style-type: none"> <li>• <i>Communication tools used by Autistic children.</i></li> <li>• <i>Transition to various activities</i></li> </ul>   | Communication   |   |

Table 6-3-5-1 showing thematic data analysis process for Bloom Source: Author



After conducting a thematic analysis on the transcribed interviews, the researcher identified two primary themes: 1. Developmental Environment, and 2. Social Environment. The questions, aims, and objectives of the research are all connected to these themes.

### 6.3.5.2 Developmental environment

#### 6.3.5.2.1 Learning needs of neurotypical and autistic children

Participants describe the various therapies used at Bloom.

*"We've got our occupational therapy, speech therapy, our academic specialists deal with academics only, and then we've got our classroom therapy. ...from the OT department, right through the school, we work on something called the DIR Floortime approach. In autism, there's one very popular approach called ABA, applied behaviour analysis... it's occupational therapy department, speech therapy department, academic department, and then obviously in the classroom." Pg1 & Pg 2 (Principle)*

*"academic support... We've got internal therapists... they'll go to speech therapy once a week with an internal therapist and occupational therapist... They 20-to-25-minute session... then they return to class. We also have external therapists, should the parents wish to have their child see a physiotherapist... Occasionally they will run group settings but usually we do one on one therapy." Pg 1 & Pg 2 (Teacher 1)*

Participants describe the draw backs of ABA vs the DIR Floor time approach.

*"... we found that that system is very robotic... if a child is not motivated, if they can't get something right, they don't get the reward. ...DIR Floortime approach is a different system where it bases its foundations on connection, heart to heart connection, relationship. We believe when a child feels safe and connected, we can put anything in front of them and they'll give it their best shot to explore, learn, and understand." Pg 1 (Principle)*

Participants described the draw backs of mainstream school's educational approach.

*"... a lot of our mainstream system is broken... As an educator, I feel that interest-based learning is the way of the future. Our mainstream schooling system has been stuck in an industrial age while the world's moved on... in the mainstream schooling system that creative right-side-of-the-brainchild is actually the one that falls through the cracks because the mainstream education system is all left-brain linear. If you don't fit that, then you just don't succeed at school... The general way that schools do it, is they do a theme every two weeks, it changes every two weeks. Pg 4 (Principal)*

Participants describe how the children at Bloom are wired differently and require a different approach to mainstream schooling.

*"we're going more interest-based as opposed to paper-based mainstream curriculum. We want to explore a little more creatively because our kids' brains are wired so differently and creatively. Pg 5 (Principle)*

Participants describe parents' expectations when sending their child to Bloom.



*"Lots of parents will come in here and go, "We want our child to read and write". That's the top of the tree, the leaves of the tree. We have to start at the roots, which is connection, emotional regulation, sensory regulation, before we can move up the bark into the top of the tree to achieve great things that the parents want." Pg 1 (Principle)*

The participants describe the various approaches implemented at Bloom to aid in the development of the children.

*"Our classroom focuses on emotional and social areas of these children. That's where we put the most value in terms of classroom time because the therapies are all one on one with the child." Pg 2 (Principle)*

*"The DIR Floortime approach, we've been on for about three years. We've been transitioning. Bloom used to use a mix of approaches. We would take the visual structure from the ABA, then we'd leave the rest of that. But, in terms of the DIR Floortime, we need somebody who's qualified in it to train our staff to be able to say we are a DIR Floortime school. This year, we started as a strictly DIR Floortime approach school." Pg 2 (Principle)*

*"what we do here is look at what we want a child to achieve in 10 years and how do we navigate that in terms of the structures we put in place." Pg 18 (Principle)*

Participant describes interest-based learning at Bloom.

*"in 2023, we're going... down the avenue of interest-based learning, which is new in South Africa. Overseas there's a lot happening. In Durban it's very hard to find an interest-based school... it's the perfect style of learning to couple with the DIR Floortime approach because it's very much what sparks curiosity in children." Pg 3 & 4 (Principle)*

*"interest-based learning... takes... one big theme like 'me and the world around me' and over a whole term period we're digging into that. Pg 4 (Principle)*

*"Each class will learn different things based off their developmental level. Under 'me and the world around me' will be my five senses, my emotions, me, and my friends... we really dig into that. Our older kids will start doing presentations, creating their own sensory profile so they know what regulates them, what sets them off." Pg 5 (Principle)*

*"Our younger ones are starting to understand how their bodies work. So, it's something that we can really play around with and upgrade and downgrade according to each child... it's all interest-based... using a lot of STEM (science, technology, engineering, mathematics) and bringing them into our classroom lessons and really giving our children a thread. Our therapists will also plan alongside the theme... So, even when the kids are going to therapy, they'll still be able to carry over. Pg 5 (Principle)*

*"the teachers are being more creative and they're able to engage their kids more because of it. It's opening our older learners, up to so much more technology and being able to do stuff they haven't been exposed to before. Working with their hands etc." Pg 5 (Principle)*

Participants describe how the various diagnosis of autism should be separated into different classes to assist the children as well as the teacher.

*“For functioning autism, as well. High-functioning because we've got a mixture. It's not all the same... It helps the teacher as well just in terms of academics or project-based work because of the functioning levels Pg 17 (Teacher 4)*

Participants described how large openings looking outside can be distracting for the children when they need to concentrate.

*“If the view is over a garden that's not going to be busy, then it's beautiful to be able to see the trees and whatever. But, if it's over an environment like this (busy walkway), you don't want that. That's a disaster.” Pg 28 (Principle)*

#### 6.3.5.2.2 Classroom layout and design

Participants described how children regulate within the classrooms (Refer to figure 6-3-5-2-2-1).

*“I find it's important to have spaces in the classroom where the kids can go themselves to regulate. Often that would mean a hammock, a mattress with pillows, or a dark sensory corner. ...you could create tents. It gives the child the freedom, if they're in meltdown mode, they can go and take themselves there.” Pg 4 (Teacher 1)*

*“...a padded half shatterproof glass, half wall, room in each classroom... we've created divisions with lockers etc. But, an ideal world, to have a wall up to half, padded, so they can crash into it and they're not going to get hurt. And then glass right up to the ceiling so that they can look out, there's natural light coming in, and the teacher can also look in while they're regulating.” Pg 15 (Principle)*

*“when we regulate, it's pitch black. ...no light. ...when people walk past, they cannot see in... and I play calm music and they all just relax for 15 minutes Pg 5 (Teacher 4)*

*“place where our kids can get a lot of Proprioception to regulate, like punching. ...to have a safe place where instead of a child just hitting the wall or hitting another child, they can have boxing gloves and something to punch. ...it has to be outside. That will eliminate a lot of meltdowns and hitting of other children.” Pg 14 (Teacher 3)*



Figure 6-3-5-2-2-1 showing regulation corner in willow classroom  
Source: Author [Taken 11/11/2022]

Participant explains the importance of positioning furniture in the classroom and how they may impact children negatively (Refer to figure 6-3-5-2-2-2).

*“For the most, ASD children where you set up your workstations. It mustn't be too close to the window, not straight in the light.” Pg 6 (Teacher 3)*



Figure 6-3-5-2-2-2 showing teacher desk being away from the windows in Maple classroom. Source: Author [Taken 11/11/2022]

Participants explained how certain design elements can hinder their ability to operate in a special needs school (Refer to figure 6-3-5-2-2-3).

*“keys are quite annoying. it would be nice to have fingerprint access or something fast that you can unlock and lock fast again because things go missing. ...it would be helpful to have something that's quick, fast, and fuss-free.” Pg 18 Teacher 1*

*“magnetic buzzers on these gates... biometrics would be amazing... because that would just assist in terms of safety. Pg 20 (Principle)*

*“Even the staff toilet, we have the key up at the top because otherwise they will lock themselves in. ...everything around this is safety. The thing you do not think is possible, they will manage too somehow do it. Pg 25 (Principle)*

*“Latches in all the classrooms because we have runners. Pg 17 (Teacher 3)*



Figure 6-3-5-2-2-3 showing one of many gates with a pad lock Source: Author [Taken 11/11/2022]

Participants described the safety concerns when designing indoor environments for children with autism (Refer to figure 6-3-5-2-2-4).

*“Runners, we’ve got runners... our classroom doors get locked. ...otherwise, it’s distracting if the children run, they get out halfway through the lesson...” Pg 19 & 20 (Principle)*

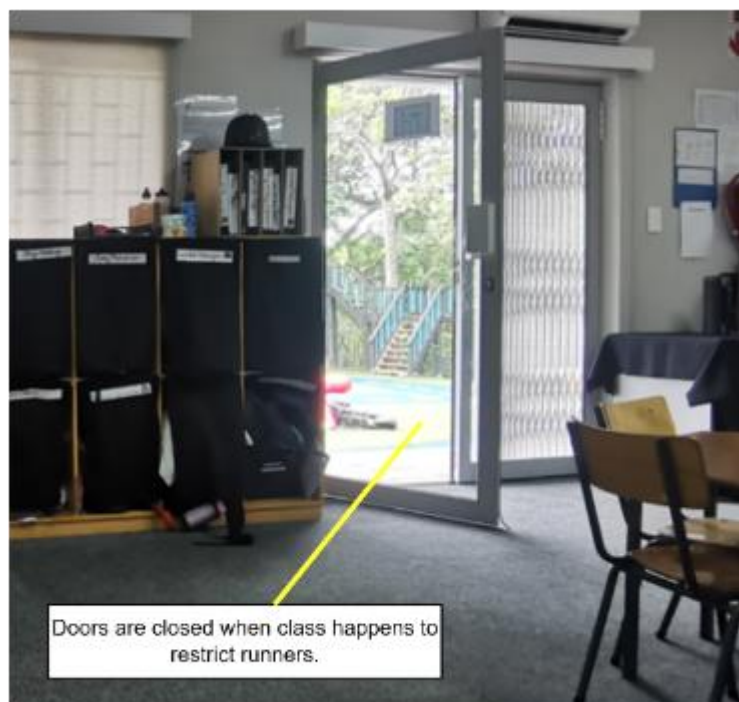


Figure 6-3-5-2-2-4 showing the doors to the classroom open, when class starts, the doors get locked to restrict runners Source: Author [Taken 11/11/2022]

Participants explain that some children are medically high-risk, and that Bloom's procedure and emergency training are important. They also discuss the significance of a simple school layout for evacuating children with special needs (Refer to figure 6-3-5-2-2-5).

*“...we have some kids who are quite high risk, medically, so we’ve invested in an AED, the defibrillator. We have invested in a CPR dummy. So, we do CPR drills as well as fire drills... we train our teachers and then on a random day and time, we evacuate the kids in an orderly fashion so that they start to get used to should this happen, because we are so high risk.” Pg 20 & 21 (Principle)*

*“how do you evacuate a special needs school. There are kids with autism but then you’ve got your very disabled kids who can’t actually move on their own... And how we do it is a lot of severe autism kiddies; they have ropes that they have to hold that actually go around them... The teachers, the moment that that fire drill happens, they pop them into the ropes. We’ve got our clipboards, so we know that every child is accounted for. We meet on the grass at the back there and then we evacuate into Umhlali Prep School. When the actual fire happened in the old village... the Bloom children were so used to knowing what to do... in terms of safety, is a lot of repetition. A lot of*



Figure 6-3-5-2-2-5 showing schools simple layout and emergency evacuation routes Source: Author [Taken 11/11/2022]



*prepping for the chance that stuff... If there's a person left behind, our management needs to check there's no kids hiding... just making sure that it's easy to get, easy access out." Pg 21 & 22 (Principle)*

Participants described the need of certain design considerations to restrooms.

*"You also have to have lots of toilets and a shower because some of the kids are not toilet trained so you still need to bath them... also a shower" Pg 20 & 21 (Teacher 5)*

*"Age-appropriate toilets." Pg 20 (Teacher 2)*

Participants described how elements of the buildings design need to consider the safety of the children (Refer to figure 6-3-5-2-2-6).

*"we've got to be cautious about what's within their reach. Pg 12 (Principle)*

*"built-in shelves higher up. ...in an autistic class they just want to grab everything and throw it on the floor... they can drink glue or anything" Pg 19 (Teacher 3)*

*"be cautious with the kitchen. Kids run into the kitchen and grab things. You have got to have high shelves for dangerous goods etc." Pg 20 (Teacher 4)*



Figure 6-3-5-2-2-6 showing Items in reach of children are safely put away Source: Author [Taken 11/11/2022]

*"if any glass is used here it has to be shatter-*

*proof and that very thick glass that doesn't actually shatter. And not within reach... it must be hard wall up until a certain point and then glass." Pg 17 (Principle)*

*"keep glass away or at a height that isn't going to be endangering themselves... meltdowns can be pretty severe... the bigger the kids get, the stronger they get and the more hectic they are. Pg 28 (Principle)*

*"padding on walls would be amazing. If you know you can allow that child to calm down in a space that they can't harm themselves when they're in that freak out mode, padding on walls would be amazing. Pg 28 (Principle)*

Participants described how children navigate around the school grounds.

*"...The kids get to know the place very quickly..." Pg 8 (Teacher 1)*

*"They know that one block is for therapists, one is academic... they learn quickly where they are in school. The school is small, in a sense that we don't have different levels or all of that." Pg 9 (Teacher 2)*

*...A lot of how they find their way around here is based off of relationship with the teacher and the teacher being a part of their every day, every activity. There's not a lot of time when these children are on their own, independently doing an activity. Pg 24 (Principle)*

*"The younger children, teachers will walk them to a therapist or another class." Pg 8 (Teacher 2)*

*"Around the school, each class has got the name outside of the door." Pg 8 (Teacher 2)*

### 6.3.5.2.3 Sensory environment

Participants describe how children with autism are all different, and how various children require different equipment or settings to regulate (Refer to figure 6-3-5-2-3-1).

*“When looking at autistic kids, they are so different.” Pg 4 (Teacher 5)*

*“We are busy making sensory profiles for individual kids. Some kids might prefer regulating in a dark room whereas for other kids it might be terrifying, you have to take them into another sensory room... Like, just a part of the class, just go there for the swing or maybe some would just prefer to come to the trampoline and jumping because a dark classroom is dysregulating whereas for other kids it's regulating” Pg 5 & 6 (Teacher 3)*



Various sensory equipment for children to regulate in a specific regulation room

Figure 6-3-5-2-3-1 showing equipment used to regulate when needed  
Source: Author [Taken 11/11/2022]

*“Our occupational therapists have a lot of input into the way we structure our classroom and what specific kids are in our class. For instance, my kids don't need as much regulation, so I don't have a space for a hammock etc. I have a smaller classroom because my kids don't need as much regulation and movement as some of the other kids. It's very individual to the specific class and the children we have in that specific class.” Pg 11 & 12 (Teacher 2)*

Participant explains how a child's ability to perceive their surrounds is diminished when over stimulated and this impacts the child's ability to engage with their surrounds.

*“It hinders them from actually enjoying or engaging in the environment... an anxious brain or an anxious spirit does not learn. It can't learn because it's so anxious, it's so dysregulated... if you think about a child who is sensitive... to auditory, to smell, to sight, to touch, how do they engage in an environment that's got all of this going on. ...we might step into that environment and think it's completely peaceful, but actually it's not because they're hearing that vacuum cleaner 10 times louder than you and I. And they're seeing those colours with so much more brightness than you and I. And then you put a task in front of them and you're making a request of them, we end up in meltdown. It's so much to do with the senses and how we set them up well to engage with the environment they're in... We've got to try keep those places as calm and uncluttered as possible.” Pg 26 & 27 (Principle)*

Participants explain the importance of keeping classrooms simple and neutral with décor and posters (Refer to figure 6-3-5-2-3-2).

*“The simpler the better for the kids, otherwise it's too busy and too overwhelming for them and they can't focus on one thing because there's too much. Pg 3 (Teacher 4)*

*“if there's too much stuff on the walls, the kids can get easily distracted. Even if it's to place their art. You want to display their art, but you can't display more than two arts on the wall because it's going to be a distraction for them. You might be needing more regulation every time because your kids will always be dysregulated by a lot of colours, perfumes, whatever they don't use in the classroom. So, the simpler the better. Pg 4 (Teacher 3)*

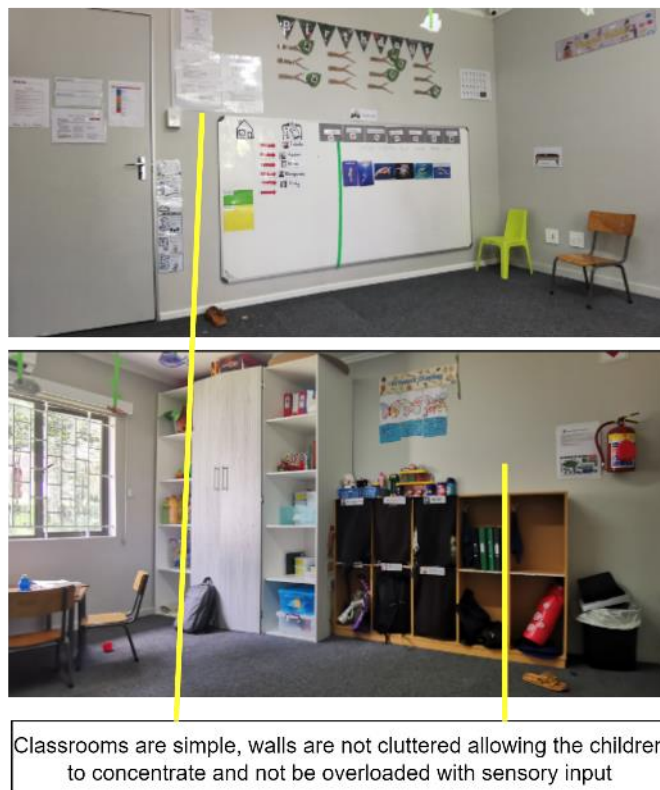


Figure 6-3-5-2-3-2 showing simplistic class posters, walls kept to a minimum Source: Author [Taken 11/11/2022]

Participants explains the importance of certain design elements in relation to the senses.

*“My biggest thing is to be so conscious of the five senses in everything. When choosing lights, materials, colours etc. ...just to constantly be asking, is this stimulating or isn't it? An autistic human is stimulated by so much input. They cannot cope with the amount of input coming at them daily. That is why you'll often see them melting down in shopping centres etc. There's smell, there's taste. And their senses are on overwind. The greatest piece of advice is to keep the senses in mind when building, designing, and thinking through anything.” Pg 26 (Principle)*

*“I think sound is huge, especially with our autism learners... That can be very stimulating in terms of we want the most calming environment.” Pg 7 (Principle)*

*“Lighting. So, these lights are actually horrific for our children... it's just very bright. ...we would love downlighters, just gentle light. Pg 7 (Principle)*

*“You want there to be natural light because it is calming. Pg 26 (Principle)*

*“I think the build just has to keep in mind the sound, even the smell. We burn a lot of essential oils, calming oils, which are known to calm children.” Pg 8 (Principle)*

*“Some ASD students are very sensitive to smell so it is very important to ventilate the classroom as much as possible...” Pg 6 (Teacher 1)*



Participants explained the impact colour and patterns have on autistic children (Refer to figure 6-3-5-2-3-3).

*“just very conscious on neutral warm colours in terms of wall tones, carpet tones, lights... go for your real earthy tones and baby blues and pinks. Those primary big bright colours are very stimulating... And that's why we steer clear of colour as much as possible. Colour and patterns, we want to keep it as neutral, earthy, and natural as possible with them.” Pg 22 & 23 & 24 (Principle)*

*“admin offices are a no-go zone for our children. It's a bright yellow wall. Outside, we wanted to keep it a little more fun because our kids aren't there all the time. Pg 9 (Principle)*

*Staff clothing - “Fridays are days where they can wear whatever they want to, but generally it's black or navy... even a pattern... will set off a child in that classroom.” Pg 8 (Principle)*



Figure 6-3-5-2-3-3 showing outside and inside colours

Source: Author [Taken 11/11/2022]

Participants explained how the therapists explored different food groups in a sensory way to help children try new food groups.

*“we did a feeding group... It was about exploring food before having to eat it. They would group it in the same colour, like get foods in green. Then they would touch it and play with it for a few weeks and then by the end, hopefully, tasting it. That would be exploring because a lot of our kids do not touch a wide range of foods. But yet, they do the craziest things and put the craziest things in their mouths. It makes no sense whatsoever.” Pg 12 (Principle)*

### 6.3.5.3 SOCIAL ENVIRONMENTS

#### 6.3.5.3.1 COMMUNITY

Participants describe how the children are part of a program where they learn skills for later on in life.

*“With some of the older kids we have a vocational skills program... It's normally a group setting where they do beadwork and making objects under the guidance of a staff member. This is just to prepare them for skills later on in life.” Pg 2 (Teacher 2)*

Participants describe how the children need to learn to regulate socially in the class.

*“in the classroom setting is where they have to learn socially and emotionally to regulate and manage themselves, to share, turn-taking, and all of that.” Pg 2 (Principle)*



#### 6.3.5.3.2 OUTDOOR ENVIRONMENTS

Participants describe blooms playground safety mechanisms to restrict children escaping outside of controlled play area/school (Refer to figure 6-3-5-3-2-1).

*We've had to put up all this Clearview... We do have a child that actually scales these fences... we have safety in terms of our guard at the gate... He keeps that gate closed and sits there the whole time. That gate is always manned. If a child does get over this gate and they run down, they can't get onto the road..." Pg 19 & 20 (Principle)*



Figure 6-3-5-3-2-1 showing fence around play area  
Source: Author [Taken 11/11/2022]

Participants described how fixed play areas for different types of play would be beneficial to the children.

*"a lot of the play equipment should be in a fixed position because you don't want to cause obstructions for kids to fall over... a lot of the play equipment we've got now, kids can fall over it, take it away, or break it. It will be nice to have a play area that they can really play in without things going missing or breaking... to have fixed areas, fixed sensory play area... one area for just sensory play and one for fantasy play Pg 18 & 19 (Teacher 1)*

Participants described the importance of outdoor spaces and what must be considered when designing them (Refer to figure 6-3-5-3-2-2).

*"We are often finding it harder to find kids, especially the younger ones... as much as it is nice to have this big open space, it is quite hard to give boundaries. It is outside time, but you need to be in a space where we can see you... it would be nice to have an outdoor space that's designed to allow them to play where teachers can watch them, but still in a contained safe space... as much as it is nice to have the space, there is now the added stress..." Pg 12 & 13 (Teacher 1)*



Figure 6-3-5-3-2-2 showing large open area for children to run and hide Source: Author [Taken 11/11/2022]

*“...having an area under cover some of our kids have seizures and it's often brought on by heat. So, as much as you want them outdoors, especially in summer you have got to be careful of the extreme heat. Pg 12 & 14 (Teacher 2)*

Participants explain how punching bags and trampolines are important to the development of proprioception (Refer to figure 6-3-5-3-2-3).

*“Some kids love movement, so we give a lot of options. Around the school you'll see a big punching bag, a lot of our kids will go and punch that bag when they just need a little proprioception... The trampolines are a must in any special needs school. I don't know how special needs schools do without them... It's your fastest way of proprioception. Pg 13 & Pg 14 (Principle)*



Figure 6-3-5-3-2-3 showing trampoline for children to jump on  
Source: Author [Taken 11/11/2022]

Participants explain how the outdoors will become part of their education program.

*“That's where even our interest-based learning is going to happen, in the gardens here. We are privileged on this property to be able to have that all out our exposure. Pg 25 (Principle)*

Participants described how the outdoors helps children regulate.

*“A lot of our kids find the outdoors, that's where they go regulate. Pg 25 (Principle)*

### 6.3.5.3.3 COMMUNICATION

Participants explained how signage could benefit the children although they are mostly accompanied by their teachers to the various zones of the school (Refer to figure 6-3-5-3-3-1).

*"I think it would be beneficial to probably have more signage up around the school... it might be more helpful, especially if you're trying to teach them the concept of PDD. We do have big communication boards outside on the playgrounds. The kid is supposed to be carrying his or her PDD book around... it is quite a nice alternative if it is not there..." Pg 8 (Teacher 1)*

*"it is important to have the photo along with the word because it teaches emergent reading... kids will then naturally start to read or at least recognise. In special needs, they do not necessarily get to the place where they are decoding every word that they see. So, it is quite helpful for them to start recognising sub words, so it helps to have words down for them to start knowing what they're doing. Pg 10 & 11 (Teacher 1)*



Figure 6-3-5-3-3-1 showing PODD signage around the school grounds Source: Author [Taken 11/11/2022]

Participants described how many of the children at Bloom are non-verbal and rely on a communication device.

*“Within speech therapy, it is specific to each child’s needs. Many of the children at Bloom are not verbal, so we use a communication device to communicate.” Pg 3 (Teacher 6)*

### 6.3.6 Conclusion

Bloom Centre's strategy to provide a "place" where children feel loved, safe, and accepted for who they have been successful, as evidenced by the children's positive attitudes and active participation in the facility's typical development and special needs classrooms. Bloom's concept of creating an environment in which children are accepted for who they are is evident during free play, when typically developing children and children with special needs interact without prejudice in the Kingdom Kids classroom. The semi-structured interviews provided a deeper understanding of the sensory differences of children with autism and how these differences may affect the child's ability to self-regulate. In the regulation rooms, Bloom provides a variety of equipment that corresponds to the sensory profile of each child, making the child's transition back into their environment easier. In addition, the use of schedules helped the children transition from one activity to the next, thereby reducing meltdowns. The new school grounds, which are larger than the old ones, provide a variety

of playtime equipment and a larger area for children to engage in unstructured play. In addition, the larger site with the dense tree line provides children with opportunities to interact with nature and develop their biophilia. The school is in the fortunate position of having a larger budget to provide the essentials for children with autism, including additional support staff and equipment to assist with the child's development and daily needs.





Figure 7-1 Figure showing chapter 7-word cloud (Author)

## 7.1 INTRODUCTION

This chapter reviews and summarise the theoretical and conceptual discussions from earlier chapters as well as the empirical information gathered using primary data collection techniques like interviews and local case studies. The case studies included interviews with principals and teachers from both schools who have experience teaching young children. Thanda, a community-based facility geared toward neurotypical children's early childhood development, provided knowledge of an early childhood development centre in rural Kwazulu-Natal, whereas Bloom Centre provided knowledge of early childhood development with children diagnosed with autism. Due to the nature of the various types of children, it was expected that the observations from the primary data collection would produce similar responses in some areas and very different responses in other areas. Thematic data analysis was used to categorise the responses of the participants into two main themes. In the context of the underlying phenomenological theory, this chapter will discuss and analyse the two main themes.

## 7.2 DEVELOPMENTAL ENVIRONMENT – THEME 1

### 7.2.1 Learning needs of neuro-typical and autistic children

It was emphasised in the interviews by the various participants that both neuro-typical and autistic children's learning needs are crucial components to their early childhood development. Representatives from both facilities who participated in the interviews emphasised the importance of allowing children to explore their surroundings in order to learn about the world around them. Day *et al.* (2007) identified that children learn through lived experiences in which they engage in activities rather than by following directives. The participants at Thanda mentioned that the children would occasionally see different activities taking place across the valley through the large glass openings. Although it is a distraction, the participants mentioned that the children would need the time to explore their interest but would turn the distraction into an educational activity. At both facilities, the need for breakaway areas was brought up. Tola *et al.* (2021), argues that classroom layouts should allow for a child to escape a certain activity when required and be able to join when feeling ready to do so. These spaces are utilised when children are overwhelmed by sensory input or other emotions. In order to assist the children in overcoming these emotions, the spaces in the two facilities are vastly dissimilar. At Thanda, the space is merely a corner of the classroom with pillows and teddy bears, whereas at Bloom, the space is more conducive to the sensory profile of the child's need for regulation. In Bloom's classrooms, there are items such as hammocks, mattresses, and additional sensory items located in the cupboards to help children self-regulate. Mostafa (2021), Day *et al.* (2007) argue that the choice of materials and equipment are imperative to ensure a safe environment for children to regulate, this is due to melt downs where children may act out (Paron-

Wildes, 2013). If the regulation space in the classroom is insufficient, the child is taken to a separate room where they can self-regulate in a quieter environment before returning to the classroom to continue the activity. Edelson (2016), argues that it is important to identify the correct teaching method for each child and apply it to ensure more significant outcomes, this is in line with the TEACCH method developed by Eric Schopler, where each autistic child's sensory and psychological differences are considered (Mesibov *et al.*, 2005). Participants response at Bloom too emphasised the importance of separating children in their classes based on their functional levels; this aids teachers in terms of academic requirements and project-based work, thereby facilitating the children's development. At Thanda, there was no separation of classes, as there was an autistic child in one class who was assigned an inclusion assistant. It was mentioned that the child occasionally plays with Legos and throws them during meltdowns. As he tends to wander out of the classroom when he loses interest in an activity, it was mentioned that this negatively affects the other children's ability to concentrate, as one participant stated that when the autistic child has a meltdown, the other children become distracted and begin to either imitate him, develop a sense of anger, or act out his behaviour.

#### 7.2.2 Classroom layout and design

Both Neurotypical and Autistic children require structured well organised spaces, however Autistic children benefit greatly from an organised environment as they organise their environment by sensations rather than functions (Mostafa, 2008). The classroom at Thanda is divided into four distinct zones: fantasy, constructive, cognitive, and quiet/reading area. According to the participants, the classroom layout facilitates day-to-day activities. By dividing the class into these zones, teachers can provide each student with the necessary attention for the day. Participants at Bloom described the structured classroom as having a place to self-regulate and a place to participate in the activities. The children at Bloom attend various therapy sessions which are separate from the class in a separate building, however the researcher observed there was separate areas for certain activities. In the Bloom classrooms, there is a space for floor time with a whiteboard on the wall and some cushions on the floor, as well as a space with tables and chairs for group activities. As children are sensitive to glare and distractions (Paron-Wildes, 2013), participants at Bloom noted that it is essential to position the teacher's desk away from windows. As mentioned before in chapter 7.2.1, regulation is an important activity for children with autism, the participants at Bloom emphasised the need to understand the children's various sensory profiles for regulation, the participants at Bloom mentioned that in the various classes, the most common way to regulate the children after outside free play was to turn off the lights and play clamming music. During regulation time, teachers utilised portable Bluetooth speakers to play music for the children to calm down prior to transitioning to the day's first activity. At Thanda, the researcher observed that after free play, the children participate in a morning song and dance in the classroom; this is Thanda's method for transitioning from

outside free play to classroom activities. The participants at Bloom recommended various factors to consider when designing spaces for children to self-regulate, such as the space must be suitable for the child to obtain a great deal of proprioception, such as by using a punching bag, and the area must be safe so that children can move around without hitting other children. Neurotypical children may not mind others in their personal space, but many autistic children find it very difficult to have other in their person space (Humphreys, 2005). One participant suggested padded walls, which would allow children to run into the walls without injuring themselves. It is essential to ensure the safety of young children, as they are natural explorers who must interact with their surroundings in order to comprehend the world they inhabit. At Thanda, the participants mentioned that the open low shelving is suitable for the children because it allows them access to the items they want to grab and use, whereas at Bloom, the participants emphasised the importance of higher shelving because the autistic children in the classrooms want to grab everything and throw it on the floor. They also mentioned the importance of locking away items for the safety of the children and ensuring that these areas are out of reach of the children. This was a common practise at both facilities, as Thanda had a separate storeroom from the classroom where additional items were stored out of reach of the children. Large openings in Thanda allow for natural cooling and lighting; however, the doors are left unlocked, allowing children unrestricted access to the outdoors. Participants mentioned how the autistic child wanders out of the classroom when he loses interest in the activities; this adds stress to the teacher's day as they must constantly check that their schoolchildren are still present. At Bloom, it was mentioned that participants need access control instead of keys to the classrooms and gates, as children will leave the classroom in the middle of an activity if they gain access to the keys, believing it to be a game. Participants at Bloom mentioned the importance of restrooms and the fact that many of the children are not toilet trained. They also mentioned that it would be beneficial to have a large number of toilets to assist with toilet training and showers for washing the children if necessary. Participants at Bloom emphasised the need for a special needs school's layout to be simple and clear; this is beneficial in the event of an emergency evacuation. They mentioned the difficulties that arise when the staff must account for autistic and disabled children who cannot move independently. The teacher's guide the severely autistic children to grassy areas away from danger using ropes that are tied around their waists and held by the children. The absence of signage was observed at both facilities, and when asked in the interviews, participants from both facilities explained that the children are familiar with their surroundings because they are shown around during their first week at school. When analysing the layouts of the schools, both facilities have very simple layouts. Bloom did mention that having more signage for children would be beneficial to their language development; by having an image and the word below it, the children can learn, similar to the Podd system. This is in line with Bogdashina (2016) findings where autistic children have associative memory.



### 7.2.3 Sensory environment

The sensory environment is crucial for all of us, but particularly for young children. At Thanda, bright colours were used in all aspects of the school's design, and the participants reported that the young children enjoy the vibrant colours and patterns on the school's buildings. However, at Bloom it was very different. The participants described how important it is to have environments that are subdued with no patterns or bright colours, as these may trigger meltdowns in the children. In fact, staff members are not permitted to wear brightly coloured or patterned clothing unless it is Friday, which is casual day. Research by Paron-Wildes (2013), identified that autistic children are more sensitive to bright colours, Sinha (2019), found that 85% of autistic children experience colours more strongly than neurotypical children. They also mentioned that special consideration should be given to the use of neutral and earthy tones, as this would reduce meltdowns in children with autism. Children with autism are negatively impacted by noise levels, and echo, reducing their ability to concentrate, response time and behaviour (Mostafa, 2008). Reducing sound transmission between rooms contributes to the creation of calming environments for children with autism. In addition, participants at Bloom noted that by burning essential oils, they contribute to the creation of calming environments for the children, thereby reducing meltdowns. One participant commented negatively on Bloom's use of fluorescent lighting, stating that it was too bright for the children and that they would like to replace them with down lighters with softer lux levels to reduce the sensory stimulation of artificial lighting. Research shows that by utilizing natural lighting the need for artificial lighting is reduced (Henry, 2011), additionally the use of florescent lighting can cause repetitive behaviours and give of flickers and humming sounds which autistic children find highly unpleasant resulting in behavioural issues, headaches, eye strain and poor performance (Winterbottom *et al.*, 2009), (Boyce, 2010). At Thanda and Bloom, the number of items stuck onto the walls was kept to a minimum. However, at Thanda, the walls of the classrooms were painted with themes such as birds, fish, and trees in bright colours, whereas at Bloom, the classrooms were kept neutral with no patterns on the walls, and only a few items stuck onto the walls. Autism affects everybody differently, and no two people are the same Flannery *et al.* (2020) argues *"If you've met one person with autism, you've met one person with autism"*. As each child's sensory profile is unique, the participants at Bloom emphasised the importance of creating neutral environments that do not dysregulate the children, and rather introducing additional stimulation only when the child requires it. When it comes to regulating children after a meltdown, the participants mentioned that some children require different environments, such as a dark room or a well-lit room. Furthermore, the equipment used may vary, as some children may want to lay down or be active, such as jumping on a trampoline or swinging in a hammock. Finally, they stressed the importance of understanding the sensory profiles of each child in order to provide the sensory release. The use of different materials can have either a positive or negative effect on children. The participants at Bloom advised that when selecting materials, one must constantly ask whether they are stimulating or not, because an autistic individual is stimulated

by so much environmental input. Tola et al. (2021), argues that selecting a limited number of materials aids individuals who are hypersensitive who may be highly sensitive to stimuli received from various materials. The participants at Bloom emphasised how the child's environment can have a significant impact on the child's ability to comprehend and complete a task. Relph (1985) argues that a place is a construct of our memories and emotions made up of connected experiences and intricate associations, if the environment is unpleasant to a child due to stimuli received then the child experiences the place negatively diminishing their ability to identify and bond with their environment. It is important for children to feel a sense of dwelling, a child cannot achieve this when they become disorientation or lost within their environment (Norberg-Schulz, 1980). When an autistic child is exposed to multiple sensory stimuli such as sight, sound, touch, and smell, he or she will be unable to participate in activities, resulting in a meltdown.

## 7.3 SOCIAL ENVIRONMENT THEME 2

### 7.3.1 Community

Being a part of the community is essential for children, as a sense of belonging can have a profound effect on the development of children in their early years, thereby fostering a lifelong connection to the community. Mostafa (2008), argues that the built environment can have a far more significant impact in creating conducive environment which are more suitable for children with autism, this in turn will help with their development and social ties to the community providing children with a sense of belonging within their community groups. At Thanda the facilities involvement and established connection with the local community is evident from the participants input from the interviews. The participants noted that Thanda is a safe place for both the younger and older children in the surrounding community who attend the early childhood development programme. The facility is open to the public on the weekends, allowing children and community members to utilise the skatepark or library. Children are also fed when they visit Thanda on the weekends, ensuring they stay out of trouble by reducing their exposure to bad habits such as smoking and drug use. At Thanda, it was mentioned that they have limited budgets for toys. As a result, the guardians of the children are asked to recycle materials, which are then transformed into toys for the children to play with. When Covid 19 entered South Africa, households, schools, and businesses had to adapt to a new way of life. Covid 19 had a negative impact on the entire world. Therefore, Thanda adopted a new way of life by adapting their programmes by moving the classrooms to the local communities, allowing residents to rent out rondawels so that local kids could attend school close to where they lived. The participants noted that yes, covid was bad, but it brought about some positives as Thanda still uses these rondawels for after school activities for the children, the children are now able to leave Thanda earlier in the day to attend after school classes in the villages, reducing the need to travel in the late afternoons and in winter in the dark, this helps with safety as many of the children either walk to Thanda, or get dropped off at points to then walk back home. Participants at Thanda

were asked how the neuro-typical children in the classroom react to having an autistic child in the classroom. The responses were both positive and negative, where the children are exposed to a child with a disability, bringing awareness to the other children, but because the children are so young, they do not understand why the autistic child behaves in a certain way. The participants described how the other children in the class are sometimes angered by the child's behaviour, or sometimes imitate the autistic child thinking it is a game. There was no mention of community involvement at Bloom but viewing their social media pages and website reveals that they are involved in the community by promoting awareness at events like Golf Days and Mid-Mar-Miles. Participants at Bloom described how children participate in a programme that teaches them beadwork and handicrafts in order to prepare them for lifelong skills. The children at Bloom attend individual sessions with additional staff support, but it is in the classrooms where they learn to regulate and manage themselves, as well as how to share and take turns with items in their environment socially and emotionally.

### 7.3.2 Outdoor environment

Exposure to the outdoors is essential for a child's development and the development of biophilia (Li *et al.*, 2019). Sugar (2021) identifies various benefits to direct exposure to nature, such as improved health, improved balance and motor coordination and increased physical activity. At Thanda, the participants described how nature is incorporated into the children's developmental programme through participation in discovery walks; these walks are connected to the theme that is being taught in class in order to reinforce what the children are learning. The participants at Bloom stated that the outdoor environment will soon be incorporated into their curriculum, as the gardens provide children with extensive exposure to the outdoors. At Thanda, the participants spoke of the children's vegetable gardens, which they water on Monday mornings and afternoons, giving them a direct connection with nature and a sense of ownership and responsibility. Children are naturally inquisitive, and enjoy exploring their environment (Day *et al.*, 2007), however Mostafa (2021) argues that when designing environments for children safety must always be an important aspect of the design. Observation through good lines help ensure children are always monitored (Scott, 2009). Mostafa (2021) argues how children's safety can be enhanced by controlling their movement between various zones, one way to achieve this is by the placement of buildings in a courtyard fashion. The participants at Bloom described the importance of safety in the playground and how the fence prevents children from entering unsafe areas. They also mentioned that the outdoor environment is good for the children, but very large; it would be advantageous to have smaller areas for children to play outside, as children sometimes wander to areas of the garden where teachers cannot see them, which adds stress to their day. Participants also mentioned that they would like to see more fixed equipment in the play areas, as many of the toys cause children to trip, take them to other areas, or damage them. They also mentioned that fixed areas for various types of play, such

as imaginative play and sensory play, would be advantageous. Fjørtoft (2001), argues that a more natural play area with varying landscapes and greenery such as trees and streams impact the child in a positive way where they performed significantly better on the balance and motor coordination assessments. This is also in line with Kellert *et al.* (2011) argument where outdoor natural play areas can positively impact a child's development through engagement.

### 7.3.3 Communication

Autistic children battle with impaired communication which is an essential part of a child's ability to interact with others (Faras *et al.*, 2010). The participants at Thanda described how they were given materials such as charts and mouth exercises to encourage the autistic child's pronunciation of words. The participants at Bloom suggested that additional signage would be beneficial for teaching the concept of PODD to children. They mentioned that having PODD-related signage throughout the school would be very beneficial and aid teachers when children are not carrying their books. They emphasised the importance of the image accompanying the word because it teaches children emergent reading, allowing them to begin reading and recognising words naturally. As previously mentioned this is in line with Bogdashina (2016) findings where autistic children have associative memory.

## 7.4 CONCLUSION

Early childhood education is a critical component of a child's learning and growth, both for neurotypical and autistic children. This chapter focused on two facilities in KwaZulu Natal involved in the development of both neurotypical as well as autistic children. From the analysis two themes were identified: Developmental environment and Social environment.

The first theme highlighted the importance of allowing children to explore their surroundings and interests. Both facilities emphasized the need for breakaway areas, although their approaches to these spaces differed significantly. Thanda's breakaway area was a corner of the classroom with pillows and teddy bears, while Bloom's was more conducive to the sensory profile of the child's need for regulation. This emphasizes the different requirements for both autistic and neurotypical children. Additionally, Bloom emphasized the importance of separating children in their classes based on their functional levels, which would require an understanding of each child's profile. Both facilities had structured classrooms that divided the space into specific zones. However only Bloom had a space for therapy which is crucial to aiding in the development of children who need additional support. Safety is critical in any learning environment, especially in early childhood education, where children are naturally curious and need to interact with their surroundings.

Adapting the learning environment to meet the child's unique needs in early childhood education is important. It is essential to consider the learning needs of both neuro-typical and autistic children, as well as the classroom layout and design and safety. By doing so, early childhood education can provide a nurturing and stimulating environment that promotes growth and development in all children.



## CHAPTER 8 CONCLUSION - REFLECTIONS, SUMMARY, LIMITATIONS AND RECOMMENDATIONS



Figure 8-1 Figure showing chapter 8-word cloud (Author)

## 8.1 INTRODUCTION

This study explored how architecture can create environments that support the wholistic developmental needs of children diagnosed with autism aged 2 to 7 years. This chapter contains the researcher's reflections, as well as a summary of the study and its limitations. Consideration is given to the study's findings, and recommendations are made for future research.

## 8.2 RESEARCHERS REFLECTIONS

As I embarked on my investigation into the impact of autism on the built form, I carried with me my preconceived notions of what I believed would be beneficial for individuals on the autism spectrum. I was under the impression that all autistic individuals were alike. However, as I delved deeper into the research, I began to realize the misconception of my assumptions. In fact, everything I thought I knew was completely incorrect. I discovered that each person diagnosed with autism has unique traits, making each child unique. This realization opened my eyes to the complexities of understanding autism and reinforced the importance of conducting thorough research before designing spaces for individuals on the spectrum.

The journey has been challenging, particularly while juggling a full-time job and part-time studies. However, the experience has taught me valuable lessons in effective time management and the power of hard work. I have come to appreciate that anything is possible if one is determined to achieve it.

## 8.3 SUMMARY OF STUDY

### 8.3.1 Rational

Government ECD centres in eThekweni provide environments that are not suitable for the developmental needs of children diagnosed with autism who are between the ages of 2 and 7 years old. The objective of this study was to investigate and understand the developmental stages of young children diagnosed with autism, ranging from 2 to 7 years of age, and its influence on the built form. Furthermore, the study aimed at identifying areas where the built environment can effectively improve the developmental outcomes of children diagnosed with autism in order to promote their overall well-being. Therefore, the study sought to identify and establish specific architectural design principles that can be used to direct the architectural designs of specialised ECD facilities intended for autistic children located in eThekweni, KwaZulu-Natal, South Africa.

### 8.3.2 Literature review

The literature review highlighted that it is fundamentally important that when designing for children with autism one needs an in depth understanding of the impact autism has on a child. Furthermore, one needs to develop a clear understanding of the developmental needs and learning styles of autistic children, as well as how this may impact the built environment, in order to provide spaces

that promote their overall well-being. The research has highlighted the importance of providing learning environments both indoors and outdoors which are well-balanced in order to make children feel more at ease as this benefits them significantly in developing their social, emotional, and cognitive skills.

Furthermore, the literature identifies the sensory sensitivities autistic children experience compared to neurotypical children, it is therefore crucial that one understands how children diagnosed with autism are impacted by stimuli in their environment to create conducive learning spaces for children with autism to develop wholistically.

### 8.3.3 Methodology

The objective of this study is to explore autistic children's early childhood development and their impact on architectural design. The study involved the participation of two facilities catering to young children, namely Thanda Early Childhood Development Centre and Bloom Centre. While Thanda is situated in a rural environment and primarily focuses on the development of neurotypical children, Bloom Centre is located in a well-developed area and is specialized in catering to autistic children. These precedent studies informed the research by providing an interpretivist approach to the different socio-economic situations in providing facilities for early childhood development. The study involved observing the children in their day-to-day activities, interviewing principals, teachers, and teaching assistants from both facilities using a qualitative methodology. Semi-structured interviews were used to ensure the flexibility of the interview process, and specific questions were asked to guide the discussion. Data was collected in November 2022, and interviews were conducted over a two-week period. A total of four participants from Thanda and seven from Bloom Centre were involved in the study, with interview durations ranging from 10 to 60 minutes. Thematic Analysis of the transcribed participant audio-recorded interviews were coded to identify research related themes and patterns. Table below shows the Sub-Themes and themes from the data.

|   |   |                             |                     |                    |                     |               |
|---|---|-----------------------------|---------------------|--------------------|---------------------|---------------|
| Thanda early childhood development centre | X   | X                           | X                   | X                  | X                   |               |
| Bloom Centre                              | X   | X                           | X                   | X                  | X                   | X             |
| Sub-Theme                                 | Learning needs of Neuro-typical and Autistic children | Classroom layout and design | Sensory Environment | Community          | Outdoor environment | Communication |
| Theme                                     | Developmental Environment                             |                             |                     | Social Environment |                     |               |

Table 8-3-3-1 showing Sub-Themes and Themes from interview transcripts. Source: Author

### 8.3.4 Overview of Findings

The problem, aim and objectives outlined in chapter one has been achieved by answering the research questions (see [1.2 Definitions of the problem, aims and objections](#))

- [Research Problem Revisited:](#)

In South Africa, the impact of the built environments on childhood development is seldomly considered. Architecture is responsible for creating environments that address not only society's general needs but also individuals' needs (Mostafa, 2008). From inducing safety, defining well-being, or creating a positive and efficient environment, space can impact how we act or feel; therefore, design and creative measures should be considered according to the occupants' (Harrouk, 2020).

The number of public schools in South Africa dedicated to autistic children varies by province. Some provinces only provide special needs schools where autistic children may be admitted, leaving the staff unprepared to handle the children's needs (Naidoo, 2021).

Early childhood development centres that support children with ASD require different environmental design strategies to aid their development and integration into mainstream society. There is a growing consensus that an appropriate classroom environment will aid in the children's performance with ASD (Keith Mcallister, 2012).

- Research Problem Response:

The literature review, case studies and participants responses confirm that environments that support the development and integration of children with autism in their early years is crucial. The respondent's identified key issues relating to design which both positively and negatively impact the wellbeing of children with autism. The two vastly different case studies, Thanda being geared towards neuro-typical children and Bloom for autistic children showed significant differences in design strategies as identified in [Chapter 6](#). Therefore, the importance of designing spaces that support the development and are considerate to the sensitivities of autistic children is crucial, this will ensure optimal development and social integration into mainstream society.

- [Aim of this study Revisited:](#)

The aim of the study is to explore and understand early childhood development in children diagnosed with ASD aged 2 to 7 years and how they are impacted by built form. This exploration will focus on spaces for positive development, learning styles, human sensory receptors & the use of nature through architecture that generates an environment suited to the needs of children diagnosed with ASD.

- Aim of the Study Response:

Literature and interpreted semi-structured interviews were used to develop an understanding of the impact of children with autism on the built environment. The study emphasized the significance of creating spaces that support the overall growth and development of young children diagnosed with autism, by taking into account various design strategies. The concerns related to the built environment mainly involved the physical aspects of the space where the child is present.

- [Research objectives](#) revisited and the responses:

Objective 1: Explore and analyse the developmental needs and learning styles of children diagnosed with ASD compared to children without ASD and how they are impacted by built form.

Response to Objective 1: Chapter [2](#), [6](#) & [7](#) explores the developmental needs and learning styles of children diagnosed with ASD compared to children without ASD and how they are impacted by built form are explored in.

Objective 2: Develop an understanding of children diagnosed with ASD and their human sensory receptors and how they are impacted by built form.

Response to Objective 2: Chapter [2.5](#), [3](#), [6](#) & [7](#) explores children diagnosed with ASD and their human sensory receptors and how they are impacted by built form.

Objective 3: Explore the impact nature has on children diagnosed with ASD in their early development stages and how they are impacted by built form.

Response to Objective 3: Chapter [2](#), [3](#), [6](#) & [7](#) explore the impact nature has on children diagnosed with ASD in their early development stages and how they are impacted by built form.

Objective 4: Assimilate how early development of children diagnosed with ASD is impacted by built form through a proposed centre for children with an autism spectrum disorder in eThekweni, South Africa.

Response to Objective 4: This objective is responded to in Stage Two of the document, based on a synthesis of research towards designing a hypothetical centre for children with an autism spectrum disorder.



- Research Question:

How can architecture contribute toward creating positive spaces for the early development of children diagnosed with ASD?

- Conclusion:

Architecture plays a vital role in creating positive spaces for children diagnosed with autism by incorporating features that promote sensory regulation, social interaction, and safety. Design elements such as natural lighting, neutral colours, and acoustical treatments can enhance children's sensory experiences. Providing designated spaces for sensory regulation or escape, as well as areas for group activities, can encourage social interaction. Moreover, outdoor play areas are essential for a child's development, as exposure to nature can improve behaviour management, learning, and the overall well-being of autistic children. Lastly, implementing safety features such as secured entrances and visible exits reduces children's anxiety and enhances their overall experience.

#### 8.4 LIMITATIONS OF THE STUDY

While the research provides valuable insights into the early childhood development of children with autism and their impact on the built form, its limitations must be acknowledged in order to contextualise the findings.

First, it should be noted that the case study interviews were conducted with a small sample size and that the experiences, backgrounds, and understandings of participants may vary across facilities. Even though the study included two facilities, one for neurotypical children and the other for autistic children, a larger sample size would have allowed the researcher to collect more data and provide more concise results. In addition, it should be noted that time constraints on both the researcher and the participants resulted in a single visit to the facilities for data collection and analysis. This may have limited the amount of data collected and analysed, which may have affected the interpretation of the results.

Lastly, it is important to consider the limitations of using CDC statistics to reference the number of people diagnosed with autism, as there are no statistics on the number of autistic children enrolled in early childhood development programmes in South Africa. Although a census study of ECD facilities in the country has been conducted, the number of autistic children enrolled in these

programmes is not included. Future research should therefore aim to determine the number of autistic children who attend specialised ECD facilities and mainstream facilities in South Africa.

In conclusion, despite the fact that this study provides valuable insights into the early childhood development of children with autism and their impact on the built form, it is crucial to recognise and account for these limitations when interpreting the results.

## 8.5 RECOMMENDATIONS

Autistic children have a strong aversion to change and require structure and routine in their lives and must be able to pre-empt what is coming next. In order to address these sensitivities, one needs to take into account the spatial sequencing of the facility addressing items such as typical scheduled uses of spaces as well as the sensory flow.

The recommendations towards designing a specialized ECD centre for Autistic children are based on design considerations which support the development of young children aged 2 to 7 years diagnosed with autism and are considerate to their unique sensitivities and needs. To accomplish this, an inclusive approach involving therapists, educators, and other relevant professionals is required. A collaborative approach ensures that the design of ECD centres meets the specific needs of autistic children, fosters their overall development, and provides a safe and comfortable environment in which they can learn and grow.

Research shows that in order for an early childhood development centre to be effective, it is essential that it provides a safe and nurturing environment for children to explore and learn. Ideally, such a space should feel like home, where children can feel secure. However, given the significant socio-economic disparities that exist in South Africa, what constitutes a "home" can vary widely depending on the local context. For this reason, architects tasked with designing these centres must take into account the specific context of the site and consider the unique characteristics of the surrounding area. This approach is known as "genius loci" and is critical to creating spaces that feel homely and welcoming to children. By incorporating these considerations into the design process, architects can create early childhood development centre's that provide a sense of safety and security to children, regardless of their background or circumstances.

Children with autism require daily structure and routine; by implementing spatial sequencing and compartmentalization in their environments, the spaces around them can foster empowerment and independence. Spatial sequencing is the arrangement of spaces in the logical order of the child's planned uses of these spaces as well as the sensory flow (refer to figure 8-5-1). Compartmentalization of spaces and structuring one's environment helps reduce the amount of sensory stimuli received for each activity, this helps the child to achieve greater on task behaviour

and higher academic achievement (refer to figure 8-5-2). To maintain daily routines, individuals on the autism spectrum benefit from compartmentalising environments for specific tasks.

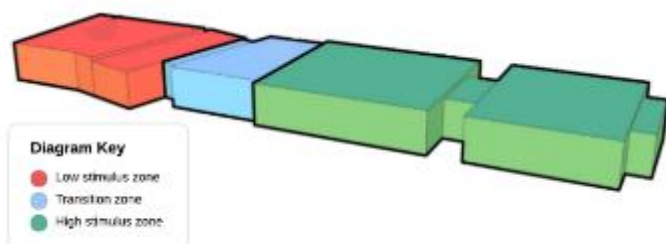


Figure 8-5-1 shows a how different zones are separated to their sensory requirement, this could be a hall separated from the classroom where different activities take place (DeLine, 2017).



Figure 8-5-2 shows spatial sequencing within a classroom environment, Source: Author

Many individuals with autism struggle with transition and change either when changing activities or moving from one location to another. Transitional zones in conjunction with spatial sequencing and sensory zoning aid autistic individuals in recalibrating their senses as they transition from one stimulus to the next (refer to figure 8-5-3). When transitioning from one area to another it should be smooth with minimal stimulus and sensory disruption. Transparent walls and doors aid in a smooth adjustment where situations may be unfamiliar allowing the child to look beyond their immediate surrounding.

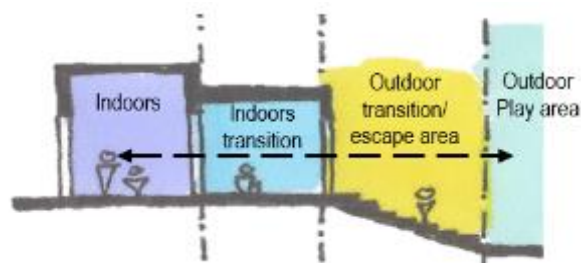
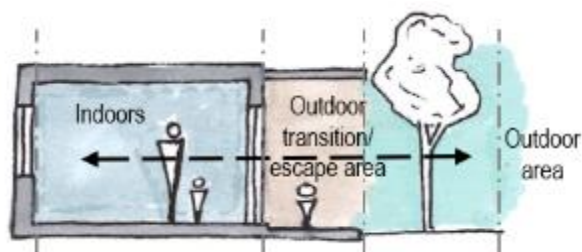


Figure 8-5-3 shows transition spaces both indoors and outdoors between various zones, Source: Author

When combined with sensory zoning and spatial sequencing, conducive wayfinding and a simplistic layout considerably assists individuals with autism easily navigating their surroundings. Various mobility difficulties may be experienced with autistic children, as well as ability in understanding a situation. As identified in the participants responses during the interviews, a simplistic layout is paramount in the event of an emergency where children do not get lost in the event of evacuating (refer to figure 8-5-4).

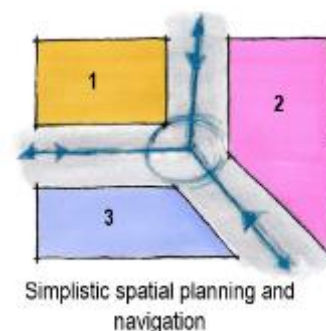
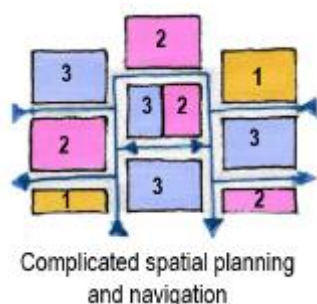


Figure 8-5-4 shows a complicated school layout with multiple routes vs a simplistic layout where spatial sequencing aids in simplistic navigation, Source: Author

When designing environments for children, safety should never be neglected; this is especially true for autistic children who may have an altered sense of their surroundings. The selection of materials, observable areas, and hierarchy of controlled zones requires careful consideration. When selecting materials, it is important to consider the effects of them on children with autism, colours (refer to figure 8-5-5), textures (refer to figure 8-5-6) and toxins play a vital role in creating safe environments where children may explore.



Figure 8-5-5 Although colour preferences are individual, with some colours triggering certain responses in some but not others, a neutral, natural tone, minimal contrast palette is suggested for autism-friendly spaces.(Mostafa, 2021) [Accessed 2022/11/20]

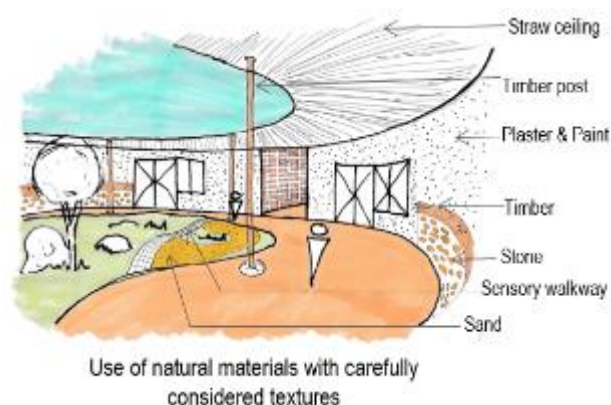
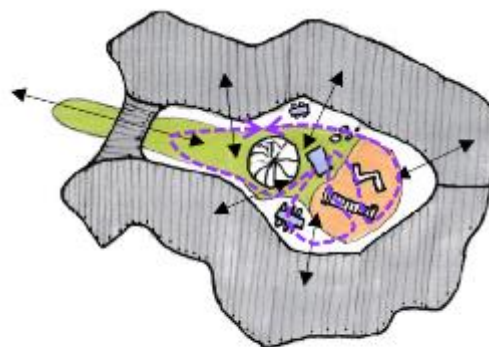


Figure 8-5-6 shows a variety of textures and materials which should be carefully considered when used in a child's environment, considering the stimuli these may give off to the child, Source: Author

Accessibility and observation are paramount to creating safe spaces for children to be free and explore their environment, outdoor courtyard spaces allow for children to participate in free play, while exploring their environment and easily observed by staff members (refer to figure 8-5-7).



Enclosed outdoor spaces allow for constant supervision

Figure 8-5-7 enclosed space with surrounding structure creating a safe space for children to play and be observed with clear lines of sight. Source: Author

Autistic children have distinct sensory sensitivities from neurotypical children; therefore, it is paramount to consider the effects of various stimuli being introduced to the environment in which autistic children find themselves. Furthermore, a child may be hyper or hypo sensitive stimuli, it is therefore recommended to create sensory neutral spaces as it is easier to add stimuli than it is to remove built in stimuli (refer to figures 8-5-8 & 8-5-9).



Figure 8-5-8 Neutral tones in classroom provide a neutral environment for autistic individuals (Furnas, 2022) [Accessed 2022/11/20]



Figure 8-5-9 Sensory room provides colourful tones and equipment provide a sensory rich environment for the autistic child who is seeking additional sensory stimuli (Fun & Function, n.d) [Accessed 2022/11/20]

The difficulty autistic children have interacting socially with others hinders their development and social interaction, both of which allow a child to develop confidence through interaction with others. Neurotypical children may feel at ease in close proximity to others, whereas autistic children may find it challenging to have someone in their personal space. Therefore, it is beneficial to have environments with sufficient space for children to move about without feeling threatened by other individuals. Additionally, withdraw spaces where individuals can retreat when feeling overwhelmed by sensory stimuli should be provided. In order for a good withdraw space to feel distinct from its



surroundings, it must be a place where a child can still engage visually and assess their surroundings prior to engaging in them (refer to figure 8-5-10 & 8-5-11).



Figure 8-5-10 Withdraw space within separated yet clear sight lines to the current activity allows an individual to assess the environment before reengaging it. Source: Author

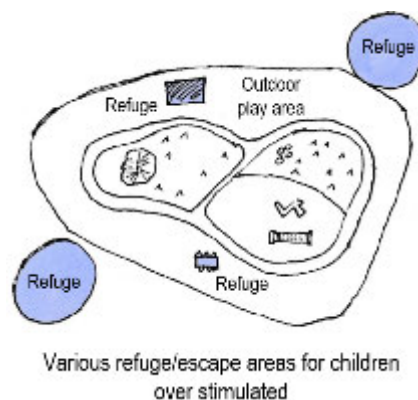


Figure 8-5-11 Withdraw/refuge space in outdoor settings allow children to assess the environment before engaging it or to withdraw when overwhelmed. Source: Author

Acoustics are an essential component of any educational facility, as they can be a source of distraction for children attempting to concentrate; children with autism have a much more difficult time filtering out background noise than neurotypical children. Reducing noise and echo in educational environments for autistic children increases their attention span, reaction time, and behavioural disposition. Noise pollution must be examined in both a macro and micro context. Vegetative screens may be implemented to reduce external noise pollution (refer to figure 8-5-12). Internally, one must consider noise, echo, and reverberation. By selecting acoustic ceilings, soft flooring (refer to figure 8-5-13), various types of furniture and positioning of windows and doors, one can significantly reduce the noise levels in a classroom, making it a more comfortable environment for children to inhabit.



Figure 8-5-12 showing Vegetative screen masking unwanted sounds from a certain zone, Source: Author

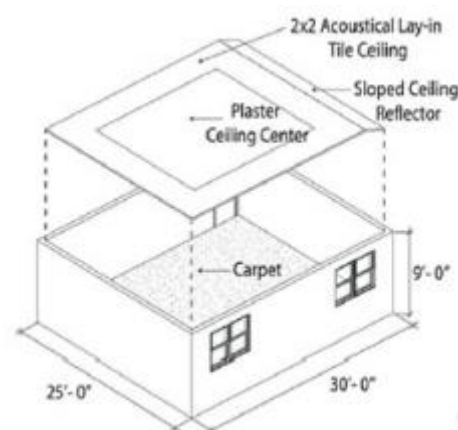


Figure 8-5-13 shows a room with carpeted floor with a combination of acoustic ceiling tiles and a sloped ceiling to reflect sound. (Gaines et al, 2016, p 129) [Accessed 26/11/2022]

Natural ventilation and lighting are important aspects of a design, the placement of doors and windows can play a significant role in passive cooling and lighting however careful consideration must be taken when placing windows and doors. One must consider the impact of these elements with sound transmission and the amount of glare entering the environment, as previously discussed children with autism struggle to filter out noise, this means the placement of windows cannot be adjacent high stimulus zones where an environment requires high acoustical control as discussed in [chapter 4.6](#). Sensitivity to lighting is far greater for autistic children than neurotypical children. For a person with autism, repetitive behaviours become more severe when exposed to fluorescent lighting, therefore natural lighting in educational facilities benefits children more, it can relieve stress, lift spirits, and improve people's well-being.

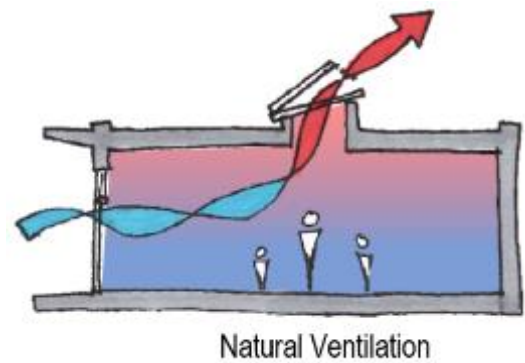


Figure 8-5-14 shows windows allowing fresh outside air into the space pushing out stale and warm air, Source: Author

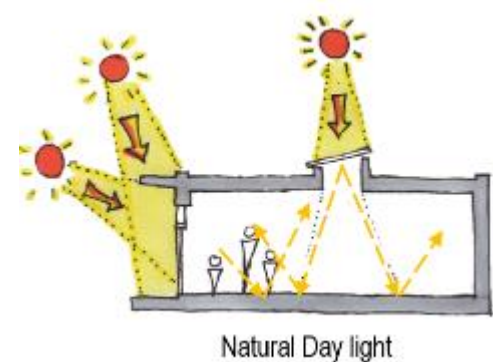


Figure 8-5-15 shows internal spaces illuminated with natural light, Source: Author

Windows play an important role in connecting children to nature and providing a lens to the outside world (refer to figure 8-5-16). Nature is crucial for the early development of children and has a positive impact on the behavioural management, learning, and well-being of both autistic and neurotypical children (refer to figure 8-5-17). By interacting with nature, children with autism can improve their sensory-motor and emotional skills. The built environment can enhance a child's connection to nature by providing strategically placed windows that allow views of natural environments. Furthermore, by providing outdoor play areas with natural setting's children can develop their balance and motor coordination. Additionally, sensory gardens (refer to figure 8-5-18) offer children the opportunity to explore with their senses, which can improve their ability to handle various sensory input.

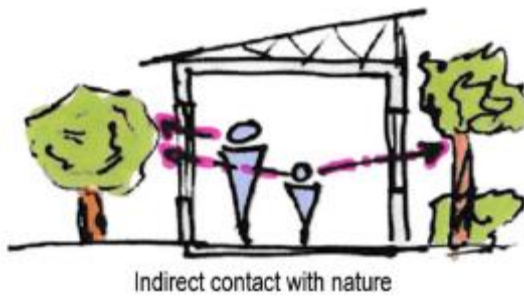


Figure 8-5-16 shows windows allowing fresh outside air into the space pushing out stale and warm air, Source: Author

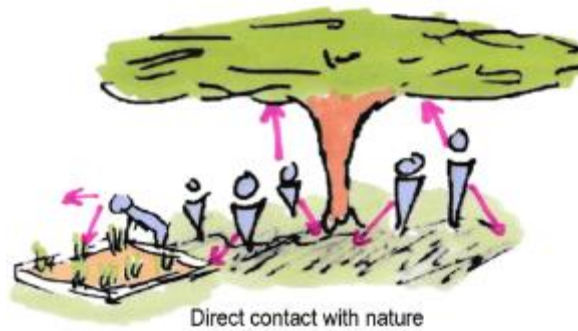


Figure 8-5-17 shows windows allowing fresh outside air into the space pushing out stale and warm air, Source: Author



Figure 8-5-18 showing garden for children to engage with their senses (Barakat *et al.*, 2019) [Accessed 27/08/2022]

## 8.6 CONCLUSION

The findings of this research dissertation indicate that having a thorough understanding of the impact of autism on children is crucial when designing the architecture of an ECD centres. This is essential to ensure that children are able to develop holistically during their early years. Several architectural design elements can impact children with autism. For instance, the use of natural light, non-reflective surfaces and muted earthly colours can reduce sensory overload and create environments in which are calming and easier to understand. Providing quiet spaces, as well as areas for physical activities benefit children with autism. The configuration of spaces should be designed to provide clear and consistent wayfinding, with distinct zones and simple navigation patterns that help autistic children understand and navigate their surroundings. Additionally, by incorporating elements of nature, such as views onto gardens and areas for outdoor play with natural settings, can enhance the sensory experience, well-being and provide opportunities to explore and develop holistically. In addition, these design considerations are not limited to ECD centres or children with autism; all children can benefit from them because they promote overall development and create environments that are simpler to comprehend and more comfortable.

Collaboration and inclusivity are key to creating effective design solutions for spaces intended for both neurotypical and autistic children. The research has shown that valuable insights can be obtained by involving professionals such as therapists, educators, and other relevant experts. To fully explore the ideas from these participants, a collaborative approach must be taken to significantly enhance the design of such spaces.

In designing spaces for children with autism, a phenomenological approach has revealed the importance of providing opportunities for orientation and identification (Norberg-Schulz (1980: 5). This aligns with perceptual theory, which acknowledges that various factors, such as input type and intensity, emotional state, and past experiences, influence how individuals perceive and interpret their surroundings (May, 2009). If a child cannot effectively perceive their environment, they may feel disoriented or lost, resulting in a diminished sense of place and a negative perception of the space.

Additional research should be conducted for older children with autism and how their difficulties impact the built environment. Future studies should aim to recruit larger and more diverse samples to increase the validity and generalizability of the findings presented in this dissertation.

# APPENDICES

## APPENDIX A – INTERVIEW QUESTIONS (PRINCIPAL)

### APPENDIX A- SEMI-STRUCTURED INTERVIEW QUESTIONS – PRINCIPAL

*The following is a sample of the interview that will be conducted with the participants. These interviews questions are open-ended to allow the participant flexibility in response.*

Interview carried out and compiled by Ross Bosiger  
Master of Architecture Student at the University of Kwa-Zulu Natal  
Student Number - 221119978

#### PART A

Name: .....

Age: .....

Position: Principal

Date: .....

Name of School: .....

#### Background to study:

The research I am doing is based on the idea that the built environment has an impact on people both physically and emotionally, this is of course an important consideration for all people, and particularly relevant for people with special needs, such as children with autism spectrum disorder (ASD). Because ASD has such a vast spectrum of disorders very little architectural research has been done to determine what positive impacts it can have on the behaviour, education, and lives of children with ASD. This research is attempting to bridge that gap.

#### A. Therapies, Treatments and Education

Which methods of therapies are used here at Name of school: .....

#### B. Architecture and the Built Environment

Have you found any specific elements of the building which affect the children in either a positive or a negative way?

My research thus far has led me to a couple of key design considerations. Please explain how these elements have been treated in Name of school: .....



- Sensory
  - Visual
  - Acoustics
  - Olfactory
  - Tactile
- Spatial Sequencing
- Escape areas
- Compartmentalisation
- Transition
- Sensory Zoning
- Safety
- Colour
- Wayfinding

### **C. Nature**

What outdoor facilities are available to the children?

### **D. Closing Statements**

Do you have any other comments?

What recommendations would you give to someone designing a building for individuals with autism?

## APPENDIX B – INTERVIEW QUESTIONS (TEACHERS)

### APPENDIX B - SEMI-STRUCTURED INTERVIEW QUESTIONS – TEACHER

*The following is a sample of the interview that will be conducted with the participants. These interviews questions are open-ended to allow the participant flexibility in response.*

Interview carried out and compiled by Ross Bosiger  
Master of Architecture Student at the University of Kwa-Zulu Natal  
Student Number - 221119978

#### PART A

Name: .....

Age: .....

Position: Teacher

Date: .....

Name of School: .....

#### Background to study:

The research I am doing is based on the idea that the built environment has an impact on people both physically and emotionally, this is of course an important consideration for all people, and particularly relevant for people with special needs, such as children with autism spectrum disorder (ASD). Because ASD has such a vast spectrum of disorders very little architectural research has been done to determine what positive impacts it can have on the behaviour, education, and lives of children with ASD. This research is attempting to bridge that gap.

#### A. Therapies, Treatments and Education

Which methods of therapies are used here at School Name: \_\_\_\_\_?

#### B. Architecture and the Built Environment

My research thus far has led me to a couple of key building design considerations. Please explain from your experience how the elements affect children with autism, both positively and negatively and how these issues are addressed in your classroom.

- simplicity
- light and ventilation
- wayfinding and orientation

From what I understand a structured classroom layout is extremely important, how have classrooms been organised to provide this?

### **C. Nature**

What outdoor facilities are available to the children?

### **D. Closing Statements**

Do you have any other comments?

What recommendations would you give to someone designing a building for individuals with autism?

## **APPENDIX C**

*During rigs approval Appendix C was removed.*

## APPENDIX D

*During rigs approval Appendix D was removed.*

## APPENDIX E – GATE KEEPERS LETTERS

### APPENDIX E – GATE KEEPERS LETTER



DATE: 24/3/22.

To whom it may concern

Mr Ross Aubrey Bösiger is a master's student in the School of Built Environment and Development Studies and formally requests permission to interview staff in your institution/department. The data collected will be used in his Masters Research Project entitled: **Exploring early development with children diagnosed with ASD and its impact on the built form: A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa.**

The study may be compiled in a few days, as it sets to include the following:

- Interviews will be conducted with members of staff to gain insight into their perceptions of learning spaces and how the natural environment forms part of the learning space.
- Observations will be done to understand how the children engage with the indoor and outdoor spaces.
- Architectural survey of the buildings will include sketches and photographs to capture the architectural form and qualities of both internal and external spaces.

Thank you and Kind regards

  
Principle Sign Above

**Bloom Centre**  
Eden Village, Salt Rock  
Tel: 032 8152701  
info@bloomcentre.co.za  
www.bloomcentre.co.za

School Name: Bloom Special Needs School.

Mrs Magdalena Catharina Cloete  
Supervisor.

SCHOOL OF BUILT ENVIRONMENT AND DEVELOPMENT STUDIES  
Email: [Cloete@ukzn.ac.za](mailto:Cloete@ukzn.ac.za)  
Tel number: 031 260 1172

Built Environment and Development Studies, University of KwaZulu-Natal, Howard College Campus, Durban 4041



## APPENDIX E – GATE KEEPERS LETTER



DATE: 24 / 03 / 2022

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Mr Ross Aubrey Bösiger is a master's student in the School of Built Environment and Development Studies and formally requests permission to interview staff in your institution/department. The data collected will be used in his Masters Research Project entitled: **Exploring early development with children diagnosed with ASD and its impact on the built form: A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa.**

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- Observations will be done to understand how the children engage with the indoor and outdoor spaces.
- Architectural survey of the buildings will include sketches and photographs to capture the architectural form and qualities of both internal and external spaces.

Thank you and Kind regards

[Redacted Signature]

[Redacted Name]

Principle Sign Above

School Name: [Redacted]

**Thanda After-School**

Reg: 2008/022644/080

PO Box 4/6

085-981-1100

Hibberdene, 4210

Tel: 039 6991253

PBO: 936031027

Mrs Magdalena Catharina Cloete  
Supervisor.

SCHOOL OF BUILT ENVIRONMENT AND DEVELOPMENT STUDIES

Email: [Cloete@ukzn.ac.za](mailto:Cloete@ukzn.ac.za)

Tel number: 031 260 1172

Built Environment and Development Studies, University of KwaZulu-Natal, Howard College Campus, Durban 4041

## APPENDIX F – ASSENT FORM - PARENTS & GUARDIANS

### APPENDIX F – INFORMED PARENTAL CONSENT

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS

COMMITTEE

(HSSREC)

INFORMED CONSENT

Information Sheet and Consent to Participate in Research

---

DATE: \_\_\_\_\_ 2022

Dear Parent

My name is Ross Aubrey Bösigler from the School of the Built Environment and Development Studies at the University of Kwa-Zulu Natal based at Howard College Campus, Dennis Shepstone building.

Your child is invited to consider participating in a study that involves research in Early childhood development Learning Spaces towards a master's in architecture.

The topic of the study is:

**EXPLORING EARLY DEVELOPMENT WITH CHILDREN DIAGNOSED WITH AUTISM AND ITS IMPACT ON THE BUILT FORM:** *A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa*

This study aims to explore and understand early childhood development with children diagnosed with ASD aged 2 to 7 years of age and the impact it has on the built form.

The case study includes 2 ECD facilities in the KwaZulu-Natal area. The study is expected to include the children, teachers and parents affiliated with a centre.

Child participation will involve a normal daily routine at school. The duration of your child's participation, if you choose to enrol and remain in the study, is expected to be for a day only.

The study will not involve any risks and/or discomforts. We hope that the study will allow design interventions at some of the centres to improve the learning environments as the final phase include design research. There may in some cases be no direct benefits to participants. However, the broad outcome of the study is to impact the policies governing early childhood care and development by firstly creating awareness of the impact of the design of learning spaces and developing design guidelines for Early Childhood Development Centres, specifically for children diagnosed with ASD.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee.  
(approval number **HSSREC/00004242/2022**)

In the event of any problems or concerns/questions you may contact the researcher or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details are as follows:

|   |
|---|
| RESEARCHER INFO<br>Ross Aubrey Bösiger<br>Email: 221119978@stu.kzn.ac.za   Cell: 083 258 1706 |
|---|

|   |
|---|
| HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION<br>Research Office, Westville Campus, Govan Mbeki Building<br>Private Bag X 54001 Durban 4000, KwaZulu-Natal, SOUTH AFRICA<br>Tel: 27 31 260455   Fax: 27 31 2604609   Email: HSSREC@ukzn.ac.za |
|---|

Please take note of the following considerations:

Participation in this research is voluntary. Participants may withdraw participation at any point, and in the event of refusal/withdrawal of participation, the participants will not incur a penalty or loss of benefit to which they are normally entitled.

To withdraw from the study the participant is required to inform the researcher in writing of their decision providing reasons for their withdrawal. This will enable the researcher to enrol another participant if required. The nature of the research does not pose any risk or discomfort, however, as participation is voluntary withdrawal will be accepted if requested.

There will be no costs incurred by participants because of participation in the study.

Centres included in the study can choose to not be named. Participants similarly can stay anonymous. To protect confidentiality no personal information will be included in the recording and reporting of the research.

Research Data will be stored both in hard copy and electronically within a secure location arranged by the supervisor.

---

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|--|

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Research Data will be stored both in hard copy and electronically within a secure location arranged by the supervisor.

---

## CONSENT FORM

Parent / Guardian

*(To be signed by the parent/guardian before the observational study is carried out)*

I have read the information presented in the information letter about a project being conducted by Ross Aubrey Bösigler of The School of Built Environment and Development Studies at Howard College, UKZN, under the supervision of Magdalena Cloete. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and additional details I wanted.

- I am aware that I have the option of allowing my child to be photographed to ensure accurate recordings of his / her engagement in the study.
- I was informed Photos used in the document will keep the anonymity of all individuals by either obscuring their facial features or taking images from an angle that hides their identity.
- I am aware that my child's name will remain anonymous.
- I was informed that I may withdraw my consent at any time without penalty by advising the researcher.
- I was informed that if I have any comments or concerns resulting from the participation of my child in this project, I may contact the researcher.

With full knowledge of all foregoing, I agree, of my own free will, for my child to participate in this study.

Yes ☐ No ☐

I agree to the use of anonymous quotations in the final research project report that comes from this research.

Yes ☐ No ☐

I agree to allow photography during the research activities.

Yes ☐ No ☐



**Participant name:** \_\_\_\_\_

\_\_\_\_\_  
**Parent / Guardian name**

\_\_\_\_\_  
**signature**

\_\_\_\_\_  
**Witness name**

\_\_\_\_\_  
**signature**

**Date:** \_\_\_\_\_

## APPENDIX F – INFORMED PARENTAL CONSENT

### UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC) INFORMED CONSENT

Incwadi yesaziso kanye nephephamvume lokuzimbandakanya nocwaningo

---

DATE: \_\_\_\_\_ 2022

Siyakubingelela Mzali

Igama lami Ross Aubrey Bösiger ngiqhamuka kwisikole sezakhiwo kanye nezocwaningo kwi University of Kwa-Zulu Natal ophikweni Howard College Campus, Dennis Shepstone building.

Ingane yakho iyacelwa ukuba izimbandakanye nocwaningo ulumayelana nokukhula komtwana kolwazi ngezakhiwo nobuchwepheshe bokwakha.

Okuzokhulunywa ngakho:

**Ukubheka kokukhula komtwana onesifo sokungazihlanganisi nezinye izingane (AUTISM) :** *Kunesiphakamiso sesakhiwo esingasiza labantwana abanalesisifo eThekwini, South Africa*

The topic of the study is:

Lolucwaningo kuhloswe ukwazi kabanzi kanye nokuqonda ngalabantwana abanalesisifo besebancane (ASD) abaphakathi kweminyaka emibili (2) kuya kwesikhombisa (7 ) and the impact it has on the built form.

Lolucwaningo luhlanganisa 2 ECD wezikhungo KwaZulu-Natal . Lolucwaningo kubhekek ukuthi luhlanganise izingane, othisha kanye nabazali abathintekayo kulezikhungo.

Kwabazihlanganisayo kuyoba uhlelo olujwayelekile lwesikole kulabo. Uma uvuma ukuthi umntwana azimbandakanye naloluhlelo kuyothatha usuku olulodwa kuphela.

Ucwaningo ngeke lubeke umtwana engozini noma angaphatheki kahle. Sethemba ukuthi ucwaningo luyokuba umhlahlandlela ukukhulisa ulwazi ekuhlaleni kanye nokuqonda ezocwaningo. Lolu ucwaningo kuphela, akukho mhlomulo oyotholakala ngokuzimbandakanya nalo. Ngemiphumela eyotholakala kuyobesekubhekwa umthelela wokukhula nokunakekelwa komtwana kanye nokubaluleka kwemfundo

kanye nokuqwashisa ngokubaluleka kwezikhungo zemfundo nemithetho yazo (Early Childhood Development Centres) ukunakekela izingane ezinesifo ( ASD).

Lolucwaningo luhlelwe lwaphasiswa esikhungweni esiphezulu sezemfundo (UKZN Humanities and Social Sciences Research Ethics Committee).  
(approval number **HSSREC/00004242/2022**).

Uma kukhona izinkinga okanye imibuzo ungaxhumana nabezocwaningo UKZN Humanities & Social Sciences Research Ethics Committee, kulezinamba ezilandelayo:

**RESEARCHER INFO**

Ross Aubrey Bösiger

Email: 221119978@stu.kzn.ac.za | Cell: 083 258 1706

**HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION**

Research Office, Westville Campus, Govan Mbeki Building

Private Bag X 54001 Durban 4000, KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 260455 | Fax: 27 31 2604609 | Email: HSSREC@ukzn.ac.za

Qaphelisisa lokhu okulandelayo:

Ukuzimbandakanya naloluhlelo akunamhlomulo. Abazimbandakanya nalo bavumelekile ukuphuma kulo noma inini,uma unqatsheliwe noma waphma kulo, akukho nhlawulo noma uhlomulo oyophuma .

Ukuphuma kulolucwaningo, lowo ozimbandakanya nalo komele abhalele umcwaningi ngezizathu zakhe zokushiya ucwaningo. Lokhu kuyokwenza umcwaningi athole omunye esikhaleni sakhe. Lolucwaningo alunangozi futhi akuhlosiwe ngalo ukuphatha kabi abanye, kodwa ke kulabo abafuna kuphuma kulo bamukelekile ngokwesicelo sabo.

Akukho nkokhelo eyobakhana ngoba loluhlelo olocwaningo kuphela.

Izikhungo ezithinteka kulolucwaningo zivumelekile ukufihla amagama azo (Centres). Nabazimbandakanyayo bavumelekile kufihlwe amagama abo. Imininingwane yakho ivikelekile ngeke ibe yinxnye yokuqoswa nokubikwa kocwaningo.

Imininingwane yocwaningo iyogcinwa ngobucwepheshe endaweni ephephile eyohlelwa abaphathi.

## CONSENT FORM

Parent / Guardian

*(To be signed by the parent/guardian before the observational study is carried out)*

Ngifundile ngolwazi olusencwadini mayelana nocwaningo oluzokwenziwa nguMnumzane Ross Aubrey Bösiger of The School of Built Environment and Development Studies at Howard College, UKZN, Ngaphansi komphathi Magdalena Cloete. Nginikeziwe ithuba lokubuza nanoma yini mayelana naluluhlelo, ngithole nezimpendulo ezigculisayo, kanye nokunye engingakudinga ukukukwazi ngohlelo locwaningo.

- Ngiyazi kuthi ngingazikhethela ukuthi umtwana wami angazimbandakanya nokuqoshwa kanye nokuthathwa kwezithombe zakhe okuyinxenye yocwaningo.
- Ngichazeliwe ngezithombe zocwaningo ukuthi ziyoba imfihlo ngeke bukhonjiswa ubusobabo ukuvikela amalungelo abo.
- Ngichazeliwe ukuthi igama lomntwana wami liyoba imfihlo.
- Ngichazeliwe ukuthi ngingayeka ukuzimbandakaya naluluhlelo noma inini ngaphandle kwenhlawulo ngokwazisa umcwaningi.
- Ngichazeliwe ukuthi uma nginemibuzo noma ukukhathazeka okuhlanganisa ucwaningo ngomtwana wami ngingathintana nomcwaningi.

Ngokolwazi enginalo, ukuyaphambili, ngiyavuma, ngokwami ukuthi umtwana wami azimbandakanye nalolucwaningo.

Yes ☐ No ☐

Ngiyavuma ukusetshenziswa kwamagama azimfihlo kumbiko ogcwele walolucwaningo.

Yes ☐ No ☐

Ngiyavuma ukusetshenziswa kwamagama azimfihlo kumbiko ogcwele walolucwaningo.

Yes ☐ No ☐

Igama: \_\_\_\_\_

\_\_\_\_\_  
Umzali / Isihlobo

\_\_\_\_\_  
signature

\_\_\_\_\_  
Ufakazi

\_\_\_\_\_  
signature

Date: \_\_\_\_\_





## APPENDIX G – ASSENT FORM – CHILDREN

### APPENDIX G – ASSENT FORM FOR CHILDREN

#### UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

(HSSREC)

#### ASSENT FORM

Teacher to read aloud to children:

“This is Mr Bösiger. He is here today to learn about our spaces, and he will be observing our classroom and our playtime. Your parents were happy for him to learn about your spaces by saying yes on the form that we sent home the other day. Now it is your turn to let us know if you are comfortable and happy for him to stay at a distance and watch over our classroom and playground.

If you are happy to say yes, please colour the HAPPY face. If you are not happy to have him include you in his study, please colour the SAD face. Now there is a picture of a camera below, Please colour in the camera if Mr Bösiger is allowed to use a picture of you in his study.  
Please write your name here”

Note:

1. Only the children whose parents have given consent will complete an ASSENT FORM
2. If a parent has not allowed photography of their child, that would take precedent over the child's consent
3. Photos used in the document will keep the anonymity of all individuals by either obscuring their facial features or taking images from an angle that hides their identity.



Name: \_\_\_\_\_

## APPENDIX G – ASSENT FORM FOR CHILDREN

### UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

(HSSREC)

#### ASSENT FORM

Uthisha makafundele abantwana:

“Lona Ngumnumzane Bösiger. Ulapha namhlanje ukuzofunda ngezindawo zethu futhi uzoba nathi umasifunda noma sidlala . Abazali benu abazange babenenkinga naye uma ezobanathi bavuma ngokusayina incwadi eyathunyelwa kubo ezinsukwini ezedlule . Manje sekuyisikhathi senu ukuthi nisho noma niyavuma ukuthi abenathi umasifunda noma sidlala asibukele.

Uma nithi kulungile, siyacela nifake umbala ebusweni ubuhlekayo. Uma ungeke uthande ukuba uhlangele naye ocwaningeni lwakhe , siyacela ufake umbala ebusweni obungahleki. Kulesithombe esingezansi sekhamela faka umbala, uma uvuma ukuthi u Mnumzane Bösiger angazisebenzisa izithombe zakho kucwaningo lwakhe.

Bhala igama lakho.

Note:

1. Kuvumeleke abantwana babazali abasayine amaphepha mvume ASSENT FORM
2. Uma abazali bengavumanga kuthathwe izithombe zezingane zabo; lokho kuyonikeza ilungelo lomzali ngaphezu kwelengane.
3. Izithombe ezisetshenzisiwe kuloluhlelo locwaningo ziyokuba imfihlo noma ubuso babo buyofihlwa ngobuchwepheshe besimanje



Name: \_\_\_\_\_

## APPENDIX H – ASSENT FORM – STAFF MEMBER

### APPENDIX H – INFORMED STAFF MEMBER CONSENT

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

(HSSREC)

#### INFORMED CONSENT

Information Sheet and Consent to Participate in Research

---

DATE: \_\_\_\_\_ 2022

Dear Staff Member (**Principal ☐ & teacher ☐**)  
(tick above box showing which position you hold)

My name is Ross Aubrey Bösigler from the School of the Built Environment and Development Studies at the University of Kwa-Zulu Natal based at Howard College Campus, Dennis Shepstone building.

Your child is invited to consider participating in a study that involves research in Early childhood development Learning Spaces towards a master's in architecture.

The topic of the study is:

**EXPLORING EARLY DEVELOPMENT WITH CHILDREN DIAGNOSED WITH AUTISM AND ITS IMPACT ON THE BUILT FORM:** *A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa*

This study aims to explore and understand early childhood development with children diagnosed with ASD aged 2 to 7 years of age and the impact it has on the built form.

The case study includes 2 ECD facilities in the KwaZulu-Natal area. The study is expected to include the children, teachers and parents affiliated with a centre.

Child participation will involve a normal daily routine at school. The duration of your child's participation, if you choose to enrol and remain in the study, is expected to be for a day only.

The study will not involve any risks and/or discomforts. We hope that the study will allow design interventions at some of the centres to improve the learning environments as the final phase include design research. There may in some cases be no direct benefits to participants. However, the broad outcome of the study is to impact the policies governing early childhood care and development by firstly creating awareness of the impact of the design of learning spaces and developing design guidelines for Early Childhood Development Centres, specifically for children diagnosed with ASD.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee.  
(approval number **HSSREC/00004242/2022**)

In the event of any problems or concerns/questions you may contact the researcher or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details are as follows:

RESEARCHER INFO  
Ross Aubrey Bösiger  
Email: 221119978@stu.kzn.ac.za | Cell: 083 258 1706

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION  
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Tel: 27 31 260455 | Fax: 27 31 2604609 | Email: HSSREC@ukzn.ac.za

Please take note of the following considerations:

Participation in this research is voluntary. Participants may withdraw participation at any point, and in the event of refusal/withdrawal of participation, the participants will not incur a penalty or loss of benefit to which they are normally entitled.

To withdraw from the study the participant is required to inform the researcher in writing of their decision providing reasons for their withdrawal. This will enable the researcher to enrol another participant if required. The nature of the research does not pose any risk or discomfort, however, as participation is voluntary withdrawal will be accepted if requested.

There will be no costs incurred by participants because of participation in the study.

Centres included in the study can choose to not be named. Participants similarly can stay anonymous. To protect confidentiality no personal information will be included in the recording and reporting of the research.

Research Data will be stored both in hard copy and electronically within a secure location arranged by the supervisor.

---

## CONSENT

I ..... have been informed about the study titled "exploring early development with children diagnosed with ASD and its impact on the built form: *A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa*" by Ross Aubrey Bösiger.

I understand the purpose and procedures of the study.



I have been allowed to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if an injury occurs to me because of study-related procedures.

If you have any further questions/concerns or queries related to the study I understand that I may contact the researcher by email. [221119978@stu.ukzn.ac.za](mailto:221119978@stu.ukzn.ac.za), or tel. +2783-258-1706.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION  
Research Office, Westville Campus  
Govan Mbeki Building  
Private Bag X 54001 Durban  
4000  
KwaZulu-Natal, SOUTH AFRICA  
Tel: +2731-2604557- Fax: 2731-2604609  
Email: [HSSREC@ukzn.ac.za](mailto:HSSREC@ukzn.ac.za)

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview/focus group discussion YES / NO

Use of my photographs for research purposes YES / NO

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Date

(Where applicable)



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# PART B

## DESIGN REPORT

### DESIGN LITERATURE

#### BACKGROUND RESEARCH:

##### Topic:

Exploring early development with children diagnosed with autism and its impact on the built form.  
Towards a proposed centre for children with an autism spectrum disorder.

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##### Problem statement:

Autism is a complex neurodevelopmental disability impacting 1:44 children worldwide. On the basis of this statistic an estimated 6807 children aged 0 to 7 years old would be impacted by some form of autism.

No two autistic children are the same, they are often misunderstood due to their differences of neurotypical children.

Autistic children have difficulties in perceiving situations, Participating socially and difficulty in processing sensory stimuli to name a few.

##### Aim:

Explore autistic children's early childhood development and architecture.

Towards a proposed centre for children aged 2 to 7yrs old with autism spectrum disorder.

##### Objectives:

To develop an understanding of autism and its impact on children as well as their **developmental needs, sensitivity to sensory stimuli** and the **importance of being connected to nature**.

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##### Theories and concepts:

Phenomenology as the main paradigm. (knowledge from past experiences)

Theories include:

- Environmental psychology – Perception and interaction a child has with the built environment.
  - Biophilia – the child's need to develop a connection to nature, creating healthy environments through passive design and the careful use of materials.
  - Place making – Through the use of sociability and uses and activities of spaces.
-

### Summary of literature:

Current ECD facilities lack the design consideration for the sensitivities and difficulties of autistic children. These include:

- Bright colours
- Busy patterns
- Hard corners and lack of soft form
- Low staff to child ratio
- Lack of refuge spaces

Additionally, the difficulties experienced by autistic children require additional remedial support which lacks at many facilities.

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### Precedent studies:

- **New Struan Centre in Scotland** used **spatial sequencing** to **group activities** to aid in the children's **understanding** of their **environment**. The use of **transition spaces** with **recesses and change in materials**. High level **light shelves** were used to restrict the **glare from high level windows**.
- **Pears National Centre for Autism in London** uses natural light and ventilation reducing the need for mechanical ventilation which is noisy. The use of both low- and high-level windows allow natural light deep into the building connecting the children with nature indirectly.
- **Jadgal Elementary school in Iran** provides enclosed safe and nurturing spaces for children through an engaging transparent façade. The forms playful opening creates an exciting environment for children to interact with. Additionally, the transparent façade allows a visual connection to the surrounding community.
- **Green School in South Africa** provides healthy indoor environment using passive design principles, a strong connection to nature is achieved using landscaping and materials. Safe nurturing spaces are created using courtyards which too function as a transition space. The spatial sequencing of the school is linked by open pathways which allow children to connect with nature when moving from one building to the next.

### Case Studies:

- **Thanda ECD South coast Kwa-Zulu Natal,**
  - Develops a connection to nature using interconnected spaces linked via open pathways. Vegetable gardens provide food security for the centre.
  - Unfortunately, the use of bright colour and patterns are a negative aspect for children with autism.
- **Bloom Centre located in the North Coast**
  - Is a private facility for autistic children aged 3 to 12yrs old.
  - Older children do attend the facility due to their developmental delays.
  - The facility provides an inclusive classroom bringing awareness to neurotypical children as well as other parents.

- Articulated spaces in the classroom aid the children in understanding their environment.
  - Internal finishes were neutral due to sensory stimuli and items were added when and if needed.
  - Additional accommodation for remedial therapy is provided at this facility.
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#### Research findings:

- **Conductive learning environments:**
    - Must be protective and nurturing.
    - Spaces must be adaptable and organised
    - Outdoor learning areas are important for children improving their learning ability and social skills.
  - **Sensory inputs:**
    - Consideration for the various senses - Sight, smell hearing, touch, taste, vestibula and proprioceptive.
    - Sensory gardens provide therapeutic spaces for autistic children exposing them to additional sensory stimuli.
    - Careful consideration to sensory stimuli needs to be made to ensure the child develops a sense of belonging and feeling of safety. This can be done by considering the spatial layout and use of materials.
  - **Connection to nature**
    - Is important for children in their developing stages of life.
    - Outdoor areas can be calming, these environments improve health, behaviour and social difficulties and should be seen as outdoor learning spaces.
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#### Design Driver:

- **Conductive environments:**

Developed through spatial planning, articulated spaces, transitional zones such as courtyards and the use of materials and colours.
- **An Enhanced connection to nature:**

Through the direct and indirect contact with nature.
- **Passive design principles:**

Soft and subtle form
- **A Family and community connection:**

Centre to be used by community through the use of community hall, library and computer labs.

Children may be assessed to help identify children needing additional support.
- **A Sense of belonging:**

Courtyard spaces allow for constant supervision.

Child refuge/ escape spaces for overwhelmed children.

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## SITE ANALYSIS

Site selection:

Primary points-

- Topography a relatively flat site as children with autism sometimes experience mobility difficulties.
- Residential context, which is calming, and away from noisy activities such as commercial and industrial zones.
- A positive connection to nature allowing children to interact with nature as much as possible.

The site located in Matabetule, is a rural lower income area of eThekweni, the nearest public school for autism is 25km away.

Contextual analysis:

The main use of transport in the area is via taxis, these stops are informal without any structure. Additionally, sidewalks to the street are narrow with the same material as the roadway. Autistic children require well-structured environments with well-defined spaces to develop an understanding and feeling of safety hence these are non-conducive.

There are 3 schools located in the vicinity all do not cater for autistic children. With a development centre located across the road.

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Site Analysis:

- **Asphalt and dirt** road provides **access to the site**.
  - **Connection to nature** is established with on-site vegetation.
  - The road produces very little noise as this is a residential area.
  - The **dirt road** may become an issue with **dust** being pushed up into the air.
  - The **quieter part of the site** is located near to the stream at the back end of the site.
  - The **prominent wind directions** are South-west and North-east.
  - **Sun travels** along the length of the site from east to west.
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Urban Response:

The urban response will be multifaceted, addressing storm water management issues, by implementing an attenuation dam as well as a community park., lost space is regained and may be used by the community.

Additionally, well defined sidewalks, street calming measures and formal taxi stops will create a calm structured environment for autistic children when transversing the area.

The site is located amongst 2 schools one being a primary school and one being a secondary school. The addition of the specialized early childhood development centre for autistic children will plug into an existing non formalised education hub.

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#### Architectural Brief:

An architectural design for a centre for early childhood development of autistic children that promotes:

- Early development
  - Exploration and
  - Provides support and information to the community.
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#### Concept:

It takes a village to raise a child. My understanding of a village is inclusive, safe and nurturing as well as interconnected spaces.

The spatial arrangement of the facility resembles a village within a community. Various activities interconnected via pathways and courtyards.

#### BUILDING DESIGN:

##### The site edge:

Part of the site is given to the community utilized as the street edge, this is to create a buffer between the street and the facilities boundary timber fence. Social spaces are located near the main pedestrian access as well as the multipurpose community hall access which is used after 12pm when functions take place at the facility.

The main pedestrian access to the ECD centre is located near to the admin block, this is met with a sensory garden to allow for children to deregulate when arriving or departing the facility.

Children arriving to the school would either use this access or the onsite drop off point located by admin.

##### Spatial sequencing:

Autistic children require conducive environment, by creating zones spatial sequencing is achieved allowing autistic children to better understand the environment in which they find themselves in.

- The centre is divided up into various zones creating structure and defined areas.
- The more public zone which acts as the spine of the centre comprises of the admin block with assessment centre, then the library and computer labs for adults from the community and then there is the centres kitchen and multi-purpose community hall with an adjacent play area and vegetable garden.



- In the more private and quieter side of the site I have positioned the children's library which is close to the admin building for after hour usage by children from the community. The children's library and computer labs are structurally joined to the adult library and computer labs yet separated from the adults to utilize the safe staff.
- Below the library is the central play area, arts drama and fantasy play area with a sensory garden off of the undercover area, the therapy rooms and classrooms made up of Nursery and 2-year-olds then the second cluster of classrooms is made up of 4-5yr olds and 6–7-year-olds. With classrooms catering for Low functioning, high functioning and neurotypical children.
- The therapy rooms are positioned in the corner of the site away from the distractions of the day-to-day activities of the facility, accommodated in the therapy zone one finds occupational and physical therapy grouped together as they produce more noise than the quieter therapies such as speech and social skills therapy which require higher concentration. These two groups of therapies are separated by the hydrotherapy pool utilized by the community after hours to develop their swimming skills.
- On the other side of the site, one finds the wilderness park located below the community hall and acts as a buffer from the road edge providing children with the opportunity to immerse themselves in nature developing their social skills, school related learning and gross and fine motor skills.

#### Linkages:

Pathways link the various zones with access control gates to reduce the children from wandering which is common for children with autism. Much like my precedent study the green school, these pathways offer opportunities for children to connect with nature while moving around the facility from one zone to the next. Having a direct connection to nature aids in the child's regulation of senses and aids in their development.

#### Sense of belonging:

To develop the child's sense of belonging the various zones form courtyards, resembling a village like layout. These courtyards aid in the transition from one space to the next, furthermore the courtyard reduces the need for passages aiding in the children's wayfinding.

#### Classrooms:

The classrooms are positioned in a circular layout resembling a village, the positioning of the classrooms in a circular footprint create a safe and nurturing space for the children. The central more intimate play area acts as a learning space for children encompassed by a wraparound covered walkway. The walkway doubles up as both circulation as well as a covered play area. The materials used for the walkway are safety rubber flooring this prevents children from injuring themselves when playing.

Various playground equipment is provided with separate demarcated colours on the floor to help with zoning, items such as wall mounted abacas, climbing wall, sensory tables and sensory wall pads and a trampoline with other play equipment. This equipment helps in the development of both autistic and neurotypical children.

### Classroom internal:

Classroom doors are positioned off the side of the building as a recess off the wraparound walkway, this is to aid in creating a quieter less stressful transition from outside to inside or visa verse.

The classrooms are articulated into various zones in an open plan setup, this is highly beneficial for autistic children as they require structure in the environment, they find themselves in to easily understand the activities and actions required. Furthermore, this allows for easy surveillance of the classroom as the staff to child ration is 2 to 8 children.

Zones include an entrance with lockers for children's items, a prep and wash area, ablutions to limit children leaving the classroom, individual desks, group desk messy area, group floor time, group play area, space for 1 of the teachers, a sensory corner and an outside more private learning space.

In the sensory corner a bay window and cubby hole provide a space for escape where children may regulate their senses after experiencing sensory overload. This space allows the child to regulate their senses before rejoining the activities for the day.

Windows and doors are strategically positioned to ensure distracting views are limited while still providing a visual connection to nature from within the classroom. The windows aid in the use of natural ventilation and natural day lighting reducing the need for artificial lighting. High level windows provide natural light deep into the building with a light shelf reducing glare in the classroom.

The classroom's baffled ceiling is made up of timber gum poles reestablishing one's connection to nature with timber vinyl flooring. Vinyl flooring reduces the amount of dust that can settle in the classroom impacting the child's senses.

Child sized furniture and toilet fittings ensure easy use of equipment for the children and help develop a sense of belonging.

### Sensory garden:

The sensory garden is positioned outside the arts drama and fantasy play area. This space allows children to develop their senses better which helps them later on in life. In the sensory garden one finds various landscaping which caters for touch, smell, sound and water play. The position of the sensory garden being off the central play area give the children free access to explore their senses when playing.

The arts drama and fantasy play area is a smaller more child friendly space rather than the community hall it can be used in multiple ways such as parent teacher evenings, fantasy play and artwork, as well as presenting plays to the community and parents. This will bring awareness to autism in the community.

### Sustainability measures:

**Solar-** The use of solar panels on the admin, library and community hall provides clean usable electricity to the facility. Angled at 25 degrees for optimal performance.

**Storm water attenuation** – JoJo tanks are used to attenuate storm water to be released back into the underground aquifers replenishing the use of the onsite borehole and the need for multiple pumps around the site. The slow release back into the ground ensures stormwater runoff is kept to a minimum.

**Indigenous planting** – The urban and internal landscaping will be indigenous planting, careful consideration to plans will be taken to eliminate any toxic or thorny plants that may harm children when exploring nature.

**Sustainable food gardens** on site provide the vegetables and fruit needed to give children meals while at school, this reduces the running costs of the facility.

**Waterwise fittings** will be provided to limit the usage of the borehole water and bring awareness to water security.

**Natural ventilation** – the buildings footprints are kept narrow to aid in cross ventilation, lower openable windows allow fresh air into the spaces with high level louver allowing hot air out.

**Natural solar shading** will be achieved by the careful positioning of trees providing shade to windows reducing direct sunlight.

**Building materials** consist of hemp walls with timber structure, hemp walls are non-toxic and low in VOC levels. Benefits include Eco friendly, insulating, sound absorbing, 100% natural and fire resistant. Timber baffle ceiling made from locally sourced gum poles. And materials with a green rating such as but not limited to vinyl flooring and paint.



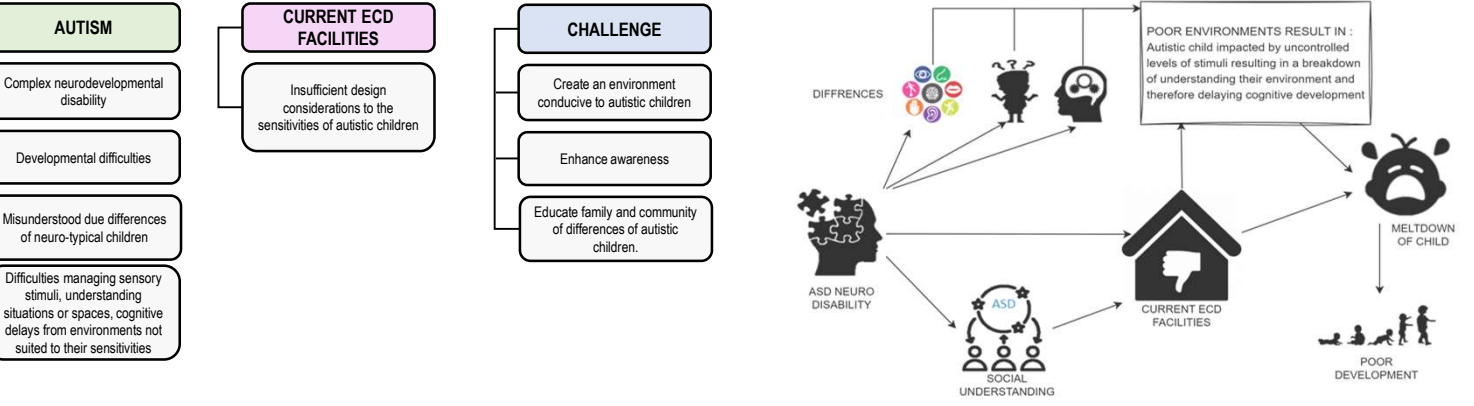
Exploring Early Development with children diagnosed with Autism and its impact on the built form

A proposed centre for children with an autism spectrum disorder in eThekweni, South Africa

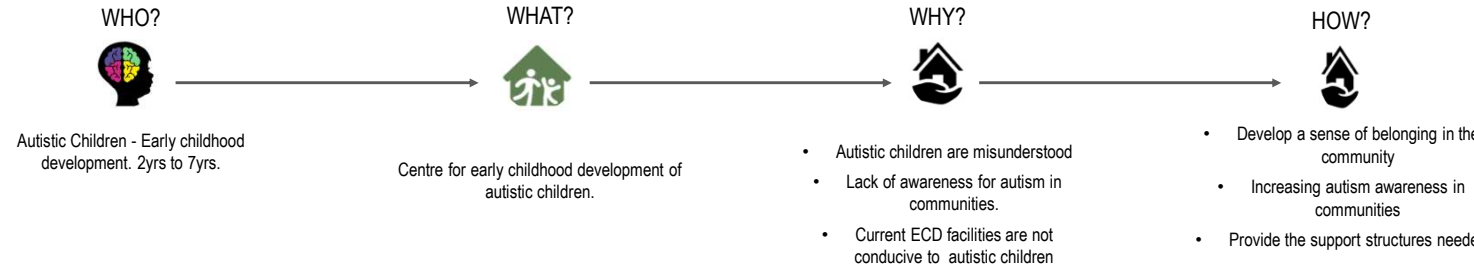
Ross Aubrey Bösiger - 221119978

PROBLEM STATEMENT

Existing Early Childhood Development (ECD) facilities in South Africa often fail to adequately address the unique sensitivities and challenges faced by autistic children (Naidoo, 2021). A lack of support structure and insufficient design consideration in these facilities can manifest in various ways, including a lack of sensory stimuli or an overwhelming sensory environment, inadequate staff-to-child ratios, excessive noise levels, limited contact with nature, and a deficiency in playful and engaging forms. In parallel to architectural considerations, there is a pressing need for social awareness and understanding of autism within communities. This lack of awareness contributes to a limited understanding of the unique differences and challenges faced by Autistic Children.

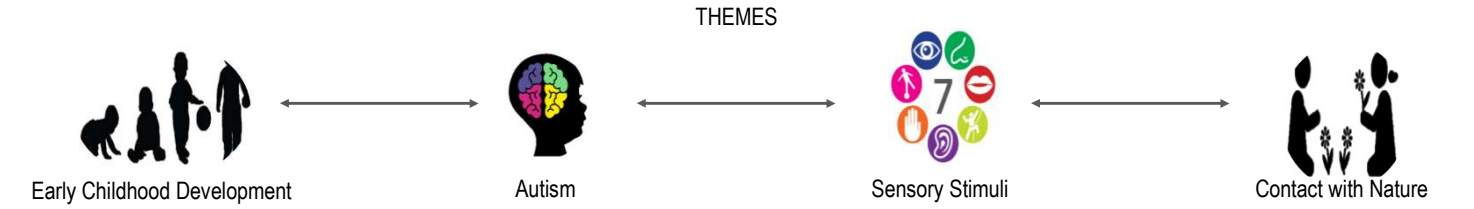


RESEARCH SCOPE

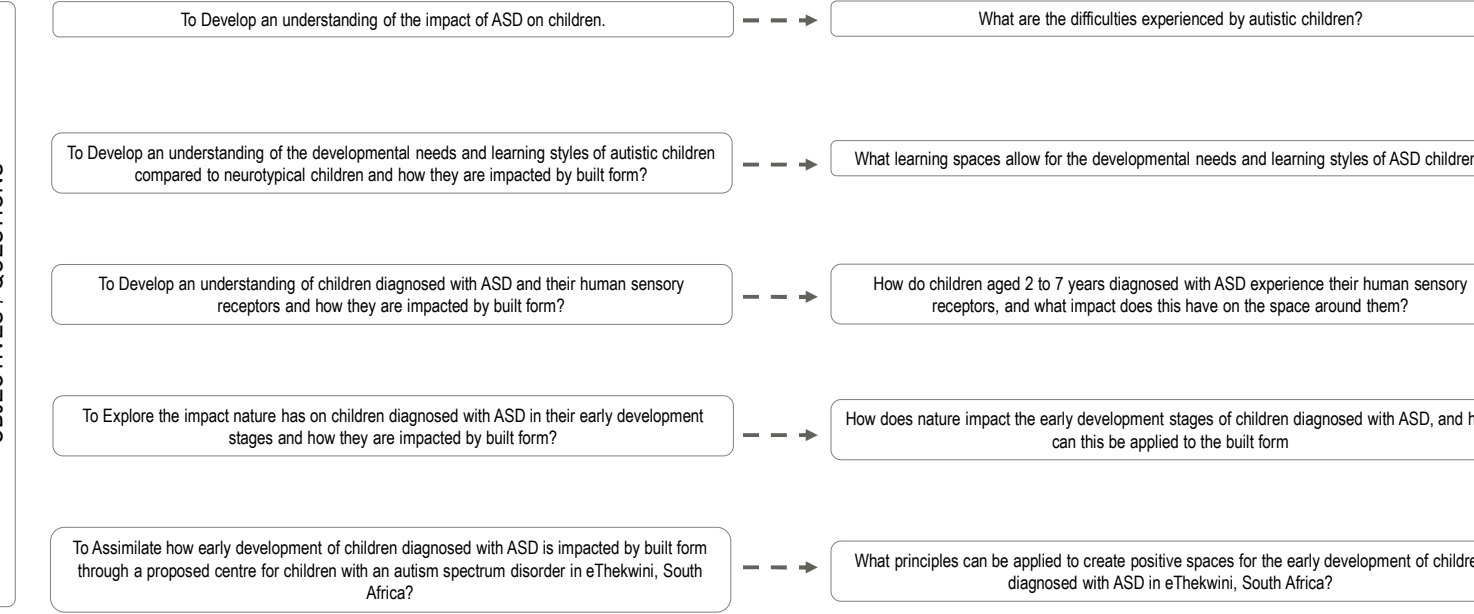


AIM OF THE STUDY

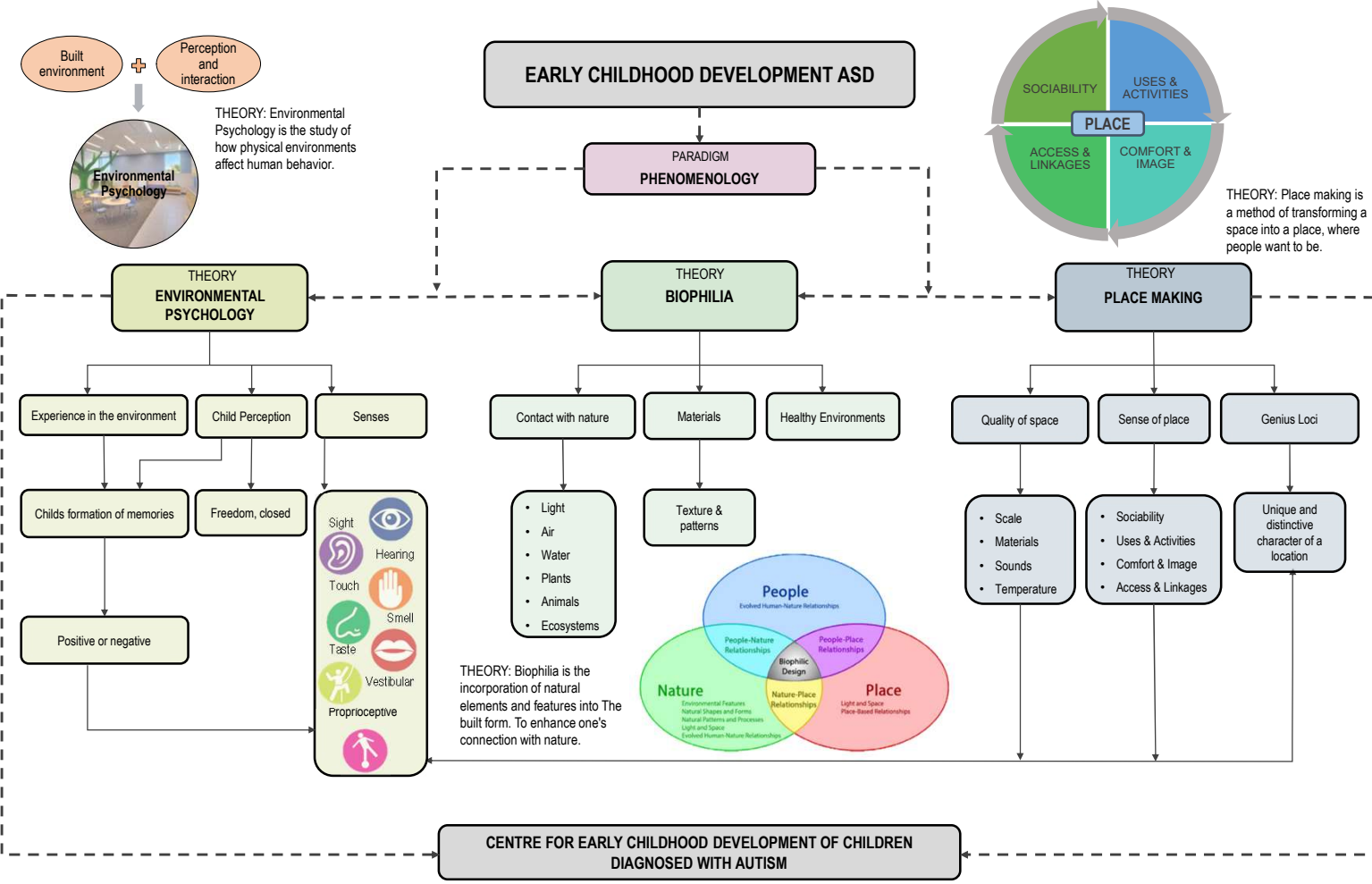
Exploration of **Autistic Children's Early Childhood Development and Architecture** to develop principles for a proposed **centre for children with an autism spectrum disorder** in **eThekweni, South Africa**.



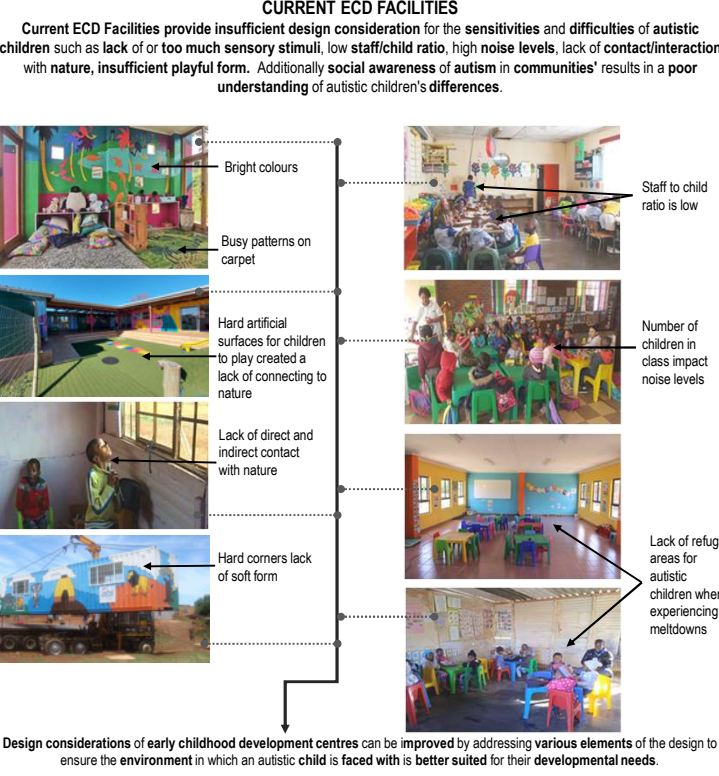
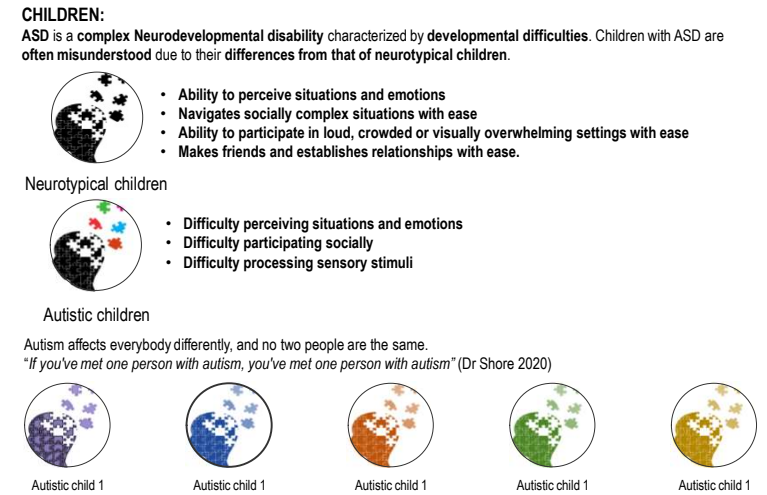
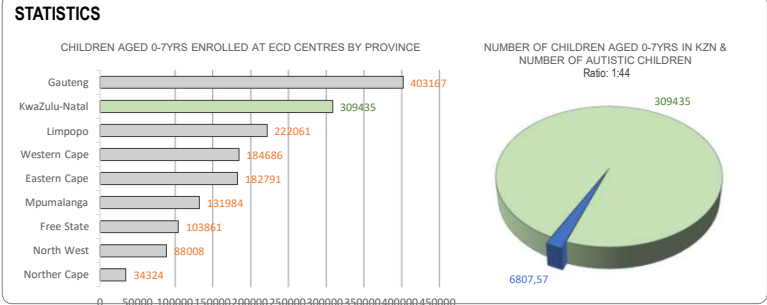
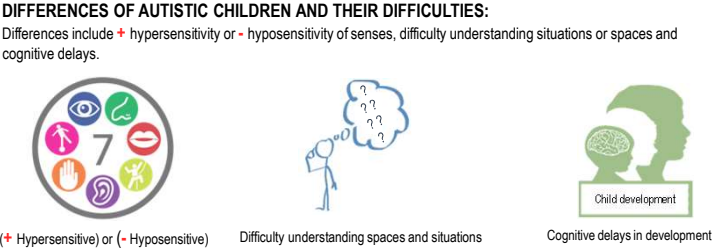
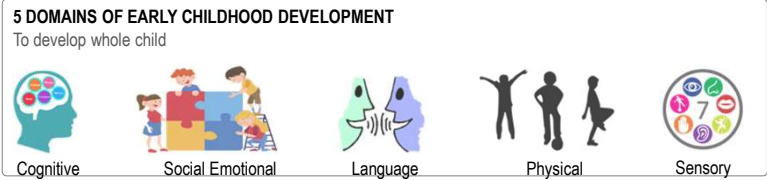
OBJECTIVES / QUESTIONS



THEORIES AND CONCEPTS:



SUMMARY OF LITERATURE REVIEW: Early Childhood Development and Autism





## PRECEDENT STUDIES

### New Struan Centre – Alloa, Scotland

**Location:** Alloa, Scotland  
**Architect:** Aitken Turnbull Architecture  
**Year of project:** 2005  
**Built Form Typology:** National Autism Centre for education, research and diagnosis  
**Age Range:** Three to Eighteen  
**Total Area:** Unknown.



**Justification**

- Autism specific centre for children
- Spatial sequencing
- Compartmentalization
- Arrangement of classrooms
- Transition spaces
- Escape spaces

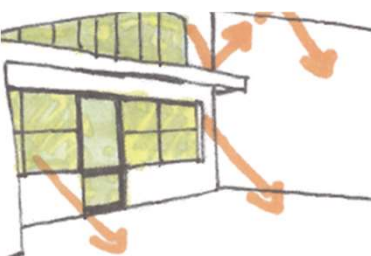
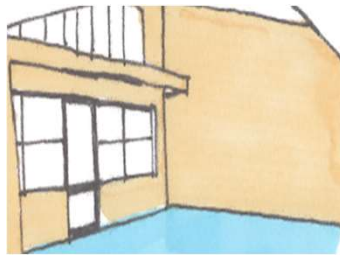
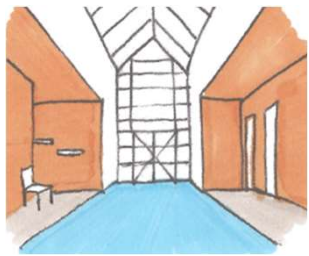
#### Theoretical connections:

##### Environmental Psychology –

- Safe nurturing spaces
- Clarity established through various materials and colour.
- Transition zones create calming environments allowing children to manage their emotions.

##### Place Theory –

- Conductive environments create comfort.
- Social spaces for children gather.
- Quality of space is enhanced through the utilization of spatial sequencing



- Colored carpets provides spatial sequencing, easy navigation and better orientation individuals can perceive their environment better.
- Neutral-colored recessed walls and ceilings provide calming refuge spaces enhancing the quality of space.

- Neutral walls and floors create a calming and easy to understand environment.
- Stimuli can be added when needed.
- Managing the sensory input children receive from their environment allowing them to manage their emotional responses.

Light shelf and blinds reduce natural light glare creating a more conducive environment.

### Green School South Africa – Western Cape, South Africa

**Location:** Paarl, Western Cape, South Africa  
**Architect:** GASS Architecture  
**Year of project:** 2021  
**Built Form Typology:** Educational facility for children in the local community.  
**Age Range:** Two to six and grades one to five  
**Total Area:** 3318m<sup>2</sup>



#### Justification

- School designed for children's interaction with nature.
- Outdoor play areas
- Habitable spaces
- Safe and nurturing courtyard play area

#### Theoretical connections:

##### Biophilia –

- Healthy indoor and outdoor environments.
- Contact with nature: Physical & Use of materials.
- Passive design creates comfortable environments
- Safe nurturing spaces in courtyard for play and exploring their environment.

##### Place Theory –

- Genius Loci - Spatial layout of school - Use of indigenous vegetation - Use of materials link the building to surrounding environment
- Linkages created through pathways of exploration.
- Quality of space – connected to the site, passive design, and use of materials.



Classrooms surrounded by timber fence.

Central courtyard providing a safe and nurturing space



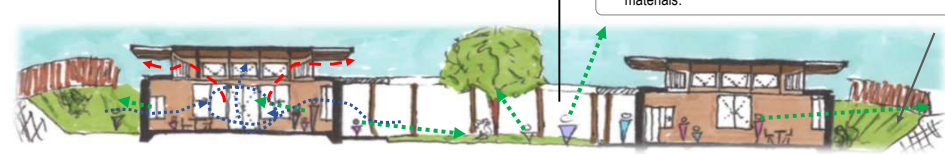
Timber fence

Courtyard

Play areas

Access linkage

- Central courtyard circulation and play spaces provide a safe environment.
- Children are nurtured, staff members can also keep an eye on the children.



- High- and low-level windows provide natural ventilation and cooling creating a more comfortable space.
- Views connecting the inside world to the outside is achieved through low level window.

Outdoor area for natural free play enhancing the children's motor development, physical fitness, imaginative and social play.

Seats on the side of the play area provide places for refuge.

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### The Pears National Centre for Autism – London, England

**Location:** London, England  
**Architect:** Penoyre & Prasad  
**Year of project:** 2008  
**Built Form Typology:** Educational facility for children diagnosed with autism, Training centre.  
**Age Range:** Three to Eighteen  
**Total Area:** 4046m<sup>2</sup>



**Justification**

- Autism specific centre for children.
- Passive design principles
- Heating
- Cooling
- Ventilation
- Natural light

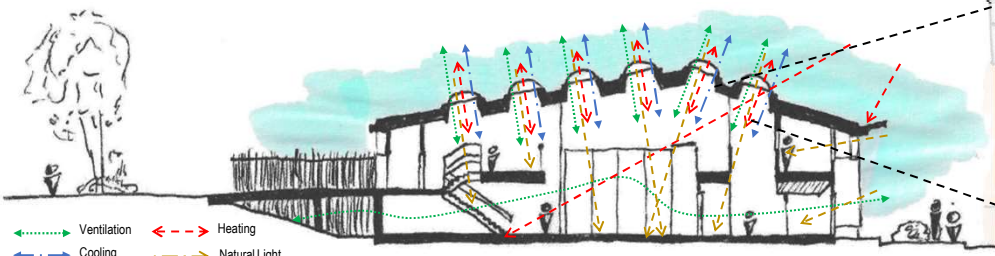
#### Theoretical connections:

##### Environmental Psychology –

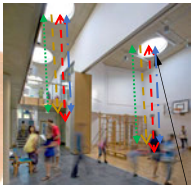
- Management of natural light and ventilation help create comfortable environments.

##### Enhancement of place –

- Needs in terms of sensory stimuli is considered improving the quality of space through passive design principals.
- Passive design principals give the building a sense of identity both internally and externally.



- Openable skylights penetrate the concrete roof, allowing for natural ventilation, heating, cooling, and lighting, thereby enhancing the comfort of inhabited spaces.
- Internal classrooms naturally ventilated, the need for noisy mechanical ventilation is reduced which impacts autistic children's sensory system.
- Artificial light is reduced by providing expansive windows.
- High level windows allows Natural lighting to penetrate open shared spaces.
- Healthy environment for children using passive design principles.



Passive design – natural lighting and ventilation



### Thanda ECD – Nyagwini district, KwaZulu-Natal, South Africa

**Location:** Nyagwini district, KwaZulu-Natal, South Africa  
**Built Form Typology:** Educational facility for children in the local community.  
**Age Range:** Early childhood development



#### Justification

- Early childhood development centre
- Rural setting
- Involved in community upliftment
- Comparison with second case study specific for autism in an upmarket area.

#### Theoretical connections:

##### Biophilia –

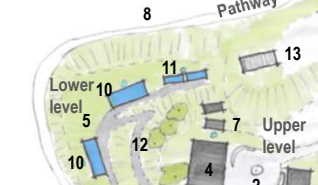
- Connection to nature: Vegetable gardens – Open Pathways – Water Storage

##### Environmental Psychology –

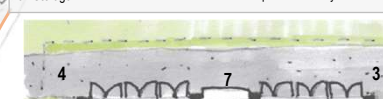
- Structured classroom helps with perception.
- Sensory – Bright Colours – Busy Patterns non conducive to Autism – Passive Design principles.

##### Place making –

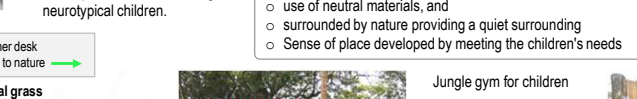
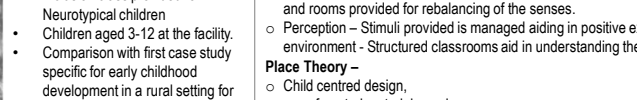
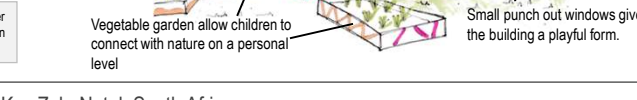
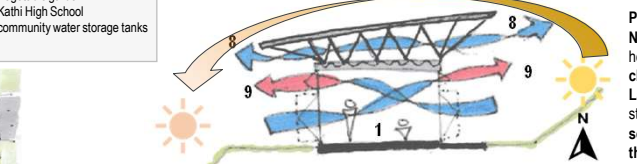
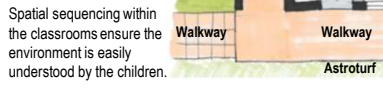
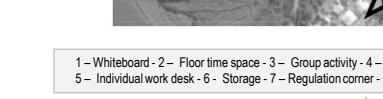
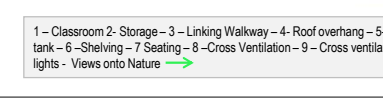
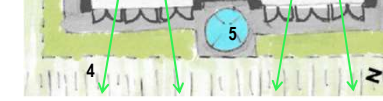
- Facility is used by the surrounding local community.
- Local community use the facility to socialise with one another.
- Sense of place is developed by addressing the needs of the community.



- Thanda community centre entrance
- Central Quad / Skate park
- Arts Centre
- Library and Main admin building
- Playground
- Storage
- Animal shed
- Sugar cane field
- Resource centre
- ECD Classroom block
- ECD ablution block
- Ramp and Walkway element
- Agricultural centre
- Outside kitchen
- Vegetable garden
- Kathi High School
- community water storage tanks



- Classroom
- Storage
- Linking Walkway
- Roof overhang
- Water tank
- Shelving
- Seating
- Cross Ventilation
- Cross ventilation fan lights
- Views onto Nature



### Jadgal Elementary School – Seyyed Bar, Iran

**Location:** Seyyed Bar, Iran  
**Architect:** Daaz Office  
**Year of project:** 2020  
**Built Form Typology:** School  
**Age Range:** Elementary & Middle School  
**Total Area:** 480m<sup>2</sup>



**Justification**

- Interaction between built form and children
- Linkage between internal and external through form.

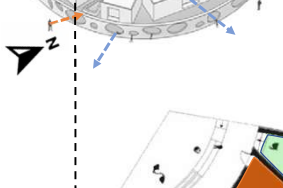
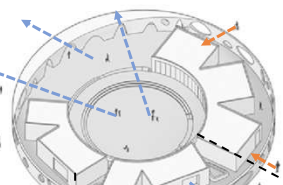
#### Theoretical connections:

##### Environmental Psychology –

- Safe nurturing spaces,
- Encouragement for children to explore
- Openness and transparency

##### Place Theory –

- Transparent linkages between internal and external
- Cultural identity created by use of materials and textures



- Classrooms joined in corners
- Small secondary yards for group work

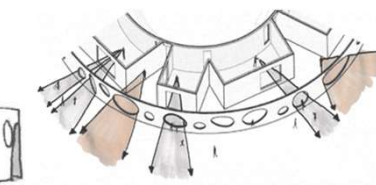
Varying thicknesses and punch outs create different areas for children to explore, relax and play

Shadows cast into the recessed cutouts, providing a place of refuge

Buildings form casts playful shadows onto surrounding landscape giving the building a strong sense of identity.



Internal views External views



Transparent façade, creates a sense of openness, inviting the community into its space. A connection is made with the village and shares its space for community gatherings.

Framed views of the surrounding landscape, connecting the building to the outside world in a playful and intriguing manner.

### Bloom Centre – Umhlali district, KwaZulu-Natal, South Africa

**Location:** Umhlali district, KwaZulu-Natal, South Africa  
**Built Form Typology:** Educational facility for Autistic children in the local community.  
**Age Range:** 3 to 12 years



#### Justification

- Facility for Autistic children
- Inclusion class provided for Neurotypical children
- Children aged 3-12 at the facility.
- Comparison with first case study specific for early childhood development in a rural setting for neurotypical children.

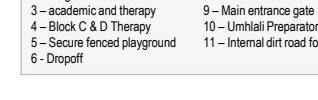
#### Theoretical connections:

##### Environmental Psychology –

- Sensory – Plain walls – neutral colours in the classrooms – regulation corners and rooms provided for rebalancing of the senses.
- Perception – Stimuli provided is managed aiding in positive experiences in the environment – Structured classrooms aid in understanding the environment

##### Place Theory –

- Child centred design,
- use of neutral materials, and
- surrounded by nature providing a quiet surrounding
- Sense of place developed by meeting the children's needs



- Whiteboard
- Floor time space
- Group activity
- Teacher desk
- Individual work desk
- Storage
- Regulation corner
- Views to nature





**Ob 2:** Develop an understanding of the developmental needs and learning styles of autistic children compared to neurotypical children and how they are impacted by built form?

**Qu 2:** What learning spaces allow for the developmental needs and learning styles of ASD children?

### CONDUCTIVE LEARNING ENVIRONMENT



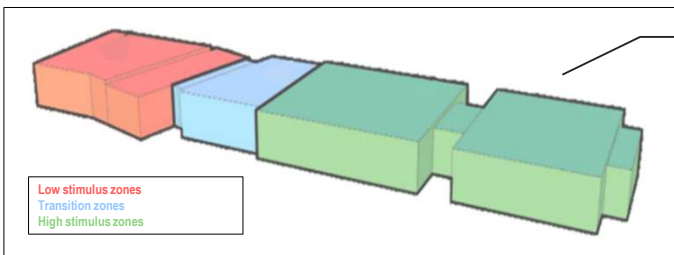
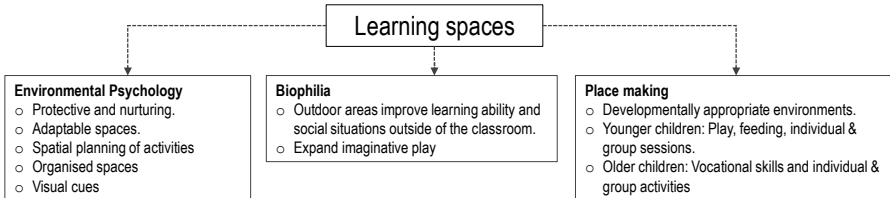
Children exploring their environment



Group activities at tables

Group activities on carpet

Rectangular classroom made different with placement of furniture



Group activities through spatial planning



Children learning in the outdoor environment.

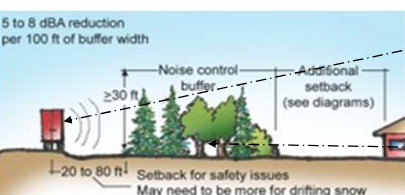


Escape space provided in classroom

**Ob 3:** Develop an understanding of children diagnosed with ASD and their human sensory receptors and how they are impacted by built form?

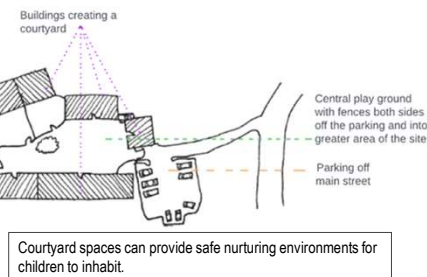
**Qu 3:** How do children aged 2 to 7 years diagnosed with ASD experience their human sensory receptors, and what impact does this have on the space around them?

### SENSORY INPUTS

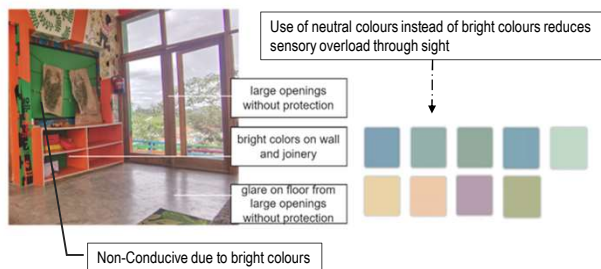


Noisy environments cause reactions

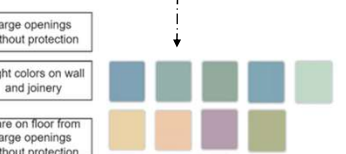
Buffering and creating white noise creates calm environments



Courtyard spaces can provide safe nurturing environments for children to inhabit.



Use of neutral colours instead of bright colours reduces sensory overload through sight



Gardens help all types of children explore and develop further.



Sensory gardens help calm children



Providing sensory objects for children to explore help with their development

**Ob 4:** Explore the impact nature has on children diagnosed with ASD in their early development stages and how they are impacted by built form?

**Qu 4:** How does nature impact the early development stages of children diagnosed with ASD, and how can this be applied to the built form?

### CONNECTION WITH NATURE



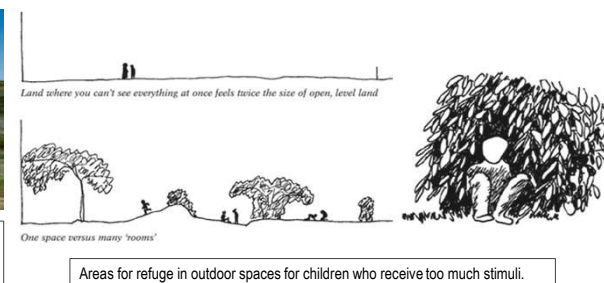
Outdoor learning environments such as pathways and gardens to connect with nature.



Natural outdoor play improve fantasy play as well as children's cognitive ability, balance, and motor coordination.

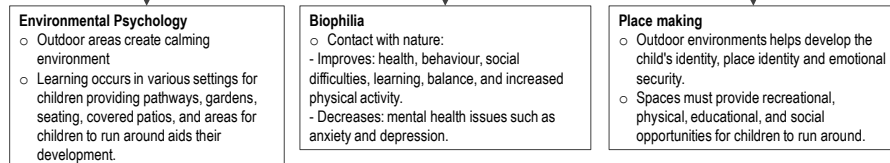


Building materials which are neutral and connect with the site help create a sense of place, form helps create identity. Soft curving walls are beneficial to autistic children

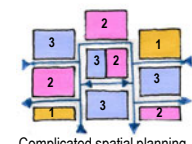


Areas for refuge in outdoor spaces for children who receive too much stimuli.

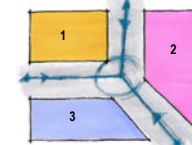
### Autistic child's Connection to nature



### MACRO SPATIAL LAYOUT

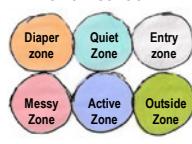


Complicated spatial planning and navigation



Simplistic spatial planning and navigation

### MICRO SPATIAL LAYOUT OF CLASSROOM

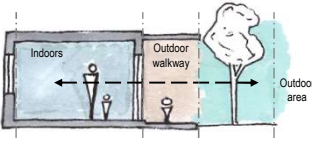


Spatial sequencing in classrooms



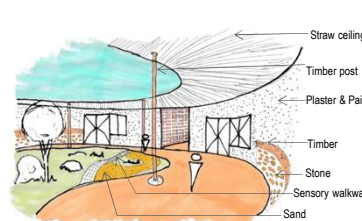
Articulated classrooms

### TRANSITION SPACES AND SENSORY ZONING



Transition zone between indoors and outdoors

### COLOURS AND MATERIALS



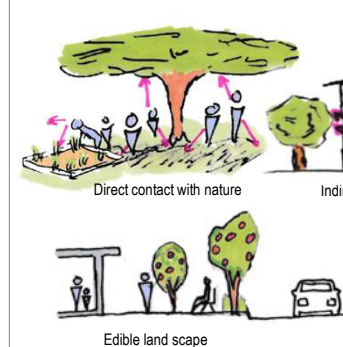
Use of natural materials with carefully considered textures



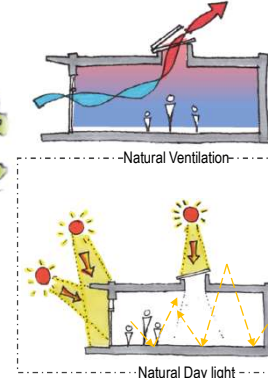
Use of neutral colours inside and outside

CONDUCTIVE ENVIRONMENTS

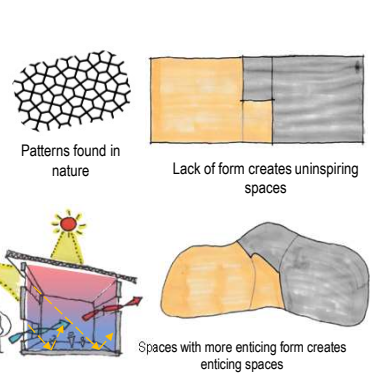
### CONTACT WITH NATURE INDOOR & OUTDOOR



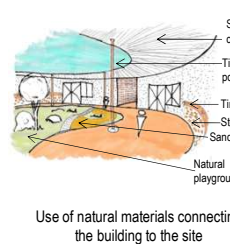
### PASSIVE DESIGN



### SOFT SUBTLE PLAYFUL FORM



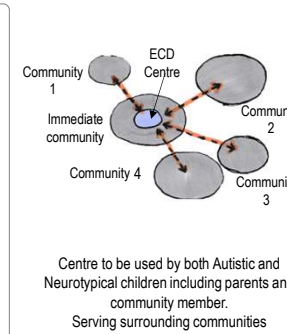
### COLOURS AND MATERIALS



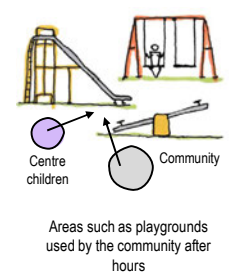
Use of natural materials connecting the building to the site

CHILDREN'S ENHANCED CONNECTION TO NATURE

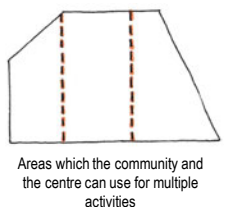
FAMILY AND COMMUNITY CONNECTIONS



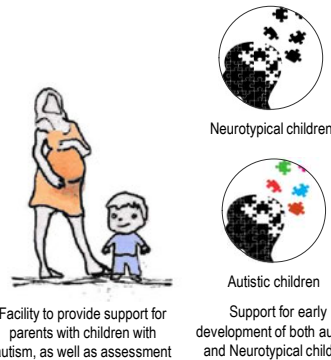
### COMMUNITY CONNECTION



### MULTI USE AREAS

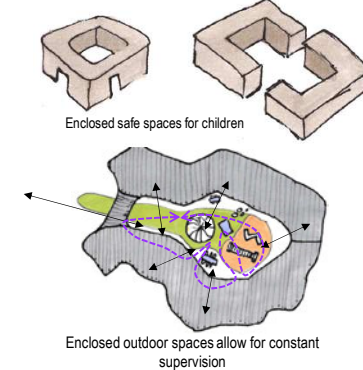


### SUPPORT FOR PARENTS

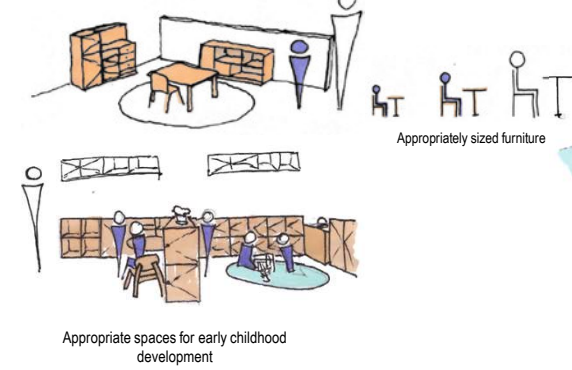


FAMILY AND COMMUNITY CONNECTIONS

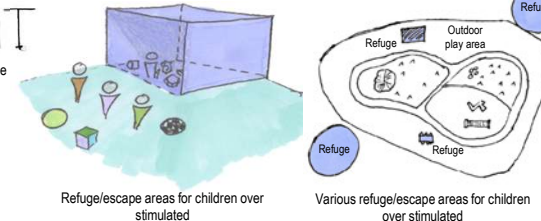
### ENCLOSED COURTYARD SPACES



### CHILD CENTRED DESIGN FOR ACTIVITIES AND USES



### SOCIAL AND ESCAPE SPACES



SENSE OF BELONGING



## CONTEXTURAL ANALYSIS

### CRITERIA



#### PRIMARY:

##### Topography:

Some children with autism battle with mobility, a relatively flat site would reduce the need for stairs and ramps to various levels.

##### Context:

The site needs to be situated in an environment that is calming and preferably within a space that is surrounding by residential properties. The site must have the potential to connect to the community to feel a sense of inclusivity and belonging.

##### Connection to nature:

The site needs to have a positive connection to sensory stimuli which benefits children with autism. Sight (views onto nature), sounds (Natural sounds away from industrial zones), smells (fresh air) and touch (ability to explore one's surroundings) will be important aspects of the site selection process. The site must allow for children to interact with nature on a personal level to grow the children's biophilia.

#### SECONDARY:

##### Need for the facility:

There must be a need for the facility, located away from other facilities to ensure children with autism are not neglected.

##### Proximity to clinic:

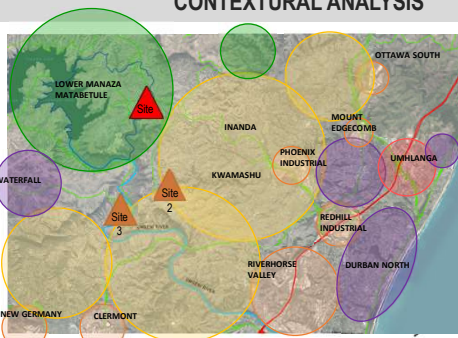
The site must be located near to a clinic to ensure when health issues arise there is medical care nearby.

##### Accessibility to site:

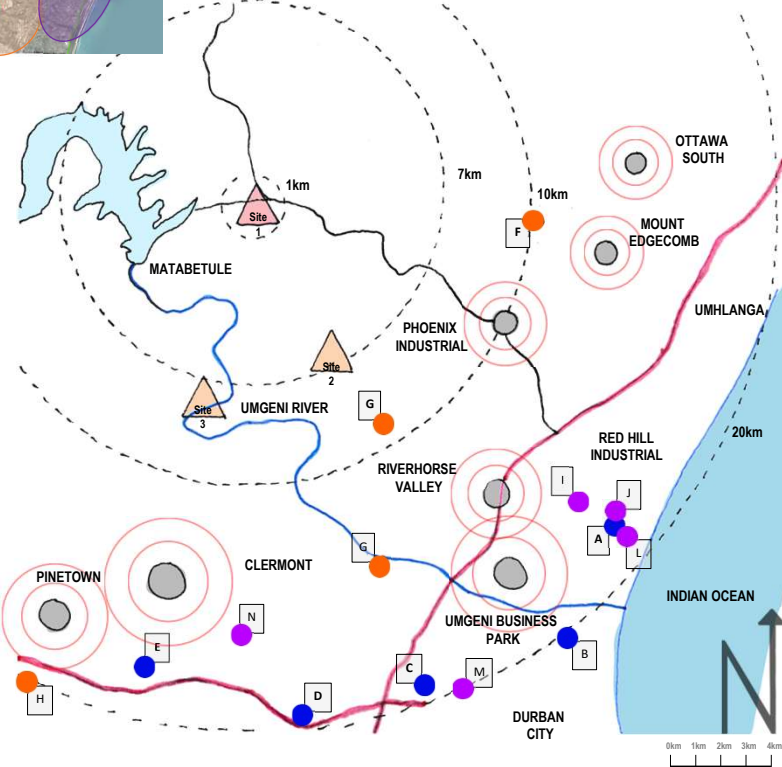
The site must be easily accessible by either pedestrian, vehicular, or public transport. The site must provide opportunities for onsite drop off to ensure a calm experience for children with autism to arrive at the facility. Connection to other communities are important to ensure more children get the support needed.

##### Site parameters:

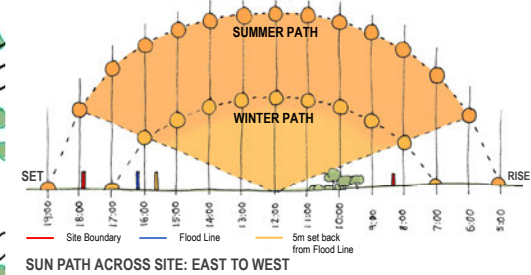
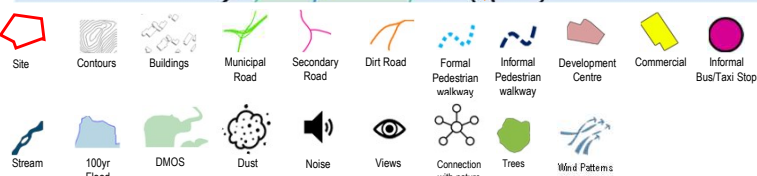
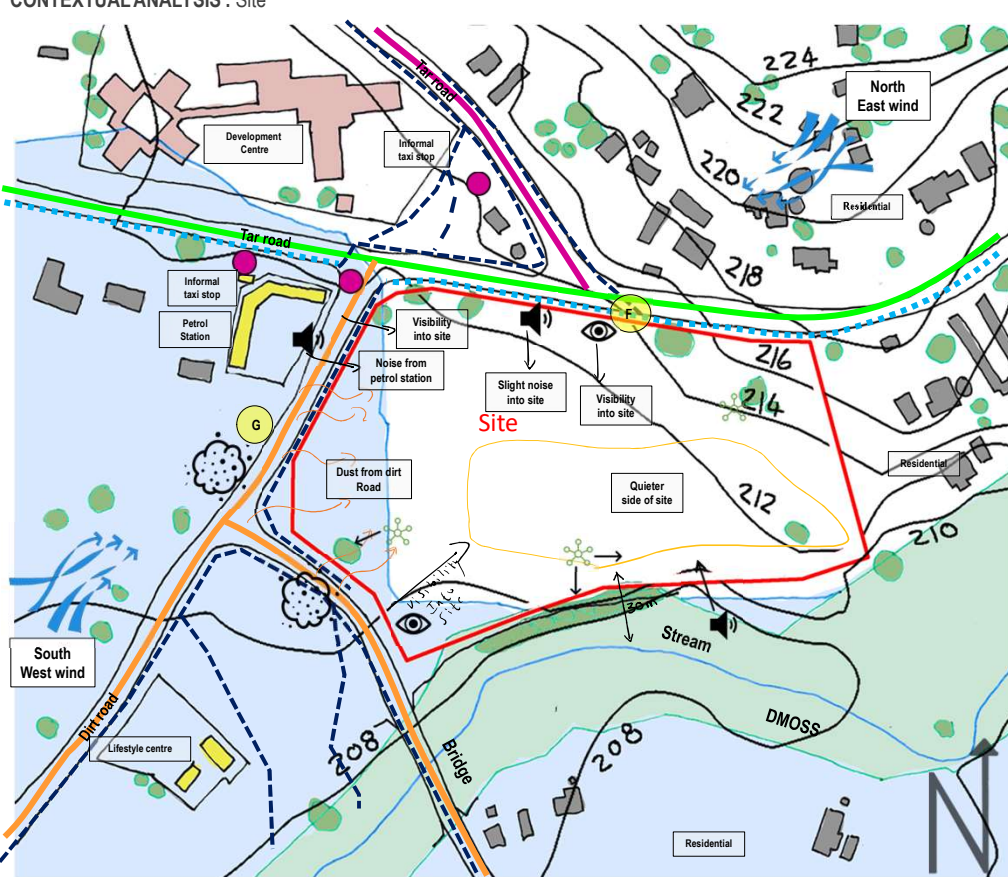
The size of the site must be able to accommodate the Early Childhood development centre accommodation, educational centre and onsite parking/drop off.



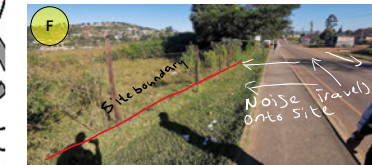
| DISTANCES FROM SITE IN MATABETULE TO SPECIALIZED FACILITIES |  |
|---|--|
| <b>AUTISM CENTRE PRIVATE</b>                                |  |
| A - Khanyisa Development Centre 21km                        |  |
| B - Hands and Hearts Centre 25km                            |  |
| C - Sherwood children's assessment centre 29km              |  |
| D - Pathways Centre 32km                                    |  |
| E - Whizz Kids Special needs Centre 36,2km                  |  |
| <b>AUTISM SCHOOL PRIVATE</b>                                |  |
| J - Action Autism 20km                                      |  |
| K - Autism Excellence 21km                                  |  |
| L - Radix James Remedial 22km                               |  |
| M - IBN Masud 31km  |  |
| N - Little Leaps 31,8km                                     |  |
| <b>SPECIAL SCHOOL GOVERNMENT</b>                            |  |
| F - S Dass School 11km                                      |  |
| G - Khalipha School 12,5km                                  |  |
| H - RP Moodley 25,1km                                       |  |
| I - Browns School 41km                                      |  |



## CONTEXTURAL ANALYSIS : Site



### SUN PATH ACROSS SITE: EAST TO WEST



Northern boundary of site adjacent to main road. Narrow pathway with no visual difference. A more defined pathway and separation between road and pedestrian walkway would benefit autistic children.



Future Petrol station opposite site will produce noise pollution, with increased traffic the dirt road will produce dust which may travel over into the site.

- Strength**
- Residential context
- Topography is flat
- Connection to nature
- Boundaries along main road have existing vegetation for screening of noise and privacy.
- Weakness**
- Along a main road
- Next to a petrol station
- Near to informal land fill
- Site is positioned near a 100yr flood line
- Opportunities**
- Well positioned to link to other communities
- 2 sides have access to roads to be used as entry points
- Threats**
- Open boundaries allow people to view private spaces
- Nearby landfill air pollution may travel with wind direction
- Adjacent road may produce high levels of traffic noise
- Flooding due to insufficient storm water management.

0km 20m 40m 60m

## CONTEXTURAL ANALYSIS : Urban

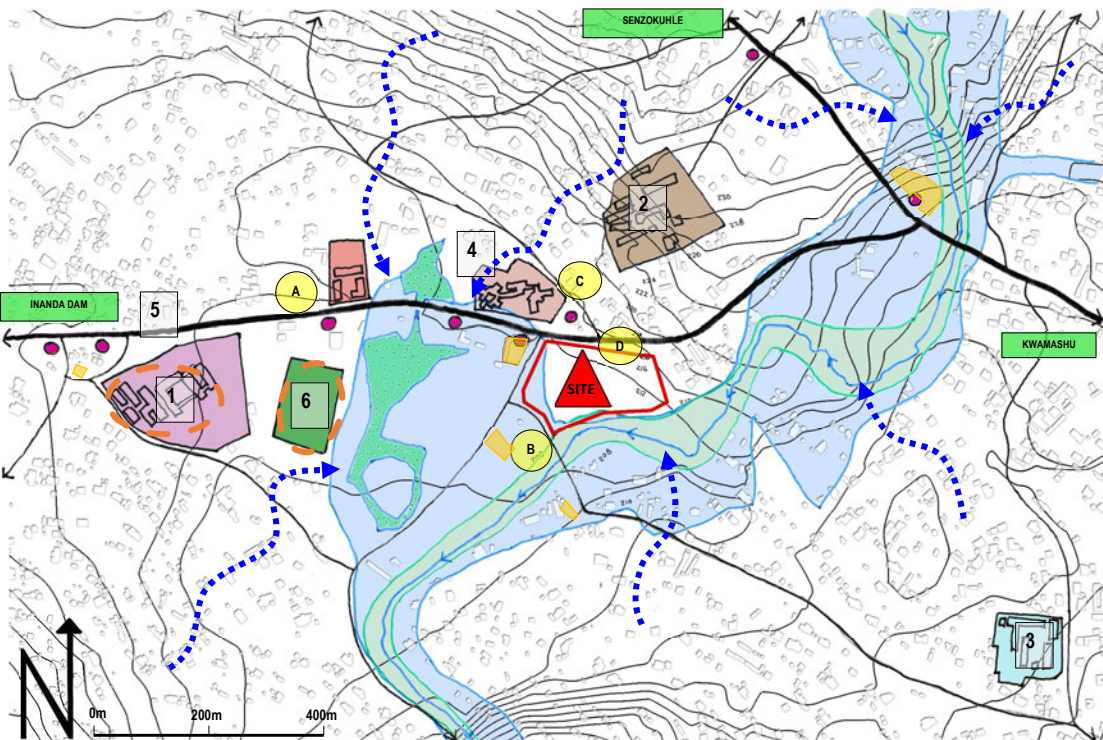


Photo A: The vicinity surrounding the site experiences adverse effects due to inadequate stormwater management. This results in runoff from the surrounding hills accumulating in lower-lying areas. Implementing effective stormwater management measures not only enhances safety for children and pedestrians but also benefits the community utilizing the open spaces.

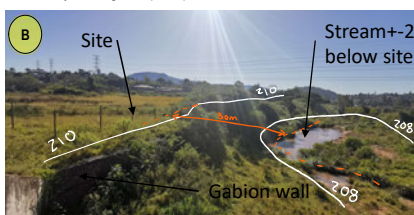


Photo B: The site is situated 2m above a riverine area, with a gabion wall between the site and the stream. Establishing a profound connection to nature, the site is characterized by lush vegetation screening, accompanied by the soothing sounds of the stream, where the gentle flow of water serves as a calming mask. Although a small part of the site falls within a 100-year flood plain, safety and resilience are ensured through a 30m setback from the river's center to the nearest building



Photo B: Showing informal taxi stop is visible across from the designated site. Given that children with autism often thrive in calm and well-structured environments to prevent meltdowns, the presence of a serene and organized setting becomes crucial.

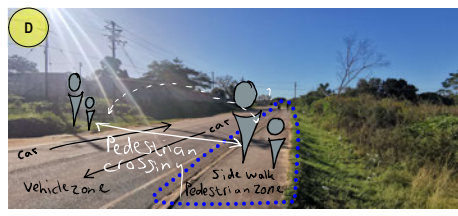
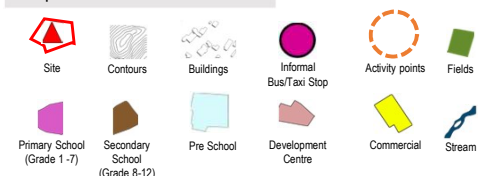
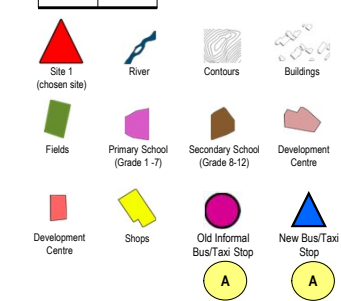
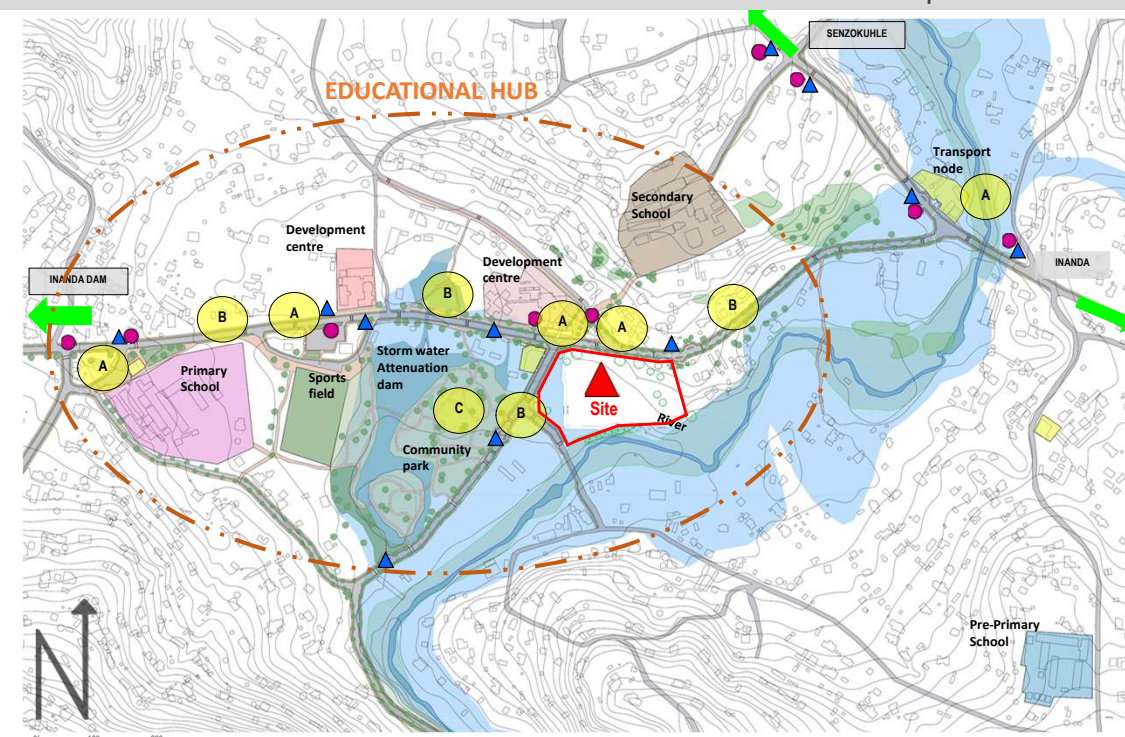


Photo C: Shows sidewalk same material as road. Sidewalk lacks any discernible demarcation or variation in materials. This absence of distinction may result in a distressing experience for autistic children when traversing on foot as they require well defined spaces and sometimes lack the ability to differentiate between objects.

1. Primary School - Hlegimpilo
2. Secondary School - Mjohawe
3. Pre School - Vusukukhanya primary School
4. Development Centre - Prophet Isaiah Shembe One Stop
5. Clinic
6. Sports Ground



## CONTEXTURAL ANALYSIS : Urban Response



### OUTDOOR PARK FOR SOCIAL ACTIVITIES



C- Public park to have a natural outdoor play area for children to explore nature and socialise between themselves.

### WELL DEFINED SIDEWALKS



B- Sidewalks to be well defined by implementing planters and a different material from the road. This helps reduce stress levels for autistic children.

### URBAN RESPONSE DRIVERS:

- Landscaping to reduce traffic noise along main road
- Street calming interventions
- Pedestrianize street edges
- Storm water management to reduce flooding
- Social spaces along street edge and in park setting
- Formalise bus and taxi stops
- Central park to connect the community
- Edible and indigenous landscaping

### FORMALIZATION OF TAXI AND BUS STOPS



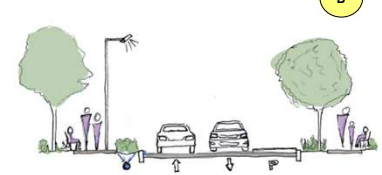
A- Upgrade and implement new well defined formal public transport stops with planter barrier, to aid children with autism have a well-structured environment.

### STREET CALMING AND ROAD CROSSING



A- Add street calming measures and formal road crossings to help autistic children cross the road. Well-structured environments are beneficial to autistic children.

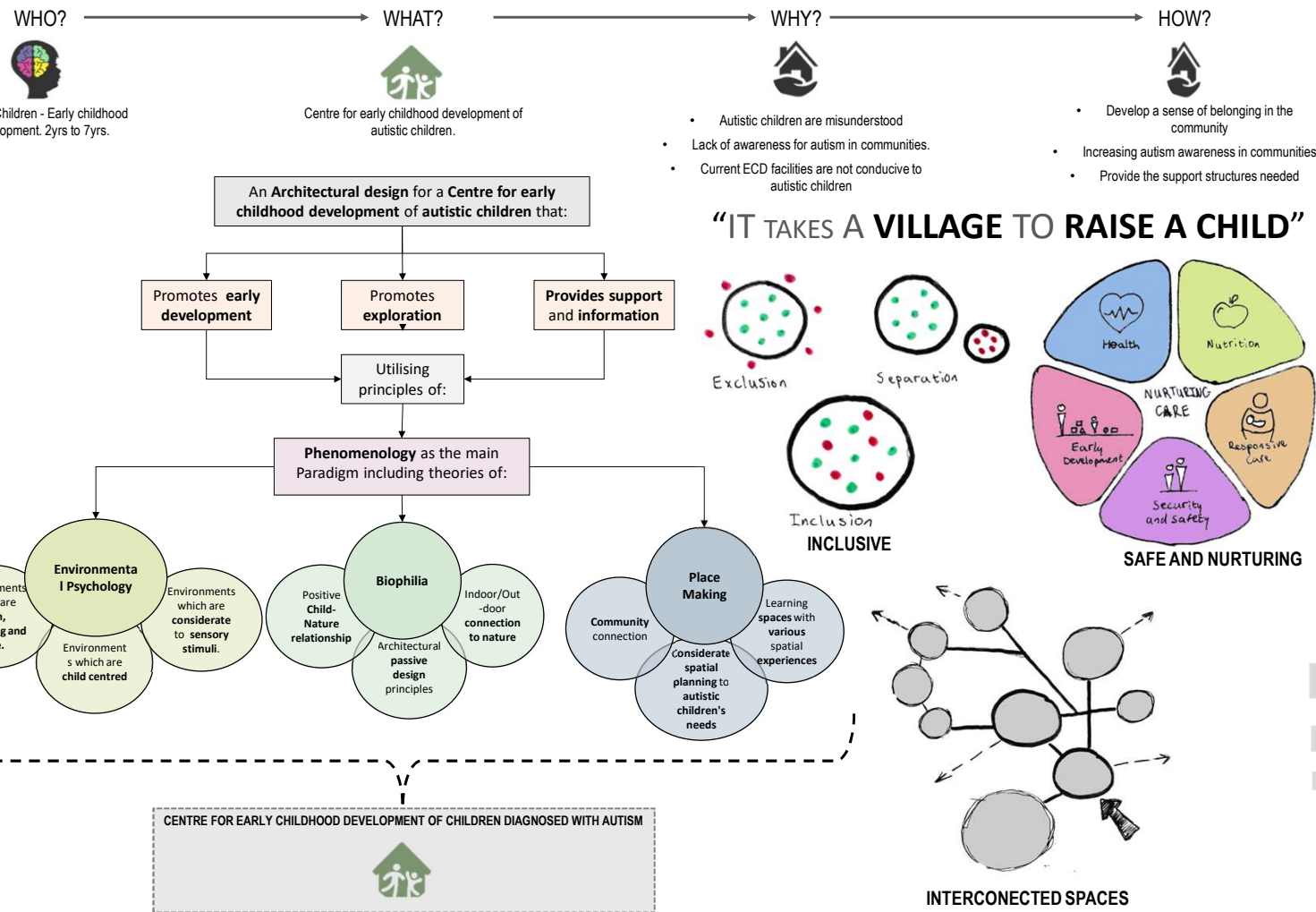
### STORM WATER MANAGEMENT



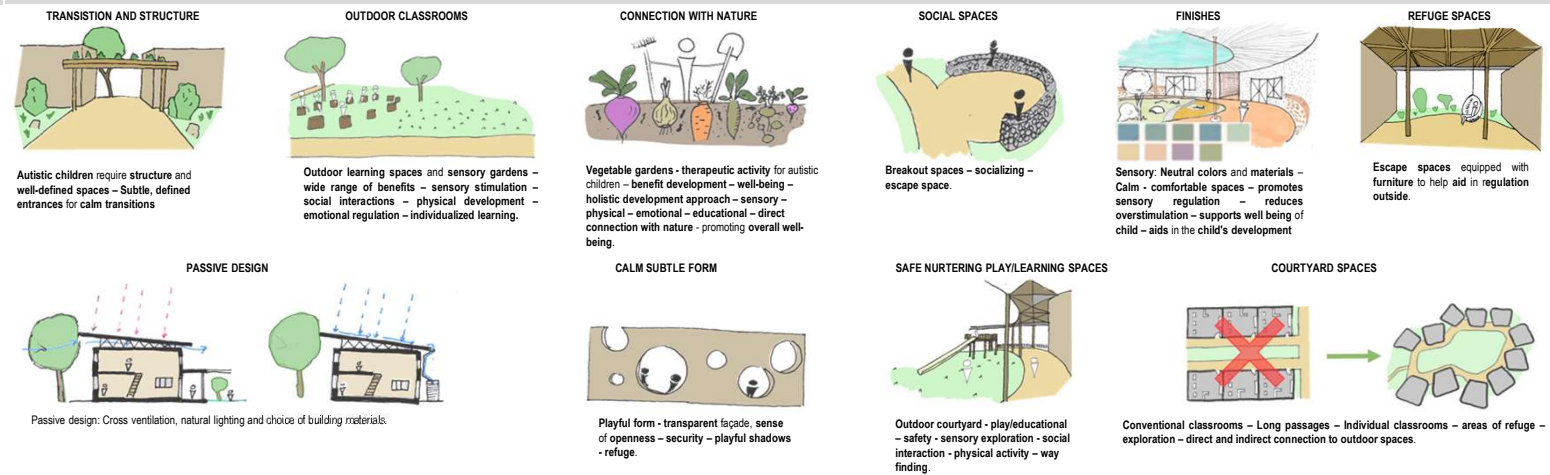
B- Implement Storm water management system to reduce flooding, add sidewalk planters to separate pedestrian walkway and road to reduce stressful situations for children with Autism.



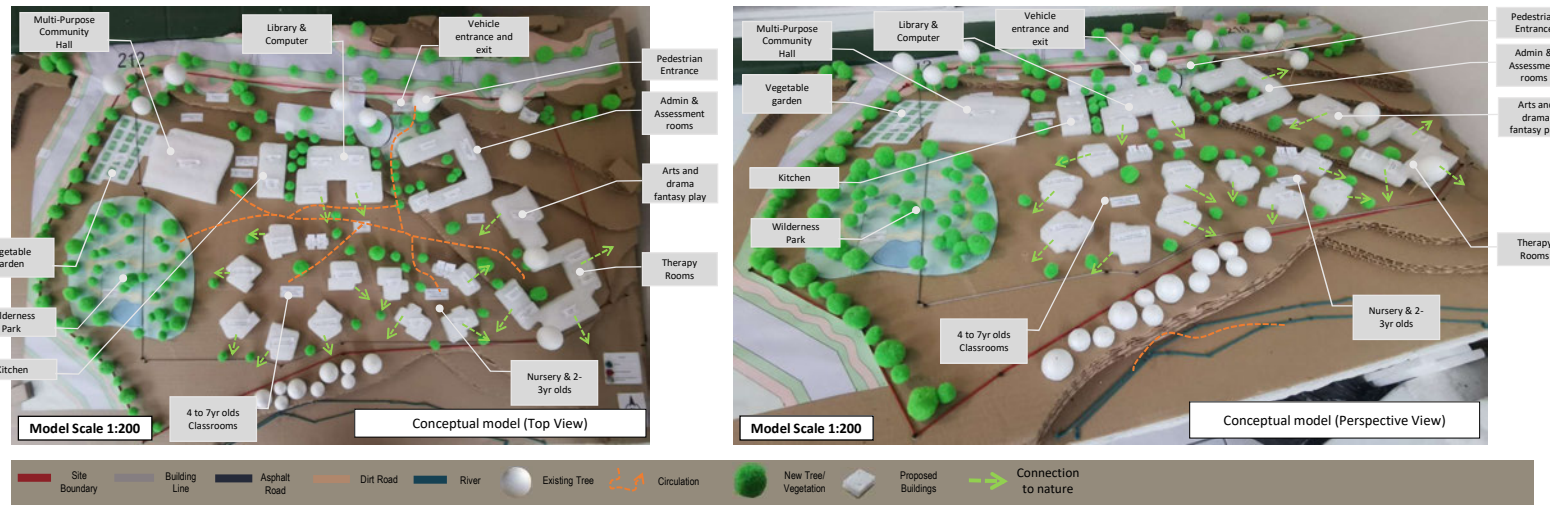
## ARCHITECTURAL BRIEF & CONCEPT



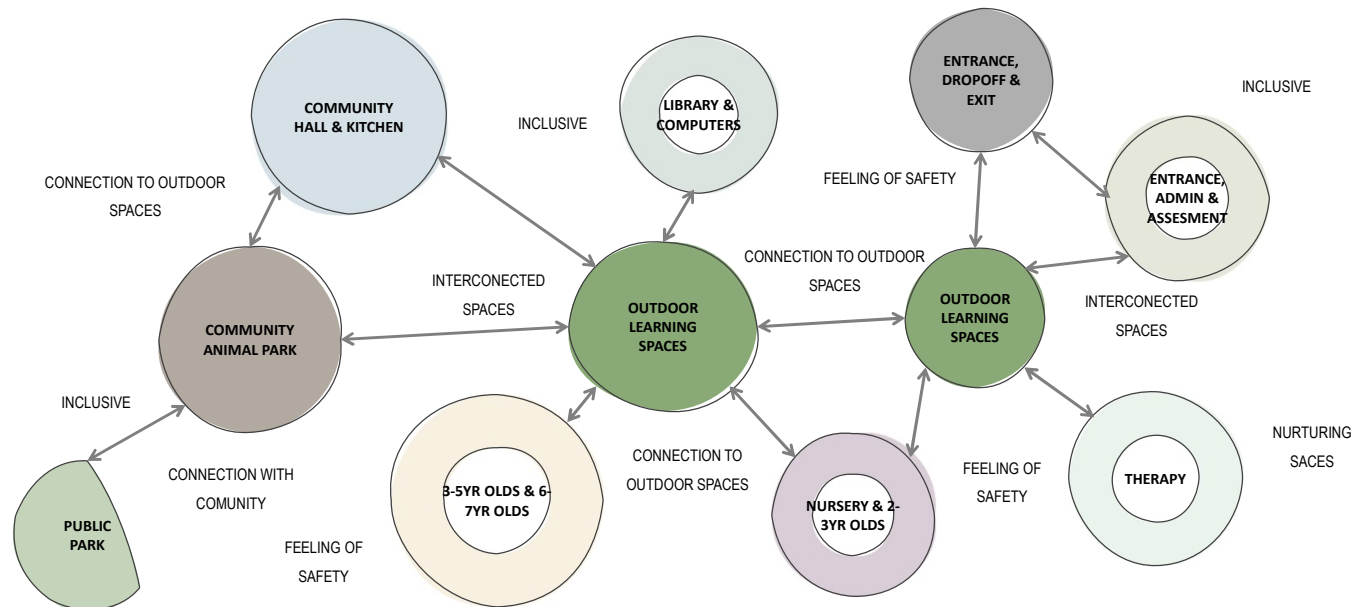
## CONCEPTUAL THINKING



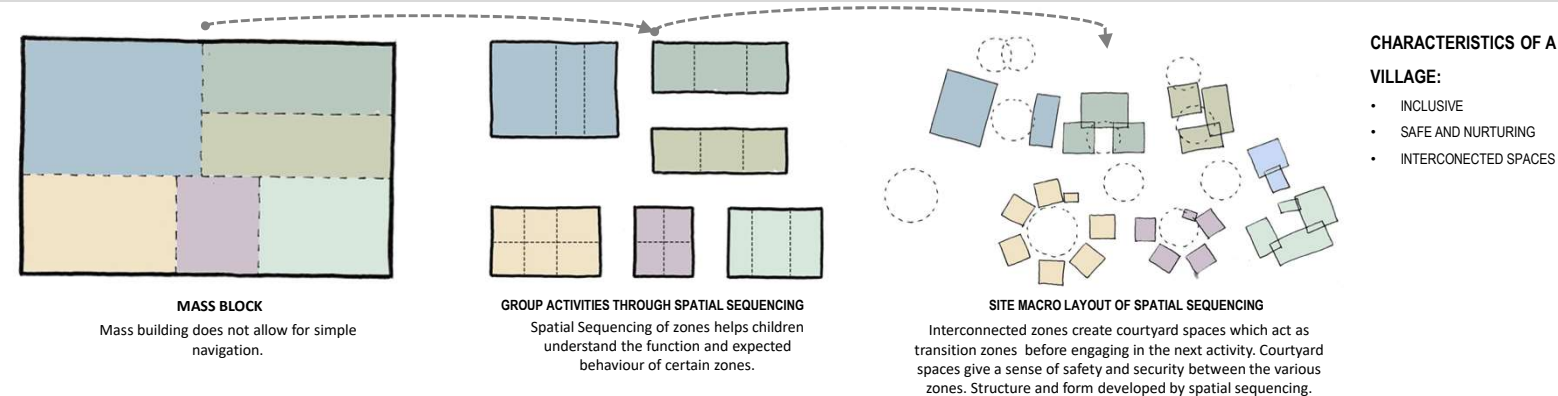
## ARCHITECTURAL DESIGN EXPLORATION: Conceptual Thinking



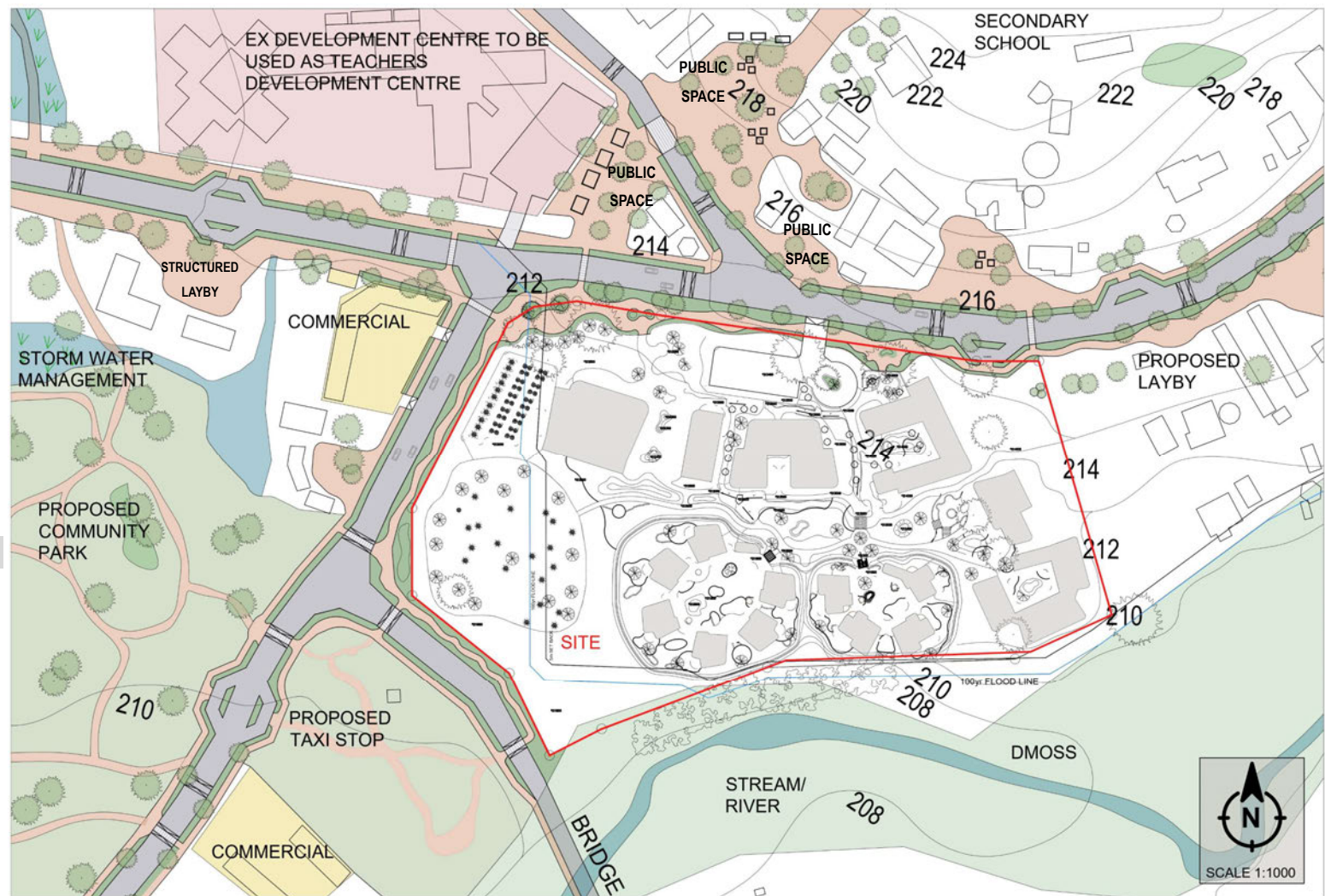
## SPATIAL ARANGMENT



## FORM DEVELOPMENT



## LOCALITY PLAN







**SITE PLAN SHOWING INTERNAL LAYOUT**  
1 : 200

**AREA SCHEDULE**

SITE AREA: 20 903 SQM  
BUILDING AREA: 3 691 SQM





**NURSERY & 2-3 YR OLDS PLAN VIEW**  
1:100



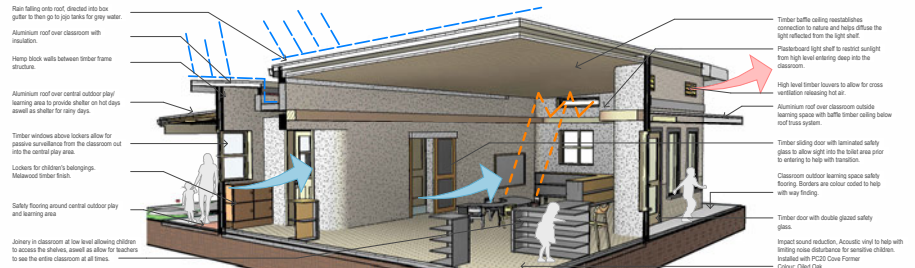
**NORTH ELEVATION 2-3YR OLD CLASSROOM**  
1:50



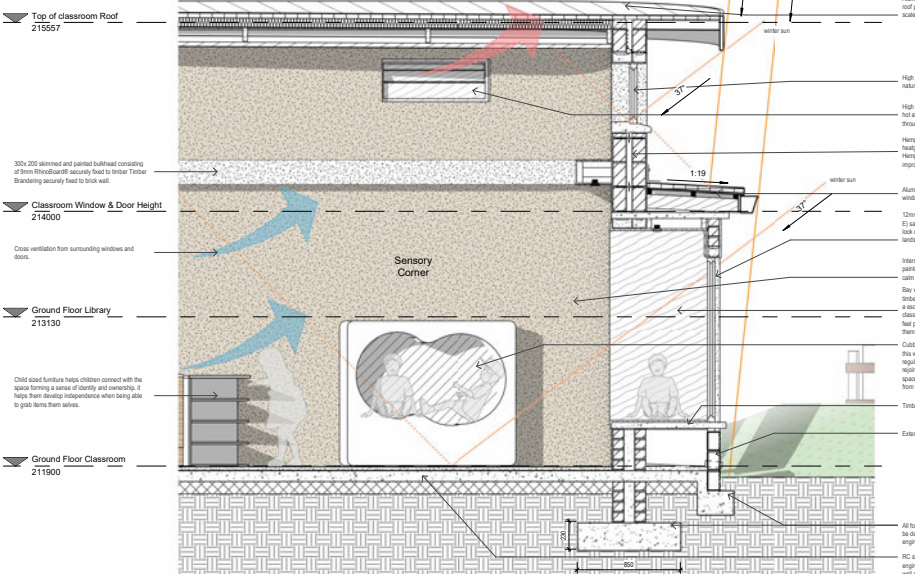
**EAST ELEVATION 2-3YR OLD CLASSROOM**  
1:50



**Section A 2-3Yr Olds**  
1:50



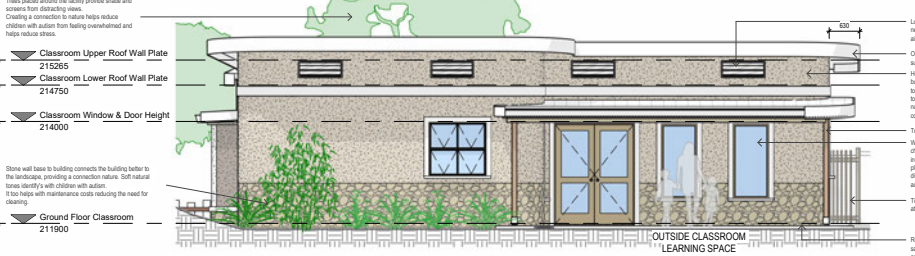
**2 to 3YR CLASSROOM ISOMETRIC SECTION VIEW NTS**



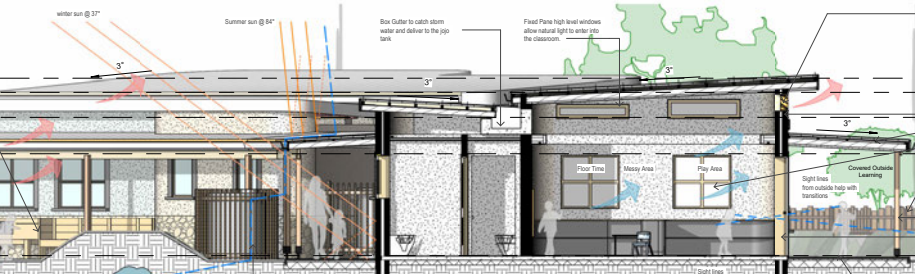
**Section C**  
1:20



**SOUTH ELEVATION 2-3YR OLD CLASSROOM**  
1:50



**WEST ELEVATION 2-3YR OLD CLASSROOM**  
1:50



**INTERNAL PERSPECTIVE OF CLASSROOM LOOKING FROM DOORWAY**



**INTERNAL PERSPECTIVE OF CLASSROOM LOOKING FROM SENSORY CORNER**



**EXTERNAL PERSPECTIVE OF CENTRAL PLAY AREA FROM UNDERCOVER WALKWAY**



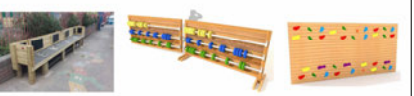
**EXTERNAL PERSPECTIVE OF CENTRAL PLAY AREA FROM ABOVE**



**EXTERNAL PERSPECTIVE OF CLASSROOMS FROM ABOVE**



**INTERNAL PERSPECTIVE OF SENSORY / ESCAPE CORNER**

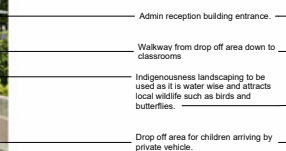
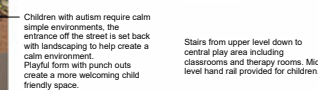
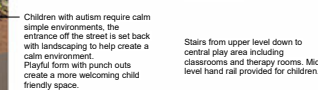
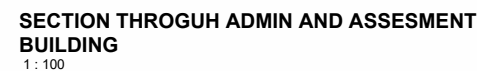


**MESSY TABLE AND SENSORY PLAY**

**ABACUS ON WALL**

**CLIMBING WALL**













MAIN PEDESTRIAN ENTRANCE





ENTRANCE/ DROP-OFF AREA SHOWING CENTRAL WALKWAY LEADING TO CLASSROOMS





ON SITE DROP OFF WITH ADMIN BUILDING





ADMIN BUILDING WITH CENTRAL WALKWAY DOWN TO CLASSROOMS





CENTRAL STAIRS WITH STAFFROOM OVERLOOKING PLAY AREA





CENTRAL PLAY AREA WITH LIBRARY AND COMPUTER LABS ABOVE





CENTRAL PLAY AREA WITH SENSORY GARDEN AND PATHWAY LEADING TO THERAPY ROOMS





VIEW OF CENTRAL PLAY AREA FROM STAFF ROOM OUTSIDE AREA





SENSORY GARDEN AND ARTS & DRAMA/ FANTASY PLAY AREA





SENSORY GARDEN AND ARTS & DRAMA/ FANTASY PLAY AREA





THERAPY ROOMS AND FROM SENSORY GARDEN





THERAPY ROOMS AND OUTSIDE AREA'S





THERAPY ROOMS INTERNAL COURTYARD





NURSERY AND 2 YR OLDS CLASSROOMS CENTRAL PLAY AND LEARNING AREA





NURSERY AND 2 YR OLDS CLASSROOMS CENTRAL PLAY AND LEARNING AREA





NURSERY AND 2YR OLDS CLASSROOMS CENTRAL PLAY AND LEARNING AREA





2 YR OLDS CLASSROOMS INDIVIDUAL FROM FRONT DOOR





2 YR OLDS CLASSROOMS SENSORY CORNER





2 YR OLDS CLASSROOMS INDIVIDUAL DESK AND MESSY TABLE





4-5 & 6-7YR OLDS CLASSROOMS ENTRANCE OFF MAIN PATHWAY





4-5 & 6-7YR OLDS CLASSROOMS CENTRAL PLAY AND LEARNING AREA





4-5 & 6-7YR OLDS CLASSROOMS CENTRAL PLAY AND LEARNING AREA





4-5 & 6-7YR OLDS CLASSROOMS CLASSROOM OUTSIDE LEARNING SPACE





LIBRARY – KITCHEN - MULTI PURPOSE COMMUNITY HALL





MAIN KITCHEN AND MULTI PURPOSE COMMUNITY HALL





MULTI PURPOSE COMMUNITY HALL PLAY AREA





MULTI PURPOSE COMMUNITY HALL AND KITCHEN





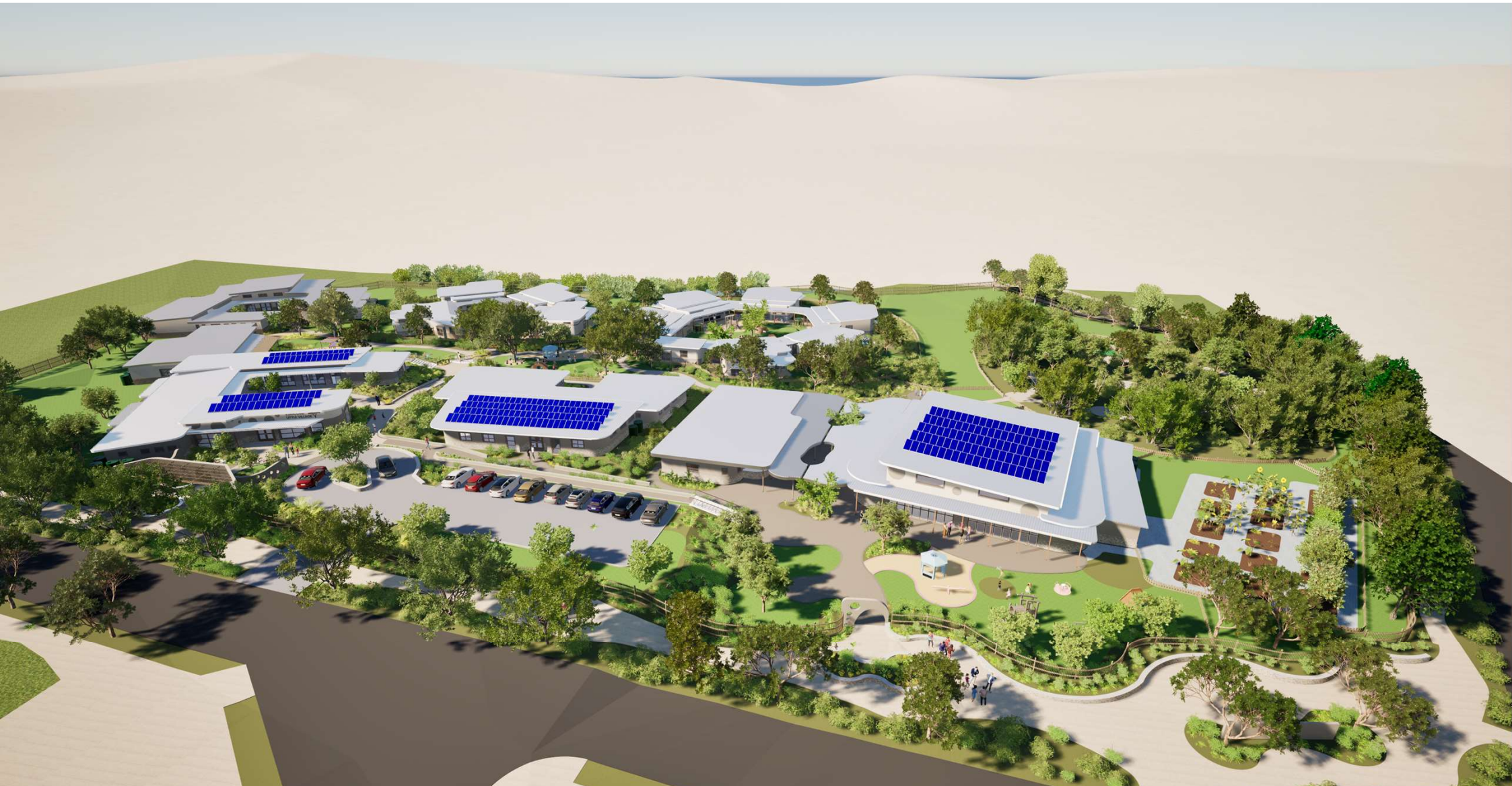
ADULT LIBRARY AND COMPUTER LABS





LAYBY AREA AND ASSESMENT ROOM EXTERNAL AREA





NORTH VIEW OF SITE





SOUTH VIEW OF SITE