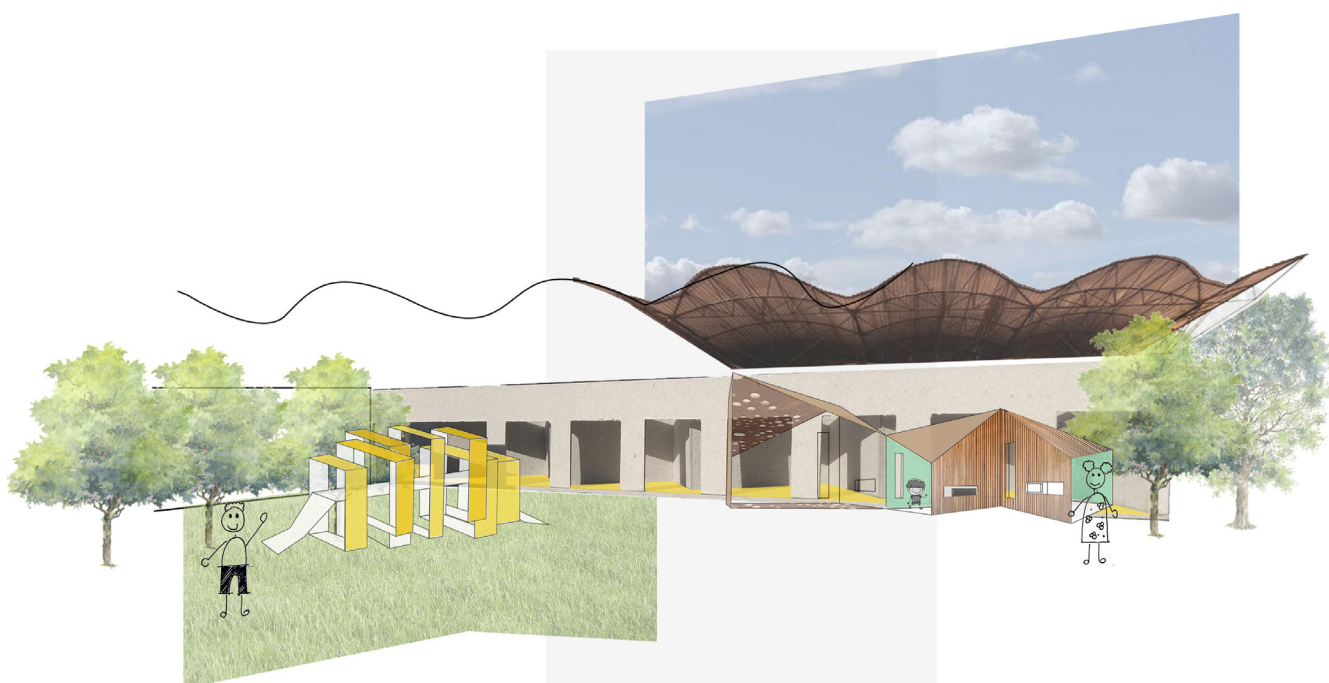


[IN]BETWEEN - Using environmental psychology for the early intervention of learning difficulties at Sunshine Nursery School, Hammanskraal



by
Vuyisile Mkandla

THE 100 LANGUAGES

The child is made of one hundred.
The child has a hundred languages
A hundred hands
A hundred thoughts
A hundred ways of thinking, of playing, of
speaking.

A HUNDRED, ALWAYS A HUNDRED.

Ways of listening
Of marvelling, of loving
A hundred joys for singing and understanding
A hundred worlds to discover
A hundred worlds to invent
A hundred worlds to dream.

The child has a hundred languages
[and a HUNDRED HUNDRED HUNDRED more]
But they steal ninety-nine.
The school and the culture separate the mind from
the body.
They tell the child:
To think without hands
To do without a head
To listen and not to speak
To understand without joy
To love and marvel only at Easter and Christmas.

They tell the child:
To discover the world already there
And of the hundred, they steal the ninety- nine.

They tell the child:
That work and play
Reality and fantasy
Science and imagination
Sky and earth
Reason and dreams
Are things that do not belong together.

And thus they tell the child that the hundred is not
there.

The child says:

NO WAY. THE HUNDRED IS THERE!

-Loris Malaguzzi-
(Translated by Lella Gandini)

Submitted in fulfilment of part of the requirements for the degree Master of Interior Architecture (Professional) in the Faculty of Engineering, Built Environment and Information Technology.

By Vuyisile Mkandla

Department of Architecture
University of Pretoria
2020

Study Leader: Zakkiya Khan
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Course coordinator: Catherine Karusseit

In accordance with Regulation 4(c) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Interior Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

Dissertation title

[IN] between - Using environmental psychology for the early intervention of learning difficulties at Sunshine Nursery School, Hammanskraal

Programme

Inclusive Early Childhood Development Centre

Address

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409 Cremona Street, Renstown, Hammanskraal, Gauteng

GPS Coordinates

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Research Field

Environment Potential (EP)

Client

Youth With a Mission (YWAM), Hammanskraal

Users

Children with learning difficulties

Keywords

Autoethnography, Early Childhood Development Centre, Environmental psychology, Learning difficulties, Narrative analysis

Interior Architectural approach

The design intervention is for an Early Childhood Development Centre. The investigation aims to support children with learning difficulties in a barrier free environment, providing them with the tools to enrich their development. The principles of environmental psychology are applied to the design of learning spaces to support social, intellectual, perceptual-motor and emotional development.

Abstract

Early childhood development (ECD) centres in townships often face environmental challenges concerning the implementation of the rights of children with learning difficulties to receive an education at a school within their local community. Within the field of environmental psychology, these challenges include the spatial legibility of an environment as well as the efforts of spatial and object design to reduce the effects of environmental stress on the user.

The study examines the extent to which children aged five and six with learning difficulties are able to interact with the physical environment of a mainstream ECD, specifically Sunshine Nursery School, Hammanskraal. Further, the implication that the design of the classroom environment might have on the individual developmental needs. The four crucial areas of child development: perceptual-motor, intellectual, social and emotional, are considered in examining the meaning of space and the classroom. A theoretical enquiry is undertaken to propose an effective learning environment for all children, in which their social and physical needs are met, regardless of their learning ability.

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Preface

A narrative introduction for chapter 1 and 2

Sizwe is a **six year old** boy in Grade R. He lives in Renstown with his father and mother. Sizwe's day in class is filled with a lot of **frustration on the part of those around him**. He fidgets a lot, **interrupting learning activities** that require quiet and concentration. Sizwe finds it difficult to complete tasks in class and has **trouble with the confines of the classroom**, resulting in disruptive behaviour.

The extrovert



Didintle is a **five year old** girl in Grade RR who lives in Temba with her mother, grandmother and seven year old brother. She is a **reserved** young girl, and only has one friend at school named Nthabiseng. Although Didintle and Nthabiseng are friends, she has **uncertainties about welcoming Nthabiseng into her personal space**. She is kind, but to children in her class who do not understand her **difficulties with social interaction**, she is classified as 'different'.

The introvert



Thabang is a **six year old** boy in Grade R, who lives with his parents and baby brother. Unlike Sizwe, Thabang's day is filled with **frustration at his own expense**. He has **difficulty following instruction**, resulting in him grasping concepts at a slower rate to his classmates. He also experiences **difficulty with sensory perception** resulting in a delayed spatial, auditory and visual awareness. This results in him avoiding interaction with the other boys in his class, fearing they might bully him because he **struggles to keep up to their rate of cognitive, physical and social development**.

The anxious child

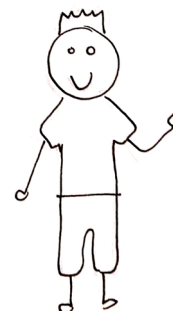


Figure 1. The child with a colourful mind (Author, 2020)

Introduction

Chapter 1 outlines the significance of an inclusive learning environment for children with learning difficulties by introducing the rights of all children to an education that supports a diversity of neurological, as well as cultural and contextual needs.

01 PROJECT PROPOSAL

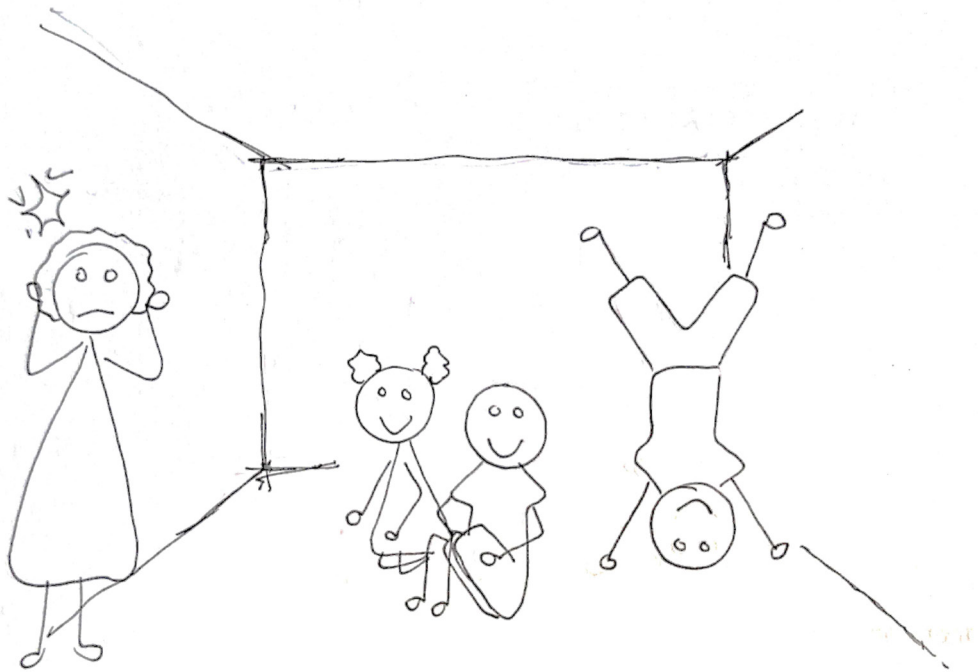


Figure 2. Learning and the extroverted child (Author, 2020)

1.1 Background

The primary objective of a nursery school should be to support the socio-emotional, cognitive and developmental needs of all students (Smogorzewska, et al., 2019). These environments have an influence on the behaviour(s) of children that will later influence their role in society. It is essential that all children, regardless of their dis/ability are included in this foundational plan, which will offer them the opportunity to integrate into society with the same opportunities as their peers.

The opening years of the 21st century has seen an 80 percent increase in children presented with “having a specific difficulty which hinders their learning” (Macintyre & Deponio, 2003). It is therefore possible that at any one stage, every teacher at an Early Childhood Development (ECD) Centre will encounter children who fall into what has evolved as a wide spectrum of learning difficulties.

In South Africa, every child has the right to an education at a local school in their community, regardless of their dis/ability (Department of Education, 2001). This right entitles children with learning difficulties to the basic support they need in order to enable learning in the same environment as their peers and not be excluded from schools that offer mainstream educational programmes. Young children in their developmental years learn from the social and physical aspects of the environment (Kopec, 2012, p. 216). Therefore, children with learning difficulties attending mainstream schools, benefit from the interaction with their peers as well as an environment designed with a strong emphasis on the needs of all its learners.

Studies show that children in the primary developmental phase, the years typically spent at an ECD centre, require a variety of “physical and emotional stimuli” and an “interactive and symbiotic relationship” between individuals and their respective environments (Kopec, 2012, p. 112). Furthermore, a successful design of a learning environment that provides opportunities for children with learning difficulties is one that is free from barriers that would otherwise hinder their learning and development (Macintyre & Deponio, 2003). Schools need to work towards a goal to accommodate the diversity of learning needs for children in the local community (Department of Basic Education, 2018), so that they can benefit from social relationships geared at progressive development.

1.2 Interior architectural issue

Guidelines for the transition from a design that was oriented at mainstream education to an inclusive environment is not necessarily met with the needs of the development of children with diverse neurological difficulties in mind. In the case of Sunshine Nursery School, Hammanskraal, the potential for such an intervention is promising. However, the existing classroom layout and interior fit-out does not meet the spatial and organisational requirements that would ease environmental stress (Figure 3) on the children. Controlled environmental factors such as accessibility, circulation, choice and control, density, legibility, safety and sensory considerations (acoustics, colour, lighting and materiality) are among the main design considerations that have been identified. The lack of these environmental considerations hinder the productive learning of children with learning difficulties.

The existing floor area of each classroom at Sunshine Nursery school is 32m², with an average of 28 learners per classroom, thus, the majority of the classrooms do not provide the required 1,5m² per child (Department of Social Development, 2006). With a densely populated classroom, this does not readily provide the freedom of movement and the manipulation of space required for a sense of choice and control (Kopec, 2012). Dimensions of the physical environment that exacerbate stress, hindering children from learning, will be addressed. The potential of the built environment to support the socio-emotional, cognitive and developmental needs of children with learning difficulties (Smogorzewska, et al., 2019), and the ability to navigate the daily programme, will be addressed with the principles of environmental psychology.

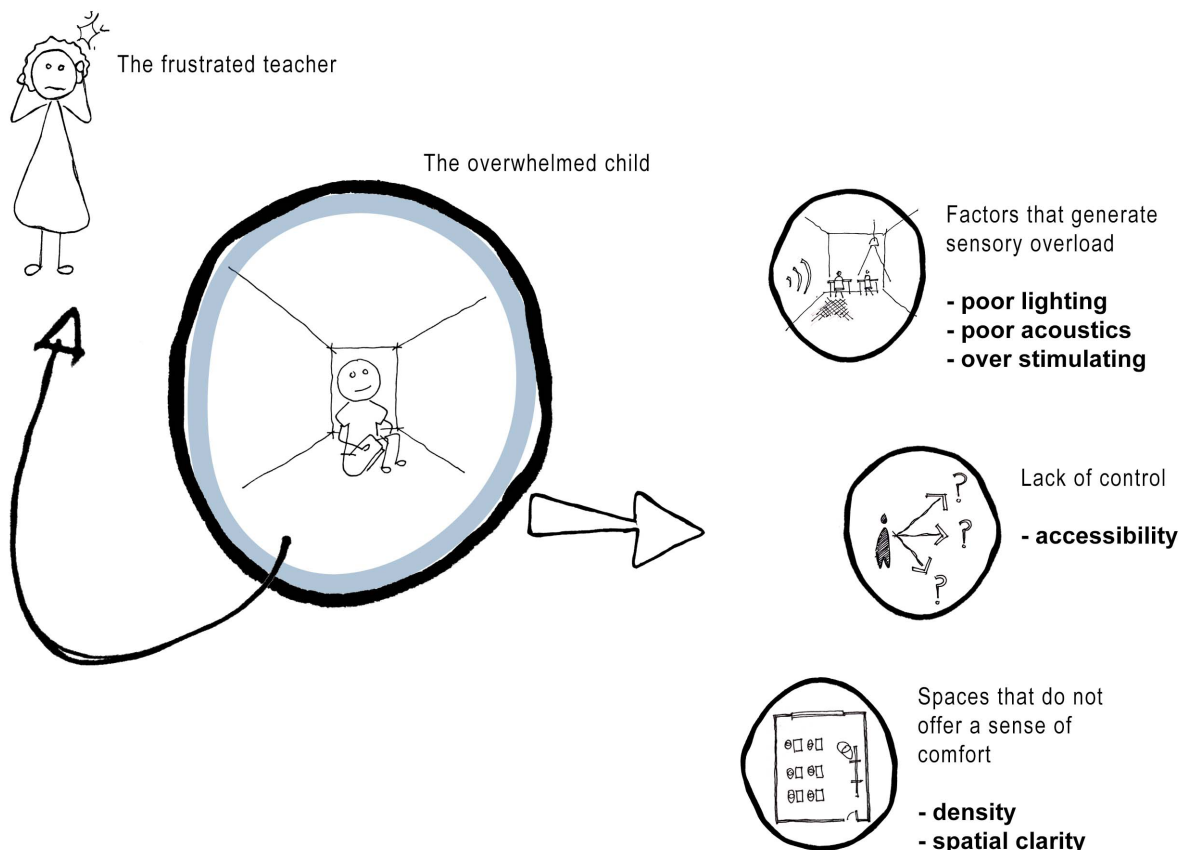


Figure 3. The impact of physical environmental factors on learning development, (Author, 2020)

1.3 Research question

How can the principles of environmental psychology be applied to support the developmental needs of children with learning difficulties at Sunshine Nursery School?

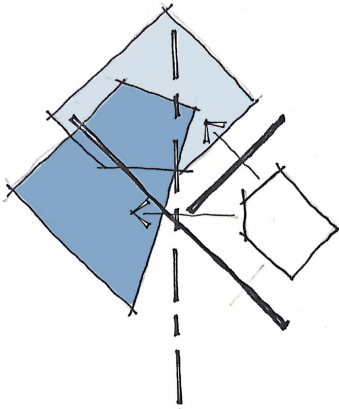


Figure 4. Active engagement with the learning environment (Author, 2020)

1.3.1 Theory

How do existing theories on environmental psychology and learning difficulties apply to the child as an active participant in the learning environment?

1.3.2 Context

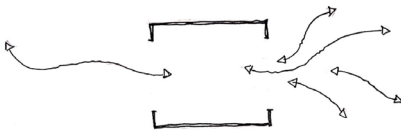


Figure 5. Enabling environments for active engagement, (Author, 2020)

Which environmental factors at Sunshine Nursery School hinder the active engagement required to assist the learning development of children with learning difficulties?

1.3.3 Design

How can the physical environment be adapted through an interior architectural intervention to benefit the developmental needs of children with learning difficulties?

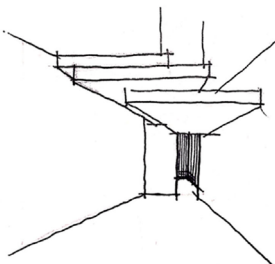


Figure 6. Using scale to respond to a child's perception of space, (Author,2020)

1.4 Aims and objectives

The aims and objectives of the study are three-fold; addressing theory, context and design.

1.4.1 Theory

The first aim is to develop guidelines from theories on environmental psychology and learning difficulties to generate a pattern language (Alexander, et al., 1977) for the design intervention at Sunshine Nursery School.

The pattern language is developed from a theoretical inquiry that supports the teachers' perceptions of the existing learning environment at Sunshine Nursery School, a user profile that is analysed as a behavioural archetype and a precedent study analysed with the principles of environmental psychology.

1.4.2 Context

The second aim is through a context study to establish the environmental factors affecting children's development.

The autism ASPECTSS Index is used to map the physical environmental factors that contribute to the cause of environmental stress on children with a sensitivity to sensory stimuli (Mostafa, 2015) and related issues. Teachers' perceptions of the whole school (meso study) and the classroom environment (micro study) are mapped using the assessment tool.

1.4.3 Design

The third aim is to generate a new conceptualisation of 'classroom' as a learning environment.

Data is collected from various precedent studies to assess the standard of learning environments being used to guide the development of young children. The thematic analysis (c.f. 1.6) generated from the theoretical inquiry is developed as a guideline that can be used to design productive learning environments for children with learning difficulties. Children's development can be affected by how much control they have over their environments (Kopec, 2012; Macintyre & Deponio, 2003), therefore choice and control become critical to the design development. The outcome is to establish Sunshine Nursery School, not only as an Early Childhood Development Centre for children with learning difficulties, but as an environment within the community linked to a resource centre to support families in alleviating barriers of exclusion for children with learning difficulties.

1.5 Methods

The research methodology used in the study will be based on qualitative data analysis, which is the author's interpretation and understanding of the data (SAGE Publications, 2020).

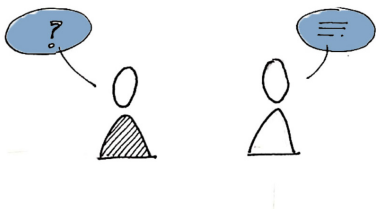
Figure 7. Autoethnography, (Author, 2020)

Figure 8. Semi-structured interviews (Author, 2020)

Figure 9. Narrative analysis, (Author, 2020)



Autoethnography is the point of departure for the study, which is a narrative of the author's personal experience in exploring the research topic (SAGE Publications, 2020). This narrative will provide an account of the experience as a volunteer at Sunshine Nursery School in 2016. The narrative takes the form of written and graphic narrative. Narration of the dissertation consciously recalls moments during the time as a teaching assistant to verify the observations of interviewees and to test design thinking. The graphic narratives interpret each chapter's aim through lived experience. It is further supported by the teacher's narrative whom the author assisted.

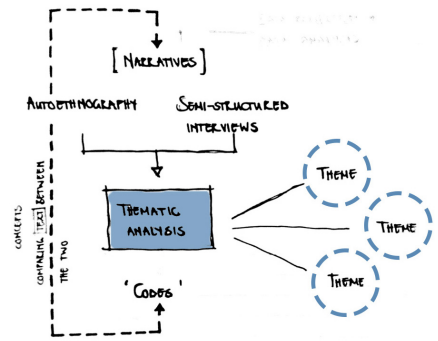


Semi-structured interviews are conducted with teachers from Sunshine Nursery School, as well as an interview with the school principal. In a semi-structured interview a combination of open and closed questions are posed to the participants (SAGE Publications, 2020), giving room for a discussion to take place. The discussion format of the interview will give the participants freedom to express any opinions they might have to support the study. The interviews will give an account of the effects of the environment on the children and fill in the gaps where the autoethnography fails to address critical issues.



Narrative analysis is the interpretation of stories generated from participants in the research (SAGE Publications, 2020). The interpretation of the Rens family history will outline the founding and development of Renstown, the area where Sunshine Nursery School is located. A brief history on the surrounding areas of significance is used to contextualise the development of the nursery school.

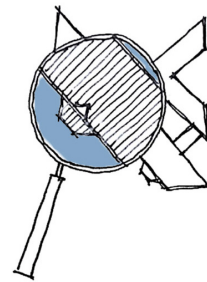
The final process of qualitative analysis is **thematic analysis**. This method provides a systematic approach to coding and theme development (Smith, 2015). The analysis serves as an informant for the development of a pattern language which will serve as guidelines for the design of an Early Childhood Development Centre. Data for the thematic analysis is gathered from the autoethnography and the interviews in the coding process, while informants from the theoretical enquiry, context analysis, precedent studies and user profiles add a secondary layer to the generation of the pattern language.



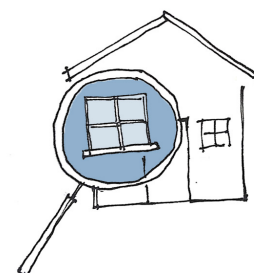
The **theoretical enquiry** is conducted to formulate a theoretical premise for the study, outlining existing and established theories (Solent Online Learning, n.d.). In order to provide a context for the proposal, the theoretical enquiry will look at theories in environmental psychology, child development and learning difficulties. This will help to frame a theoretical framework for the study.



Design analysis is the most practical way of gaining insight into the process of an existing site or building (Leupen, et al., 1997). This process is undertaken through site visits and documentation (observation drawing and text), to assess the characteristics of the site and its context in terms of accessibility, choice and control, legibility and safety; environmental issues that affect use by learners and educators alike (Steg, et al., 2013).



Local and international **precedent studies** provide design informants for the study of learning environments for children with learning difficulties. The studies look at school models illustrative of the theoretical premise as well as inclusive programme and active engagement between user and object/product. The precedent studies are executed in an attempt to distil design principles gained from built examples. (Wang & Groat, 2013).



1.6 Limitations

Ethics

The ethical clearance for this study disqualifies interaction with, and/or the observation of children, therefore the site may only be accessed outside of school hours. As a result, the study will rely on the author's interpretation in order to capture a sense of place. This is achieved with a narrative analysis of the author from experience as a teaching assistant, interviews and a context study.

Semi-structured interviews

An initial round of interviews could not be conducted in person, due to the COVID-19 pandemic, which led to a nationwide lockdown. As an alternative, a questionnaire with sample questions was sent to each of the participating teachers and their responses were communicated back via text message or voice note messages, using What's App as a digital platform. Although the feedback provided was valuable, this method limits the intended prospect of an open-ended conversation.

1.7 Delimitations

Inclusive learning

An inclusive learning environment aims to accommodate the full breadth of human diversity and difference that would otherwise hinder ones access to a school within the local community (Dr. Owen, 2016). While this approach serves as a general driver, the focus of the design problem and proposal is limited to learning difficulties with specific impact upon the socio-emotional and cognitive developmental skills in children.

Figure 10. Thematic analysis, (Author, 2020)

Figure 11. Theoretical inquiry, (Author, 2020)

Figure 12. Site analysis, (Author, 2020)

Figure 13. Precedent study, (Author, 2020)

1.8 Significance

The research is based on theories of a continued inclusion for children with learning difficulties in mainstream education (Danforth & Rhodes, 1997) and the Department of Education's (DoE) framework for the provision of educational opportunities for children with learning difficulties (Department of Education, 2001). An opportunity for an interior architectural design intervention is uncovered. The intervention furthers academic discourse surrounding the role of considered spatial design in the development of young children.

The interior design discipline, in respect of environmental psychology, is in a position to evaluate the factors that influence how children, with or without difficulties, are able to learn within their environments. This can happen through an approach that considers design without boundaries; a thoughtful, explorative and inventive learning environment. This approach can provide learners with a positive foundation for the development of social and emotional skills, a critical point best addressed in the early years of development (Kopec, 2012; Macintyre & Deponio, 2003).

1.9 List of terms

Developmental needs

Healthy development means that children of all abilities, including those with special health care needs, are able to grow up where their social, emotional and educational needs are met (CDC, 2020).

Developmental phase

Kopec (2012) describes the developmental phase of children between the age of four and six as the pre-schooler phase. This is a time when some of the most important aspects of development in children are being realised. The developmental phase includes a sophistication of cognitive thought (Kopec, 2012, p. 124). This is also an important time where children require freedom of movement and exploration that will help them achieve their greatest milestones.

Early Childhood Development (ECD) Centre

A building or premises used for the care of six or more children away from their parents is considered an ECD centre (Department of Social Development, 2006). The purpose of an ECD centre is to protect the rights of young children within the community and to encourage the development of their full cognitive, emotional, social and physical potential (South African Government, n.d.).

Environmental psychology

Environmental psychology analyses the transactions and interrelationships of human experiences and actions with pertinent aspects of the socio-physical surroundings (Kopec, 2012). In essence, environmental psychology is defined as the “interaction between humans and the built environment” (Steg, et al., 2013).

Inclusive learning environments

The classroom is a place that provides an environment for continuous interactions between children, both with and without learning difficulties (Smogorzewska, et al., 2019, p. 1243). These environments foster the social behaviours associated with development. An inclusive learning environment is one that creates opportunities for children with learning difficulties/disabilities to acquire social and cognitive skills amongst their peers that will foster their development, in a diverse environment (Department of Basic Education, 2018; Macintyre & Deponio, 2003; Smogorzewska, et al., 2019).

Learning difficulty

A learning difficulty can be defined as a factor exhibiting challenges in the cognitive development of a child; “affecting the way the brain receives, processes, stores and analyses information” (GoodTherapy, 2019). It is important to understand that not all learning difficulties are a result of an intellectual or neuro-developmental disability, but that these difficulties can occur from a change in environment or social settings that overwhelm the learner (Macintyre & Deponio, 2003).

Pattern language

In order to provide children with learning difficulties the opportunity to understand their learning environments and independently navigate learning activities, a pattern language is developed.

Conclusion

In this chapter, the rights of children, regardless of their learning ability, to an education is established. This chapter emphasises the importance of the effects of the environment on the developmental needs of children with learning difficulties. Further, the significance of enriching the discipline of interior design with theories of environmental psychology and learning difficulties is highlighted. The consideration of civic space to encourage the involvement of parent/family and community in early childhood development is introduced.

Document structure

Introduction

Chapter 2 presents a theoretical enquiry into the role of the physical environment for the learning development of young children. The chapter is structured in two parts:

The first part is concerned with the child with specific learning difficulties and existing approaches proven to support the development of the child in the learning environment. Two learning philosophies and a strategy for the design of inclusive learning environments are discussed. The intention is to position the role of the physical environment in the development of young children with learning difficulties within a related theoretical context.

The second part, presents an ethnographic review of the teacher's perceptions of the physical environment of Sunshine Nursery School. This section follows as a response to the local and design issue raised in 1.3., highlighting the barriers to inclusion that continue to hinder the development of children with learning difficulties attending mainstream Early Childhood Development Centres.

02 THEORY

Part 1 - Philosophy for learning development

How do existing theories on environmental psychology and learning difficulties apply to the child as an active participant in the learning environment?

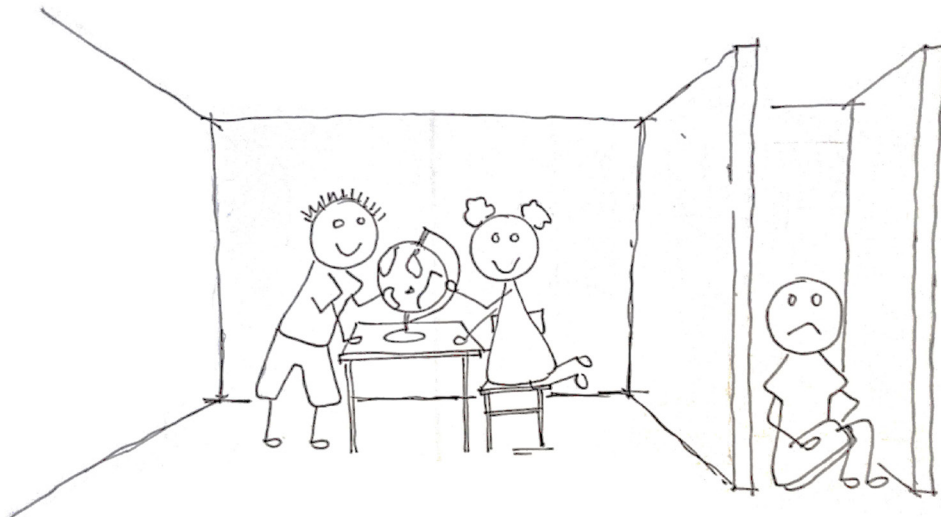


Figure 14. Social activities and the introvert (Author, 2020)

2.1 Specific learning difficulties

A child with a learning difficulty is described as having a developmental delay which hinders the skills expected of a child of his or her age (Powell, 2011). This delay can affect one, or an overlap, of the following areas of development: intellectual, social, perceptual motor or emotional maturation. 'Specific learning difficulties' is used as an umbrella term to describe these developmental delays (Macintyre & Deponio, 2003), which are identified through persistent problems in learning activities due to "neurological differences and deficiencies" (Macintyre & Deponio, 2003; NACLab, 2019; Shepley & Pasha, 2017). While there have been a diverse spectrum of learning difficulties diagnosed across the world, and the intention of inclusive learning is to respond to learning difficulties and disabilities in their entirety. The following learning difficulties are considered for the scope of this proposal:

Attention Deficit Disorder (ADD), with the addition of **hyperactivity (ADHD)**, is defined as a "complex neurological condition resulting in significant problems with concentration, hyperactivity and impulsivity" (Macintyre, 2009). Children with ADD are more likely to display characteristics of withdrawal or be easily distracted by something in the learning environment. With ADHD, the opposite is true. The addition of hyperactivity means that children with this condition are prone to disrupt others around them with their constant impulse to move around. Although children with ADD or ADHD are not typically considered as badly behaved, they are more than often accused of such. Conditions such as ADD and ADHD often result in developmental delay, and create a scenario where the child requires support from the teacher, parent or peers for an extended period of time (Macintyre, 2009).

Autism Spectrum Disorder (ASD), is a neurological disorder that affects how a child perceives his or her environment (Macintyre, 2009; Mostafa, 2015). Characteristics common to ASD are difficulties in social settings, issues with language and communication and thought and behaviour issues. Social difficulties hinder the child from developing meaningful relationships, often resulting in isolation. Common behavioural traits in children with ASD is their tendency to stick to routine. This routine may develop into obsessions that provide comfort to the child (Macintyre, 2009). The impact of the physical environment on children with sensitivity to sensory stimuli needs to be considered. Typically, the environment is full of factors that distract learning such as lighting, noise, colour and materials or textures (NACLab, 2019). When a child with ASD experiences sensory overload, they might display a variety of coping strategies, from "withdrawing or flapping their hands in distress, to inflicting harm on themselves" (Macintyre, 2009).

Dyslexia is a “specific learning difficulty focused on literacy skills” (Macintyre, 2009), although movement and behaviour can also be associated with the difficulty. At an early developmental stage, children experience problems in the following areas (Macintyre, 2009); learning rhymes, paying attention during story time, keeping still, forgetting names of objects, handling a pair of scissors, remembering instructions, hand-eye coordination and hopping and/or skipping.

Dyspraxia, also known as developmental co-ordination disorder or disorder of attention, movement and perception (Macintyre, 2009), is a neurological condition that affects a child’s perceptual-motor development. Balance, coordination and control are the main factors affected by dyspraxia (Macintyre & Deponio, 2003; Macintyre, 2009). This condition is associated with poor spatial awareness, resulting in difficulties with “visual perception” (Kid Sense Childhood Development Corporation, 2020).

Specific language impairment (SLI), or language disorder refers to the slow development of languages relative to the “normal sequential developmental pattern” (Kid Sense Childhood Development Corporation, 2020). In the context of this description, language is defined by different ways of communication, through reception and expression. Children with SLI experience trouble learning how to communicate, and are often confronted by anxiety, bullying, social isolation and stress because they find it difficult to cope in group situations or environments where they experience sensory overload (Kid Sense Childhood Development Corporation, 2020; NACLab, 2019).

2.2 Environmental psychology

Steg, et al. (2013) defines environmental psychology as the “interaction between humans and the built environment”. This interaction considers the effects that the physical environment has on the user, which is revealed in behavioural patterns and indications of stress as a result of physical environmental factors in an Early Childhood development Centre. For children with learning difficulties, the careful consideration of spaces for learning become a priority. Providing children with an environment that works to support their learning development is the aim of the proposal.

2.2.1 Principles of environmental psychology

The principles that could benefit the development of children with learning difficulties, by alleviating the effects of stress caused by the physical environment:



Figure 15. Choice and control (drawing adapted from Shepley & Pasha, 2017)

Choice and control

In the context of the learning environment, choice and control can refer to flexibility and adaptability. The provision of flexible learning spaces is intended to support the “adaptable delivery of teaching and learning programmes to meet the needs of all students” (Dr Wall, 2016). Providing opportunity to alter the physical environment, through the classroom configuration or the control of sensory effects (i.e. lighting or noise levels) or to “regulate exposure to one’s surroundings” (Evans & McCoy, 1998), can be beneficial to learners and teachers alike. Offering choices can very well reduce the effects of stress caused by the environment (Shepley & Pasha, 2017).

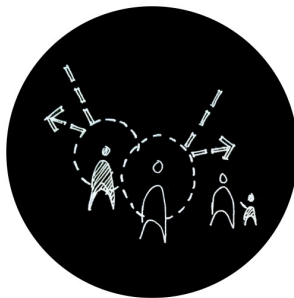


Figure 16. Personal space (drawing adapted from Shepley & Pasha, 2017)

Personal space

Personal space is the ability of the user to control social interactions within their immediate context (Altman, 1975). According to Shepley (2017), personal space is a conceptual boundary surrounding an individual that determines their social interactions or relationships with others. The personal space is also characterised by density. In the context of this proposal, density refers to the number of children in a classroom, which should be determined by the floor area required per child, in accordance with the guidelines for Early Childhood Development (Department of Social Development, 2006).



Figure 17. Sensory considerations (Author, 2020)

Sensory considerations

Sensory considerations are factors that affect one's perception of the environment. The quality of a space can be determined by the ability to control acoustic properties, lighting, colour, texture, ventilation, sense of closure or orientation (Mostafa, 2014; NACLab, 2019; Shepley & Pasha, 2017). The provision of sensory stimuli in the classroom and the playground encourages children to engage actively with their environment. It can work to provide a sense of familiarity to the child with learning difficulties at Sunshine Nursery School.

Legibility

Legibility helps the user make sense of their physical environment. In the context of an Early Childhood Development Centre, it is important to have spatial clarity and organised spaces in order for children to function comfortably (Migliani, 2019). Clear distinction between public and private areas, successful wayfinding and the placement of materials are ways to achieve legibility (Shepley & Pasha, 2017). Disorganised learning environments can contribute to a negative display in behaviour, creating confusion and disruption. An ideal environment that offers a “balance between interest, challenge and comprehensibility” (Appleton, 1996) is found in a well-ordered environment.

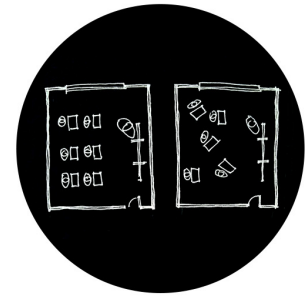


Figure 18. Legibility (Author, 2020)

Familiarity

Environments where children feel comfortable and safe are most likely to have a positive influence on their development. The general association with home is said to provide this sense of comfort and safety, while introducing a less institutional environment to reduce, or altogether eliminate factors that could exacerbate difficulties associated with learning (NACLab, 2019). A familiar environment with a sense of comfort and security can provide children with the level of confidence needed to support their developmental needs.

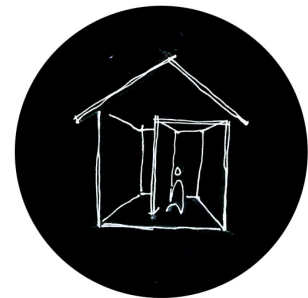


Figure 19. Familiarity (drawing adapted from Shepley & Pasha, 2017)

Quality

Studies show that high-quality and well maintained learning environments are beneficial to the well-being of students (Clark, 2002; Dudek, 2000). The quality of furniture, finishes and sensory characteristics of the environment (acoustics, lighting, material) can have a significant effect on the outcome of student achievement and engagement.

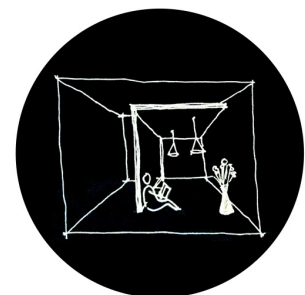


Figure 20. Quality (drawing adapted from Shepley & Pasha, 2017)



Figure 21. Positive distraction (drawing adapted from Shepley & Pasha, 2017)



Figure 22. Social interaction (Author, 2020)

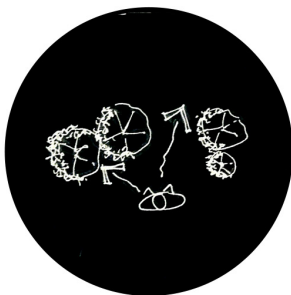


Figure 23. Access to nature (drawing adapted from Shepley & Pasha, 2017)

Positive distraction

Shepley & Pasha (2017) state that the reduction of negative aspects within an environment can be achieved through the reinforcement of positive experiences by redirecting one's focus to 'positive distractions'. Positive distractions encourage children to focus on experiences outside the negative environment. Contributing factors include creative and recreational activities (art, music and sports), fantasy and imaginative play, social interaction and access to nature. These help to reinforce the perception that the child has with the negative aspects of the classroom.

Social interaction

Interactions with peers and teachers is encouraged for the social and emotional development of a child (Gettman, 1987; Shepley & Pasha, 2017). In designing spaces for young children, it is important to consider the ability to regulate social interactions as this contributes to a sense of control in the learning environment (Altman, 1975; Evans & McCoy, 1998). Social interactions within the classroom can be achieved through the establishment of focal points, or furniture arrangements (Evans & McCoy, 1998; Shepley & Pasha, 2017).

Access to nature and natural light

Access to nature could imply the direct or indirect incorporation of natural elements to a space. This strategy is said to reduce factors of stress, while increasing "productivity, creativity and well-being" (NACLab, 2019). Paget and White (2004) suggest that providing access to nature can act as a tool to encourage social interaction between children, while Bailey (2002) recommends that children should be encouraged to participate in interactive activities with their peers in outdoor settings, as this has a positive role with regard to their development. Similarly, access to natural light is proven to show significant progress in development among children in the learning environment (Dr Wall, 2016); however, the placement of windows should be strategic, because children tend to get distracted by activities happening outside the classroom.

Safety and security

It goes without saying that a safe and secure environment is a crucial factor in the design of an Early Childhood Development Centre. This refers to the interior environment, as much as to the exterior. For the context of this study, it is important to note the increased vulnerability of children with learning difficulties to bullying; therefore, an environment that provides transparency into all spaces for “passive supervision” (NACLab, 2019) should be provided. Another concern is the potential of children wandering. Again, the design of the built environment needs to minimise the occurrence of going unnoticed by providing visual access by teachers and supporting staff.

Safety and security needs to be provided from access to the school premises, down to the finest details, like finishes and joinery.

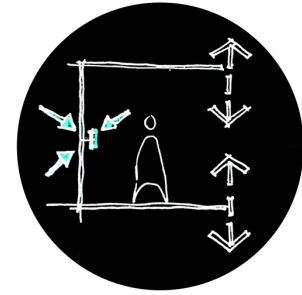


Figure 24. Safety and security, (Author, 2020)

Supervision

Adult supervision, much like safety and security, is critical in Early Childhood Development. All areas occupied by young children need to be visually accessible by teachers and supporting staff (Shepley & Pasha, 2017), at all times.

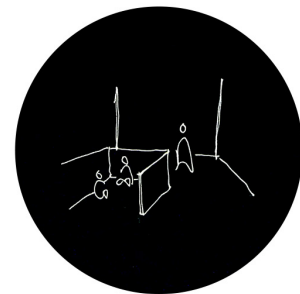


Figure 25. Supervision, (Author, 2020)

2.3 Learning philosophies for Early Childhood Development

2.3.1 The Montessori Method

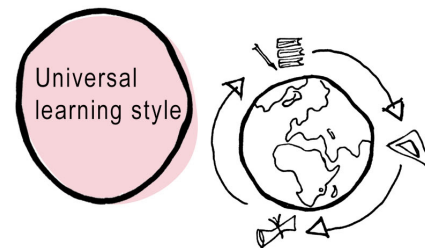
Maria Montessori's theories are based on the capabilities that young children have revealed, to develop cognitive skills by their free and natural inclination (Gettman, 1987), when given the opportunity to do so. This comes about by encouraging a young child, in his/her respective environment, to regulate an independent pattern of learning, resulting in the development of "complex skills and sophisticated knowledge" (Gettman, 1987). The skills developed, include, but are not limited to concentration, creativity, curiosity and an impressive level of self-discipline (Fundacion Argentina Maria Montessori, 2018; Migliani, 2019). The principle of the Montessori Method is founded on 'three pillars' (Migliani, 2019); the child, the 'prepared environment' for self-directed learning (where the child is in control), and the adult/ teacher who is viewed as an observer, facilitating the "needs, abilities and interests" of the child (Fundacion Argentina Maria Montessori, 2018). The significance of the prepared environment originates from Montessori's hypothesis, stating that a lack of appropriate stimuli in a child's environment is among the main concerns hindering learning development and exacerbating behavioural issues (Migliani, 2019). Montessori's theories of development are broken down as follows:

The child

According to Montessori, a child's development is structured around three aspects. The first is the 'absorbent mind', which is ever growing and immersed in knowledge (Pickering, 2017). The second is the unfolding intellectual structure. This stage is defined by the 'sensitive periods' (Gettman, 1987); where perception, language, order, an interest in small detail, coordination of movement and social relations are developed. The third stage involves giving meaning to the knowledge acquired through the absorbent mind and the sensitivities. This is the point at which connections are made between concepts and situations, giving it a "meaningful place in the child's world" (Gettman, 1987, p. 12).

The prepared environment

The prepared environment is the child's work place, and it prioritises accessibility and legibility, in order for children to use the space independently. Learning environments prepared for young children need to make provisions for the necessary learning activities and experiences to occur with ease (Gettman, 1987). The intention of the classroom is to act as a tool to encourage the child's participation with the preferred activity. In order for the Grade R and RR classroom to be meaningful, and encourage positive participation from each child, strategies for specific learning will be developed. In order to successfully respond to the problem seen in the guidelines for inclusive learning spaces, the design needs to be free of factors that might otherwise hinder development and exacerbate stress (Evans & McCoy, 1998; Dr Wall, 2016). The encouragement of diverse learning styles will be considered in order to provide opportunities for children to develop their socio-emotional, cognitive and perceptual-motor skills.



The adult

The adult plays three roles in the classroom environment, the role of a caretaker, a facilitator and an observer (Gettman, 1987; Migliani, 2019). The adult forms part of the prepared environment, in the capacity of the roles mentioned above. The adult needs to be consistently aware of the child's interaction with the environment and their development with the work (Gettman, 1987).



To synthesize the theories above, the design intervention of the classroom at Sunshine Nursery School needs to present opportunities for all children, regardless of their ability/disability, to act independently by navigating convenient learning processes through active discovery, and avoiding the influence of preconceived instruction initiated by the teacher, Figure 26.

Prepared environment

Prioritises **accessibility and legibility**, in order for children to **use the space independently**

Figure 26. Learning philosophies _ Montessori (concepts adapted from KLA Schools, 2019)

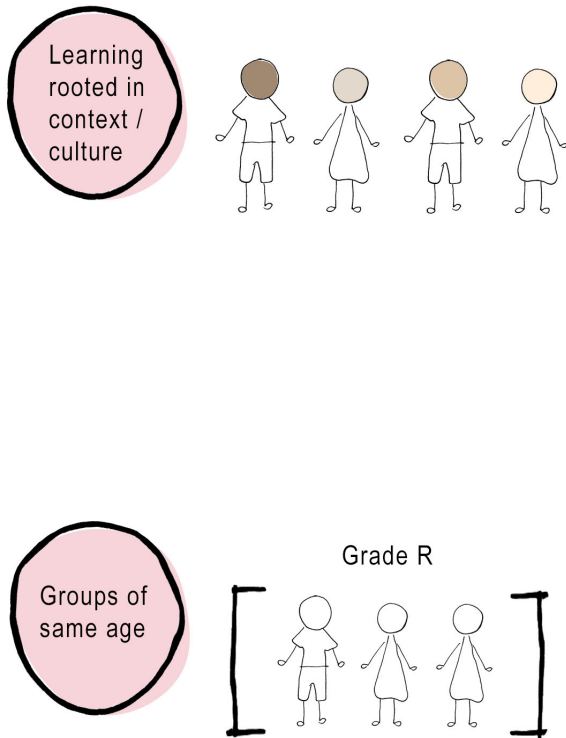
2.3.2 Reggio Emilia Approach

In the Reggio Emilia Approach the child is viewed as having the primary active role in his or her own education (Hewett, 2001). Developed under the guiding influence of Loris Malaguzzi, the Reggio Emilia Approach advocates for children's rights in possessing the competence to take on the role of active constructor of knowledge, researcher and a social being as seen in Figure 26 (Hewett, 2001; Migliani, 2020).

The environment is described as 'the third teacher' (Herbert, 1998; Moore & Sugiyama, 2007; Weinstein, 1987). Young children are encouraged through exploration and experimentation of the learning environment, Figure 27. This is made possible by providing them with an environment that stimulates active engagement, creating a space that is safe enough to investigate their curiosity and creativity. Within the Reggio Emilia approach, the child's development occurs in a "multitude of different languages" (Migliani, 2020), termed the '100 languages'. The '100 languages' is communicated through "expression, communication, cognitive development, ethics, logic, imagination and rational" (Migliani, 2020; Reggio children, 2020).

The third teacher

The physical environment is viewed as a facilitator in the development of the child, enabling them to construct knowledge through the exploration of space with the freedom to enquire about their place and role in the environment (Migliani, 2020). The third teacher will be translated by the intervention through the provision of different learning styles, which are integrated in the design.



Third teacher

Enabling children to construct knowledge through the **exploration of space**

Figure 27. Learning philosophies _ Reggio Emilia (concepts adapted from KLA Schools, 2019)

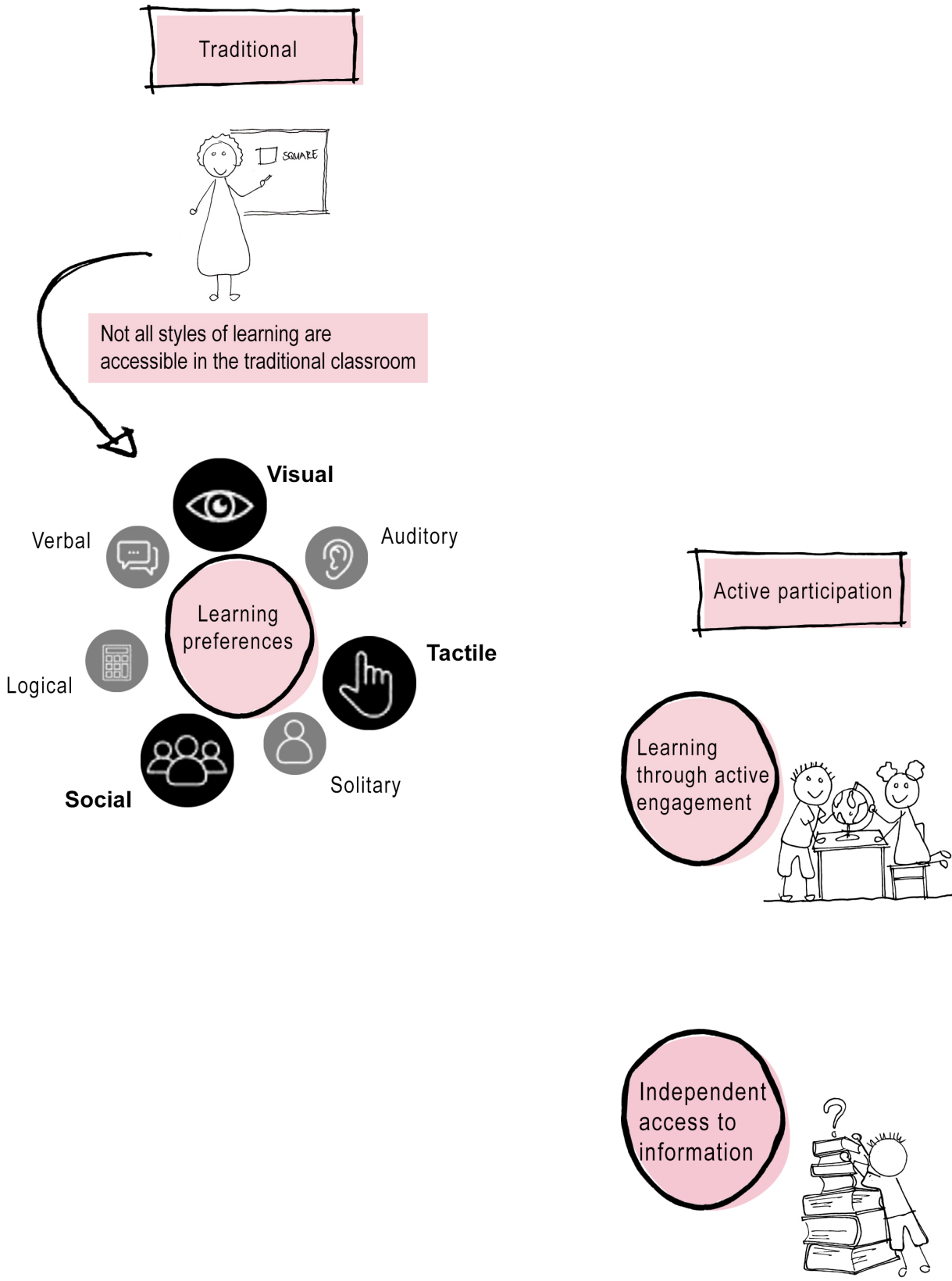


Figure 28. Learning styles _ Traditional vs active participation (concepts adapted from KLA Schools, 2019)

2.4 Inclusive Education

Inclusive education introduces a mandate to offer children with learning difficulties and/or disabilities with an environment that is independently accessible by them. Environments considered inclusive or accessible, offer “a least restrictive environment for children with atypical developmental characteristics” (Vakil, et al., 2003). One of the objectives of inclusive education is to eradicate constraints of institutionalisation that continue to separate children with special education needs from their peers (Evans & McCoy, 1998; Danohue & Bornman, 2014), therefore providing them with equal opportunities to learn in a diverse environment.

2.4.1 Barriers to inclusive education _ a local issue

The goal for inclusive learning is that every child, regardless of their learning ability, be allowed to receive an education at a local school within their community (Department of Basic Education, 2018). This is to ensure equal learning opportunities for children with learning difficulties and to encourage the development of social and emotional skills through meaningful relationships with their peers (Macintyre & Deponio, 2003; Smogorzewska, et al., 2019). In spite of this, up to 70% of children in South Africa confronted with a learning difficulty or disability are out of school (Danohue & Bornman, 2014). Many encounter challenges of development because the learning environment is not designed to facilitate the cognitive, social or perceptual needs of the child. The learning environment of an ECD centre like Sunshine Nursery School has the tendency to exacerbate behavioural issues in the developing child by not affording the children the ability to control their environment. The design intervention will consider the inclusion of children with sensitivities to sensory considerations presented by the learning environment.

Conclusion

The philosophies discussed in 2.4 show the role of the physical environment in the development of a child, Figure 28. These can be linked to the principles of environmental psychology to formulate an approach for the design of Early Childhood Development Centres, to support the development of children with learning difficulties.

- The Montessori Method is characterised, primarily by the prepared environment, encouraging children to engage in self-directed learning; producing the fundamental tools they require for their cognitive and social development.
- The Reggio Emilia Approach is characterised by the physical environment as the third teacher. Children are encouraged to explore their roles in the environment through the expression on their 100 languages, in order to communicate their level of development.

02 THEORY

Part 2 - Ethnography

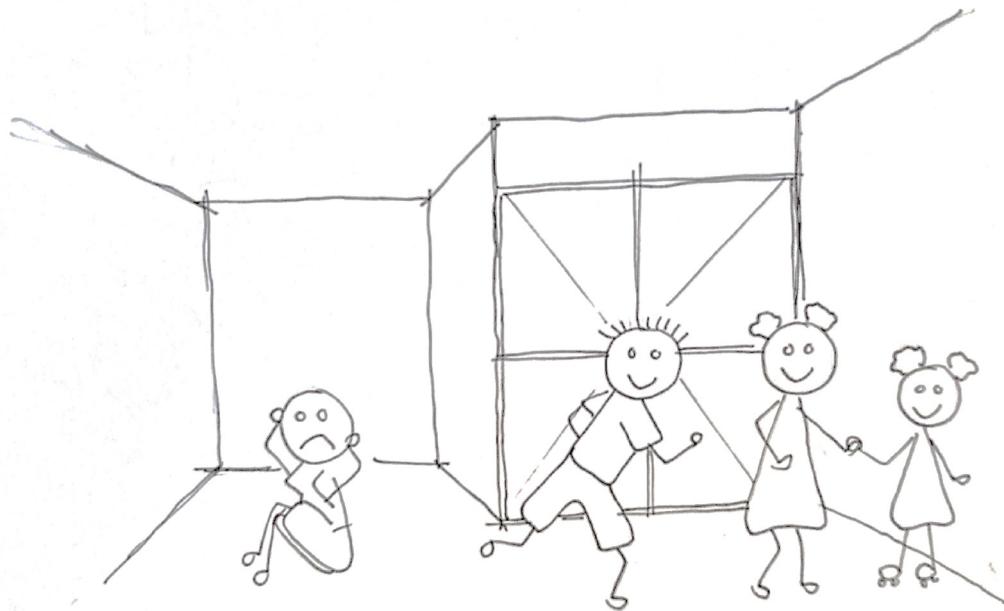


Figure 29. Active engagement and the anxious child (Author, 2020)

2.5 Background

A child's ability to reach their learning potential at school is dependent on more than being urged to cope with the challenges of grasping new concepts and keeping up with the pace. The physical environment in which young children learn has a significant effect on the ability of the child to participate in planned activities that require their cooperation and discipline. This could be due to characteristics of the built environment that challenge their adaptive coping resources (Evans & McCoy, 1998). These characteristics include, but are not limited to, familiarity and spatial clarity (legibility) of their surroundings.

Part 2 is structured as follows:

- The theoretical inquiry will investigate the role of the environment in the development of children with learning difficulties at an Early Childhood Development Centre.
- An investigation of teachers' perceptions is conducted to evaluate the influence on learning development of physical environmental factors on children with learning difficulties. The study uses Sunshine Nursery School in Hammanskraal as a case study.

It was established by the author that the study would benefit from the teachers' perceptions of the environment because they have a lived experience with the environment and they are familiar with its context. The teachers and principal, unlike the author or designer/architect, have an intuitive perspective of the children's interactions with the environment - this, which can only come as a result of the day-to-day observations and evaluations carried out over a number of years with the diverse personalities of a number of children.

2.6 Informants

The study is concerned with the development of children aged four to six as learning difficulties tend to go undetected until the age of five (Macintyre & Deponio, 2003). For this reason, the selection of teachers participating in the interviews are currently responsible for either the four, five or six year old class. A summary of their responsibilities is given below in Table ???

Informant	Role	No. of learners	Motivation
A	Grade R teacher	25	<ul style="list-style-type: none"> • Role as a Grade R teacher, 10+ years • At least 20 years of experience at Sunshine Nursery School • Experience teaching a child with an identified learning difficulty (2016)
B	Grade R teacher	25	<ul style="list-style-type: none"> • Role as a Grade R teacher, 5+ years • Previous experience as a teaching assistant for Grade RR
C	Grade RR teacher	28	<ul style="list-style-type: none"> • Current role as a Grade RR teacher • Has taught four and five year olds
D	Principal		<ul style="list-style-type: none"> • Interaction with teachers and children for learning evaluation • Supervision of learning activities • Previous experience as a Grade R teacher • At least 20 years of experience at Sunshine Nursery School

2.7 Environments for learning

The role of the physical environment in early childhood development is critical for a child's cognitive, social and physical development. The physical properties have the potential to either enable a child's learning potential and their interaction with other children, or to hinder it. In essence, the physical environment is an invaluable educator, referred to as the 'third teacher' (Herbert, 1998; Moore & Sugiyama, 2007; Weinstein, 1987), during the early development of a child.

An active relationship between young children and their physical environment is of great importance in early child development (Konstantina, 2014).

This is particularly important for children with learning difficulties, as the physical characteristics of the environment influence a young child's learning ability, and an understanding of the immediate setting affects developmental skills, shapes early exploratory experiences and impacts on activity competency (Matthews & Lippman, 2020; Maxwell, 2007; van Liempd, et al., 2020). Children with learning difficulties might experience a unique difference in sensory perceptions of the physical learning environment, which means they would process information such as sight, sound and touch differently from their peers (Spitzer, 2003); therefore the quality of the spaces which accommodate learning activities (both interior and exterior) need to encourage an active relationship with the environment.

2.7.1 The physical environment and learning development

Environmental psychology argues that the physical environment has a significant influence on our social interactions and behaviours (Proshansky, et al., 1983); it conditions how we feel, think and conduct ourselves (Ata, et al., 2012; Matthews & Lippman, 2020). Matthews & Lippman (2020) suggest that physical environmental factors act as features of a setting for moderating, enabling and/or hindering our ability to learn, impacting on developmental skills. The designed environment needs to represent an awareness of this because the early stages of development are considered the most crucial, where children engage in open dialogue with environments that contain stimuli for their development (Migliani, 2019).

On average, children in the early developmental phase spend close to seven hours of their waking day at school; this establishes that an Early Childhood Development Centre has a significant role in shaping long-term personal cognitive and emotional development (Ata, et al., 2012).

2.7.2 The importance of indoor and outdoor learning

Indoor and outdoor environments of an Early Childhood Development Centre should be designed in such a way that they encourage an optimistic approach to learn through various levels of exploration. The levels of exploration need to vary from interesting to safe, and appropriate to challenging (Ata, et al., 2012; Konstantina, 2014); characteristics that focus on the overall development of children with learning difficulties and those without. Environments that provide a variety of positive stimuli and opportunity for one to express themselves through play are essential for young children. Children in the early stages of development need environments that allow them to move freely and give them a choice between spaces that provide privacy or social interaction (Konstantina, 2014; Maxwell, 2007). They need a balance between fast paced, spontaneous environments and a slower, more structured environment. These spaces provide learning opportunities through exploration and experimentation.

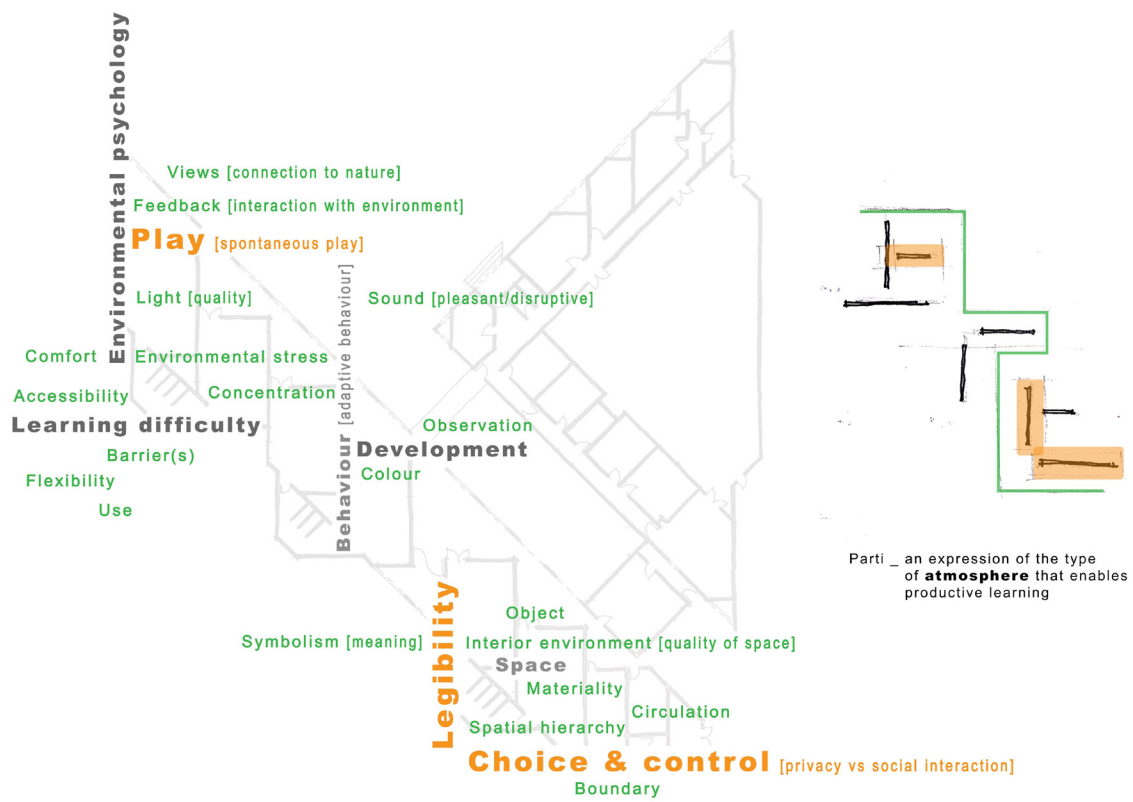


Figure 30. Environmental psychology word cloud, (Author, 2020)

2.8.2 What we make of space

When asked about the physical factors influencing learning within the classroom, the teachers referred to the provision of tools that children are able to understand, and not physical characteristics of the designed environment:

“The provision of teaching aids for teacher-guided activities enable learning in the classroom. The learning aids in the classroom include reading cards, pictures and rhymes. Children are able to recognise the pictures and connect them to the letter” (Respondent 2).

Although teaching aids are a part of the methods used for teaching in ECD Centres, this response drew attention to a gap in the design of spaces that assist teachers with the learning development of young children. Because young children are resourceful in their perception of space, the built environment has an unprecedented opportunity in facilitating learning development for young children.

2.8.3 The extended classroom

The teachers acknowledged the importance of outdoor play for the children’s physical development with one respondent saying, *“I think spending time in the playground has a positive influence on the learners’ development because that is how their gross-motor skills are developed and where they are free to exercise” (Respondent 3).*

Another important factor was referring to the outdoor environment as an ‘extended classroom’. All four respondents expressed an interest in the exterior environment serving as a classroom for activities not considered as high focus. Factors of the exterior environment disrupt learning activities taking place inside the classroom, but the nature of the physical factors encourage explorative and experimental learning. These factors are referred to as ‘rich learning stimuli’ (Maxwell, 2007), which can act as a teaching aid for children with learning difficulties.

The overall response from the teachers supports the theory that the physical environment of an ECD centre is crucial for the development of a young child. An environment designed as an aid for learning becomes beneficial for the child as well as the teacher, giving the child the benefit of developing cognitive, social and physical skills (van Liempd, et al., 2020).

Spaces in an Early Childhood Development Centre similar to Sunshine Nursery School should be accessible to the children attending the school. Consequently, the school should be considered as a space that enables the learning development of children. The physical environmental factors should not hinder the development of children with learning difficulties, but rather encourage an active relationship (Konstantina, 2014), and function as a facilitator for the teachers.

Three themes for the assessment of the design of Sunshine Nursery School are identified, Figure 26:

- 1. Legible learning environments:** This is a critical factor to enable the independent use of space by young children with and without learning difficulties.
- 2. Choice and control:** The need for children to choose spaces that provide privacy or engage in social activities.
- 3. In-between spaces:** The intermediate zone between the classroom and the playground. This space is developed as an extension of the classroom.

Conclusion

Chapter 2 discusses the role of the physical environment in the learning development of young children. In order to support the intellectual, social, perceptual-motor and emotional development of children with learning difficulties, opportunities for active engagement is encouraged. From the theory it was established that the physical environment has the potential to encourage self-directed learning (c.f. 2.6) through the introduction of environmental principles.

The role of the prepared environment and the environment as 'the third teacher' plays a significant role in learning development. Children with learning difficulties who find themselves in environments encouraging active physical engagement are benefitted through their interaction with the environment. Environments supportive of the developmental needs of children work to develop a sense of control, familiarity and spatial awareness.

Introduction

The conceptualisation of a strong sense of community engagement is emphasised early in the chapter to draw attention to what is one of the greatest barriers to inclusive learning. One of the greatest causes of barriers facing families affected by learning difficulties and disability is community perception (Mostafa, 2015), therefore a strategy to assist the nursery school in its efforts to becoming an inclusive Early Childhood Development Centre is addressed.

The investigation of the selected site examines its current condition in respect of environmental issues facing the user on a daily basis. This chapter will investigate the physical environmental factors that have an effect on the learning development of children with learning difficulties while mapping the characteristics of the physical and perceptual environment at the 'whole school' and classroom scale.

03 CONTEXT

Which environmental factors at Sunshine Nursery School hinder the active engagement required to assist the learning development of children with learning difficulties?

3.1 Mapping assessment tool

The Autism ASPECTSS Index, developed by Magda Mostafa (2014), is an environmental design assessment tool for spaces occupied by children with autism spectrum disorder. The Autism ASPECTSS principles include, **acoustics, spatial sequencing, escape spaces, compartmentalisation, transition spaces, sensory zoning and safety**. The principles are used as spatial design criteria to navigate the analysis and mapping of Sunshine Nursery School. They are used again in Chapter 6, as an informant for the design response of learning spaces aimed at enabling the learning development of children with difficulties.

While the guidelines of the index are a response to “the most pressing built environment issues for autistic users” (Mostafa, 2015), the design strategy lends itself to the principles of environmental psychology; and in this particular instance, it is used as a holistic approach to the design of an Early Childhood Development Centre for children with learning difficulties. It is therefore the discretion of the author to map the different scales of the chosen site by making reference to the Autism ASPECTSS Index.

3.2 Macro study

This study is concerned with the identified site at a community scale in order to make informed decisions as to the relationships that stem from filtered spaces, which is the degree to which the public is involved in activities with the nursery school. This will be illustrated in the community framework (c.f. 3.3.3).



Figure 31. Sunshine Nursery School locality map, (Google earth, 2020)

3.2.2 Community school network

Sunshine Nursery School, in Renstown, forms part of an existing Early Childhood Development Centre cluster, with schools from three of the neighbouring extensions of Mandela Village and Marokolong. The aim of the cluster is to create a structure for resource sharing between the Early Childhood Development Centres in Hammanskraal, and ensuring the schools are part of a community.

For the purpose of this study, the mapping of the ECD cluster and other identified learning environments will become the foundation to developing a school network to support the development of children with learning difficulties within Hammanskraal. Schools that will form part of this network are categorised as Early Childhood Development Centres, primary schools with Grade R and a school for special education needs.

The first category is the Early Childhood Development network, which is within a 4km radius of the selected site:

- Sunshine Nursery School (identified for this study) is an Early Childhood Development Centre in Renstown. The school intake at Sunshine Nursery School is from the ages of three to six, with a total of seven classrooms; one of which is a temporary structure to accommodate a growing demand in enrolments.
- Bambino's Daycare Centre is another school in Renstown, considerably smaller than Sunshine Nursery School. The school intake is from the age of one right through to the age of six.
- Jabulani Daycare Centre and A Re Itereleng community preschool are located in Mandela Village, within a 1km radius of Sunshine Nursery School.
- Union Daycare Centre is 3,6km for the selected site, in Marokolong.

The second category identifies primary schools with Grade R. These schools have an established relationship with Sunshine Nursery School, with the majority of Grade R and RR learners from the Sunshine enrolling at these schools:

- Bethesda Outreach Ministries
- Klipdrif Primary School
- Prestige Collage

The final school in the network is a school for children with special education needs, the Dominican School for the Deaf. The inclusion of the Dominican School in this network is to emphasise the need for inclusive learning environments in Hammanskraal. As stated by the name, Dominican School is a special needs school for hearing impaired and deaf students. The introduction of inclusive learning environments considers the full breadth of human diversity and difference (Dr. Owen, 2016), therefore, in order to satisfy the needs of all learning difficulties and disabilities, it is suggested that the Dominican School for the Deaf become a partner in the ECD network.

The aim for establishing a network is to assist the Grade R and RR pupils with learning difficulties in their advancement to primary school, providing them with equal opportunities to their peers. This is achieved through the network by introducing the concept of feeder schools, in order to accommodate the need for inclusive learning across the various early stages of development. Although research suggests that children benefit from mixed-age classroom environments (American Montessori Campus, 2020), an often limited access to resources, and the physical barriers created by existing and newly established Early Childhood Development Centres might hinder this. Therefore, the opportunity to accommodate children in the schools according to their age group is made possible with the feeder schools.

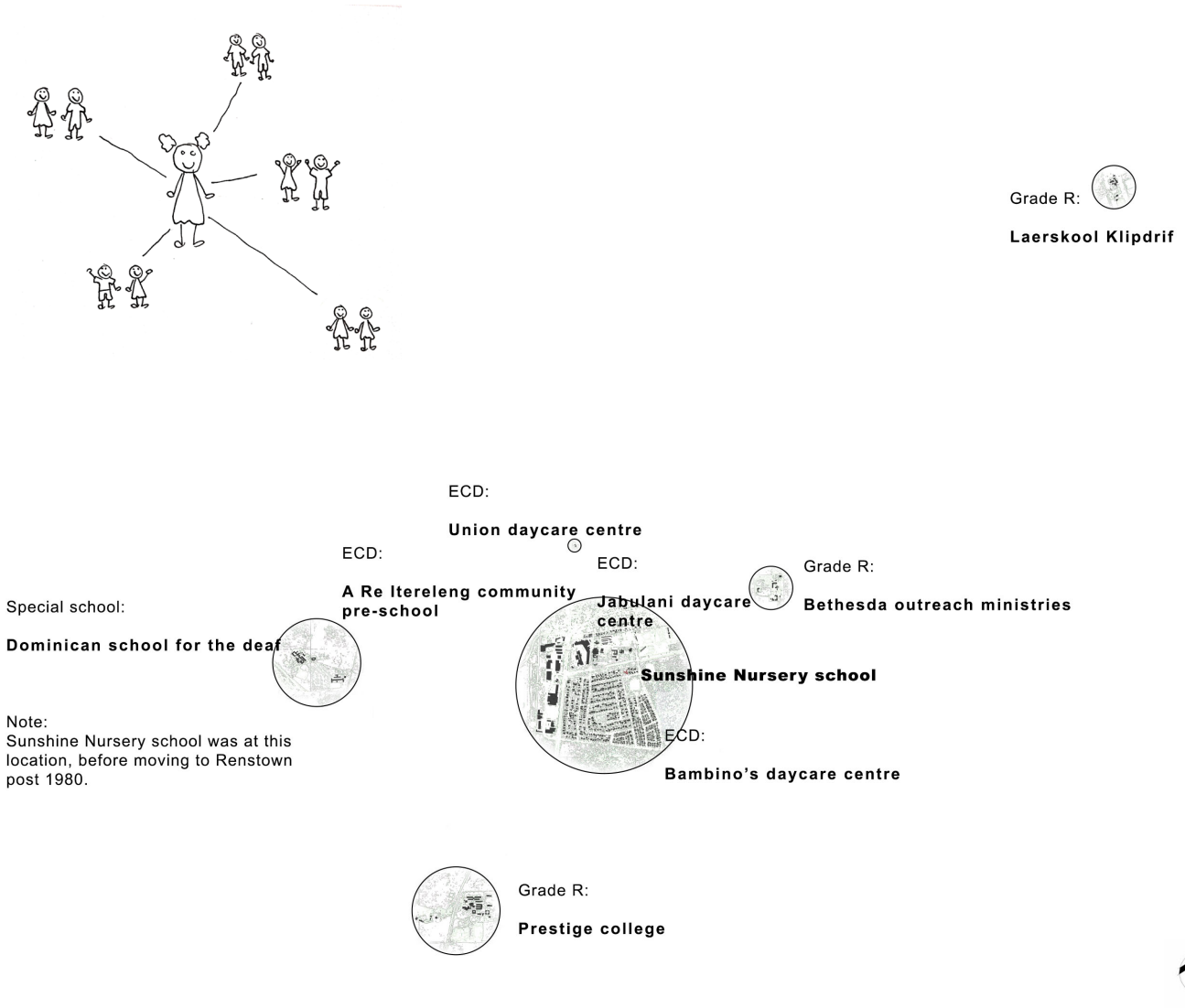


Figure 32. Community school network, (Author, 2020)

3.2.3 Community framework

The school network discussed above forms the premise for the community framework and is discussed here:

The provision of a community-linked service is viewed as an essential instrument in the conceptualisation of an inclusive environment for an Early Childhood Development Centre (Mostafa, 2014). This consideration leans on the principle that children with learning difficulties benefit from an opportunity to interact with their peers and develop the social skills required to progress in various areas of development (cognitive, physical and social). The aim of the community-linked service is to support the families of children with learning difficulties, as well as to generate an awareness and “positive productive image” (Altenmüller-Lewis, 2017) towards special education and a growing need for inclusive learning environments within the community. Sunshine Nursery School will form part of the bigger vision to support and strengthen social cohesion between families of children with learning difficulties and the community. As stated with the school network, Sunshine Nursery School will form part of an adapted vision for the Early Childhood Development school cluster; a satellite campus, which will have its roots in the community hall and library in Mandela Village. The block vision is to establish the community centre in Mandela Village as a nucleus for resource sharing as an extension of the developing network. The greater vision of Hammanskraal was to establish a lasting identity for the community (Rens & Rens, 2020), creating room for the community centre to develop as an environment where members of the larger community can access information and benefit from family-support systems for navigating the learning development of the children with learning difficulties.

The amenities listed below will form part of the support system for the vision of the ECD cluster:

- Hammanskraal Library
- Mandela Hall
- Mandela sports complex
- Mandisa Shiceka Clinic
- Tshwane Metropolitan Police Service

This support system will provide resources such as extra care (with the provision of family counselling and assisted learning/training), extra-curricular activities and security.

3.3 Meso study

The studies that follow (Meso and Micro) will use the Autism ASPECTSS index as a criteria to analyse the effects of the 'whole school' and the classroom on the learning development of the user.

The meso study looks at the environmental condition of the whole school in order to respond to the barriers faced by children with learning difficulties (Mostafa, 2014). The following ASPECTSS principles are used to analyse the school condition:

3.3.1 Safety

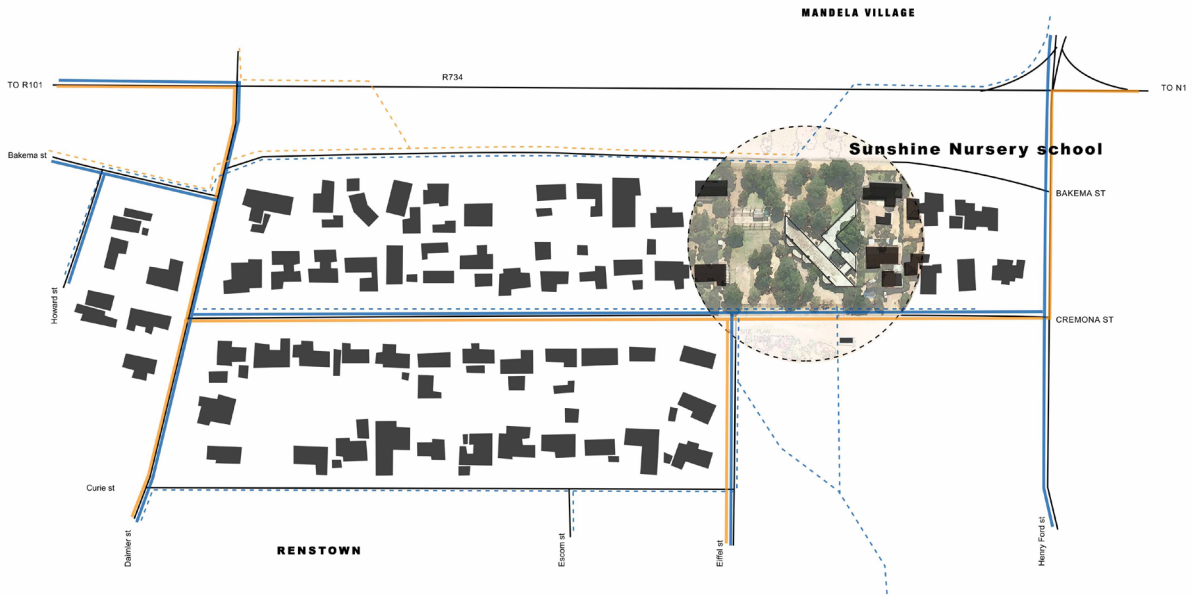
The safety of children at an Early Childhood Development Centre is paramount. Every effort needs to be made to provide safety on the site from point of access to the playground boundary. Safety measures should also be taken for the potential wandering of children while in the care of teaching staff.

3.3.2 Zoning, spatial sequencing and wayfinding

The functional organisation of the site has an impact on the independence with which children are able to navigate the site (Mostafa, 2014). Adequate circulation and tools for navigation need to be visible to young children in the school environment to aid them in the independent use of space. Providing them with tools for independent navigation of their environment helps them gain control over their environment.

3.3.3 Thresholds

Thresholds can help children distinguish between different functions. The thresholds on the school grounds are the transition zones between the classroom and the playground, or vegetation between different zones of the school.



BLOCK CONDITIONS - TRAVEL ROUTES
SCALE 1:1000

TRANSPORT ROUTES

- Private transport
- Taxi - 'special'
- - - Walking from home
- - - Walking from CBD (public transport)

Figure 33. Travel routes, (Author, 2020)

Travel routes, (Author, 2020)

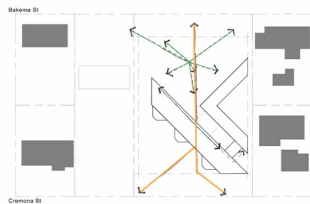


Figure 34. Accessibility, (Author, 2020)

Accessibility, (Author, 2020)

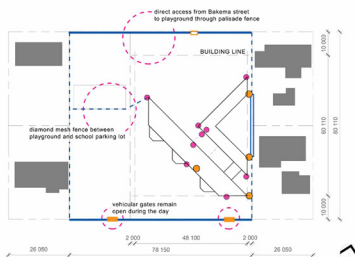
Figure 35. Safety and security, (Author, 2020)

Safety and security, (Author, 2020)

SITE CONDITIONS - ACCESS & MOVEMENT
SCALE 1:500

ACCESS & MOVEMENT

- Main axis
- - - Movement in corridor
- . . . Movement in the park



BOUNDARY & ACCESS

- Palisade fence
- - - Diamond mesh fence
- Concrete block wall
- Vehicular gate
- - - Pedestrian gate
- Security gate

SAFETY & SECURITY

- Cameras
- Security conflict

SITE CONDITIONS - BOUNDARY & SAFETY
SCALE 1:500



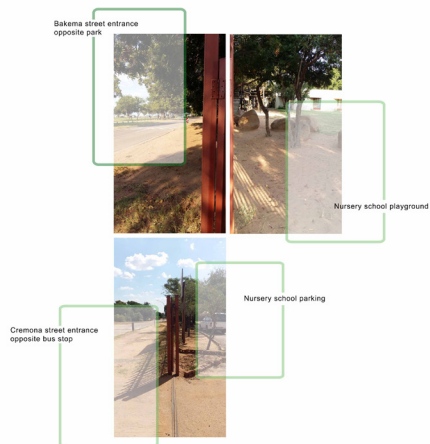
Figure 36. Block conditions, (Author, 2020)



Figure 37. Vegetation, (Author, 2020)

Figure 38. Site boundaries, (Author, 2020)

SITE CONDITIONS - VEGETATION
SCALE 1:500



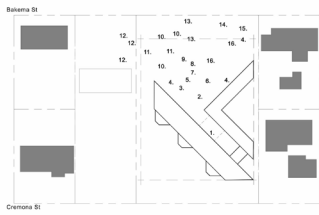


Figure 39. Playground analysis, a sense of place, (Author, 2020)

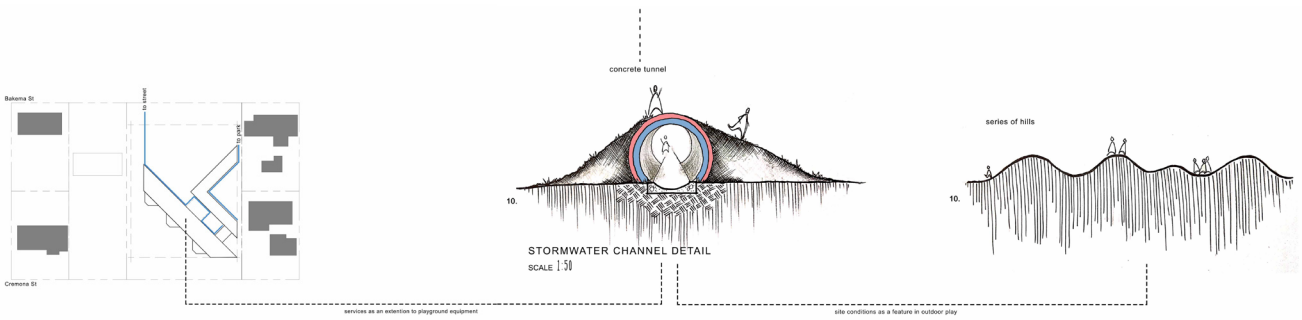
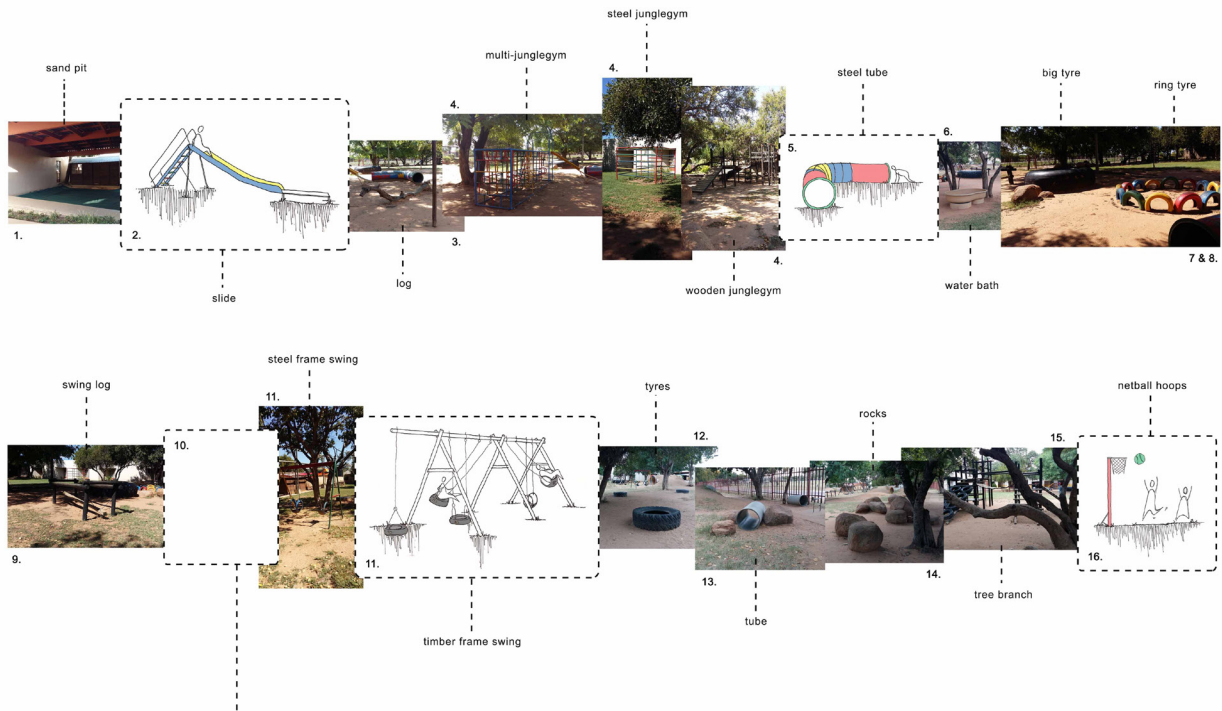


Figure 40. Playground conditions, (Author, 2020)

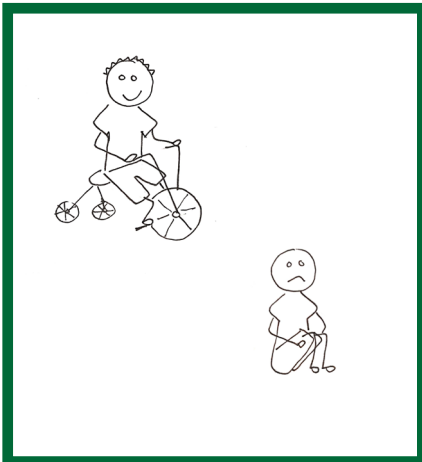
3.4 Micro study

The micro study considers the programme and user of Sunshine Nursery School, as well as a classroom analysis focused on the perception of the learning environment relative to these activities of the daily programme followed by the Grade R and RR class.

3.4.1 User profiles

The focus of the study is on the Grade R and RR learners, therefore the analysis of the user considers the profile and needs of children aged four to six. Sunshine Nursery School has three classrooms dedicated to Grade R and two classrooms dedicated to children between the age of four and five.

Primary users

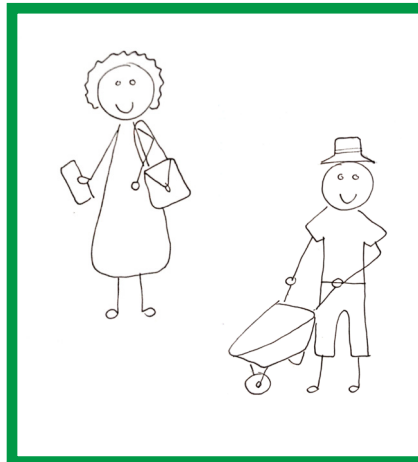


Grade R and RR learners

- Ages four to six
- Neurotypical learner (considered normal developmental)
- Atypical learner (children with learning difficulties)

Needs:

- Min. 1,5m² free play area per child
- Dedicated story, study and play areas
- Furniture suited for age group (see Chapter 6, Part 2)
- Sensory considerations: acoustics, lighting, material, accessible wayfinding



Sunshine Nursery School staff

- Principal
- Teachers
- Administrative staff
- Cook
- Cleaner(s)
- Grounds man

Needs:

- Staff room
- Breakout space



Teachers

- Grade R teacher
- Grade RR teacher with assistant teacher

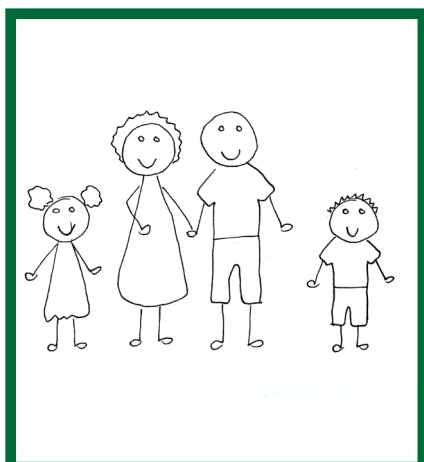
Needs:

- 1 teacher per 25 learners
- Assistant teacher for children with learning difficulties
- Secure storage for teacher's belongings
- Work station for teacher preparation

Figure 41. Primary user profiles, (Author, 2020)

Figure 42. Secondary user profiles, (Author, 2020)

Secondary users

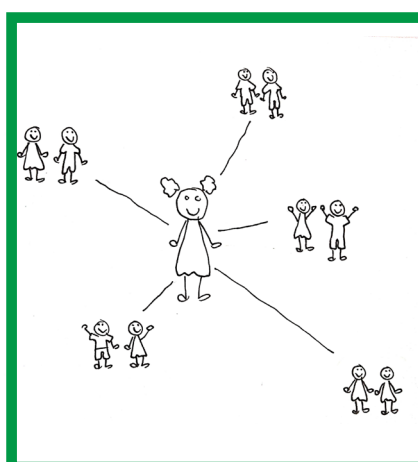


Family

- Family members are encouraged to participate in the learning development of the children with learning difficulties
- Encourage continued learning at home

Needs:

- Access to resources
- Access to consultations with teachers, learning specialist and similar professionals
- Support system



ECD school cluster

- Bambino's Daycare Centre
- Jabulani Daycare Centre
 - A Re Itereleng Community Preschool
 - Union Daycare Centre

Needs:

- Access to resources
- Community support facilities



Professional staff

- Executive function coaches
- Learning specialist and educational therapist
- Occupational therapist

Needs:

- Dedicated work space at the nursery school
- Room designed with sensory considerations in mind

3.5 Daily programme

The programme illustrated in ... below is a comparison of the daily routine followed by the Grade R and Grade RR classes. The time frame between 09:10 and 12:30 shows a split in the activities between the two age groups. This split creates the potential for shared activity spaces without a clash between the two classes. An example of this would be the Grade RR class participating in creative activities, while the Grade R class has their free play in the park, resulting in the Grade RR class using a common space for their creative activity.

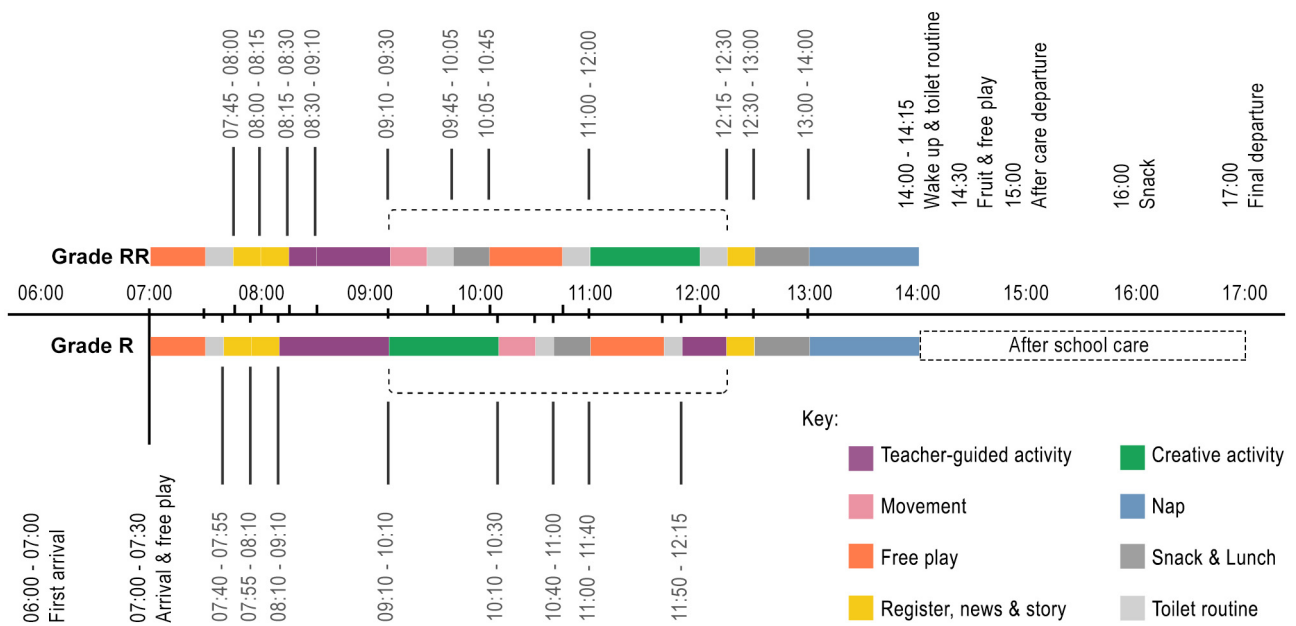


Figure 43. Daily school programme analysis, (Author, 2020)

The following ASPECTSS principles, with the respective descriptions, are used to analyse the classroom condition:

3.4.1 Zoning and compartmentalisation

Well-defined areas provide predictability for children with learning difficulties. Zones are organised according to sensory quality instead of programmatic function (Mostafa, 2015), providing children with more control over their learning environments. The classroom presents a need for defined functions addressing the various sensory qualities (acoustics, lighting and colour).

3.4.2 Spatial sequencing

Spatial sequencing helps to reinforce a sense of predictability in the classroom. The need for organised spaces, to aide children with learning difficulties with routine is advised.

3.4.3 Thresholds

Transition zones in the classroom help children recalibrate their senses as they move from one space or one learning activity to the next (Leestma, 2015).

3.4.4 Escape spaces

Escape spaces in the classroom create a sense of safety for a child who struggles with social interactions. The escape space provides them with control over their position in the environment when they feel overwhelmed.

3.4.5 Control of sensory stimuli

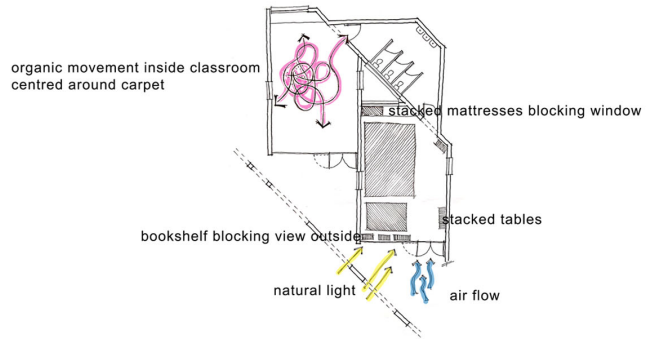
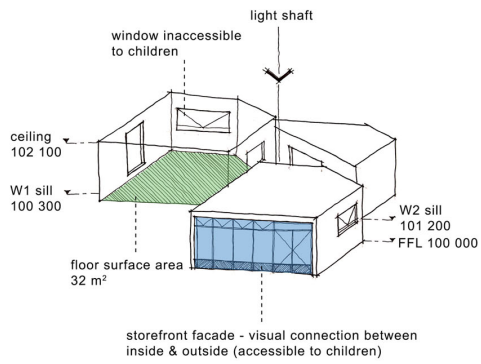
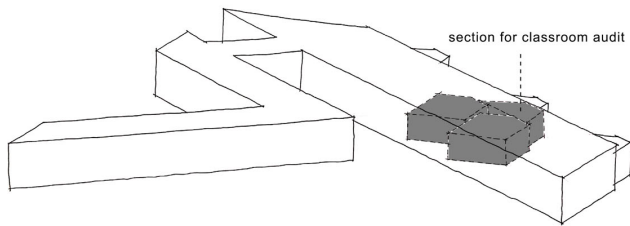
The sensory quality of a space has an influence on how the learning environment is perceived by the children and the teachers. A child's learning ability is directly affected by properties of acoustics, lighting and colour.

3.4.6 Safety

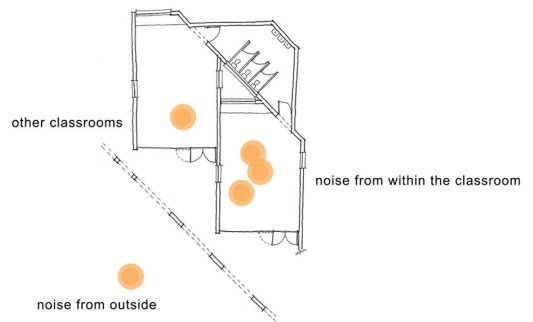
The safety of the learning environment as the children interact with space and object relates to material choices, surfaces, barriers, furniture and fixtures. Another factor to consider is visibility. Spaces should provide visual access to supervise children with learning difficulties who might be susceptible to bullying by their peers.



Figure 44. Classroom condition (Author, 2020)



MOVEMENT DIAGRAM



NOISE DIAGRAM

Figure 45. Physical environmental conditions of the classroom (Author, 2020)

3.5 Mapping teacher responses

Teacher’s perceptions of the quality of the existing school design was mapped. The mapping was done using the ASPECTSS Index rating system as shown in Table 3.1. The analysis uses a rating system between one and five, five being exceptional, and an average score is calculated. The study limits any interaction or observation of the children at Sunshine Nursery School (c.f. 1.8), therefore the teacher’s perceptions play a vital role in understanding how the classroom is used on a daily basis and how learning activities might be put at a disadvantage due to current barriers presented by the learning environment.

Criteria	Respondents	A	B	C	D	
	No. of learners	25	25	28	Whole school	
	Age	6 yrs	6 yrs	4-5 yrs		
	Performance rating	1 - 5 points				
	Overall school performance (perceived score)	60				
						Average
Acoustics	School	2	3	2	3	2,5
	Class	4	4	3	4	3,75
Spatial sequencing	School	4	4	5	5	4,5
	Class	3	5	4	3	3,75
Escape spaces	School	2	4	3	5	3,5
	Class	1	4	3	3	2,75
Compartmentalisation	School	4	4	4	5	4,25
	Class	3	4	3	2	3
Transition	School	4	3	5	4	4
	Class	n/a	n/a	n/a	n/a	n/a
Sensory zoning	School	3	4	5	5	4,25
	Class	2	2	3	3	2,5
Safety	School	4	4	4	4,5	4,13
	Class					
	ASPECTSS Index score	26	45	44	46,5	40,38
	Index & perceived score difference	34	15	16	13,5	19,63
	Index: Perceived score	0,43	0,75	0,73	0,78	0,67

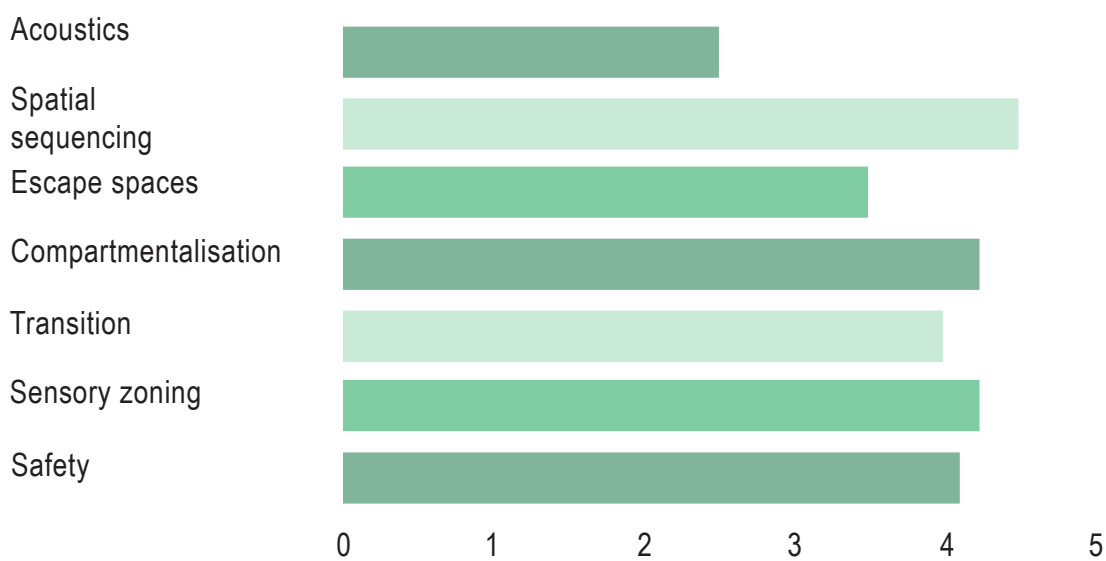


Figure 46. Whole school ASPECTSS Index analysis, (Author, 2020)

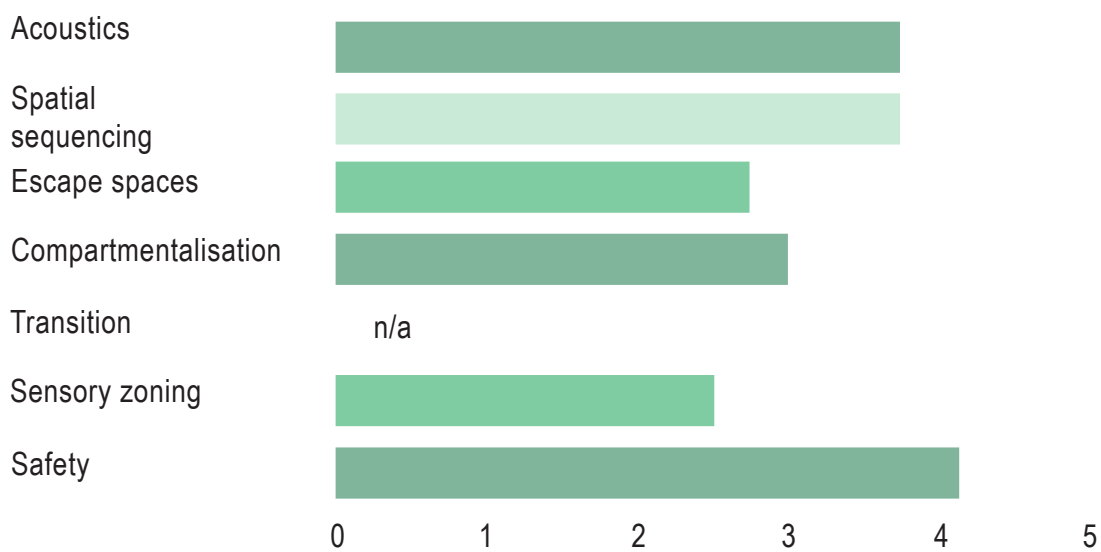


Figure 47. Classroom ASPECTSS Index analysis, (Author, 2020)

Conclusion

Context

Following the macro-study a school network is proposed support the ECD cluster. The purpose of the school network is to help children with learning difficulties during their transition to primary school. The network also presents an opportunity for parents to support one another as well as encourage parent involvement at school. In so doing the network groups further the goal for inclusive learning in Hammanskraal.

The community framework focuses on supporting the families of children with learning difficulties. Furthermore, the framework introduces a resource centre to encourage community engagement to support early development for all children.

Whole school and classroom

The findings of the micro analysis present environmental barriers that hinder the productive facilitation of learning development for children with learning difficulties. The existing school programme in Figure 3.1 unpacks the daily ritual of the five and six year old class, highlighting an opportunity for shared spaces where a break-away in the day's activities occur. The analysis of the ASPECTSS design strategies gives an overview of the barriers to inclusive design present in the classroom.

The overall perception of the school rates the outdoor environments as more successful in enabling the development of children, while the interior classroom highlights more concern in areas of sensory consideration and control. The classroom presents more control over acoustics, but legibility (c.f. 2.3.1) and transition zones shown in the mapping of teacher perceptions are of concern.

Introduction

Chapter four uses the principles of environmental psychology to analyse different learning spaces.

04 PRECEDENT

4.1 Introduction

With reference to the analysis of Sunshine Nursery School's daily programme (c.f 3.4), it is clear that children spend a considerable portion of their day at school. The physical environment has a great impact on the development of a young child; more so for children with learning difficulties, as their perception of the environment can affect their ability to navigate learning activities. Therefore, the conscious design of environments to enable learning development is vital for a young child with learning difficulties.

The following chapter makes use of the design strategies from the Autism ASPECTSS Index as an assessment tool, in order to extract informants based on the ability of school designs to support children's learning development. Furthermore, the principles of environmental psychology (listed below) are considered as a layer to enrich the analysis of key aspects identified in the precedent studies that follow.

1. Choice and control

2. Personal space

3. Sensory considerations

4. Legibility

5. Familiarity

6. Quality

7. Positive distraction

8. Social interaction

9. Access to nature and daylight

10. Safety and security

11. Supervision

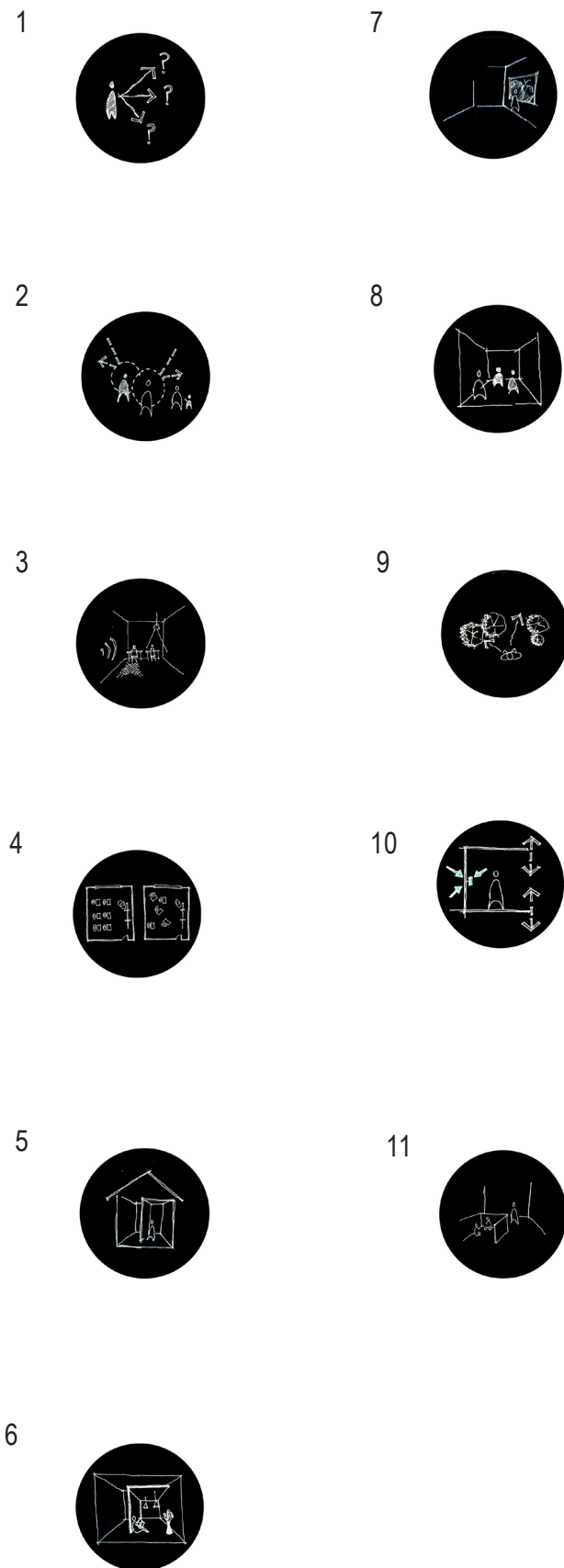


Figure 48. Principles of environmental psychology, (Author, 2020)

4.1.1 Rallim Preparatory

Architect: studioMAS

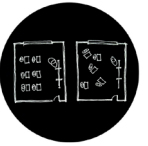
Location: Capetown, South Africa

Year: 2019



Figure 49. Work rooms, (studioMAS, 2020)



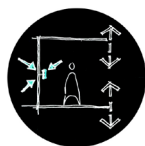


Rallim Preparatory redefines the landscape of education in the South African context with a design that **creates opportunities for collaboration, with explorative and experiential learning in integrated spaces**. Following the Reggio Emilia approach in the pre-preparatory phase (ages three to five), spaces are viewed as an “environmental tool for learning” (Rallim Preparatory, 2019) or the **‘third teacher’** (Reggio children, 2020), expanding the concept of a school beyond the classroom. The design **optimises the use of communal space**, considering the curiosity of young children and the physical environment as an opportunity to introduce learning strategies.

- Design considerations:
- Accessibility
 - Adaptability (operable walls for shared space)
 - Flexibility
 - Visual link between learning spaces



Figure 50. Connection to nature, (studioMAS, 2020)



4.1.2 Tuupala elementary school and Daycare Centre

Architect: ALT Architects and Karsikas Architects
Location: Kuhmo, Finland
Year: 2017

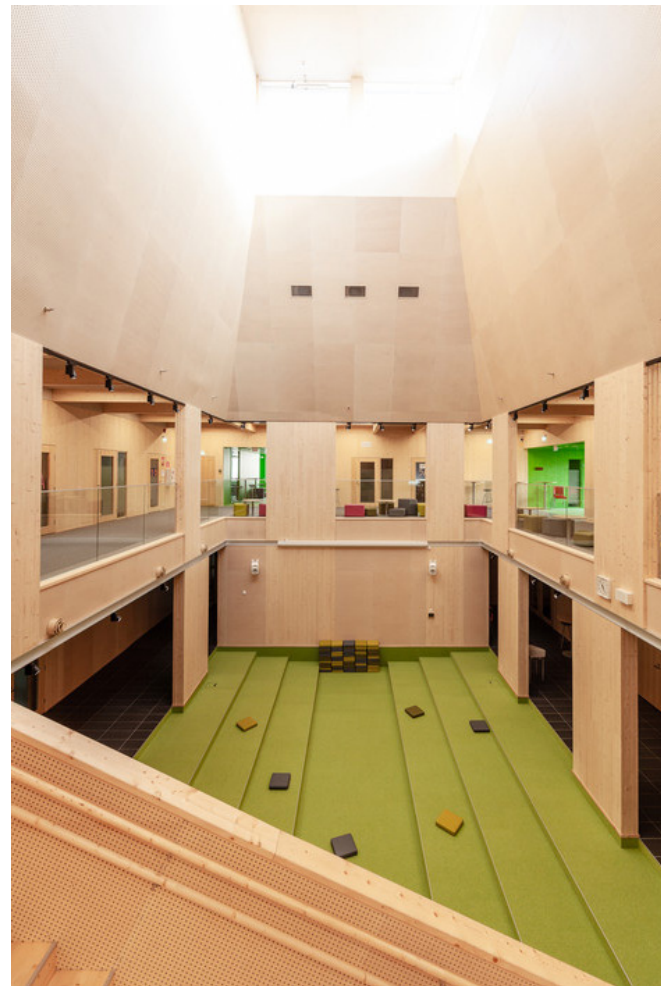
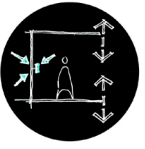
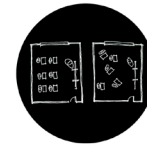
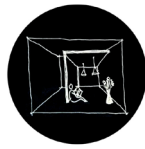


Figure 51. Tuupala daycare communal spaces, (ALT Architects, 2020)



Tuupala elementary school and Daycare Centre is designed around three timber cubes, connected to create child centred outdoor spaces. The layout follows the pattern of a village, **celebrating the extensive use of timber** by leaving the locally produced CLT surfaces visible on various areas of the interior. Attention to detail and materiality provides a refined aesthetic, with a **coherent design language which is carried throughout the interior spaces** (ALT Architects, 2018). The circulation spaces are multi-functional, serving as breakout spaces for learning activities. Design finishes include perforated plywood with fabric muffler wool to control unwanted noise (New Nordic Timber, 2020).



Figure 52. Tuupala classroom, (ALT Architects, 2020)

Figure 53. Wall details, (ALT Architects, 2020)

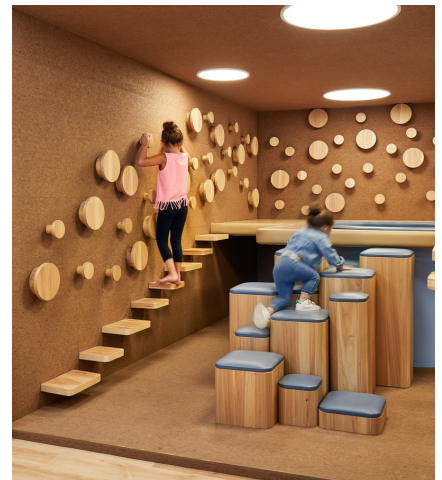


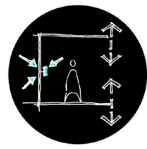
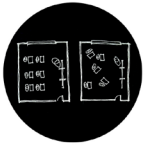
4.1.3 Nía School

Architect: Sulkin Askenazi

Location: Mexico City, Mexico

Year: 2019



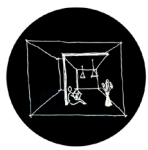


The design of Nia School encourages the creative potential of children by considering **various spaces for creativity** within the interior classroom. Learning is linked to music, creative activity and play through a **design that considers freedom of movement**. The aim is to “support the growth of children through various environments that allow them to develop their skills through interactive learning” (Archdaily, 2019). Large windows connect the exterior to the interior spaces, giving **visual access** to the children and continuing the perception of free movement from one space to the other.



Figure 54. Interior play scape, (Sulkin Askenazi, 2020)

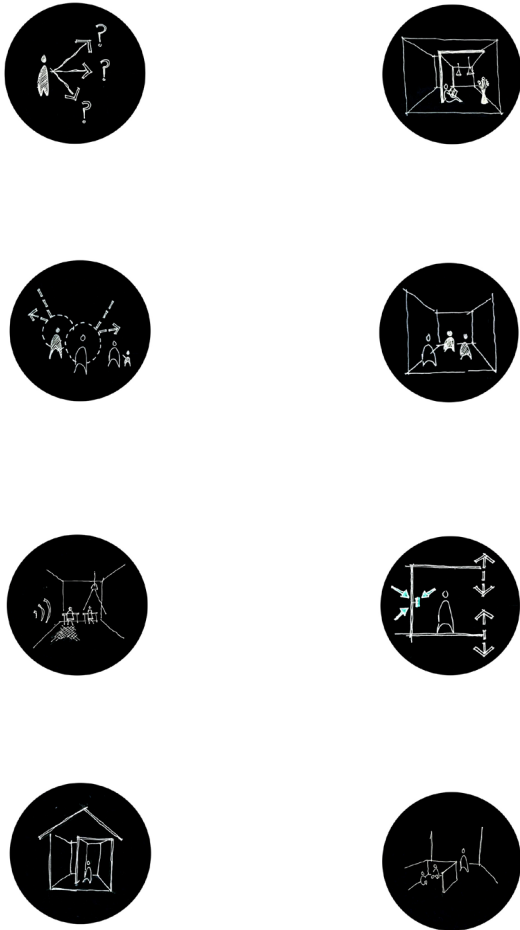
Figure 55. Work spaces, (Sulkin Askenazi 2020)



4.1.4 Alt School

Architect: A + I Architecture
Location: New York, America
Year: 2017





The school is centred around a blue agora, which functions as a gathering space for presentations and events. It also **provides children with escape spaces** when they need to break away. The agora includes a design lab, used primarily as a “maker-space” (Brillon, 2018) for science experiments and arts and crafts. The design of the **central spaces are adaptable**, making provision for events, performances or an indoor playground. Classrooms line the perimeter of the space, **giving access to natural light**. **Classrooms can be adapted** for large or small group activity, with a “flex room between two classes used as a breakout classroom to accommodate independent learning” (Brillon, 2018). **Differentiation between spaces is achieved through colour coding**, marking quiet and reflective spaces, to more collaborative and active spaces.

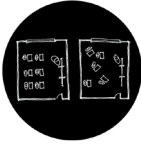
Design considerations:
 Adaptable learning environments
 Colour coding to indicate learning activities
 Storage spaces double as pin up/presentation boards



Figure 56. Colour coded communal spaces, (A + I Architecture, 2017)

Figure 57. Individual and group work spaces, (A + I Architecture, 2017)





Following the Reggio Emilia approach, English for Fun encourages children to learn through the activation of their five senses (Lorena del Río + Iñaqui Carnicero, 2016; Singhal, 2017), using the built environment as an aide in directing **learning through play**. The design steers away from the traditional spatial practice of compartmentalisation, by **blurring the boundary between classrooms and circulation spaces**.

This approach expands the perception of space (Singhal, 2017), giving the user **visual access** from circulation into classroom and vice versa, for a continued engagement with the learning activity taking place.

Design considerations:

Accessibility (considering scale for children)

Adaptable (furniture systems)

Flexible use of space

Inhabitable walls as escape space and storage

Visual connection between spaces

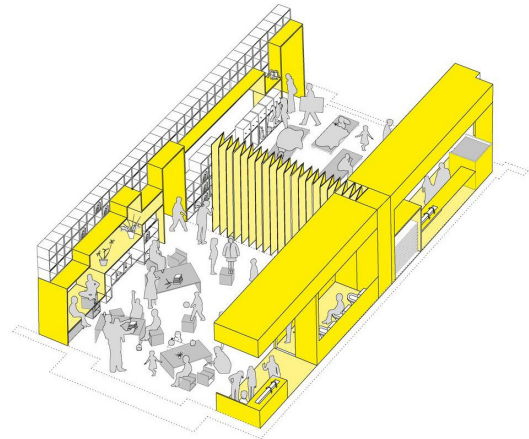
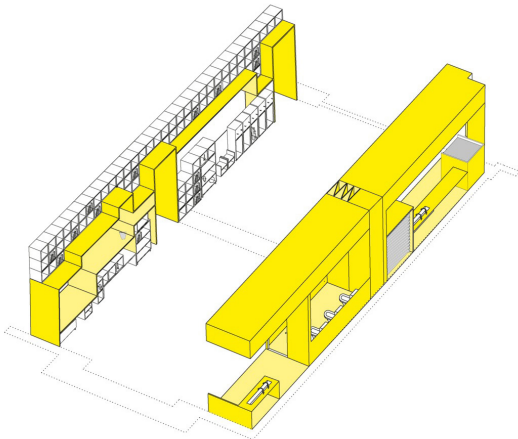


Figure 58. Interactive wall, (Lorena del Río, 2016)

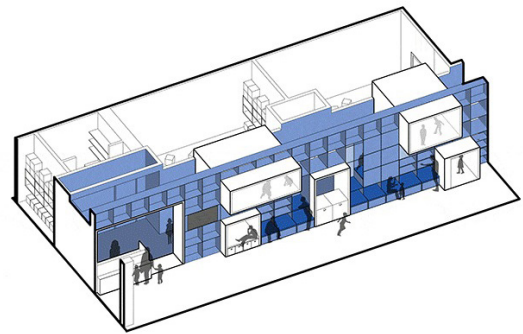
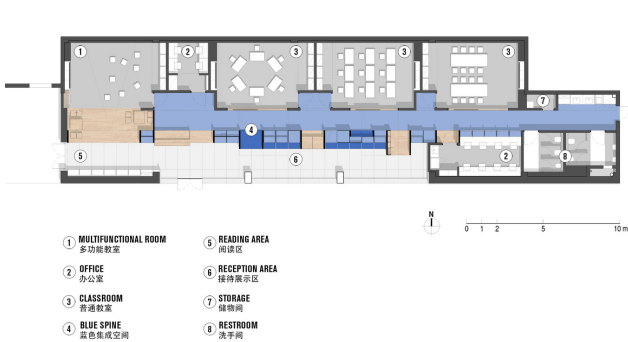
Figure 59. Design scenario, (Lorena del Río, 2016)

4.1.6 Qkids English Centre

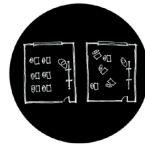
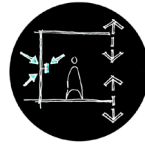
Architects: Crossboundaries

Location: Xiamen, China

Completion date: 2020



THE BLUE SPINE
蓝色功能集成空间



The design of Qkids is based on a blue spine, which is the main design feature running right through the core of the site, acting as the host for a series of modules. **The spine serves as a threshold between public and private space**, while the **modules consist of fixed and flexible units** of furniture that can be used in the adjacent classrooms. This design offers an **interactive environmental experience, concerned with stimulating curiosity towards learning** within the traditional classroom (Crossboundaries, 2020).

- Design considerations:
- Accessibility (considering scale for children)
 - Break-away spaces
 - Encourage play and exploration
 - Multifunctional space (divide or expand public interaction)
 - Sensory considerations (light, acoustics, material and texture)
 - Visual connection between spaces
 - Zoning according to level of privacy



Figure 60. Interactive wall, (Crossboundaries, 2020)

Figure 61. Spatial configuration, (Crossboundaries, 2020)

4.1.7 Kit of Parts: a portable classroom concept

Architect: Studio Jantzen

Location: America

Year: 2012

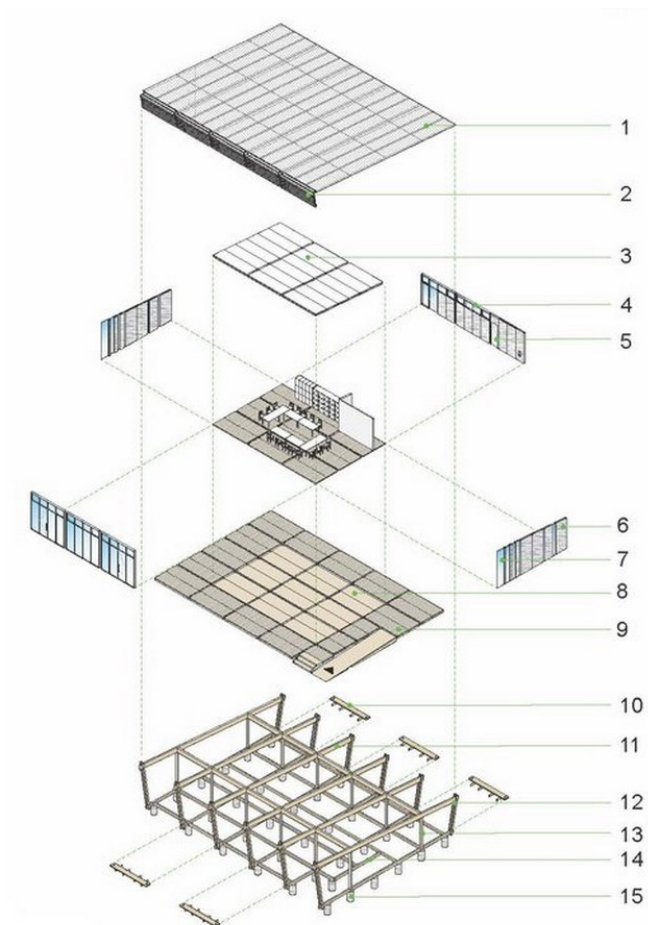
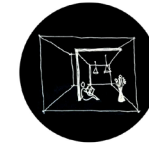
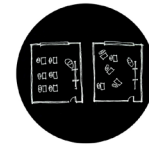


Figure 62. Kit-of-parts construction, (Studio Jantzen, 2012)



This portable classroom was conceptualised as a response to counter the negative connotations associated with mobile classrooms. Characteristics that hinder the well-being of children in their learning environment were identified and used as informants for the design. These include cheap infrastructure that is not durable or recyclable, the isolation of the classroom from other classes, students and activities, and most concerning, an unhealthy learning and teaching environment (Studio Jantzen, 2017). To address these issues, the classroom construction looks at **a creative, flexible and sustainable construction model.**

The classroom **offers variations in environmental quality settings** by providing the user with an **opportunity to control acoustics, light and ventilation; offering an ideal setting for a more productive learning and teaching environment.**

The fast construction method of the structure creates an opportunity to configure the classrooms in a manner that creates communal spaces.

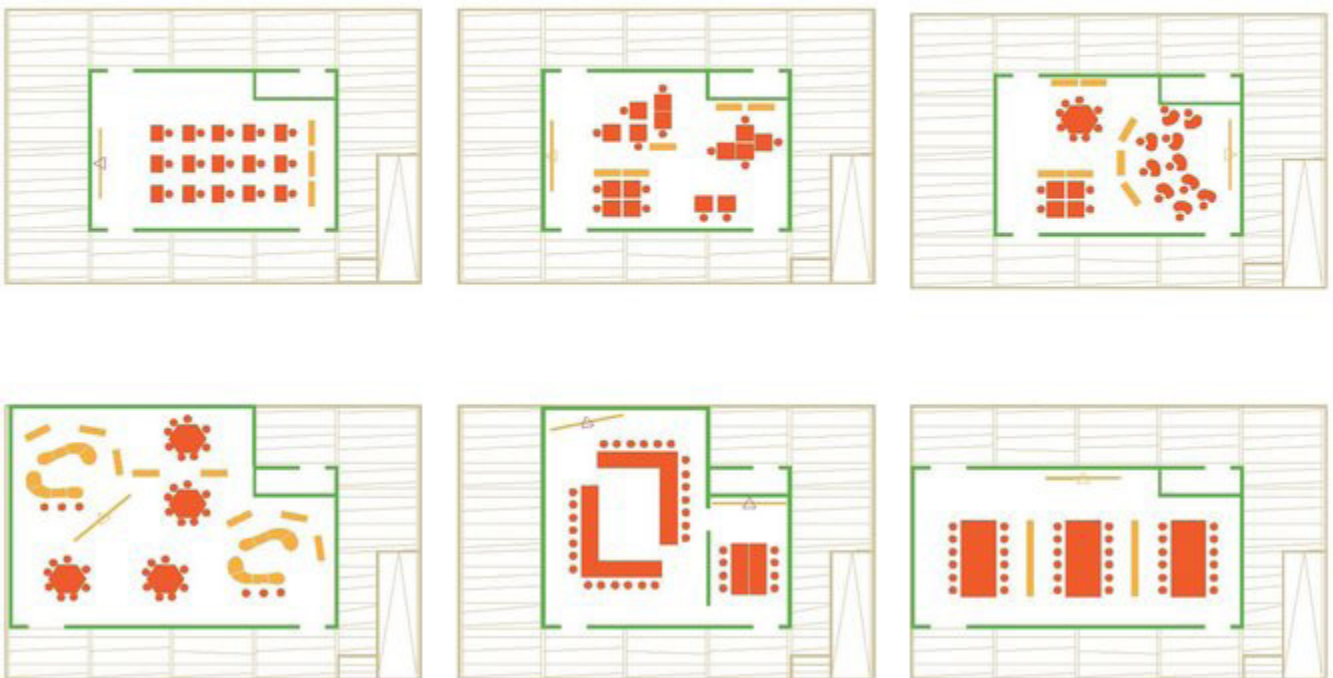


Figure 63. Teaching configurations, (Studio Jantzen, 2012)

4.1.8 L+

Architect: SITU Studio & collaborators
Location: New York, America
Year: 2014

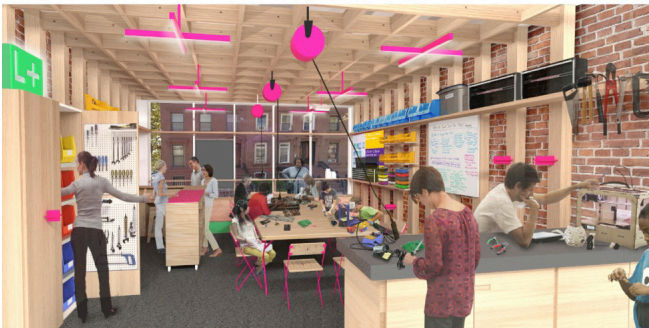
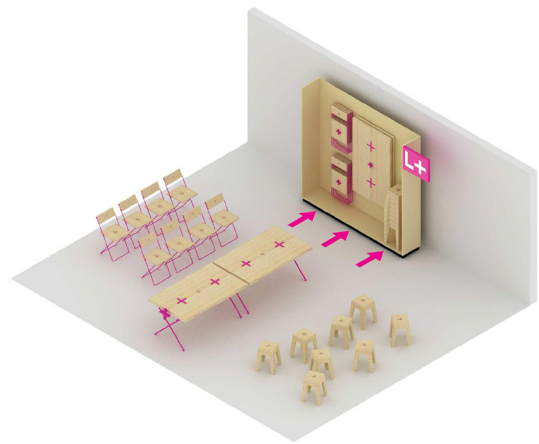
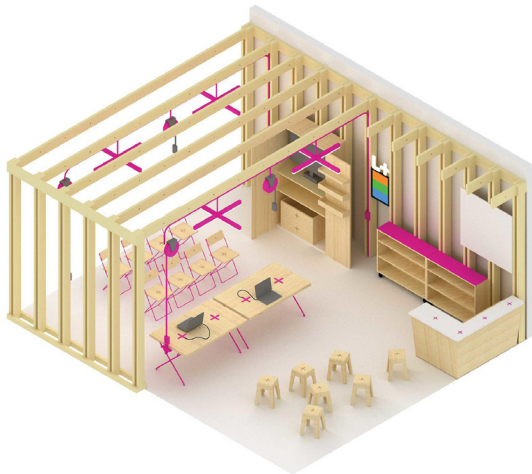
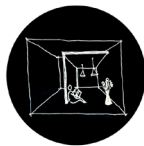
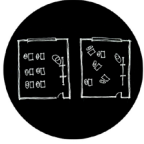


Figure 64. Pop-up library, (SITU Studio, 2014)



L+ was conceptualised as a new strategy for libraries across New York City. The goal of the project was to “realign the design of the institution to match contemporary needs” (L+: Re-Envisioning New York’s Branch Libraries, 2014), addressing the programme to meet the developing functions that a 21st century library presents. The proposal is based on a kit-of-parts construction, **responding to spatial limitations**. The result is that the design becomes an **extension of the existing space** to which it is included. The collaborators of L+ have envisioned the insertion of this library as an **adaptable structure that offers diverse scenarios to meet the needs of the various user groups** (SITU Studio, 2014). Various layouts are made possible with the design team’s conscious decision to **integrate a furniture system as part of the construction**.

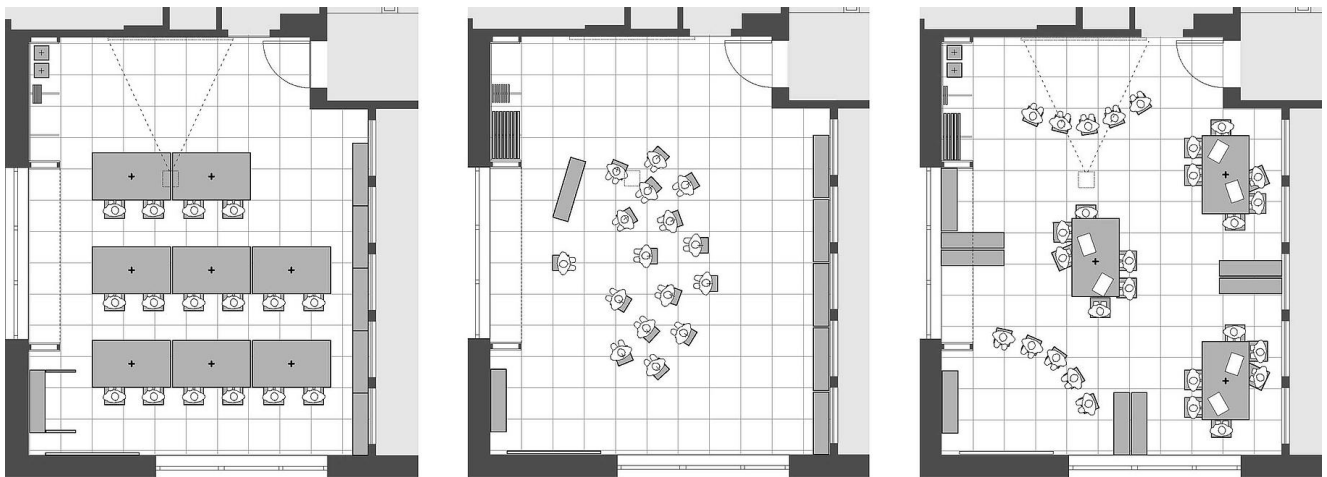


Figure 65. Learning configurations, (SITU Studio, 2014)

4.2 Findings

The table below is a summary of the principles of environmental psychology identified by each precedent study.

	1	2	3	4	5	6	7	8
Choice & control	X	X	X	X	X	X	X	X
Personal space	X		X	X		X		
Sensory considerations	X	X		X			X	
Legibility	X	X	X		X	X	X	X
Familiarity	X	X	X	X				
Quality	X	X	X	X			X	X
Positive distraction	X		X				X	
Social interaction	X	X	X	X	X	X	X	X
Access to nature & light	X	X	X			X	X	
Safety & security	X	X	X	X		X		
Supervision	X		X	X	X	X	X	

Conclusion

The precedent studies investigated ECD environments that provide opportunities for active participation. Furthermore, the facilitation of social interactions in the learning environment.

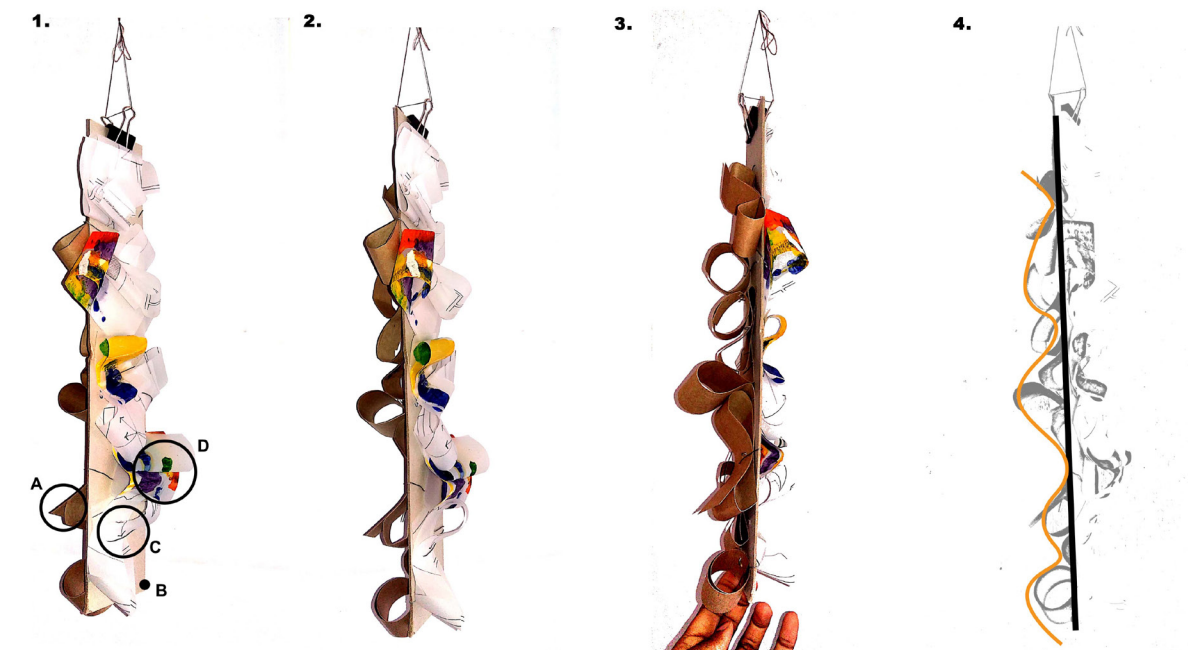
Design strategies for the Autism ASPECTSS Index, as well as principles of environmental psychology served as tools for analysis of the precedents. Methods to address spatial constraints through the design of dynamic learning environments for young children were uncovered through the analysis.

Having realised a need for additional learning space and the benefit of outdoor learning for young children (c.f. 2.9.2), a new conceptualisation of classroom (c.f. 1.5.3) is envisioned through the precedent studies of portable classroom concepts.

Introduction

The conceptual vision for the proposed design intervention is explored in this chapter. The program and persona's of four primary users serve as informants for the design of spaces that will enable the development of children with learning difficulties.

05 CONCEPTUAL APPROACH



The exploration above is a series illustrating learning through active engagement and play.

- A: The boundary between the classroom and the playground
- B: The landscape
- C: The building
- D: The '100 languages' _ for the child with a colourful mind

Figure 66. In-between, an exploration, (Author, 2020)

5.1 Program and persona's

<p>Classroom</p> <ul style="list-style-type: none"> - 1,5m² of free floor area per child (Department of Social Development, 2006) - Dynamic learning spaces (floor area needs to be free of obstruction and boundaries of a permanent nature) - Storage for children's bags and personal belongings - Storage and work space for teacher(needs to be flexible) <p>Note: Required activity areas for foundation phase is discussed below</p>	
<p>Children's WC</p> <ul style="list-style-type: none"> - Accessible by young children - Ratio of WC's and WHB to child is 1:20 - Wheelchair accessible WC 	
<p>Circulation route</p> <ul style="list-style-type: none"> - Clear path for circulation (according to SANS 10400-S) - Navigation tool for independent use of space by children - Space along the route for informal learning - Social and recreational functions <p>Note: Potential breakout space for paraprofessional to work with small group (1 or 2 children)</p>	
<p>Playground</p> <ul style="list-style-type: none"> - Accessible from classrooms where possible (physical and/or visual accessibility) - Potential spaces for outdoor learning (in-between spaces) - Safety and security - Suitable equipment for free play 	
<p>Sensory garden</p> <ul style="list-style-type: none"> - Interactive learning environment that prompts participation - Safety and security 	
<p>Sensory room</p> <ul style="list-style-type: none"> - Escape space and low-stimulation respite spaces (Dr. Owen, 2016) - Visually accessible by teachers to facilitate children at all times - Accommodate professional support staff during school visits 	

Figure 67. Design intervention diagram, (Author, 2020)

Figure 68. Persona's, (Author, 2020)

The introvert



Didintle is a **five year old** girl in Grade RR who lives in Temba with her mother, grandmother and seven year old brother. She is a **reserved** young girl, and only has one friend at school named Nthabiseng. Although Didintle and Nthabiseng are friends, she has **uncertainties about welcoming Nthabiseng into her personal space**. She is kind, but to children in her class who do not understand her **difficulties with social interaction**, she is classified as **'different'**.

The extrovert



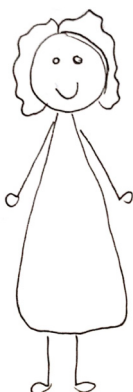
Sizwe is a **six year old** boy in Grade R. He lives in Renstown with his father and mother. Sizwe's day in class is filled with a lot of **frustration on the part of those around him**. He fidgets a lot, **interrupting learning activities** that require quiet and concentration. Sizwe finds it difficult to complete tasks in class and has **trouble with the confines of the classroom**, resulting in disruptive behaviour.

The anxious child



Thabang is a **six year old** boy in Grade R, who lives with his parents and baby brother. Unlike Sizwe, Thabang's day is filled with **frustration at his own expense**. He has **difficulty following instruction**, resulting in him grasping concepts at a slower rate to his classmates. He also experiences **difficulty with sensory perception** resulting in a delayed spatial, auditory and visual awareness. This results in him avoiding interaction with the other boys in his class, fearing they might bully him because he **struggles to keep up to their rate of cognitive, physical and social development**.

The patient teacher



Teacher Onika is Sizwe's Grade R teacher. She has been teaching the Grade R class at Sunshine Nursery School for 6 years, and has had quite the colourful experience **teaching one or two children with learning difficulties** in her class throughout her career. Teacher Onika is an enthusiastic teacher, trying to **find resources within the natural environment to help the children learn**, being fully aware that the classroom has presented barriers for a number of her Grade R learners. When possible, the **playground becomes the classroom**, but she often struggles to control the group of 25 children in an **uncontrolled environment** by herself.

5.2 Concept development

Learning environments for children with learning difficulties need to take several factors into consideration that are perceived as the main cause of environmental stress and that hinder learning development. These factors include sensory experience, cognitive processing, perception and social needs.

Chapter 2 discusses the role of the physical environment in the learning development of young children. In order to support the intellectual, social, perceptual-motor and emotional development of children with learning difficulties, opportunities for active engagement is encouraged. From the theory it was established that the physical environment has the potential to encourage self-directed learning (c.f. 2.6) through the introduction of environmental principles.

Chapter 3 identifies physical environmental factors that hinder the learning development of children at Sunshine Nursery School. This provides the designer with opportunities to respond to the barriers of inclusive education at a community, whole school and classroom scale. The three scales of investigation consider how the public is filtered into the learning development of children with learning difficulties, how learning can be expanded into the active zones of the school, steering away from the traditional boundary of the enclosed classroom. Figure 67 illustrates the intention of bridging the three scales to support the active engagement of children with learning difficulties.

Chapter 4 identifies studies illustrative of the theoretical premise, inclusive learning environments and active engagement between user and object. From the precedent studies, the informants identified are choice and control, legibility and social interaction (c.f. 4.2).

Initial conceptual statement

The concept approaches **opportunities to learn through play by identifying the value of in-between spaces that support the development of children with learning difficulties.**

For the purpose of this proposal 'in-between' refers to the spaces or objects that enable 'active engagement' required by children in order to gain a sense of control of their environment.

A concept for [IN] between spaces

The initial response considered three approaches to in-between space that could potentially add value to the development of children with learning difficulties at Sunshine Nursery School. The selection of these areas is based on the analysis of key environments within the school premises that have the potential to facilitate the productive development for children with learning difficulties, based on Aminpour's (2020) physical characteristics of in-between spaces:

Enclosure

Condition one as 'space type' illustrated in Figure 69

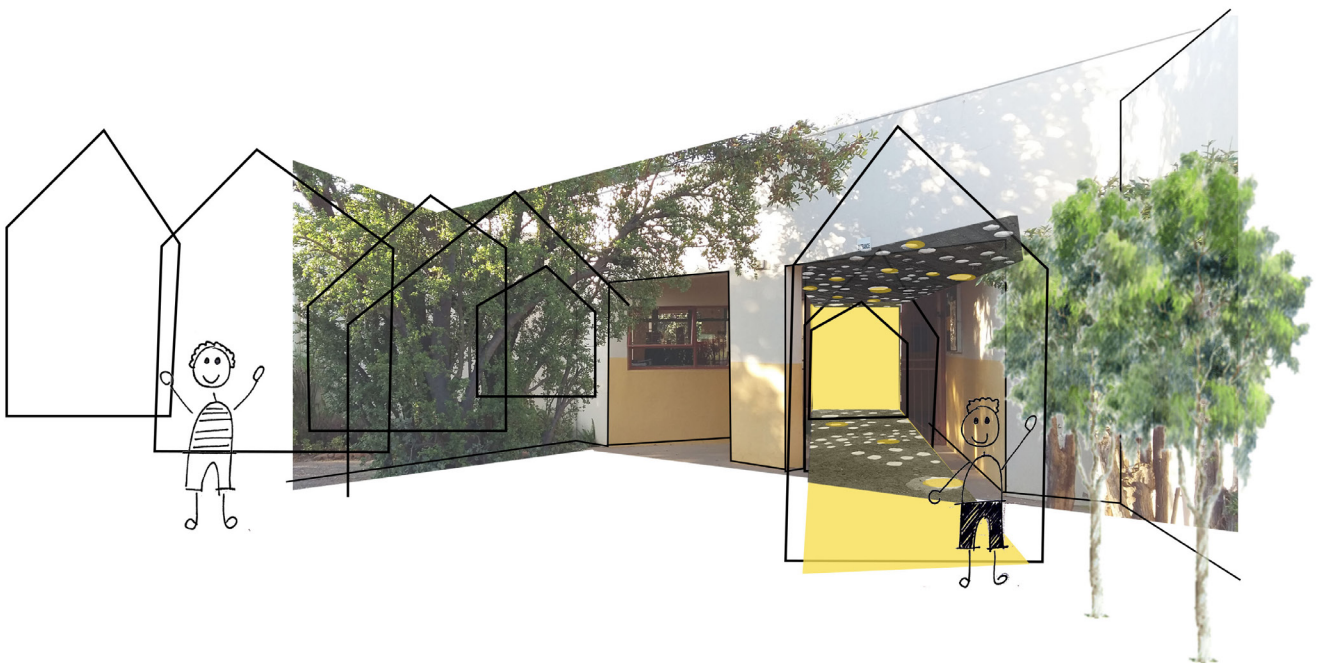


Figure 69. Enclosure, (Author, 2020)

The concept is based on the principle that a child's first point of contact with the learning environment should provide them with a sense of comfort, as this influences their initial perception of the environment. The enclosure becomes a space of escape for the child who experiences an overwhelming feeling of sensory input from environmental factors or when seeking out personal space.

Threshold

Condition two as 'space location' illustrated in Figure 70

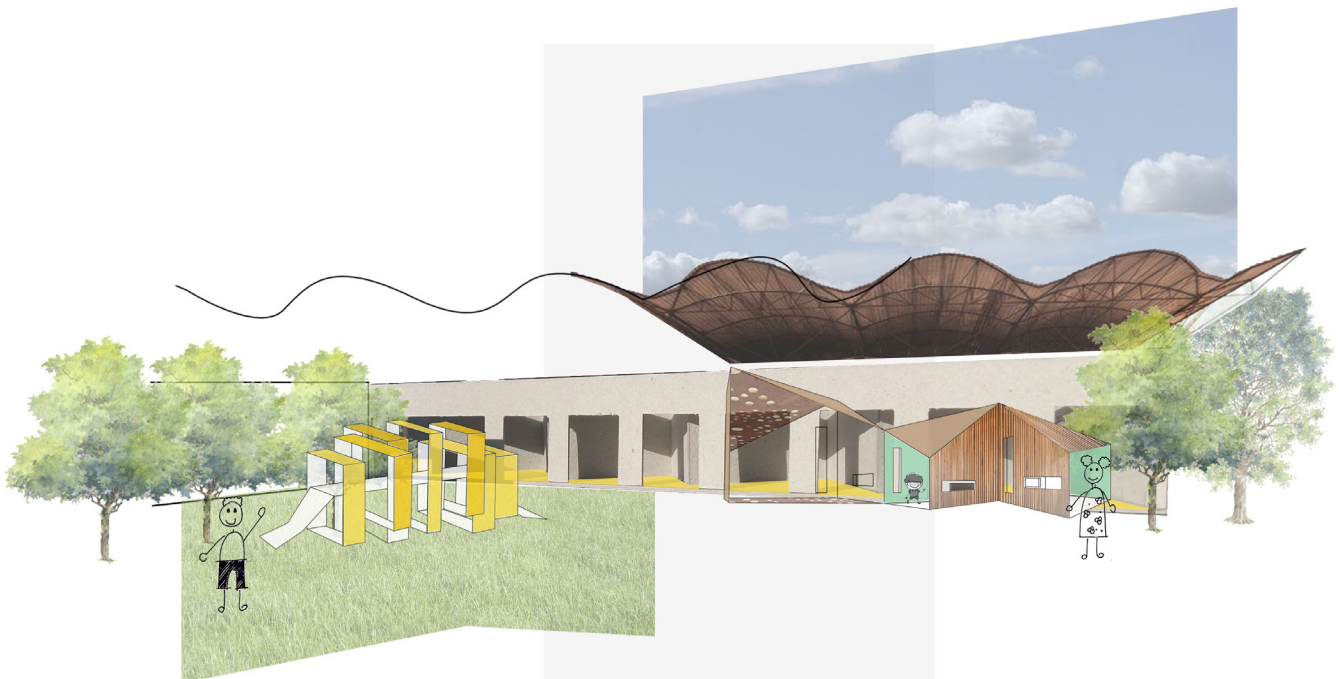


Figure 70. Threshold, (Author, 2020)

This space is the primary circulation route within the nursery school, and is referred to as [IN] between – the space between inside and outside. This refers to the threshold between the classroom (low-stimulus zone) and the playground (high-stimulus zone). This transition space becomes essential to the process of sensory zoning, which provides the user with an opportunity to mitigate the intensity of sensory output.

Meeting space

Condition three as 'space elements' illustrated in Figure 71

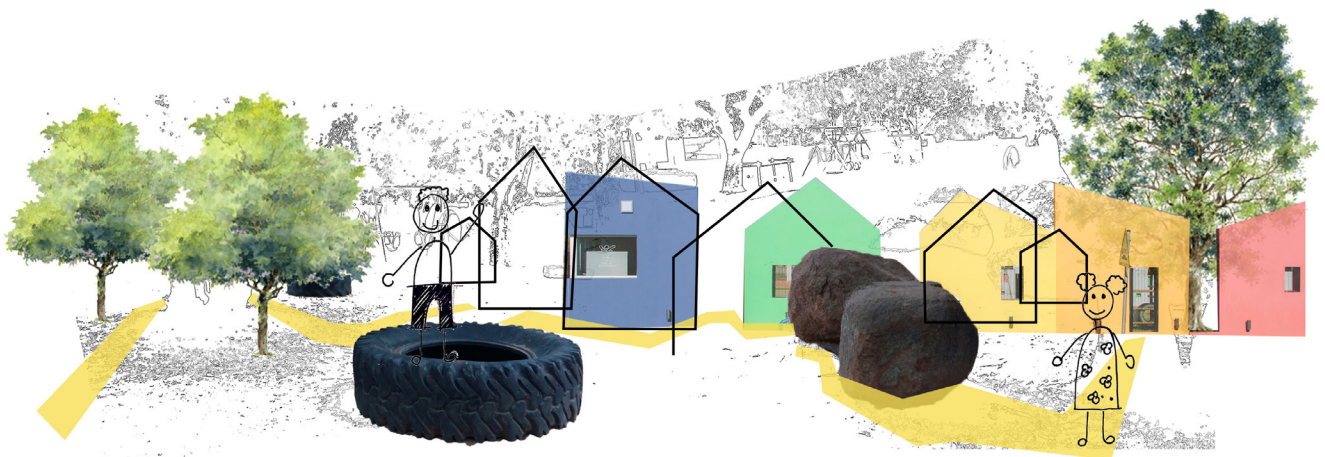


Figure 71. Meeting space, (Author, 2020)

The edge of the playground at Sunshine Nursery School was identified as a space to which a number of the children retreat when they do not desire to participate in the more active and physically driven forms of play. Instead, intimate scales of interaction emerge around natural elements of the environment, like the trees and boulders along the edge of the site.

The purpose of these in-between spaces is to support different systems of the design to establish a pattern language for learning development (c.f. 1.5.1); a system of interventions to ease the barriers to inclusive design.

5.3 [IN] between

The three in-between conditions can be translated into the learning environment through **scale, control** and **spaces for interaction** represented in Figure 72.

The value of [IN] between space is in the opportunity it provides for children to gain a sense of control over the learning environment, introducing legibility so that children can differentiate between learning activities, and providing an intermediate space where learning through play can be expanded upon. The active engagement with the learning environment is encouraged for the development of socio-emotional, cognitive and perceptual-motor skills.

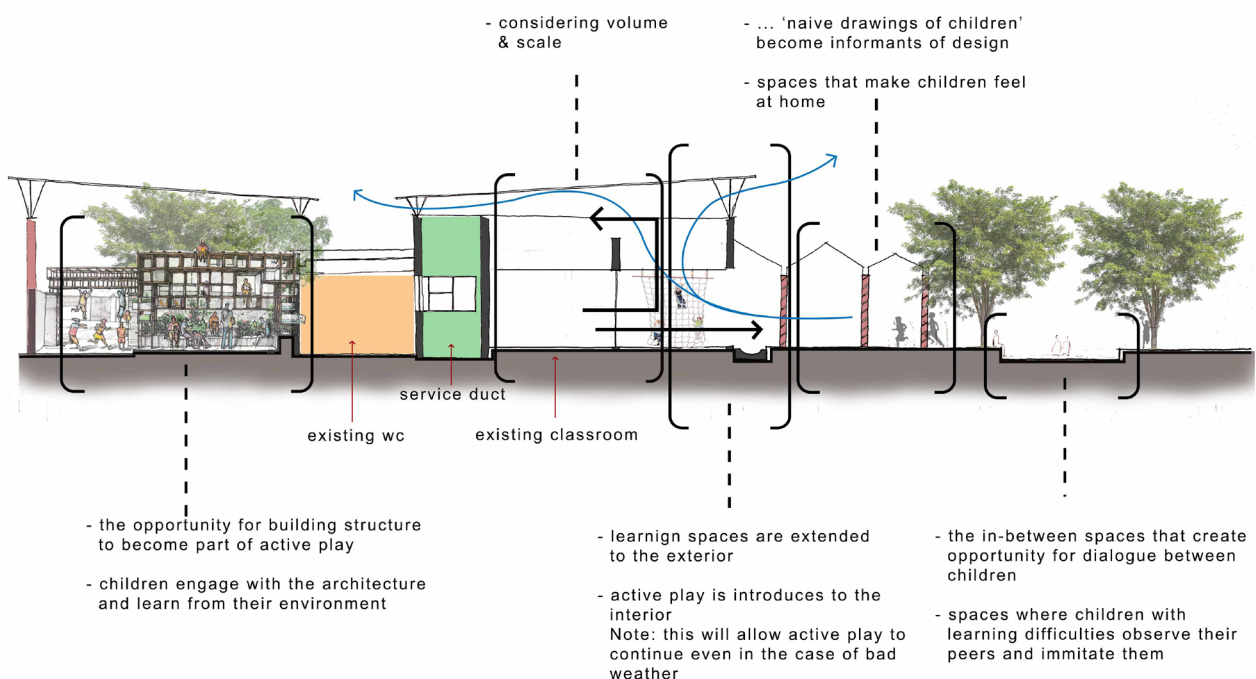


Figure 72. Imagining in-between spaces, (Author, 2020)

5.3.1 Design intention

The intention of the design proposal is to adapt the physical learning environment of Sunshine Nursery School, to benefit the learning development of children with learning difficulties by addressing the existing barriers to inclusive design (c.f. 1.2). Chapter 6 will identify specific learning to organise- spaces that will benefit children with learning difficulties, and a pattern language (themes from the thematic analysis). The intention is to provide children, regardless of their ability/disability, with the opportunity to navigate space independently.

Conclusion

The three conditions – space type, space location and space element, illustrated in the conceptual development were used to demonstrate the value of in-between spaces in the development of children with learning difficulties. In-between spaces are adopted as the conceptual approach. In-between spaces can be viewed as a system to structure and implement support the various principles of environmental psychology (c.f. 2.3). This will be achieved in the development of the design through consideration for scale, control and spaces for interaction.

Introduction

Chapter 6 presents a design response to the physical environmental barriers hindering the learning development of children with learning difficulties at Sunshine Nursery School. The chapter is structured in two parts:

The first part investigates how the informants are used to develop a pattern language based on the principles of environmental psychology and the areas of development. Design strategies are applied to the area of investigation to articulate how the intervention has addressed the barriers that hinder the development of children with learning difficulties.

06 DESIGN DEVELOPMENT

Part 1 - Specific learning

How can the physical environment of Sunshine Nursery School be adapted to benefit the developmental needs of children with learning difficulties?

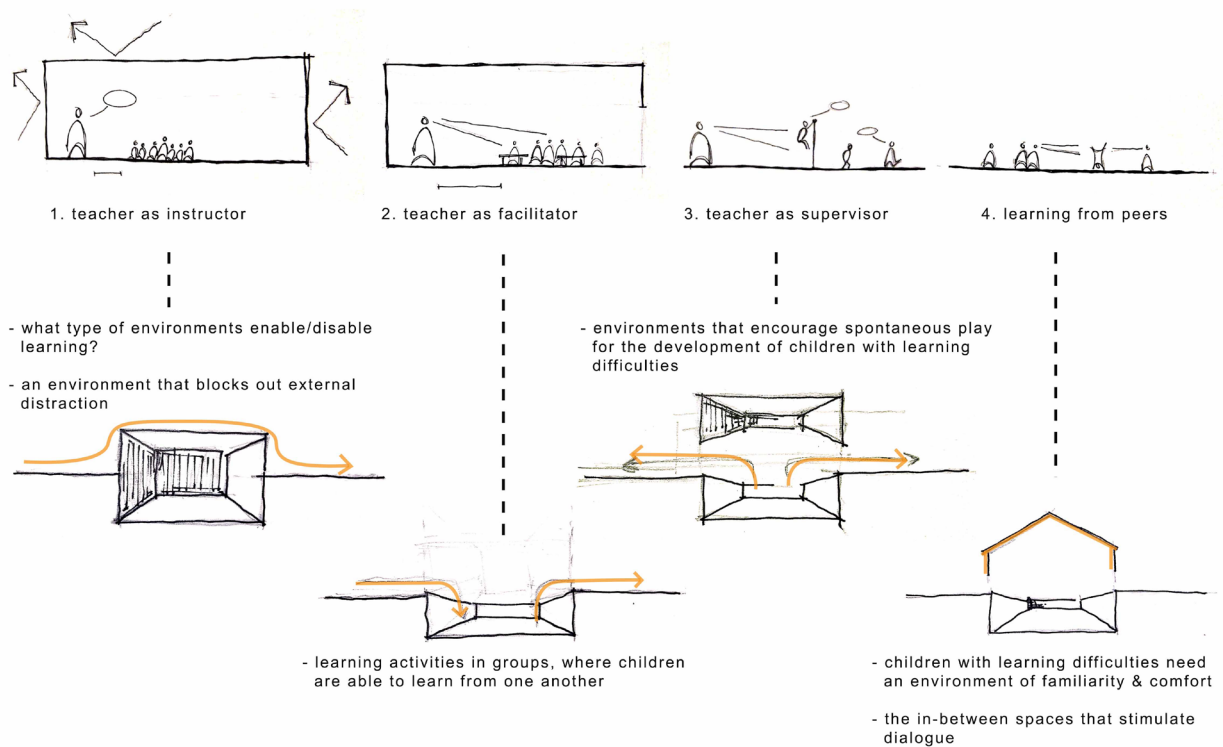


Figure 73. Addressing physical environmental factors, (Author, 2020)

6.1 Program

The activity areas for a Grade R and RR classroom differ from low-stimulus to high-stimulus environments. At this phase, learning development occurs through the engagement of the senses, therefore an active engagement with the environment is encouraged as stated in the theoretical inquiry (c.f. 2.4.2). This is achieved with different styles of play which help to improve competencies in their emotional, intellectual, perceptual-motor and social development. The types of play include active play (physical activity), guided play, imaginative play, planned play, spontaneous (free play) and structured play.

According to the Department of Social development guidelines (2006) and Eurydice teaching policies for Early Childhood Education and Care (2019), early learning activity areas for foundation phase are as follows:

- Art and craft – relatively messy activities including paint, glue and modelling equipment.
- Book and story corner – a space for communication and teaching literacy.
- Home corner – offers practical and imaginative driven activities.
- Movement and music corner – expressive environment equipped with instruments (homemade or commercial) and theatrical devices. These activities can also be prompted by physical environmental factors, like instruments that are built into the fabric of the learning and play areas.
- Problem solving – different methods of awareness and observation for teaching numeracy.
- Sand and water play – experiment through play with toys and hands. Sand and water activities are categorised as sensorial play.
- Small and large equipment – primarily for outdoor play.
- Table-top activities – creative focused/driven activities like drawing and colouring. Painting and collaging is reserved for the art and craft activity area.

These activity areas are used as informants to formalise program and function for specific learning (Figure 6.1), helping the designer articulate the space to create a dynamic environment that supports learning development.

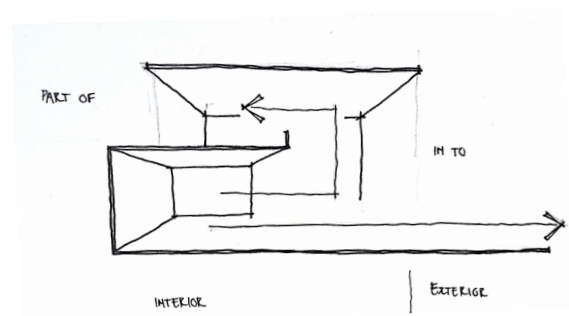


Figure 74. Design intervention diagram, (Author, 2020)

6.2 Concept for specific learning

Specific learning is used to refer to the area of intervention, and linked to the early learning activity areas for foundation phase (Department of Social Development, 2006; Eurydice, 2019). The need for specific learning is developed from the informants in chapters 2, 3 and 4. These are used to identify the potential of providing different learning areas within the classroom. This results in the proposal of an extended learning environment, in order to support a diversity of needs;

- The design proposes an extension to the interior classroom. The intervention includes the adaptation of the existing circulation route as part of the interior classroom, increasing the floor area of each classroom.

- The new circulation route is considered a place for learning. It acts as a spine, connecting the classrooms.
- The extension of the classroom goes beyond the boundary wall. The proposal sees the addition of a creative studio. The purpose of these spaces is to separate the low-stimulus activities from the high-stimulus activities.
- The addition of a sensory play-scape and garden has been included as an outdoor learning experience, lending itself to the different types of learning.

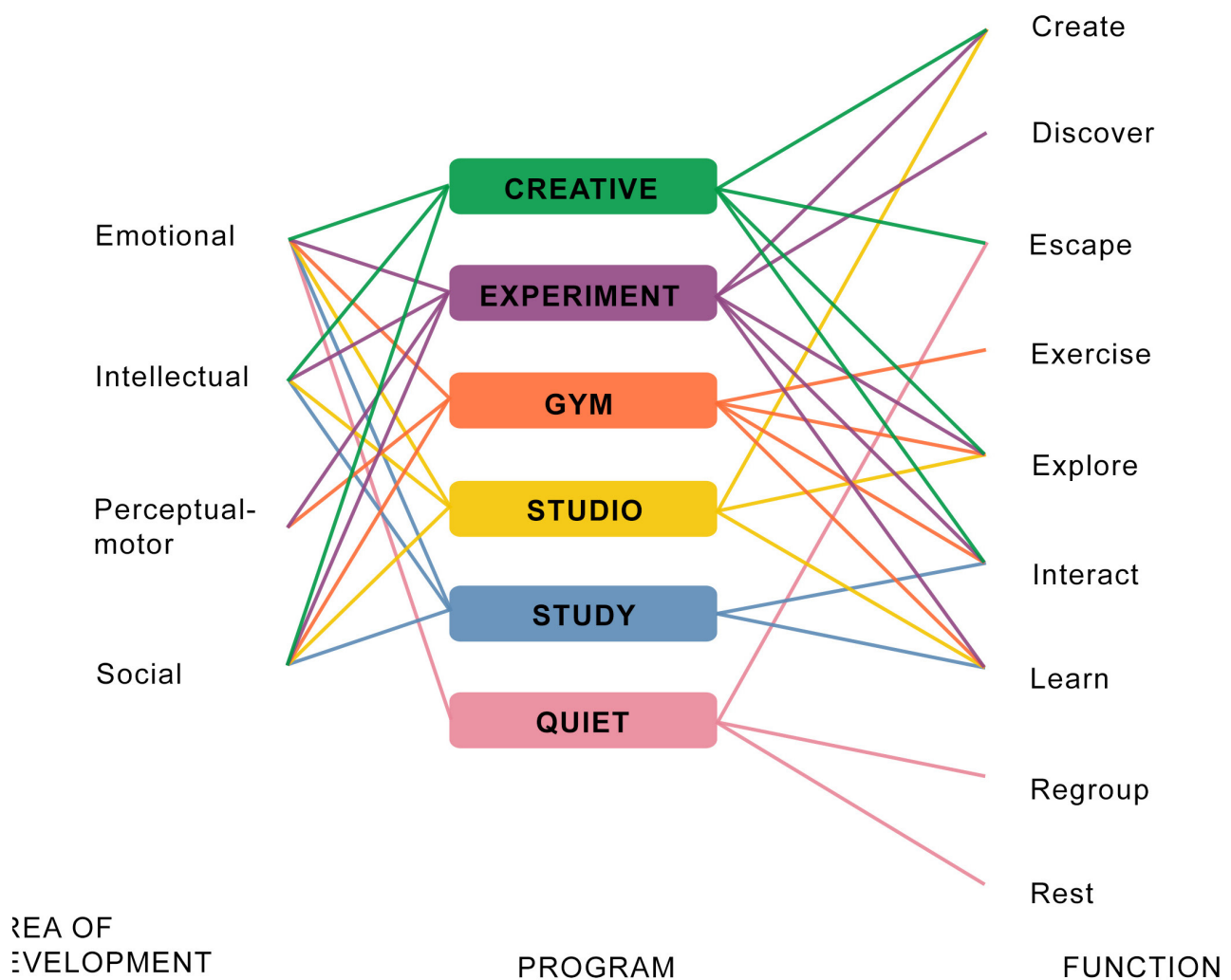


Figure 75. Specific learning matrix (Author, 2020)



1. Creative studio and sensory garden
2. Creative studio and sensory garden
3. Sensory garden and circulation route
4. Classroom and creative studio
5. Classroom and circulation route
6. Classroom

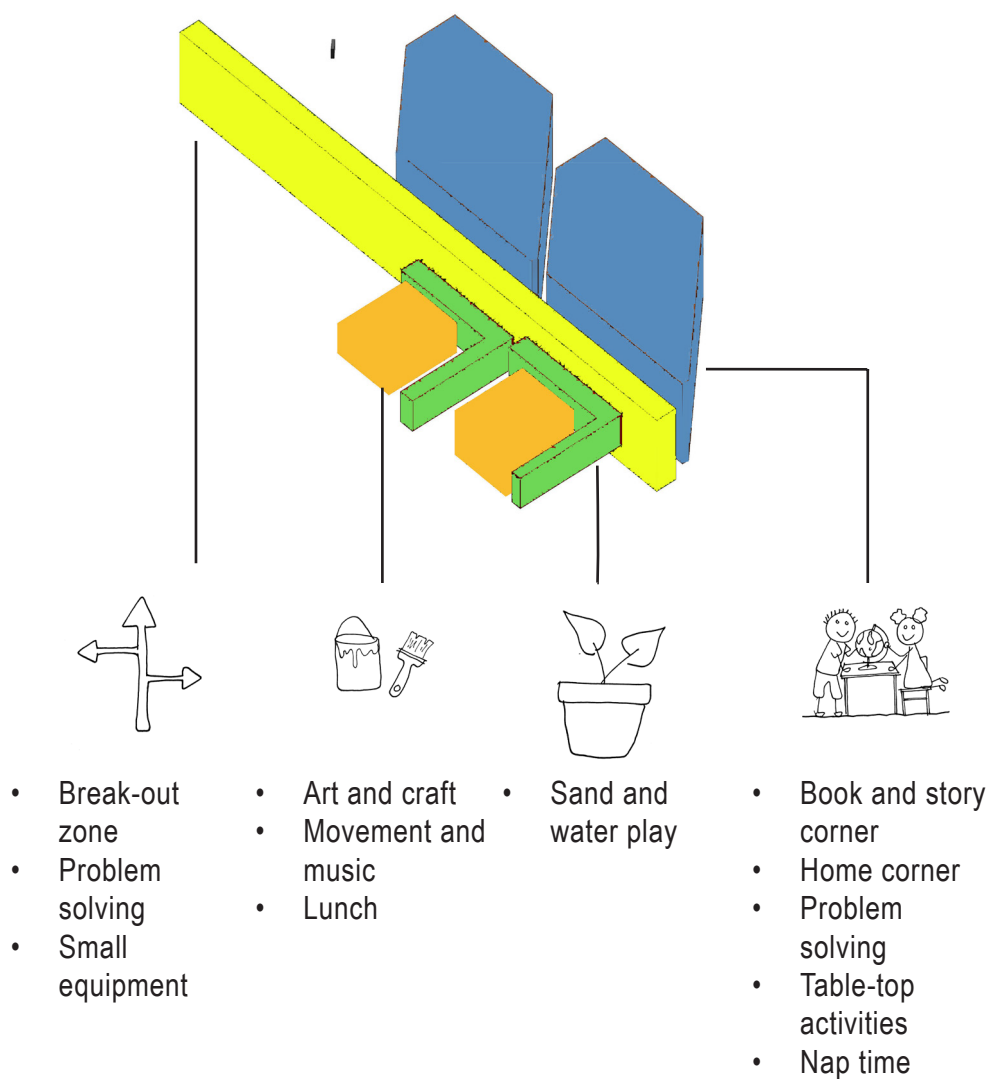
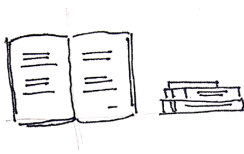


Figure 76. Specific learning diagram (Author, 2020)

6.3 Informants

The intention of the study is to generate a new conceptualisation of the traditional classroom by developing a pattern language. The informants for the pattern language are derived from theory, context and precedent.

1 Theory



Legible learning environments: This is a critical factor to enable the independent use of space by young children with and without learning difficulties.

Choice and control: The need for children to choose spaces that provide privacy or engage in social activities.

In-between spaces: The intermediate zone between the classroom and the playground. This space is developed as an extension of the classroom.

2 Precedent



- optimising the use of communal space
- coherent design language carried throughout the interior spaces
- visual access
- provision of escape spaces
- dynamic and adaptable spaces
- levels of permeability
- environment stimulating curiosity
- response to spatial limitations
- extension of the existing learning space

Figure 77. XXX, (Author, 2020)

6.4 Pattern language for specific learning

The pattern language for specific learning is derived from the thematic analysis (c.f. 1.5). The comparison of emerging themes from interview narratives and codes arising from the theoretical inquiry, precedent studies and persona's result in themes that are used as guidelines for the design of specific learning spaces. The patterns

3 Persona



Needs:

- Choice and control (privacy or social interaction)
- Personal space
- Sensory considerations
- Legibility
- Familiarity
- Quality
- Access to nature
- Safety and security

Themes:

Communicating environments

Dynamicspaces

Intermediate zones

Sensory considerations

Spaces within spaces

Structured environments



- Sensory considerations
- Legibility
- Personal space
- Positive distraction
- Social interaction
- Supervision
- Access to nature



- Choice and control
- Sensory considerations
- Legibility
- Personal space
- Social interaction

6.5 Patterns: overview and design strategies

6.5.1 Communicating environments

The communicating environment looks at strategies to encourage the independent use of space through legibility (c.f. 2.3.1). Children with learning difficulties are empowered when they feel capable of navigating the school premises. The intention is to use visual and tactile aids to help children better understand their environments, in order to use them independently.

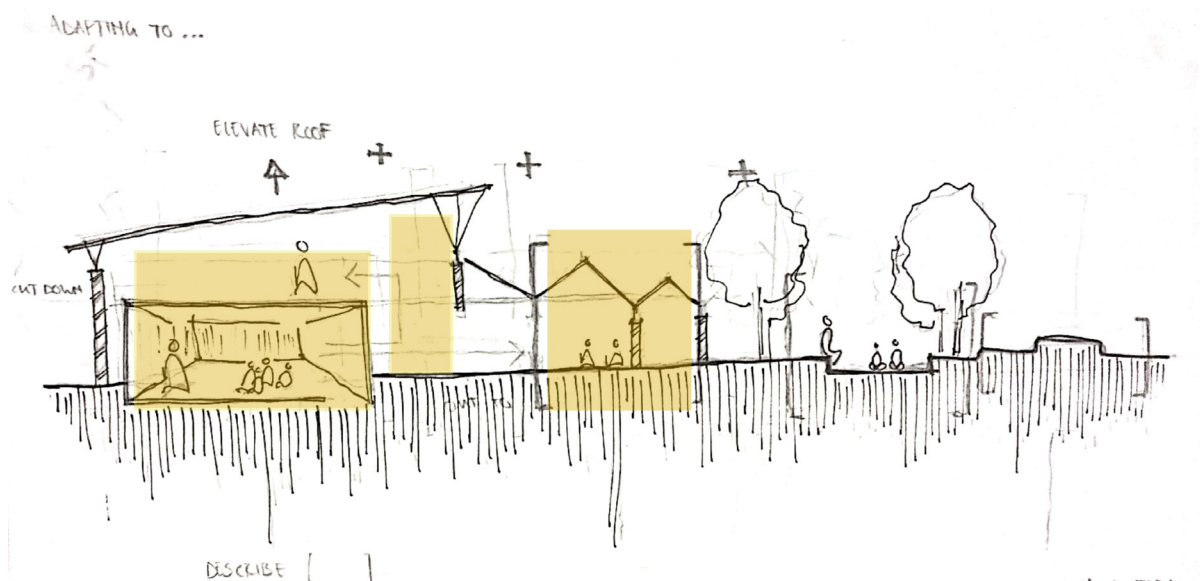


Figure 78. Diagram for communicating environments (Author, 2020)

Circulation – visual cues are used along the circulation route to help children navigate the space. These cues include signs with a universal symbol that children with learning difficulties can identify. The use of signs along the circulation route is also viewed as a learning opportunity.

Creative studio – colour has been used to mark the high-stimulation activities in the creative studio. The use of colour in all three zones is based on the colour strategy discussed in 6.6, which refers to children's perception of colour. Another method to communicate the activities in the school is the use of simple symbols or icons. This is used throughout the school.

Interior classroom – the visual cues used at the entrance to each classroom is continued in the classroom as a method to ensure consistency in communication for children with learning difficulties. Assigning a shape to each group has been identified as a visual cue that can be communicated to all children of the identified aged group, without causing confusion or overstimulation. Hints of colour are used in the classroom to communicate the level of activities that occur.

6.5.2 Dynamic spaces

When considering the various activities that take place in the school day, and the limited space available in a single classroom at Sunshine Nursery School, adaptability becomes important. The need for a dynamic response to design has the potential to encourage active engagement (c.f. 2.4.2), where children feel free to participate and interact. This is achieved through user/object interactions. Featuring products and/or objects that are adaptable will help with the structuring and organization of learning scenarios.

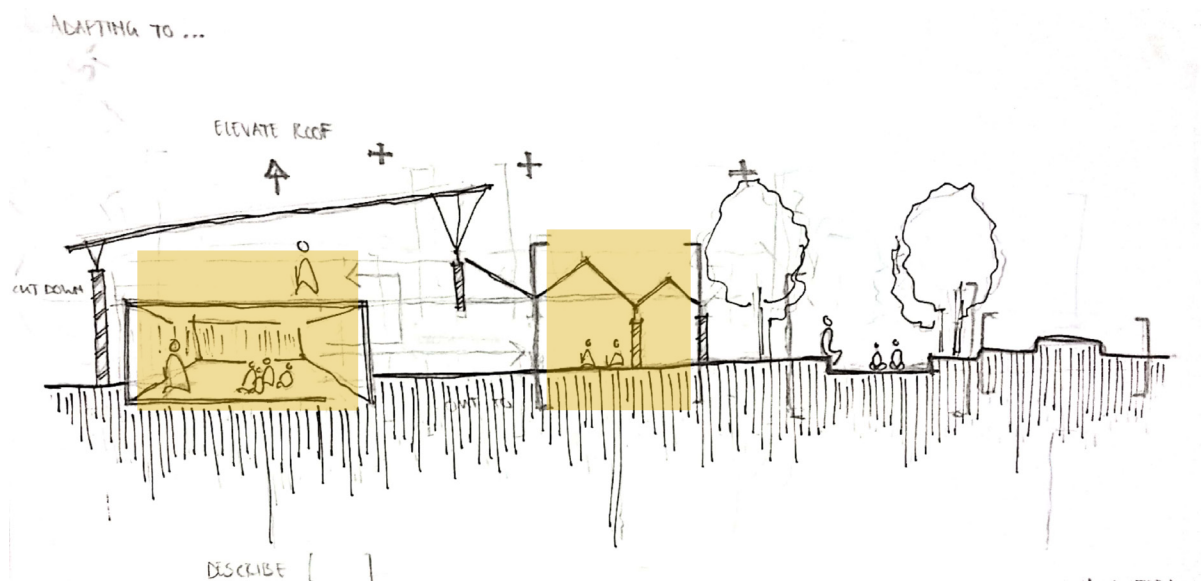


Figure 79. Diagram for dynamic environments (Author, 2020)

Creative studio - the studio needs to accommodate creative and movement related activities, therefore the environment needs to effortlessly adapt to the activity at hand. In order to make the transition smooth, the creative studio needs to have a direct connection to the sensory garden.

Interior classroom - due to the issue raised about availability of free space in the classroom (c.f. 1.2), the need for a dynamic design intervention is critical. The classroom will achieve this by considering the opportunities provided by a wall. The wall becomes a multifunctional object in the classroom; it not only features learning aides, but becomes the primary object of active engagement.

6.5.3 Intermediate zones

The intermediate zones are those spaces that serve as transitions between learning spaces. The intention is to introduce an intermediate zone between learning activities that require high focus and activities that involve movement and forms of active play. These spaces will help children transition from one level of activity to the next. Introducing intermediate zones can help to moderate abrupt changes that might occur between different activity zones.

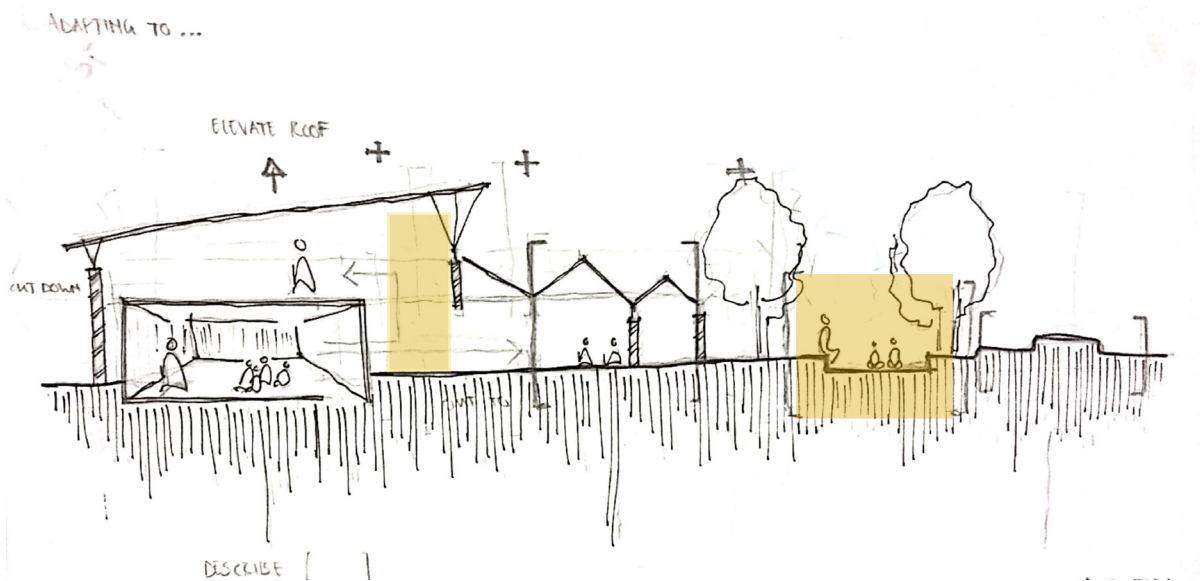


Figure 80. Diagram for intermediate zones (Author, 2020)

Circulation – the intention for the circulation space is to use it as a transition between the high-stimulation and low-stimulation learning zones.

Play-scape and sensory garden – the play-scape between the creative studios is a space is a transition between the classroom and the activity of the playground. It is also used as a sensory garden for sand and water play, encouraging development.

6.5.4 Sensory environment

Providing spaces that offer different sensory experiences can be beneficial for children with learning difficulties. Sensory considerations are factors that affect the manner in which children perceive their learning environments (c.f. 2.3.1). The sensory environment considers the quality of a space which is influenced by multiple factors. The ability to control acoustics, lighting, colour, texture, ventilation, sense of closure or orientation within the learning environment are all considered when looking at the quality of the space (Mostafa, 2014; NACLab, 2019; McCuskey Shepley & Pasha, 2017). These factors need to be taken into account when considering children with ASD (c.f. 2.2). The intention of the design is to create an environment where all children are comfortable. Although meeting the diverse needs of each individual might appear presumptuous, the objective is to provide opportunities where children are able to mitigate any negative perceptions that might occur as a result of the physical environment.

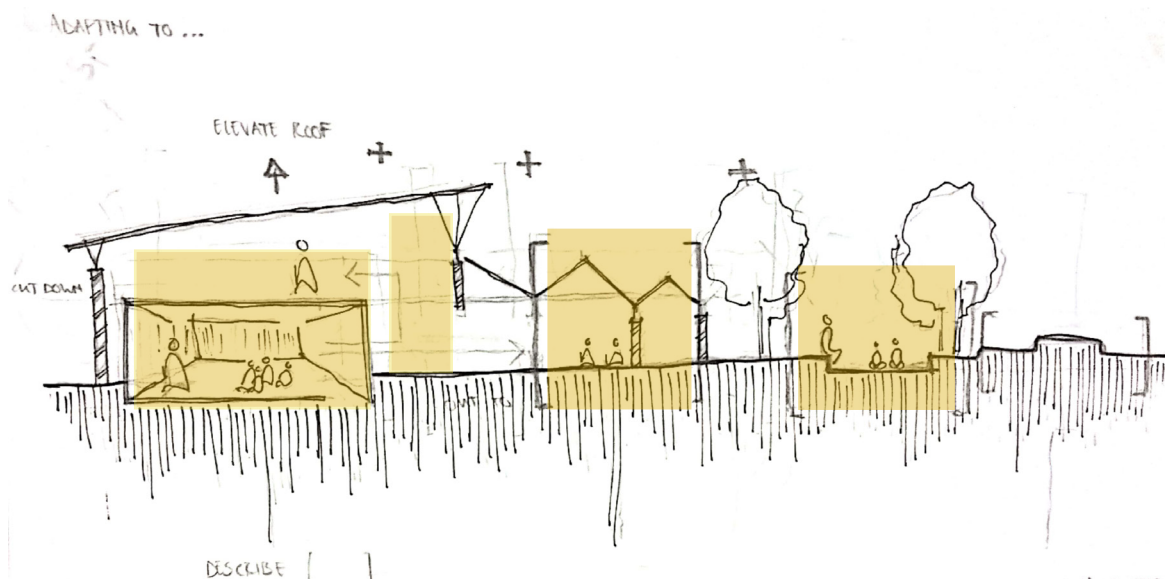


Figure 81. Diagram for sensory environments (Author, 2020)

Circulation – the approach to sensory consideration in the circulation route is achieved through wayfinding and environmental quality (c.f. 2.3.1). Strategies for wayfinding address the visual and tactile senses through the use of colour (marking the learning activities that spill out into the route), the application of acoustic panels is also considered in the circulation route to create a buffer that reduces unwanted noise from the playground entering the classroom.

Creative studio – the creative studio is an expressive environment for song and dance. Although this extension to the classroom is located outside, the control of sound is required. Strategies to control acoustics are applied to the studio to absorb noise and prevent it from infiltrating the high focus classroom.

Interior classroom – the main consideration in the classroom is over control. The control of the interior environment creates a sense of comfort for the users. The strategy used in the classroom involves the application of acoustic ceiling and wall panels, operable windows for air circulation and the control of natural and artificial lighting.

Play-scape and sensory garden – activities involving sand and water occur in the play-scape and sensory garden.

6.5.5 Spaces within spaces

The idea of spaces within spaces is addressed at the scale of the whole school as well as the classroom scale. Spaces within spaces provide an escape or refuge from the busy environment around the child, whether it is in the classroom or out in the playground. Children who experience difficulty with social interactions (c.f. 3.6.1) will benefit from spaces that provide refuge. The spaces are either enclosed or addressed through scale suitable for children, i.e. crawling spaces. This gives children control over the “extent of social interaction with their peers” (Dr. Owen, 2016).



Figure 82. Diagram for spaces within spaces (Author, 2020)

Circulation – the edges of the circulation space provide opportunities for respite. The location of these spaces are used as opportunities to pause between activities or to escape the interaction of large groups.

Interior classroom – the interactive wall in the classroom provides a seating nook that can be used as space for escape or refuge. It is treated as a space element (c.f. Figure 4.4), where the edge of the classroom provides opportunities to escape the interactive activities.

6.5.6 Structured environments

The proposal acknowledges the needs of children with learning difficulties to learn in an environment that provides them with a sense of familiarity, spaces that are clear and legible. The classroom is structured and organised around the daily programme (c.f. Figure 3.1), helping children transition from one activity to the next with more ease because they know what to expect. Generally children with learning difficulties take longer to adjust to the learning activities, therefore an environment that is structured and organised can help them become familiar with the classroom routine and encourage learning development (c.f. 2.3.1).

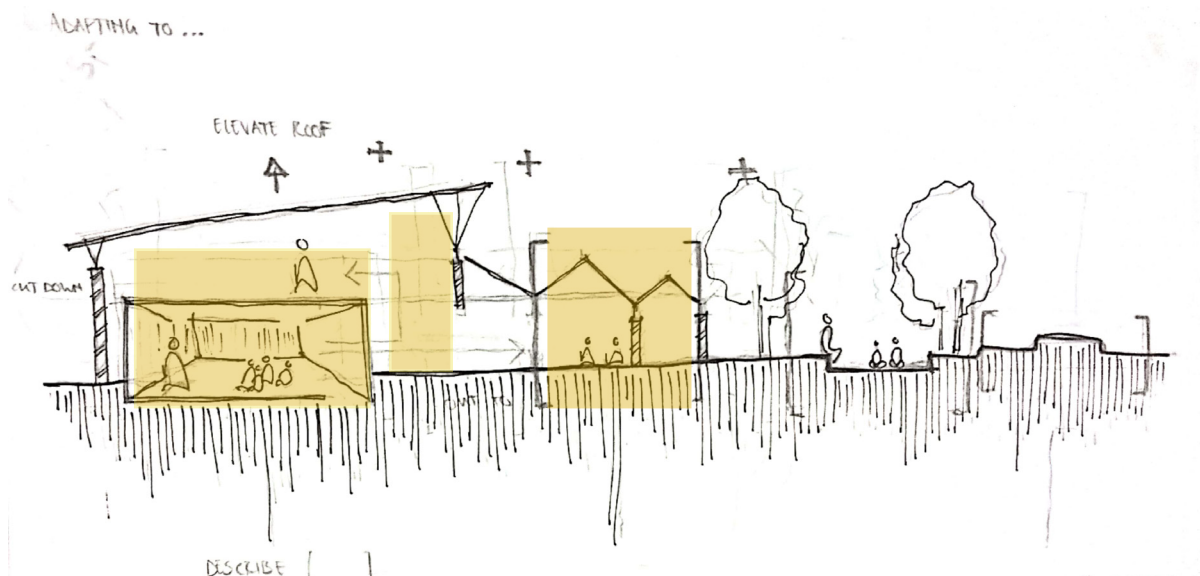


Figure 83. Diagram for structured environments (Author, 2020)

Circulation – organisation is achieved through wayfinding. This helps children to orientate themselves.

Creative studio – the need for an adaptive environment has influenced the storage of furniture and material in the creative studio. The studio serves multiple functions based on creativity, exploration and movement, therefore different floor layouts are required. The studio is based on a 'joint kit of parts' (Howe, et al., 1999), which includes the furniture.

Interior classroom – the interior classroom also needs to be dynamic in order to accommodate the different learning activities. Using fixed partitions for compartmentalisation and spatial clarity is not feasible, therefore the strategy is to use the two long interior walls to supporting activities for specific learning. The walls are meant to function as more than storage or pin up space.

6.6 Design development

6.6.1 Existing



Figure 84. Existing floor plan, (Author, 2020)



The first iteration shows the intention to expand the area of the classroom through an addition that extend to the exterior of the classroom. The extension to the classroom is a space for art and craft activities, with a suggested boundary (400mm wall), which doubles as seating and a balance beam for movement activities. The pitched roof over the classrooms and the entrance to the school, derived from the naive drawings of a child representing home, extends over the new classroom.

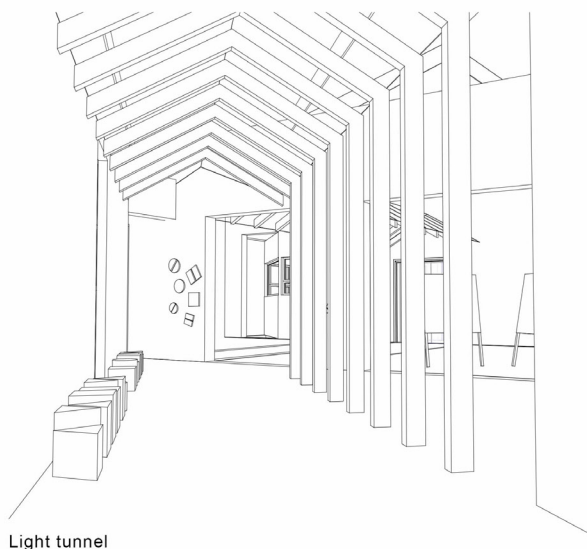
Analysis:

- Intervention is not clear, and does not effectively impact the interior design problem (c.f. 1.2)
- The principles of environmental psychology are not adequately addressed
- Sensory considerations are not addressed



Classroom from door

Facing IN-between space



Light tunnel



IN-between
The new concept
of classroom

Figure 86. Classroom iteration 1, (Author, 2020)

6.6.3 Iteration 2

August 2020

- Changes made to iteration two include the application of the ASPECTSS principles.
- Learning zones (high- vs low-stimulus considerations) and colour theories are adapted accordingly.
- Shared learning spaces for cross-age learning.

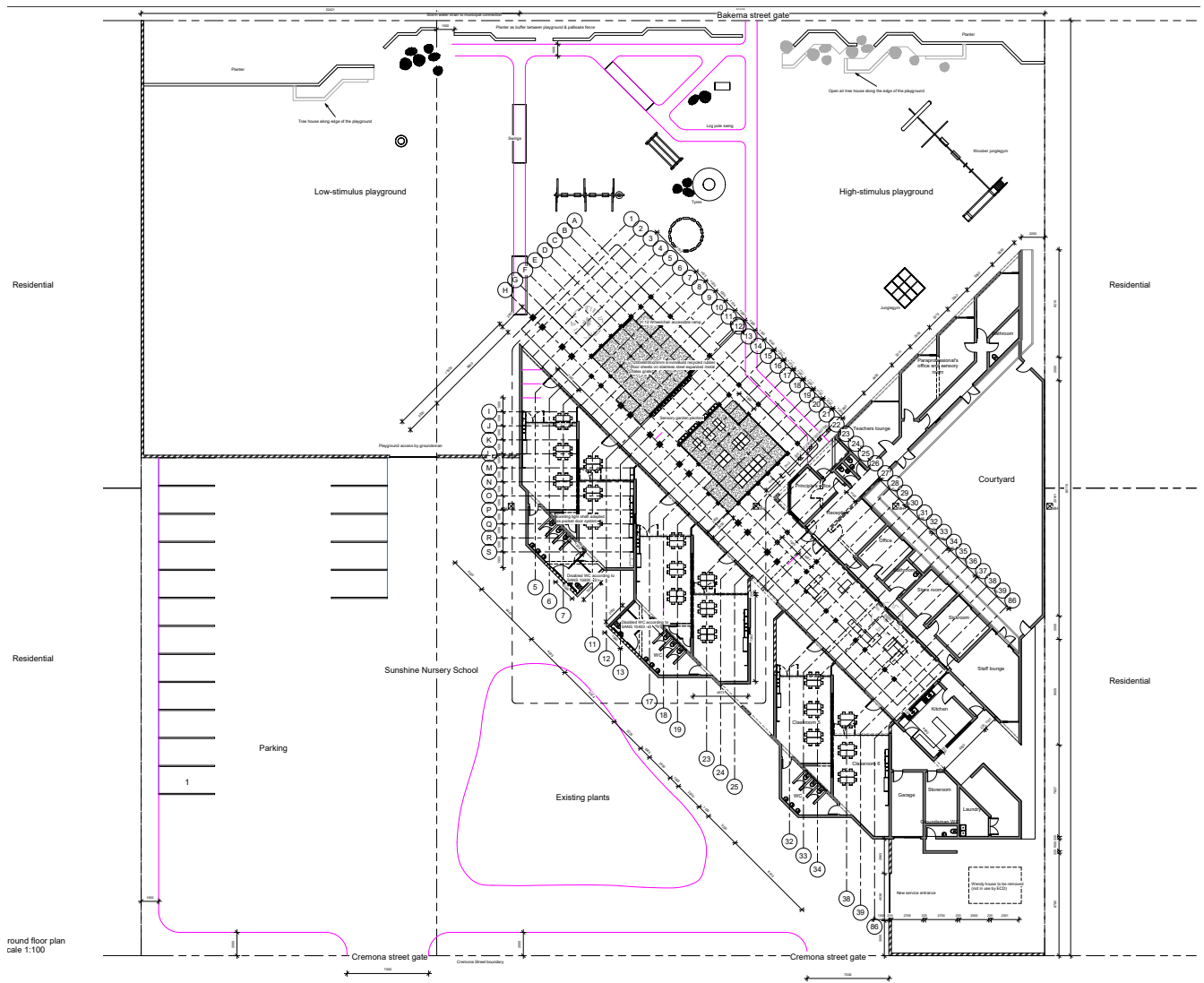
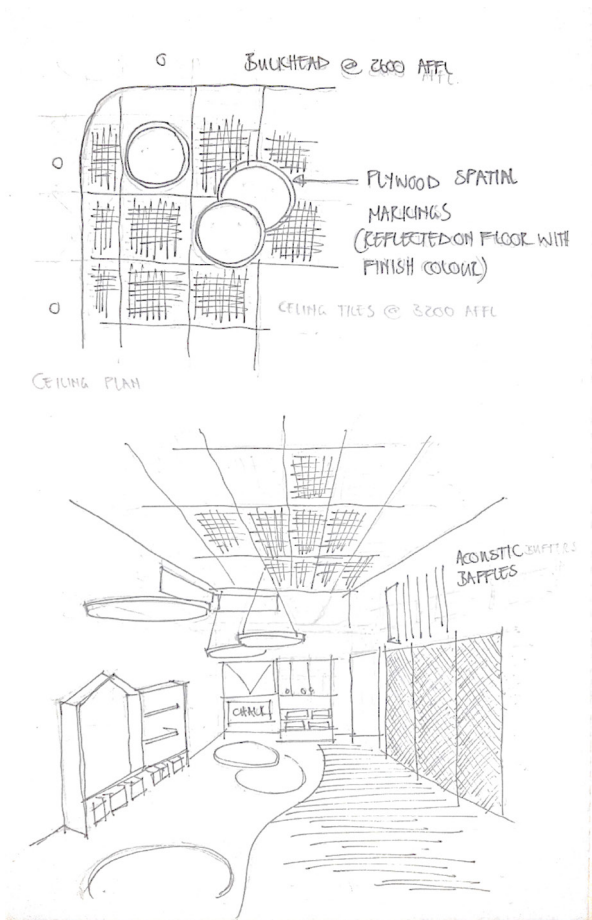
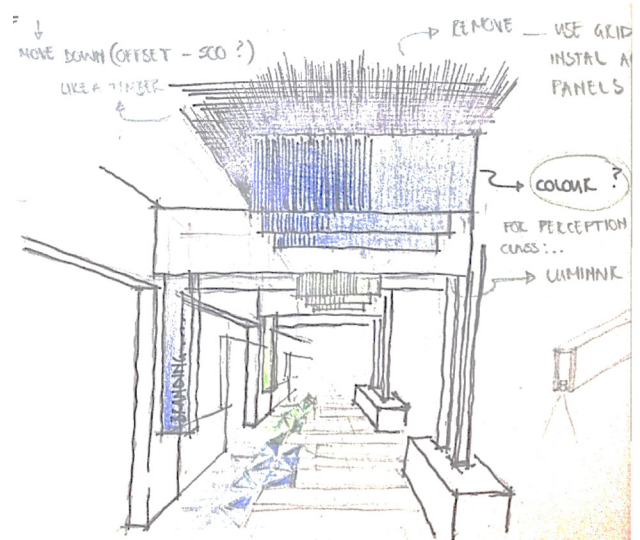


Figure 87. Ground floor plan, iteration 2 (Author, 2020)

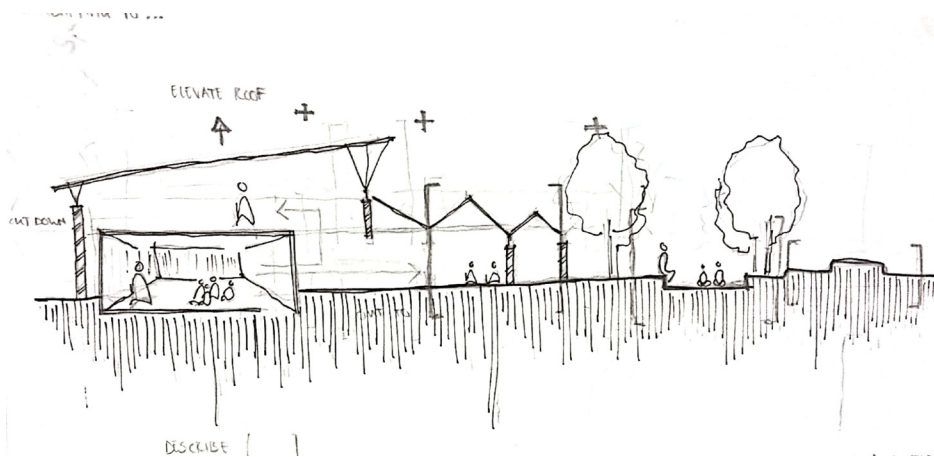




Classroom



Circulation _ [in] between



Creative studio and sensory garden

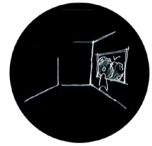
Figure 89. Design vision for final iteration (Author, 2020)

Part 2 - Technical investigation

Choice and control



Positive distraction



Personal space



Social interaction



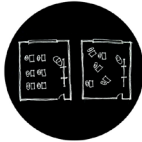
Sensory considerations



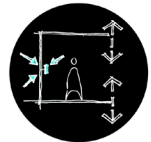
Access to nature and daylight



Legibility



Safety and security



Familiarity



Supervision



Quality

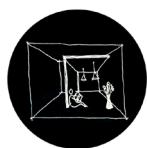


Figure 90. Principles of environmental psychology (Shepley & Pasha, 2017)

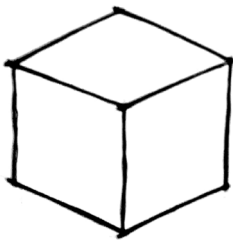
6.7 Concept for specific learning

The area(s) of design under investigation will be cross-referenced with the identified systems to evaluate how the physical environmental factors are applied to support the development of children with learning difficulties.

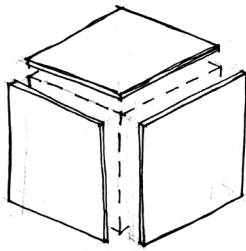
Acknowledging the conceptual approach of in-between space as a system for design development, the technical concept looks at in-between space as a set of parts for flexible, replicable design, following the design informants; choice and control, legibility and sensory considerations.

6.8 Construction

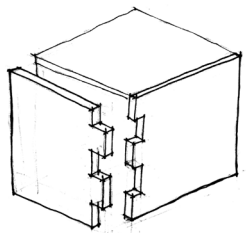
The construction philosophy is based on the construction for a kit-of-parts. Each part is constructed with the intention to enrich the learning experience of the child by giving some insight into; 1) the construction of structures that they inhabit and/or its systems, 2) the perception and function of materials, which defines the properties of objects and how we interact with them (Fleming, et al., 2015), or 3) the use of scale to create a sense of place that supports the needs of children with learning difficulties. The latter prescribes to the fifth pattern mentioned in part 1, spaces within spaces (c.f. 6.5.5), which results from the need for escape spaces or personal space.



Module based construction



Panel based construction



Joint based construction

Figure 91. Kit-of-parts construction methods (Author, 2020)

The spaces provide a sense of control for children with learning difficulties, over the degree to which they engage in social interactions (c.f. 3.6.1). The perception of the physical environment needs to support the learning development of children with learning difficulties and reinforce the concept of learning through play by identifying the value of in-between spaces.

6.9 Colour perception

The importance of colour perception is placed on the design of specific learning for the nursery school. Colour psychology in young children, especially those with learning difficulties such as autism spectrum disorder, has a great effect on the way children perceive space. In the design intervention, colour has been used according to the level of stimulation required as seen in Figure 87.

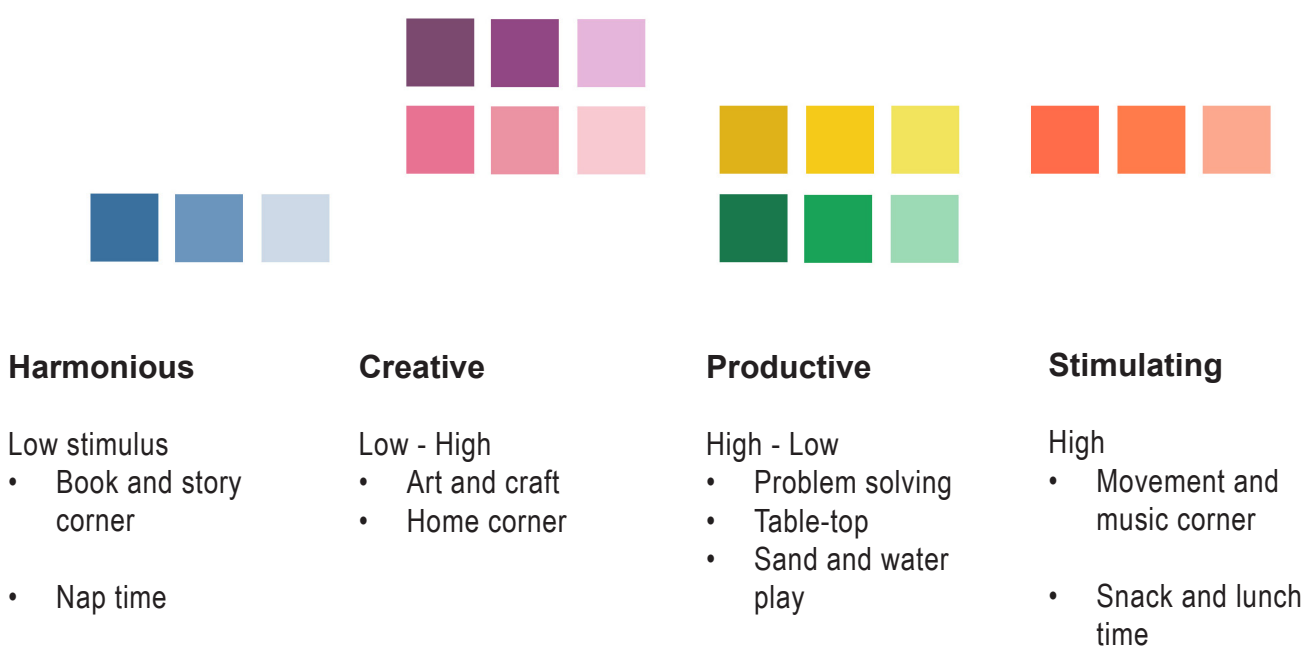


Figure 92. Colours conducive to learning, (Author, 2020)

The interior classroom uses colours from the harmonious and productive categories to create an environment for high concentration (Scranton Products, 2020) during lessons and creative activity (c.f. 3.5.1), while toning down with hues of blue for quiet during naptime. The stimulation pavilion uses colours from the creative and stimulating categories. While orange is perceived as vibrant, pink and purple are used to stimulate creativity and innovation, which is required for art and craft activities. The colours are used in subtle applications within the design, to avoid over stimulation which can occur on either end of the spectrum.

6.10 Material strategy

Materials have been selected based on a multimodal perception of material properties (Martin, et al., 2015), focusing on the visual and haptic characteristics that contribute to the perception of space, object and use. This approach to materials is related to the environmental psychology principles (c.f. 2.3), design informants from the user profiles and the pattern language; which are all concerned with designing learning environments that reduce possible triggers inhibiting the children's development. The operational characteristics of materials, i.e. structural integrity, durability, maintenance and safety, take preference in the specification; while the perceptual properties take a closer look at visual, tactile and subjective qualities (Fleming, 2014; Fujisaki, et al., 2015) as a method to reinforce the use of environmental psychology principles to enable children's development.

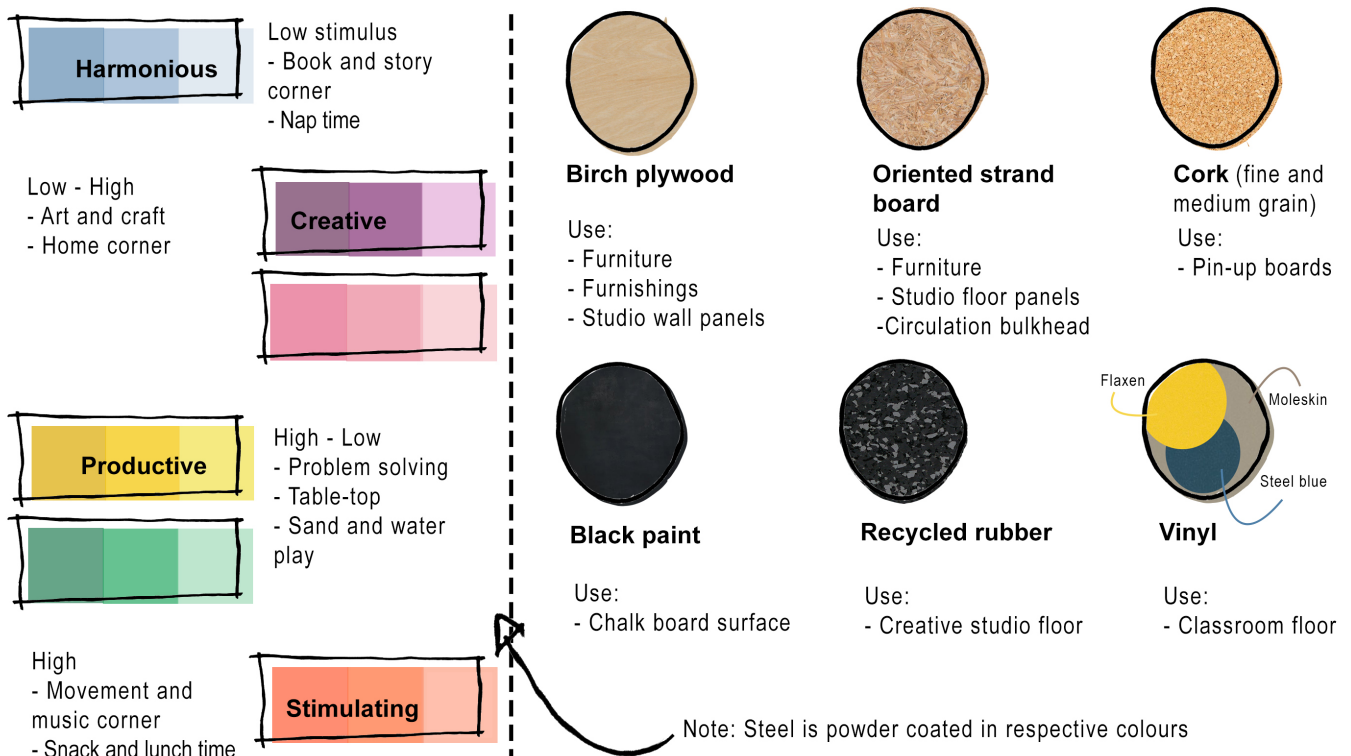


Figure 93. Materials

6.11 Systems for inclusive learning

Three building systems have been identified as strategies to enhance the sensory quality of specific learning environments. Lighting, acoustics and wayfinding are identified, with the addition of safety in a post Covid-19 classroom. The systems, similar to the material strategy (c.f. 6.10), considers the benefit of multisensory or multimodal experiences (Eaton, 2020) for the development of children with learning difficulties.

The appropriate application of each system will be discussed alongside the corresponding detail(s).

6.11.1 Acoustics

The acoustic quality of the classroom is among the most important sensory considerations when designing for children with learning difficulties. Sound contributes to a child's ability to concentrate during lessons, to focus on a task at hand, to the clarity of instruction and for communication; therefore strategies to reduce background noise and reverberation inside the classroom is critical.

6.11.2 Lighting

Two aspects that the design considers with regard to lighting is distribution and control. Natural light is typically the preferable source of light for high concentration activities in a classroom (Dr Wall, 2016), however, the consistency in distribution can vary throughout the day depending on the placement of openings and environmental factors. In addition to concerns with uneven light distribution, a lack of control of natural light can be considered as a barrier to inclusive learning because it is not universally calming (NACLab, 2019). Artificial light is used in conjunction with natural light, however, caution needs to be taken when specifying lighting because the source of light can impact the visual and neurodevelopment functions. The lighting strategy considers full-spectrum LED lamps to "emulate sunlight and reduce glare, fatigue and eyestrain" (Eaton, 2020; NACLab, 2019). Lighting controls are also provided to enable teachers to customise the light intensity according to the needs of the students, providing a comfortable learning environment.

6.11.3 Wayfinding

Three wayfinding strategies have been applied to the design of Sunshine Nursery School: colour, material and symbols. The selection of colours, materials and/or symbols has a significant implication on a young child's ability to navigate space independently; this is particularly true for children with neurological deficiencies, due to a variation in their perception and interaction with the environment (NACLab, 2019).

6.12 Details

The technical resolution seeks to address the perception of learning spaces through the intervention of specific learning. The areas of specific learning that will form part of the investigation are the interior walls of the classroom, the circulation space and the stimulation pavilion.

6.12.1 The grid

The system of design interventions is a series adapted from a kit-of-parts (c.f. 6.8) that have been constructed to fit within a 1200 x 1200mm grid. The grid was determined by the ergonomics of the 'Berliner Hocker' (Ros, 2011), a multifunctional modular furniture piece for young children, based on Max Bill's 1954 Bauhaus 'Ulmer Hocker'. The grid also looks at the 1,5m² of free play area per child, for children over the age of 3, as required by the Department of Social Development (2006). The grid is used to support the design of activities carried out by the children, by marking out the parameters on which the parts will be assembled.

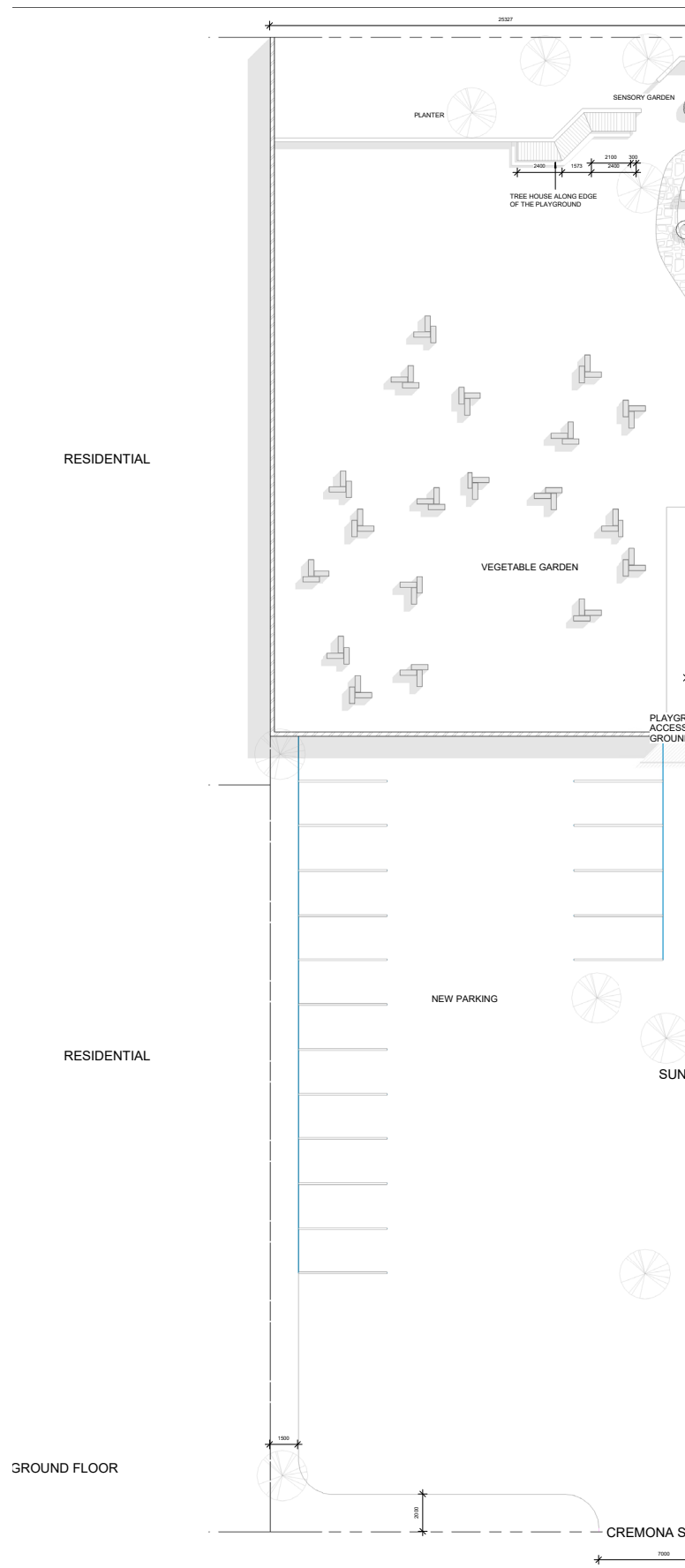


Figure 94. Ground floor and site plan (Author, 2020)

6.12.2 The new roof

The new raised roof is the result of reoccurring issues with inadequate drainage from the existing flat roof parapet gutter. The roof intervention considers the opportunity to provide an intermediate zone below with a covered circulation route.

Due to the existing shape of the building Figure 90 and the existing mono pitched roof, the proposal is to raise the new roof above the parapet wall in order to divert rain water into storage tanks located on the southern façade of the building. This results in a south facing roof, ensuring the runoff does not obstruct the activity of the children below.

Louvers are installed on the northern façade due to the orientation of the roof, reducing the uneven distribution of natural light entering the classrooms. Clerestory windows are positioned on the southern façade, permitting light to enter the spaces below, illuminating the high focus areas in the classrooms. Inverted Howe trusses are positioned at 750mm centres, using the existing structural walls of the classrooms as their primary support, followed by purpose made columns as secondary supports in order for the roof to cantilever the span of the new circulation route. The roof sheeting is constructed from Chromadek IBR profiles with 20mm Ecophon Focus™ F acoustic ceiling panels.

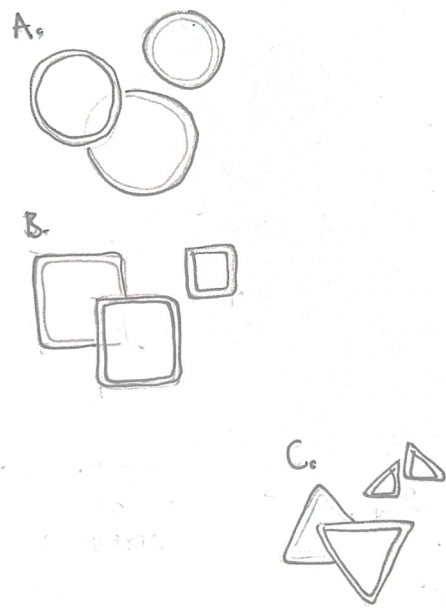
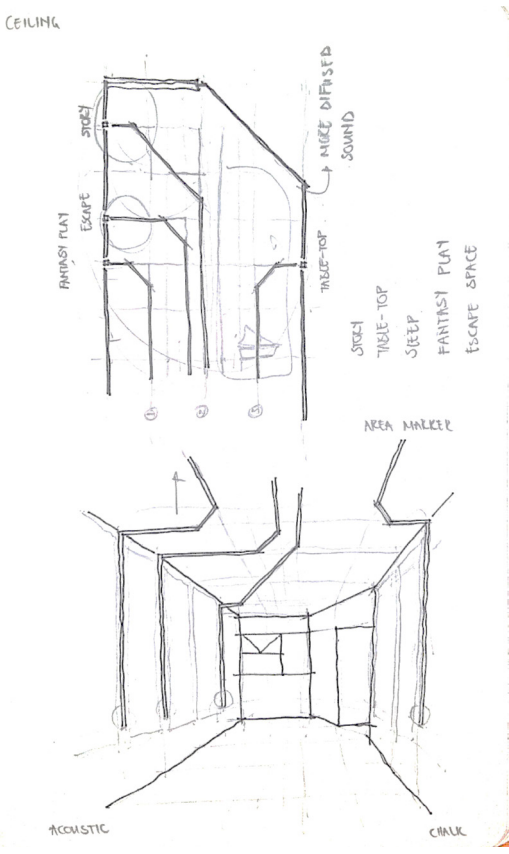
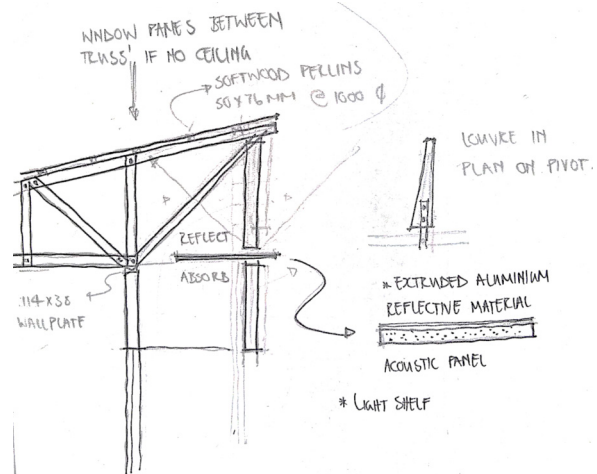
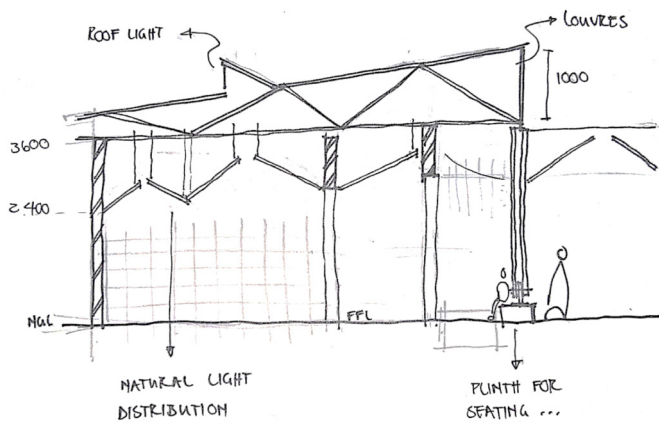
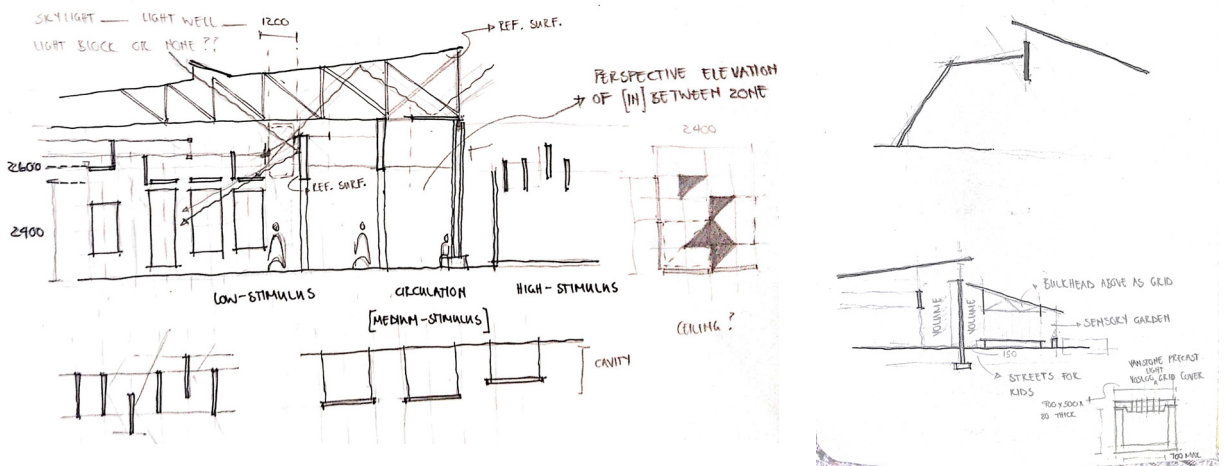
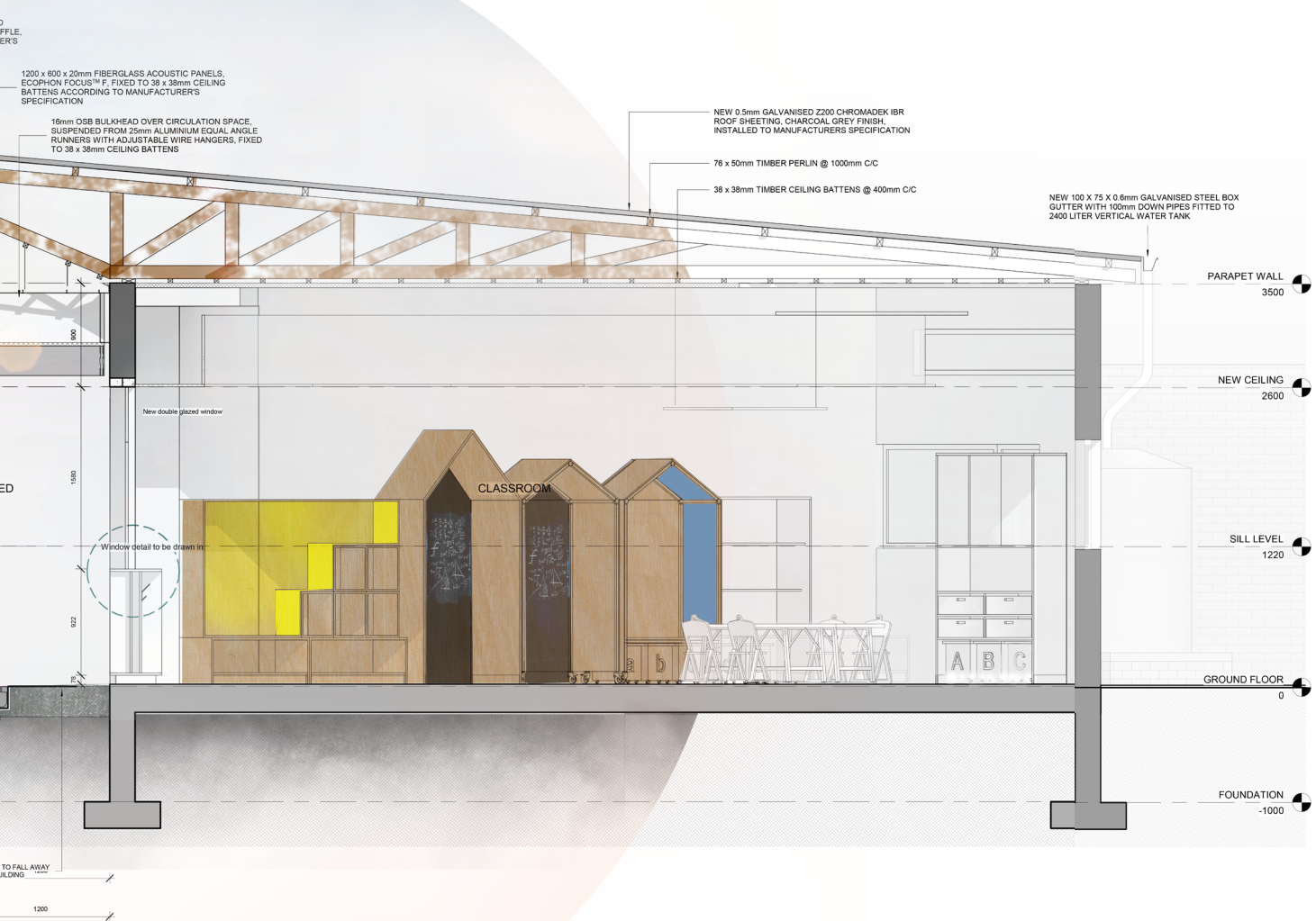
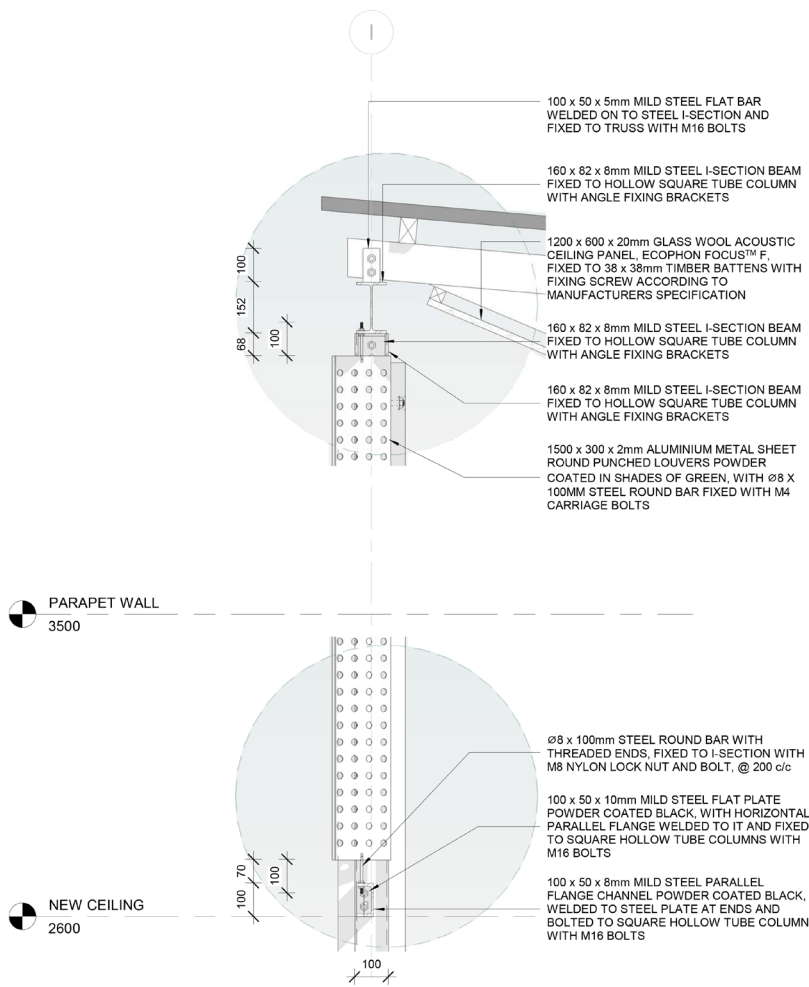
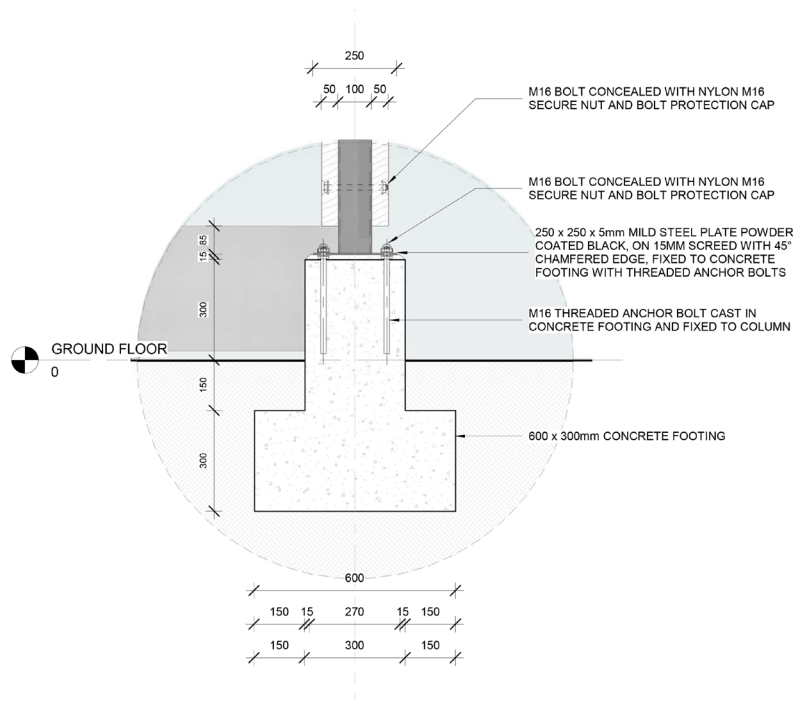


Figure 95. Process work _ Roof and circulation (Author, 2020)





Detail 1 _ Louvre and roof overhang on reverse Howe truss, n.t.s.



Detail 2 _ Column and concrete footing, n.t.s.

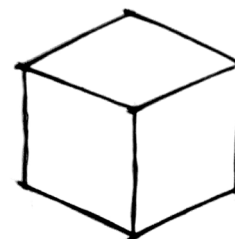
Figure 97. New column and secondary support for roof (Author, 2020)

6.12.3 Between the walls

The walls inside the classroom are viewed as an opportunity to learn from the environment and promote flexibility (Randall, 2014). Between the walls explores methods to create an adaptable learning environment within the low-stimulus classrooms. The eastern and western interior walls, shared between adjacent classrooms, are adapted to support the needs of the children and teacher, while the northern and southern walls maintain their functions of access and services.

6.12.3.1 Discovery wall

The discovery wall is a multifunctional wall for active engagement, escape, imaginative play, social interaction and storage and display. The wall unit is divided into a fantasy play area with a home corner, and a reading corner. The purpose of the discovery wall is to compartmentalise the play area, creating well-defined spaces to provide the children and teacher with control over the learning environment. The home corner's doll house and the reading nook are assembled with powder coated aluminium frames on castor's, making the unit flexible. Three compartments are formed when the units on castor's are in an open position. The units can be assembled and configured to suit the needs of the children in the classroom.



Module based

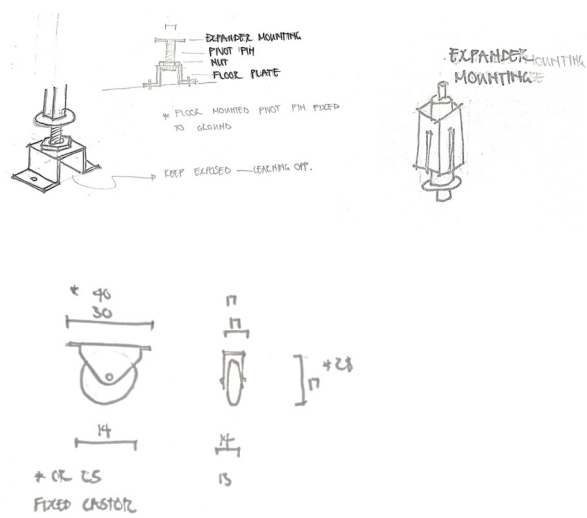
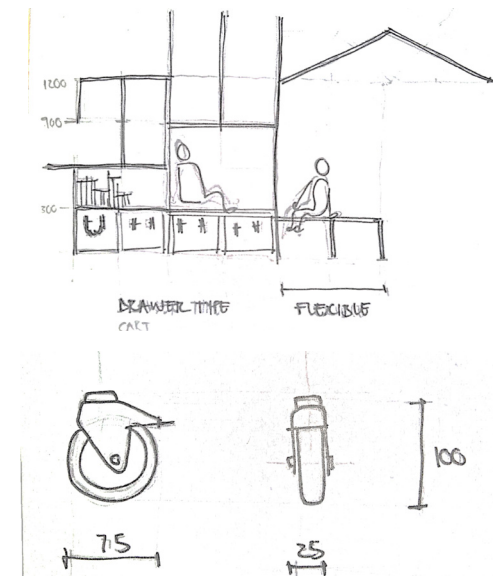
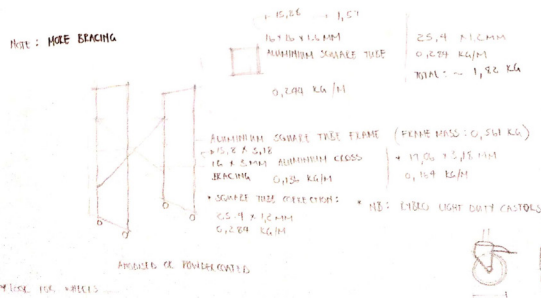
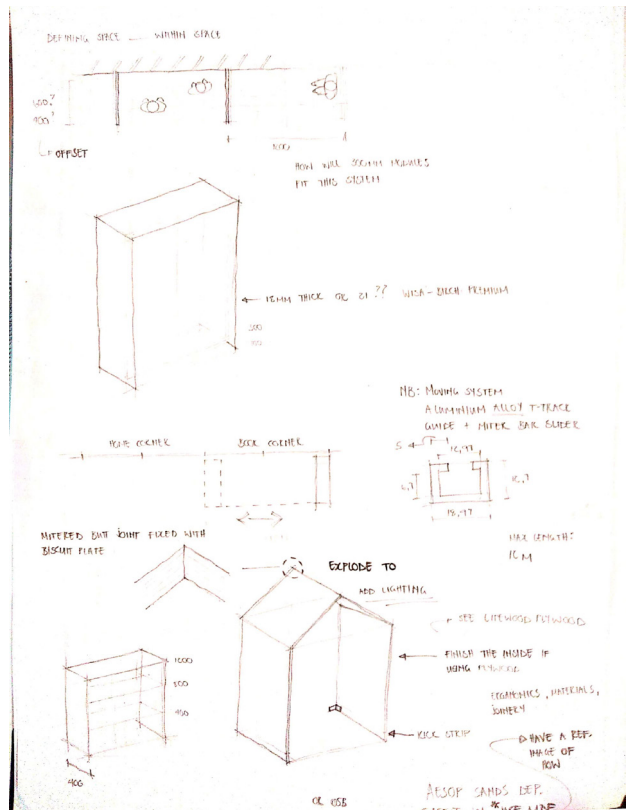
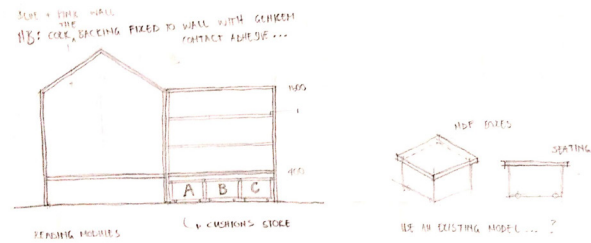
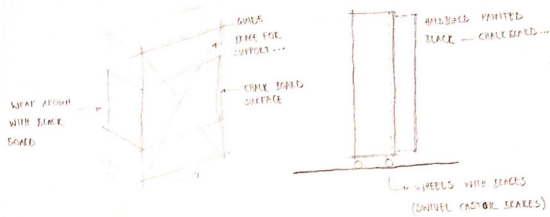
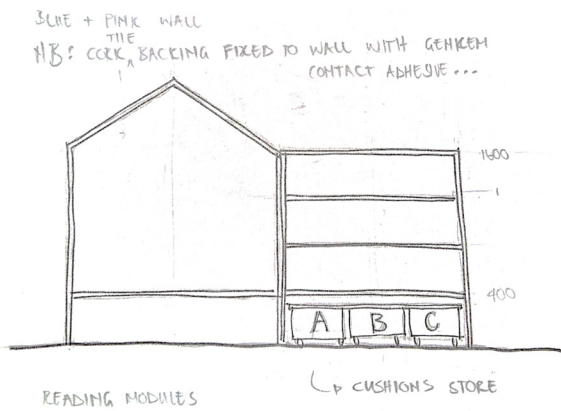
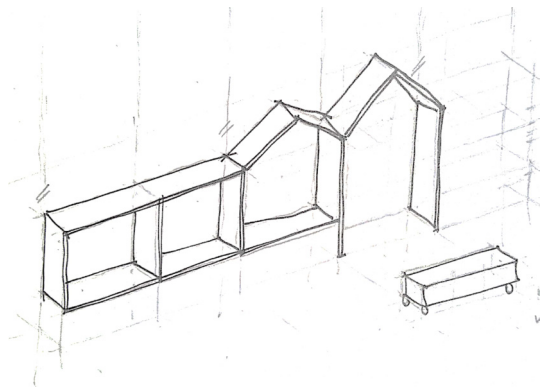


Figure 98. Process work _ Reading nook (Author, 2020)

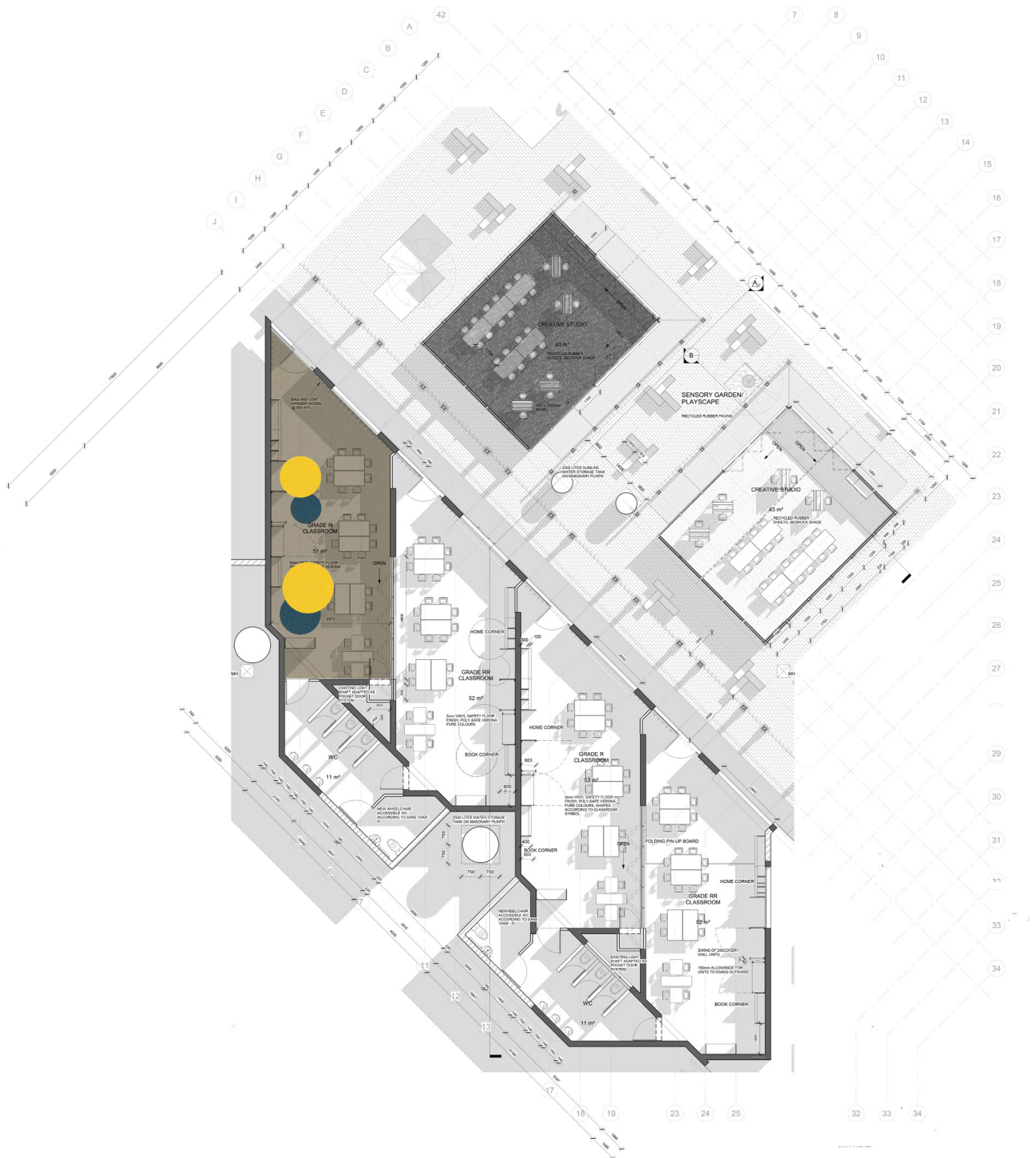


Figure 99. Classroom plan _ specific learning (Author, 2020)



Discovery wall reading nook on castor's

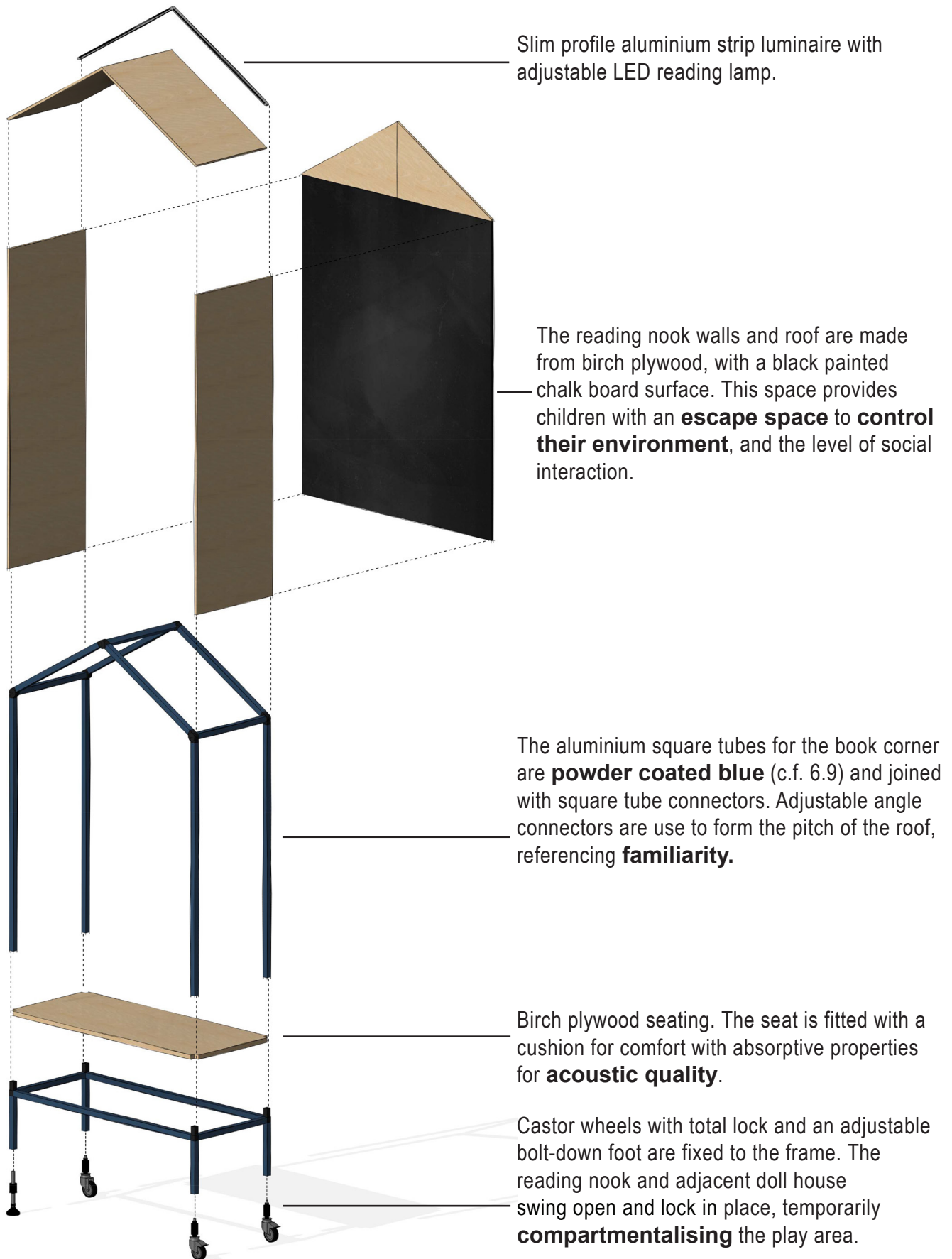
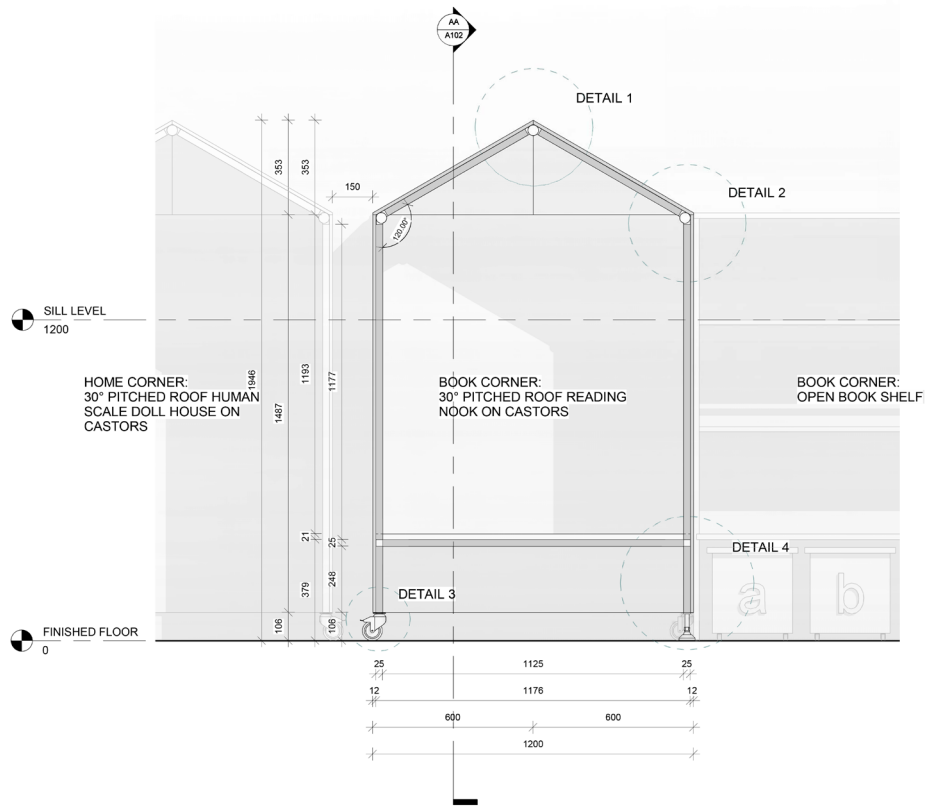
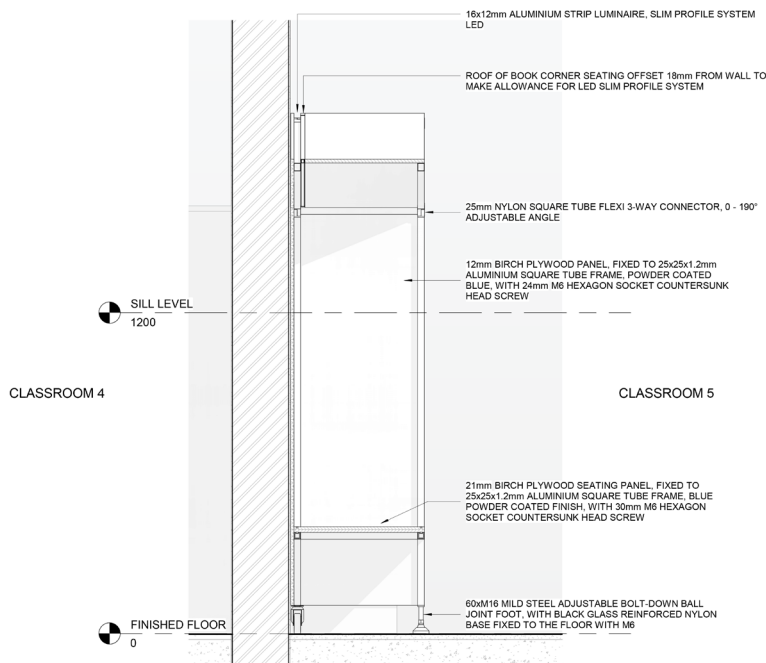


Figure 100. Reading nook assembly, (Author, 2020)

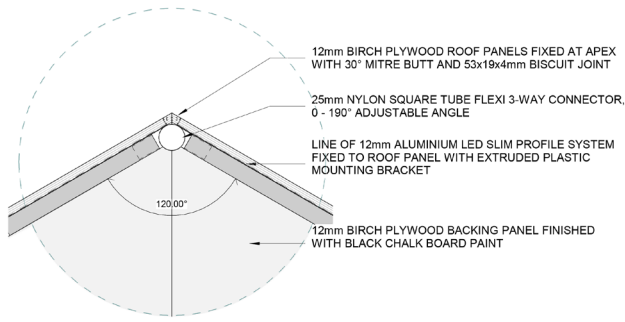


Elevation _ Reading nook on castor's, n.t.s.

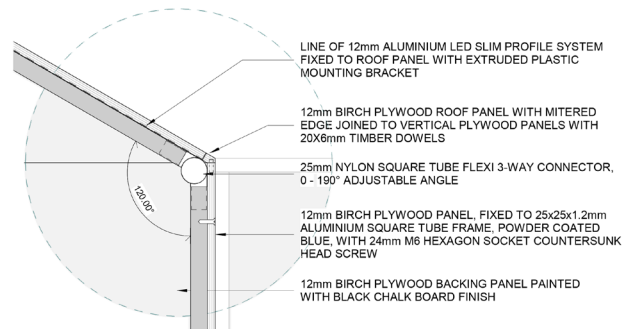


Section _ Reading nook on castor's, n.t.s.

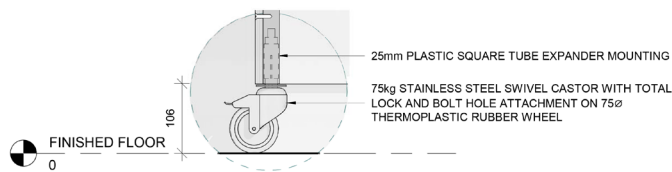
Figure 101. Discovery wall reading nook detail (Author, 2020)



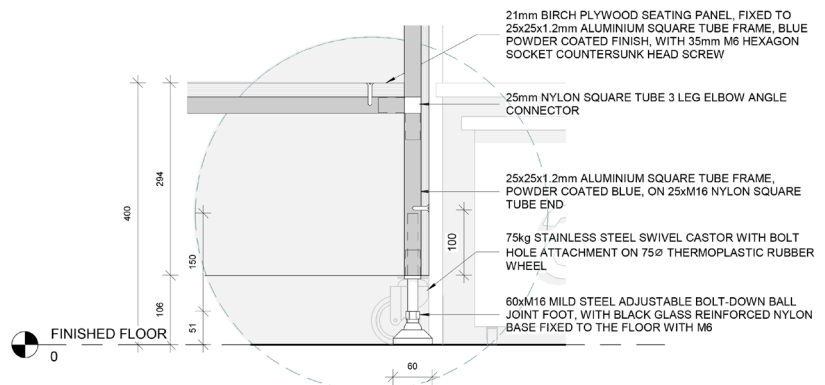
Detail 1 _ Pitch of reading nook, n.t.s.



Detail 2 _ Framework and roof connection, n.t.s.

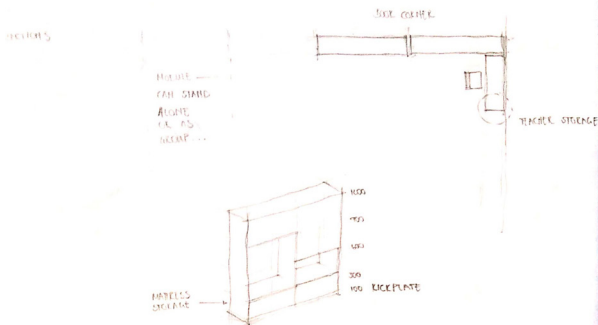
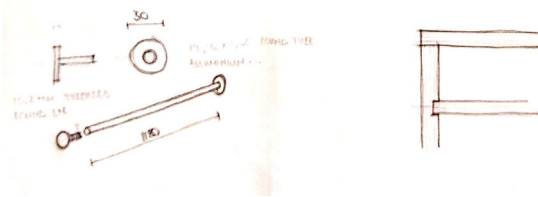
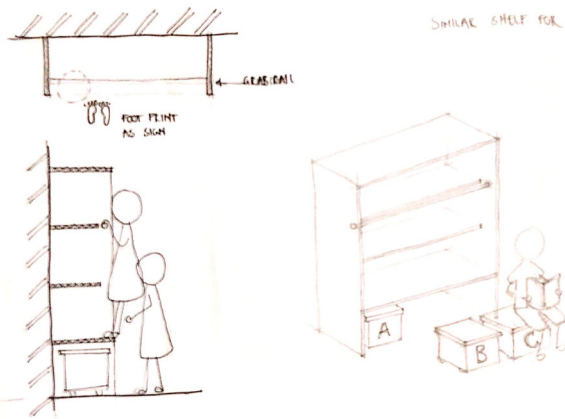


Detail 3 _ Castor with total lock and expander mounting, n.t.s.

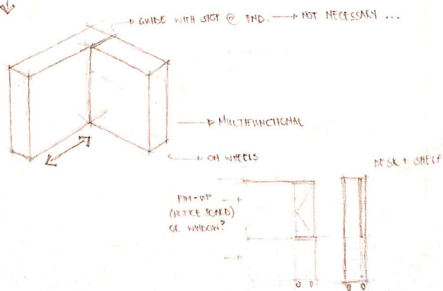
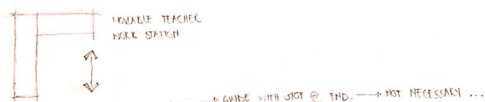


Detail 4 _ Framework and seating detail on footing, n.t.s.

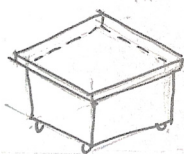
Figure 102. Discovery wall reading nook detail (Author, 2020)



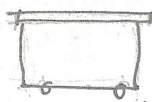
ME: DICK WOOD — FROSTEN IN SA
SPRICE WOOD — KATE ...



MDF BOXES



SEATING



STORAGE

USE AN EXISTING MODEL ... ?

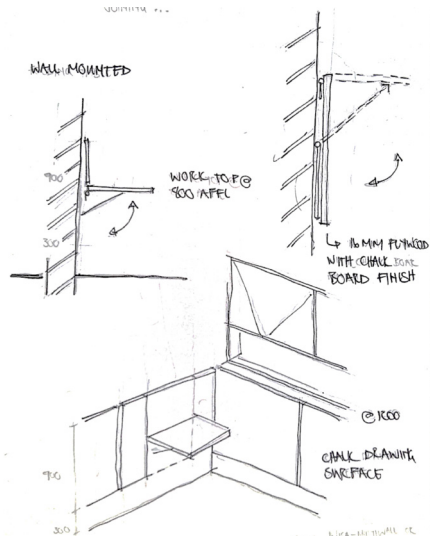
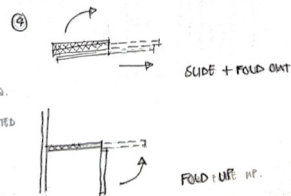
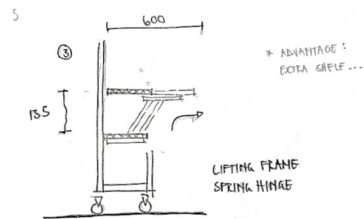
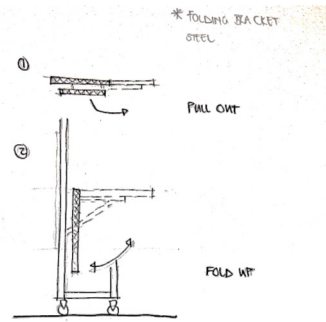
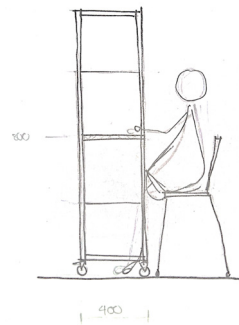


Figure 103. Process work _ Book shelf (Author, 2020)

Discovery wall book shelf with mobile seating / storage

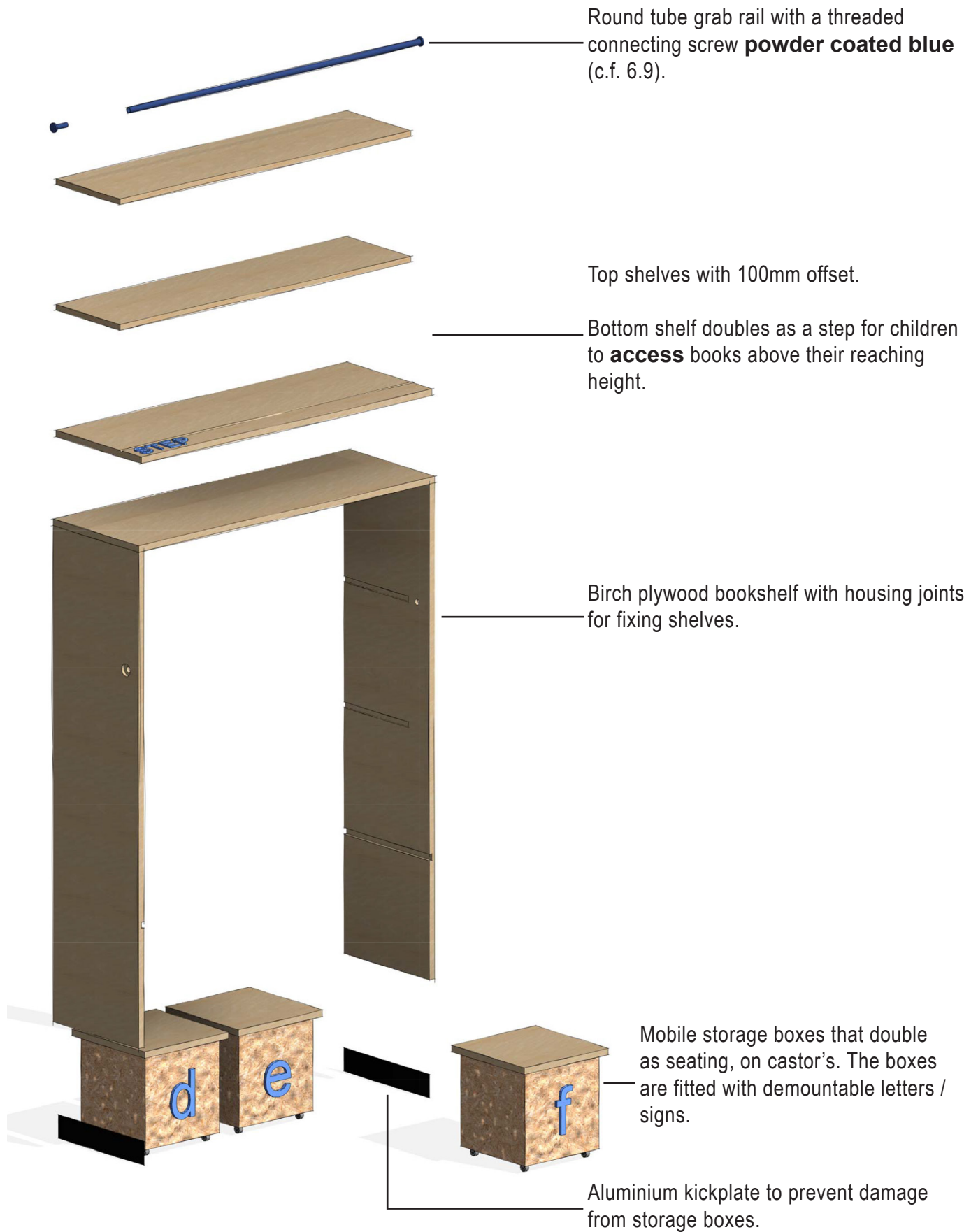
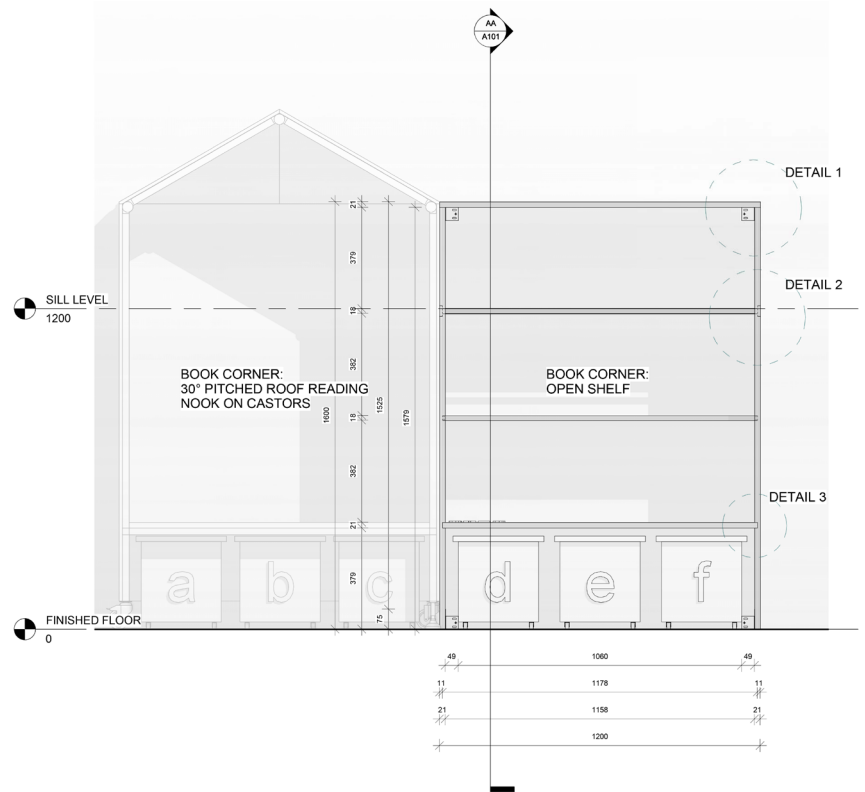
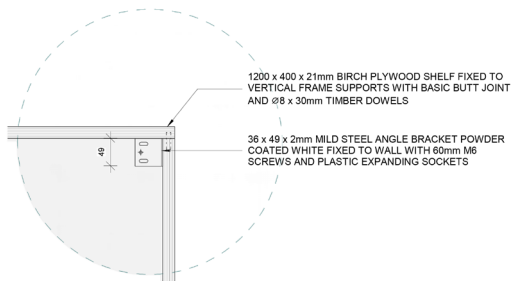


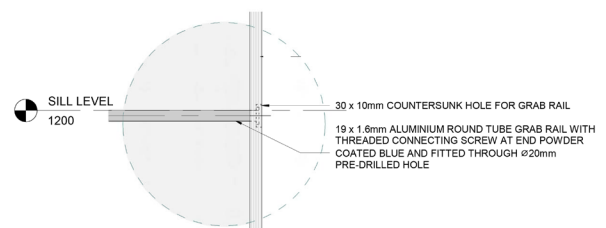
Figure 104. Book shelf assembly (Author, 2020)



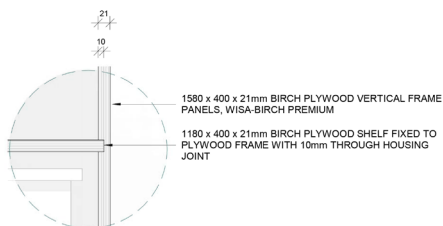
Elevation _ Open book shelf and mobile seating / storage boxes, n.t.s



Detail 1 _ Top shelf and framework connection, n.t.s.

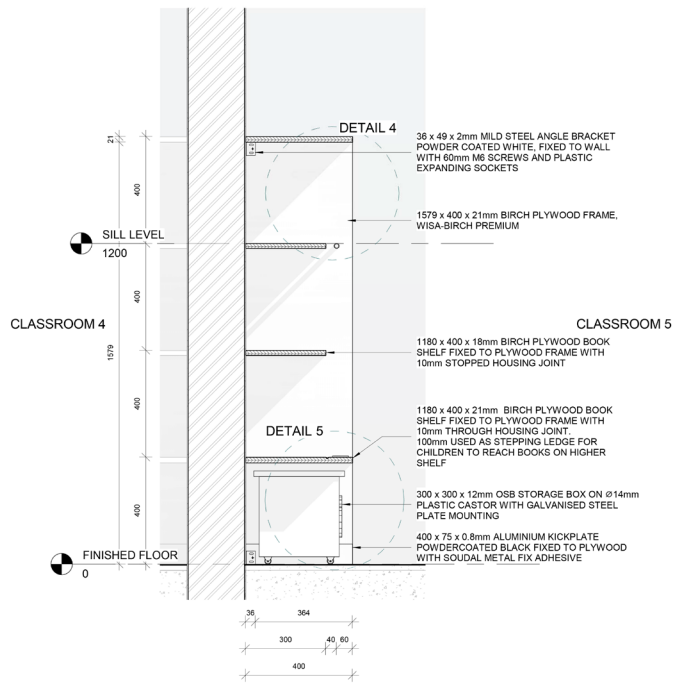


Detail 2 _ Children's support grab rail, n.t.s.

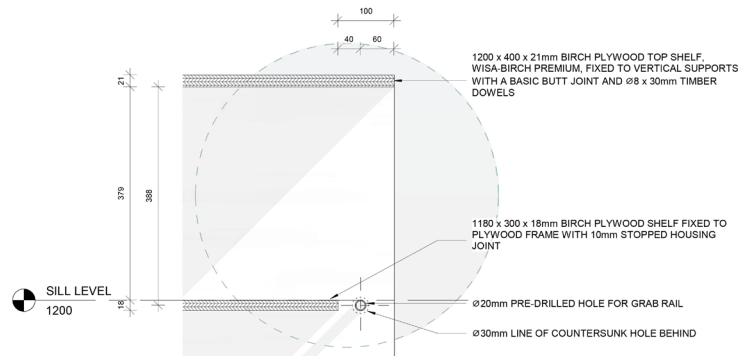


Detail 3 _ Shelf construction method, n.t.s.

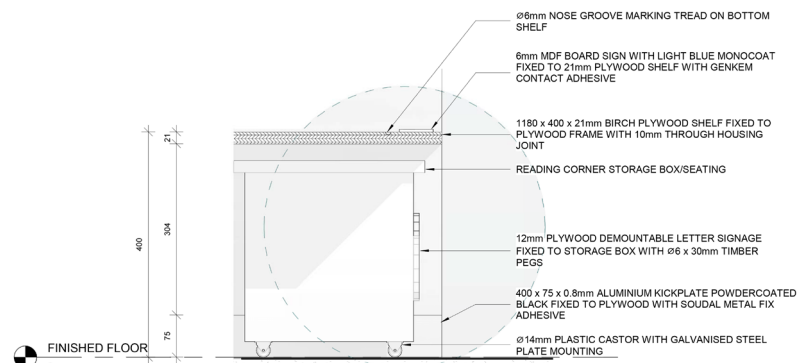
Figure 105. Discovery wall book shelf detail (Author, 2020)



Section _ Open book shelf, n.t.s.



Detail 4 _ Shelf construction method and grab rail, n.t.s.



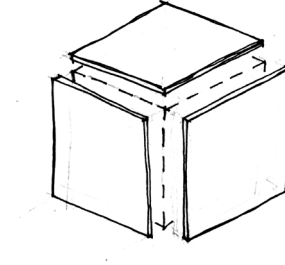
Detail 5 _ Mobile seating / storage box, n.t.s.

Figure 106. Discovery wall book shelf detail (Author, 2020)

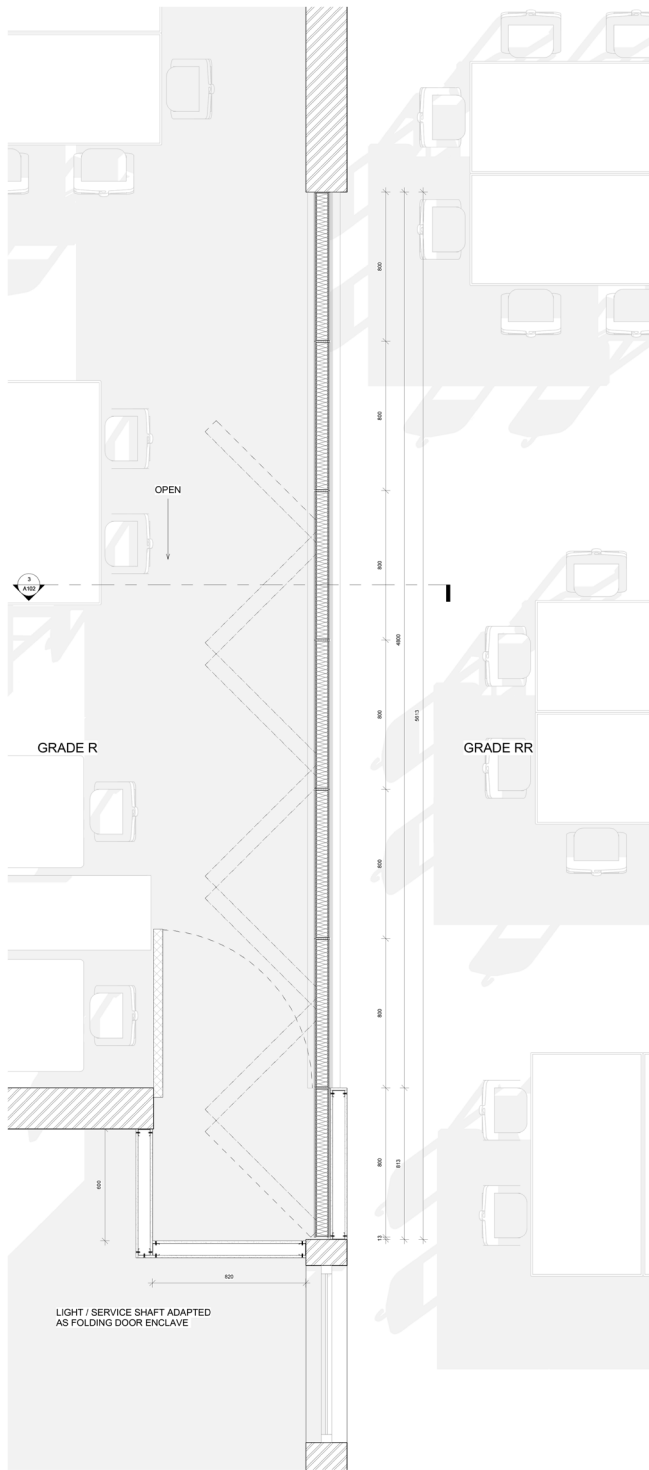
6.12.3.2 Pin-up stacking wall

The insertion of a stacking panel wall between the five and six year old class is meant to present an opportunity for collaborative learning in the low-stimulus classroom. This will give children the benefit of mixed-age learning while participating in high-focus activities. The wall is a panel-based construction method, taking the acoustic properties of the system into consideration. Panel sizes are 2100 x 800mm, with a total thickness of 84mm. The individual panels are composed of an ISOVER 63mm Cavitybatt glass wool insulation with a sound rating of 49dB and a fire rating of 60min (ISOVER Saint-Gobain, 2020). The insulation is clad with 2 x 3mm hardboard backing, and finished with 6mm cork tiles on either side, cut to the required shape(s). Cork was selected as a finish for its use as a pin board and acoustic properties. The panelling of hardboard over the glass wool insulation is to avoid the likelihood of sharp objects puncturing the insulation (during the pinning up of children's work), potentially omitting a tiny amount of glass wool into the surrounding atmosphere (Resonics, 2014).

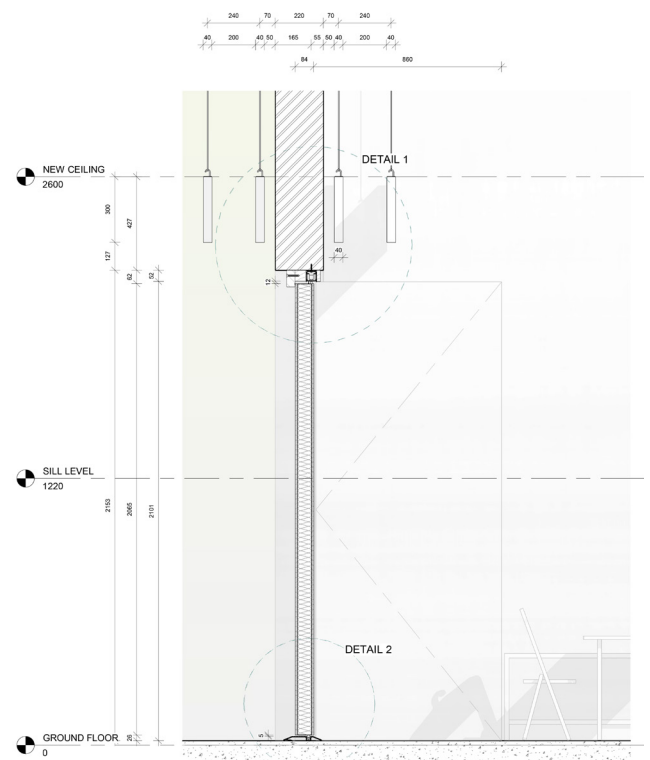
Additional technical specifications for the panels include the pivot folding hardware, acoustic rebate and sound seals, as well as sound baffles to mitigate unwanted sound being transmitted between classrooms when the panels are in the closed position. In the open position, the panels slide into an enclave in the existing light shaft.



Panel based

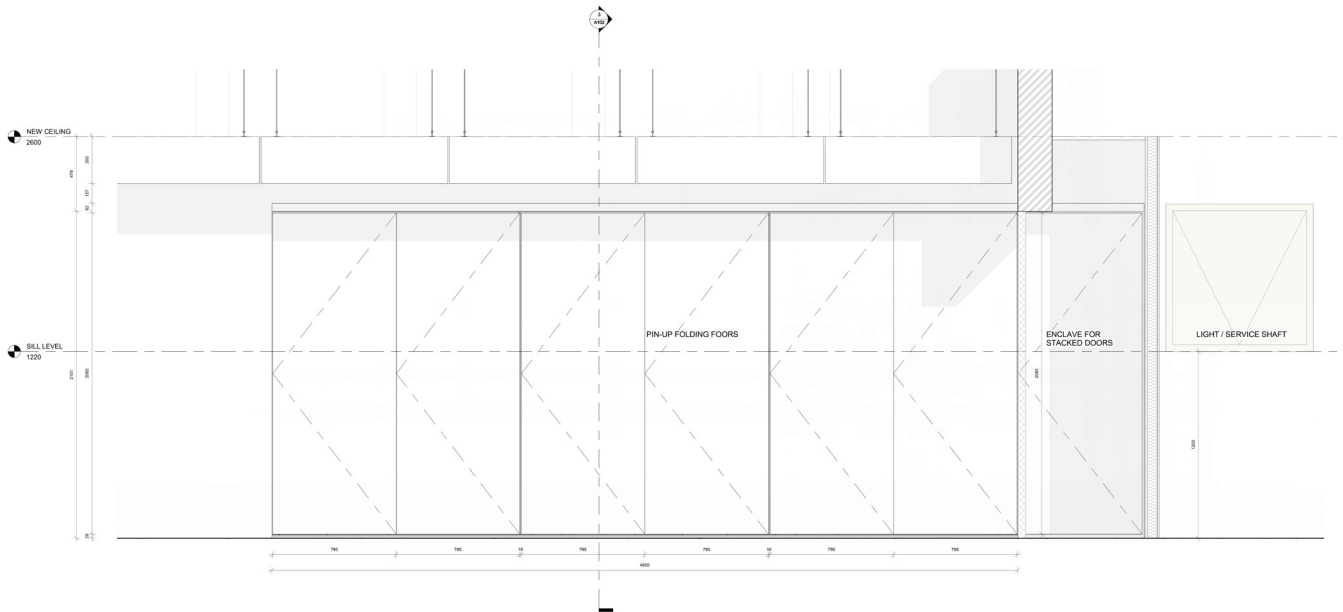


Plan _ Folding door and enclave, n.t.s.

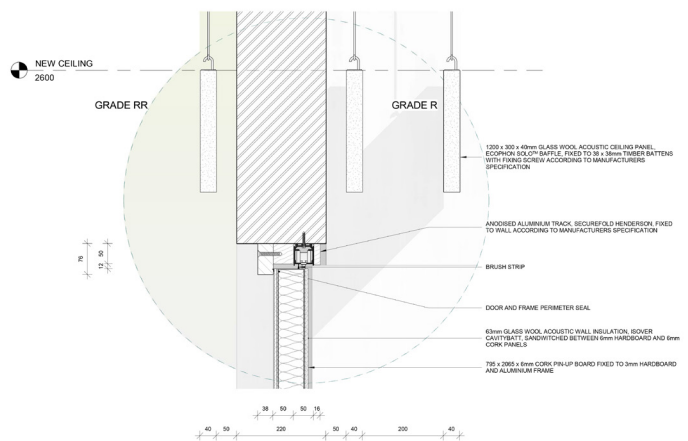


Section _ Folding door and acoustic baffles, n.t.s.

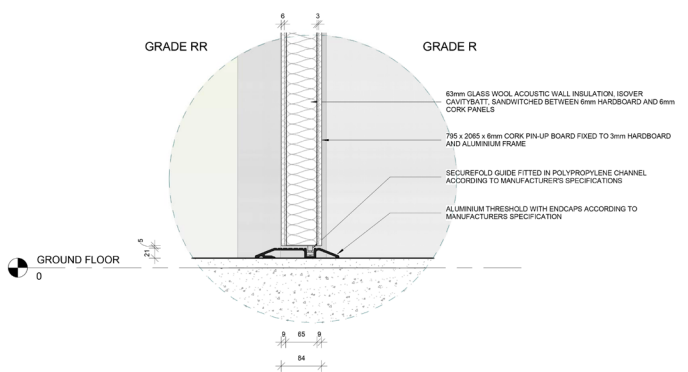
Figure 107. Teaching wall folding door detail (Author, 2020)



Elevation _ Folding door and enclave n.t.s.



Detail 1 _ Folding door rail hanger connected to new wall opening, n.t.s.



Detail 2 _ Folding door guide, n.t.s.

Figure 108. Teaching wall folding door detail (Author, 2020)

6.12.4 [IN] between – new circulation route

The new circulation route serves several functions. It provides the main circulation between classrooms from the entrance and the administration block, navigation cues are used in combination with the circulation zone, it is an intermediate zone between low- and high-stimulus learning, with the primary function of helping children transition between the different learning activities, and a breakout space where informal learning can take place. This space is referred to as [IN] between (refer to chapter 5), and is used to assist the transition from one level of stimulus to the next. The new circulation space is introduced as a result of the existing circulation being adapted as an extension to the interior classroom, to address spatial barriers presented by the classroom and the 1,5m² required per child (Department of Social Development, 2006). The new roof cantilevers over a spacious 2,5m circulation providing a sense of enclosure below.

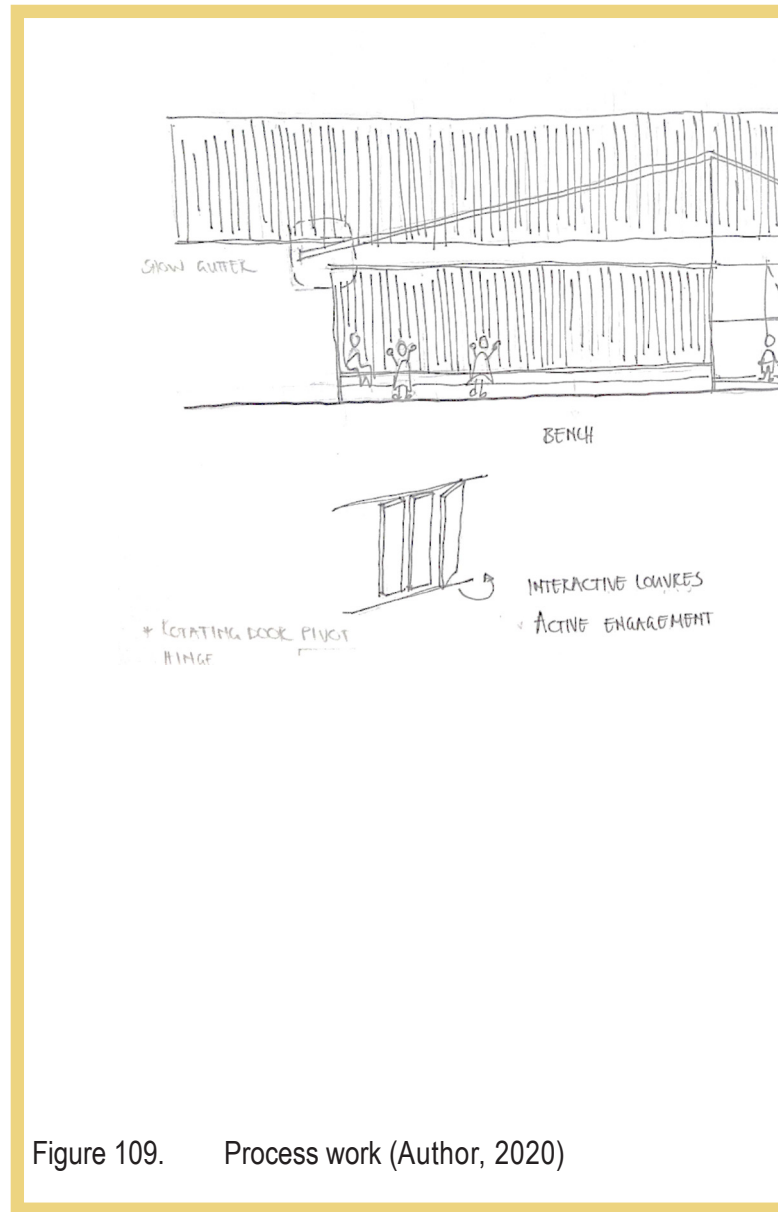


Figure 109. Process work (Author, 2020)

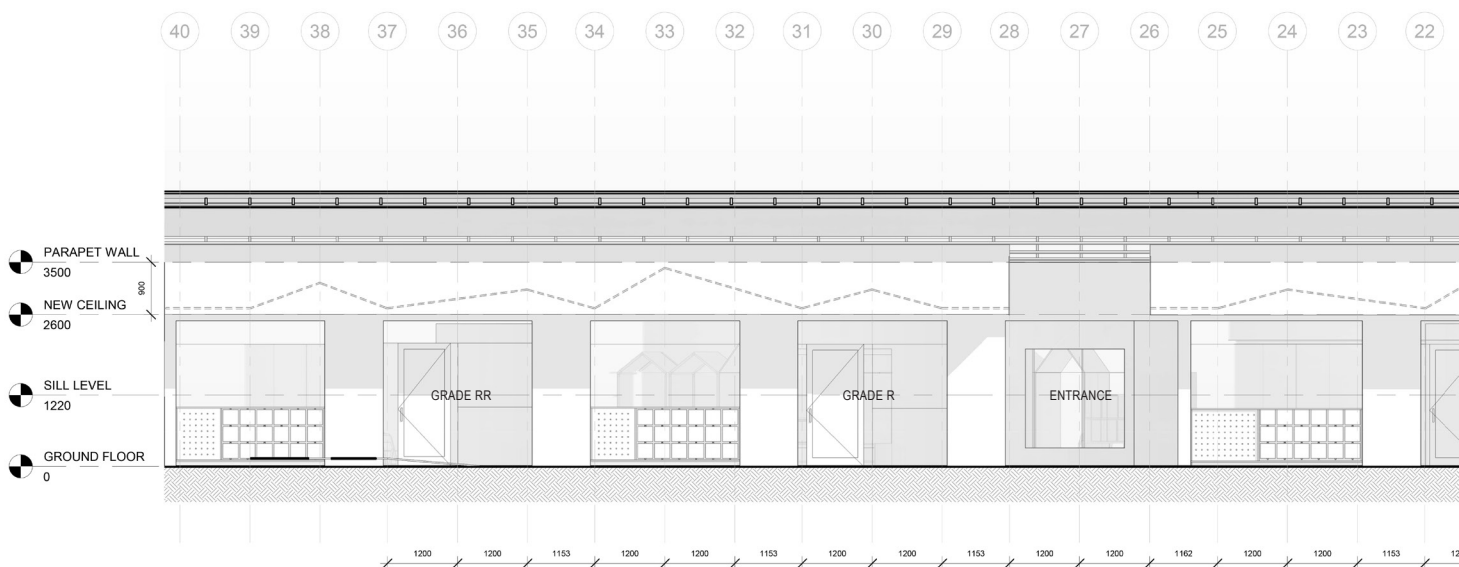
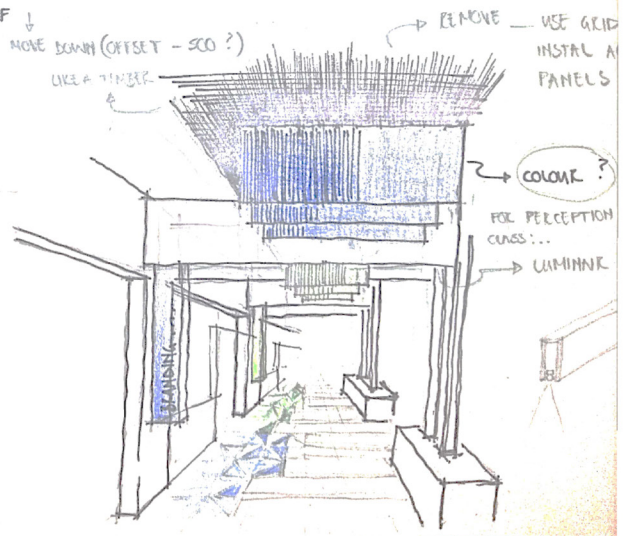
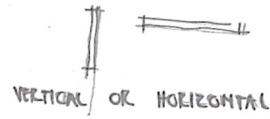
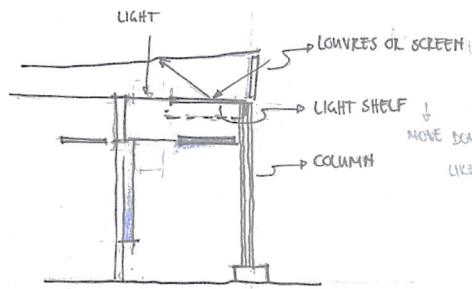
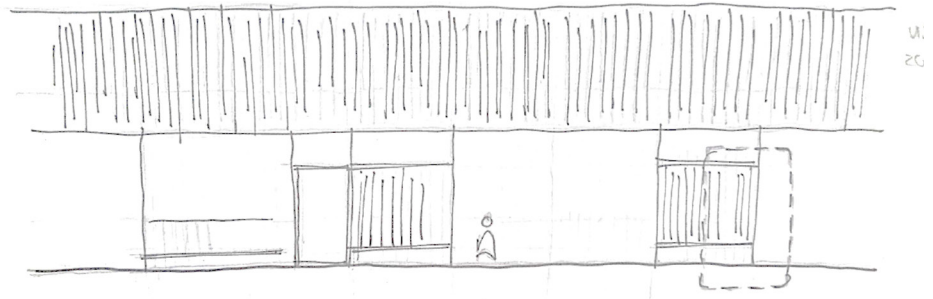
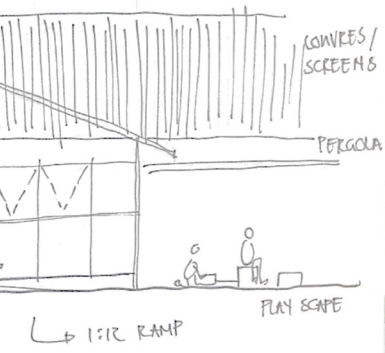
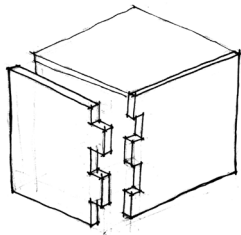


Figure 110. Elevation _ In-between (Author, 2020)



6.12.5 Creative studio

The creative studio is an interactive, high-stimulus activity zone for art, craft and movement activities. Easy to install, recycled rubber cradles are used to raise the floor 150mm AGL. Three variations of the wall panels are used to clad the studio; a cork pin-up wall, peg-board and a mirror finish dance studio wall. The glazed partitions provide a visual connection between the studio and the sensory garden. Ecophon ceiling tiles are used to control the interior acoustic quality.



Joint based

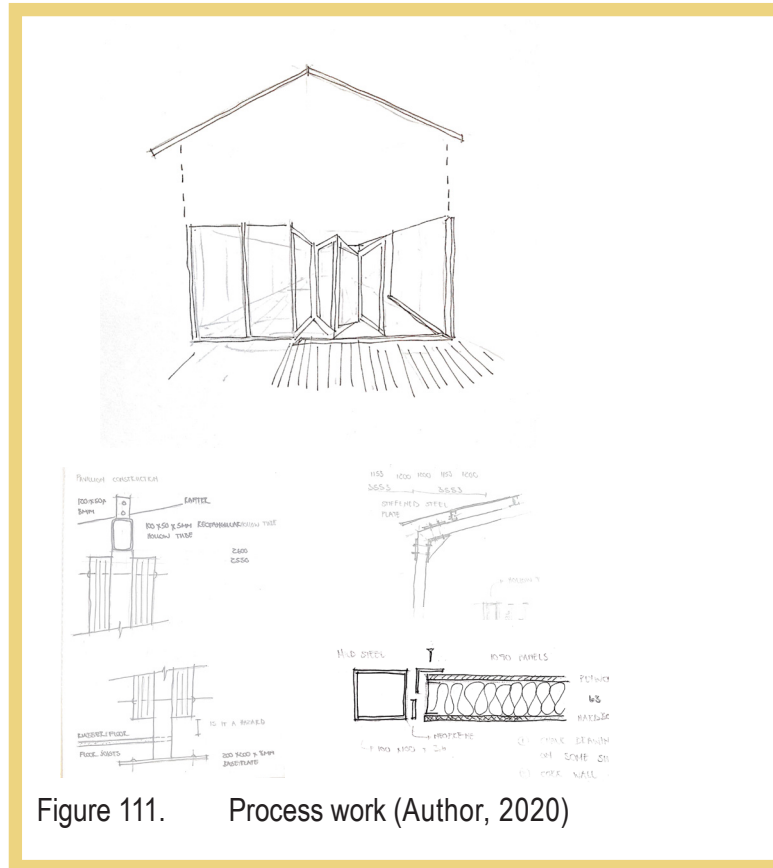
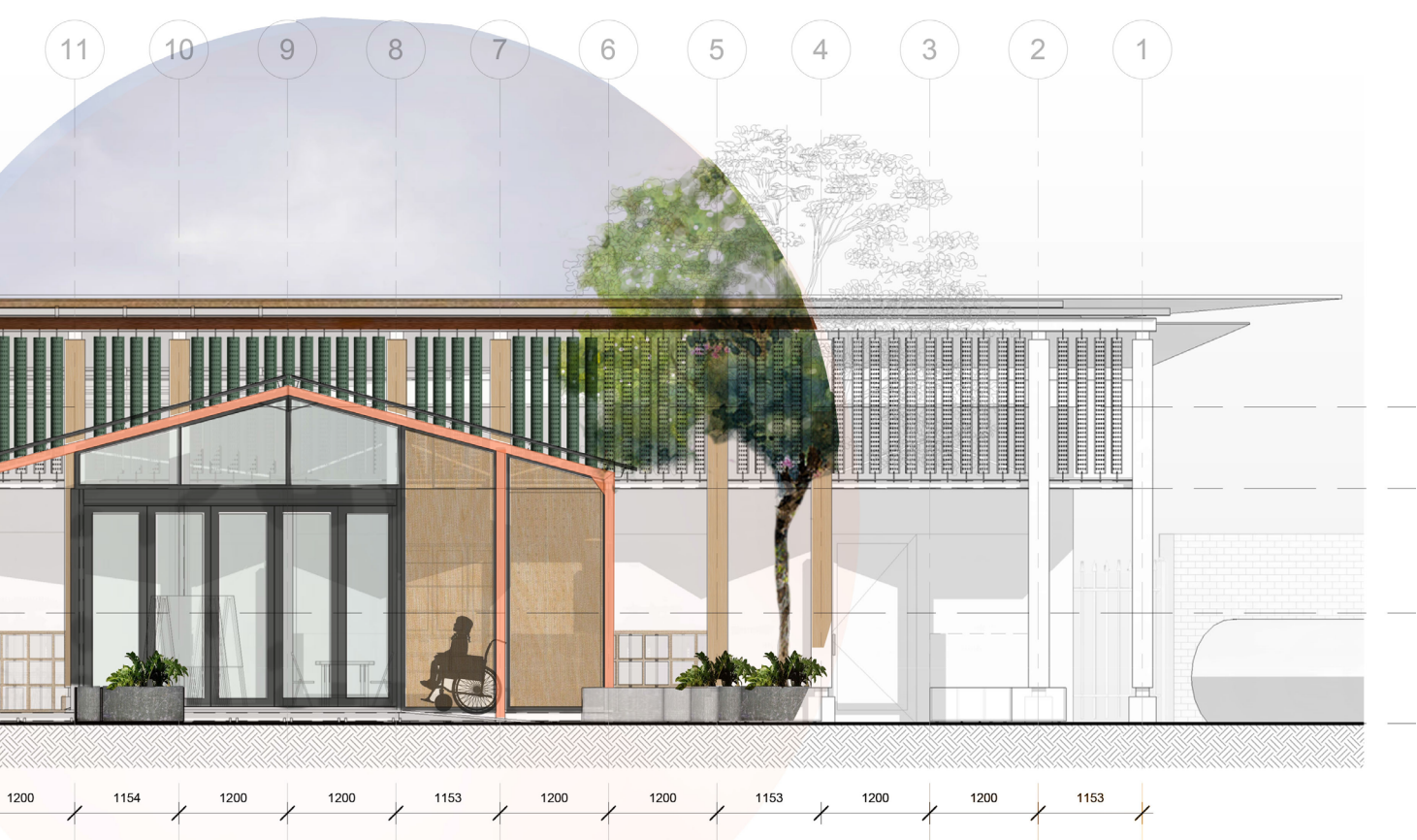
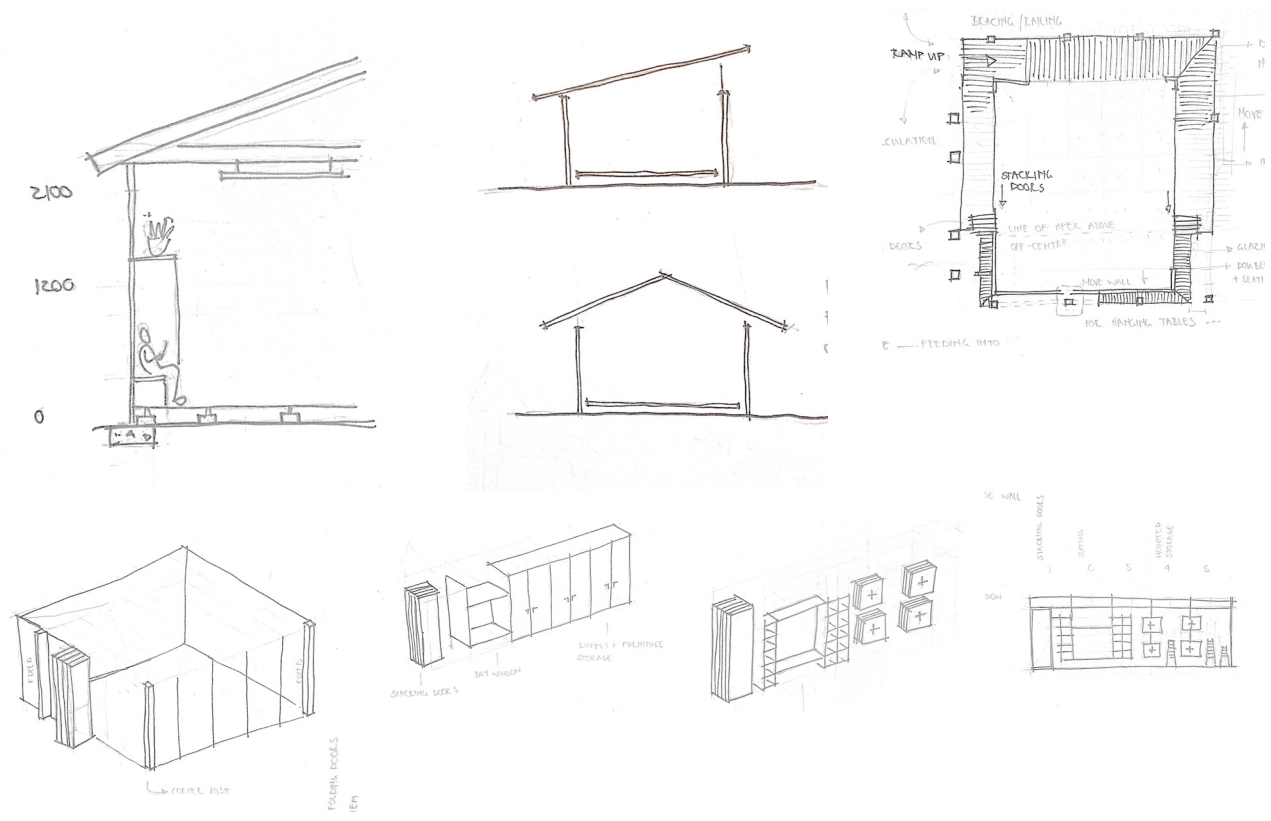
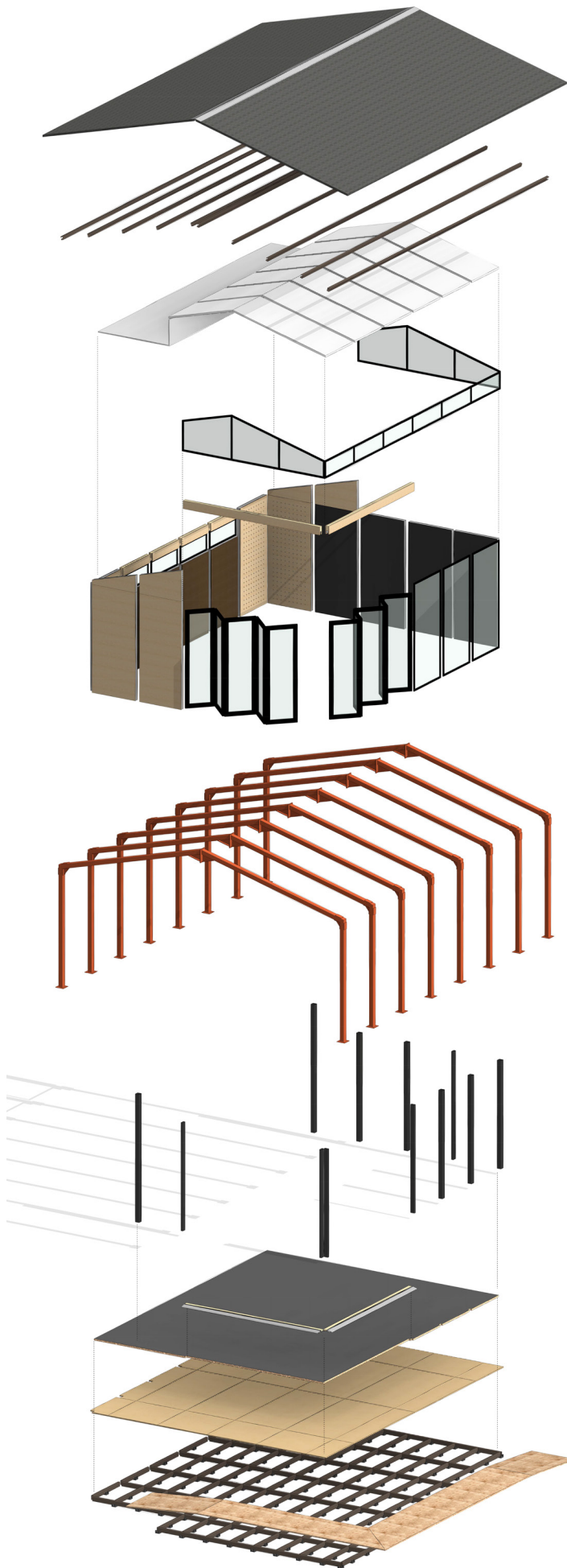


Figure 111. Process work (Author, 2020)



Figure 112. Elevation _ Creative studio and sensory garden (Author, 2020)





Roof:
 15° Chromadek pitched roof representing
familiarity
 20mm Ecophon Focus Fixiform acoustic ceiling
 panels.

Windows:
 Operable glass windows are provided for
 ventilation.

Cladding:

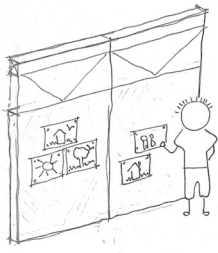
Structure:
 The primary frame is powder coated orange (c.f.
 6.9), and bolted to a concrete footing foundation.

Secondary steel profiles and mullions are installed
 between the wall panels and folding doors

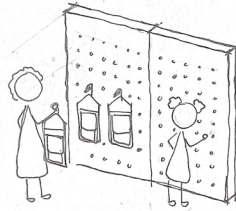
Floor:
 Recycled rubber on OSB boards.
 Shutterply substrate boards cut to desired sizes.

Raised floor system:
 Recycled rubber cradles with packers to level
 uneven floor.
 Steel framework at 600 centres.

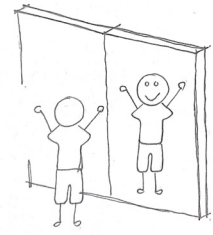
1:12 Ramp for wheelchair access.



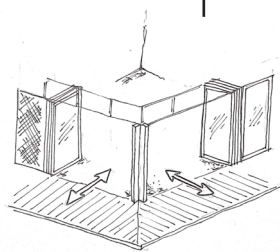
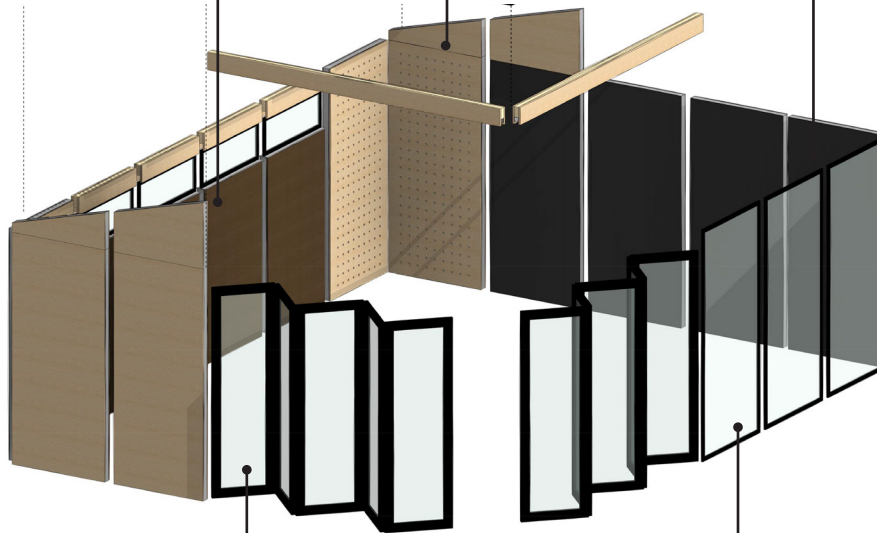
Pin-up board with 10mm cork finish and operable windows at 1600mm AFFL for ventilation



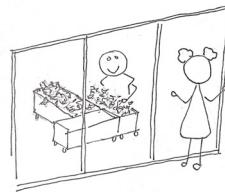
Peg board used for interactive learning (supporting fine-motor skills and hand-eye coordination), and storing hanger chairs



Full length dance studio wall with 6mm mirror finish



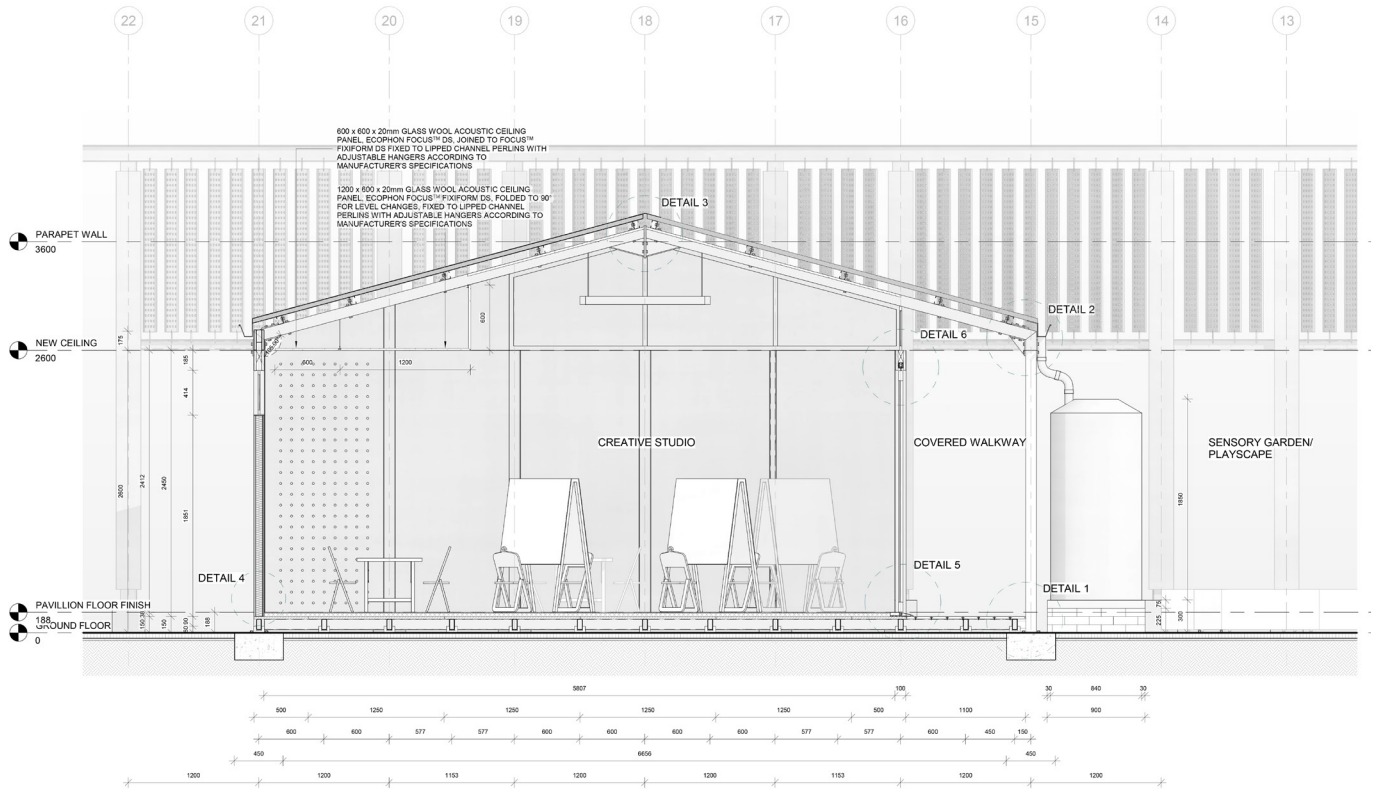
Folding doors open for activities to spill out to covered decking



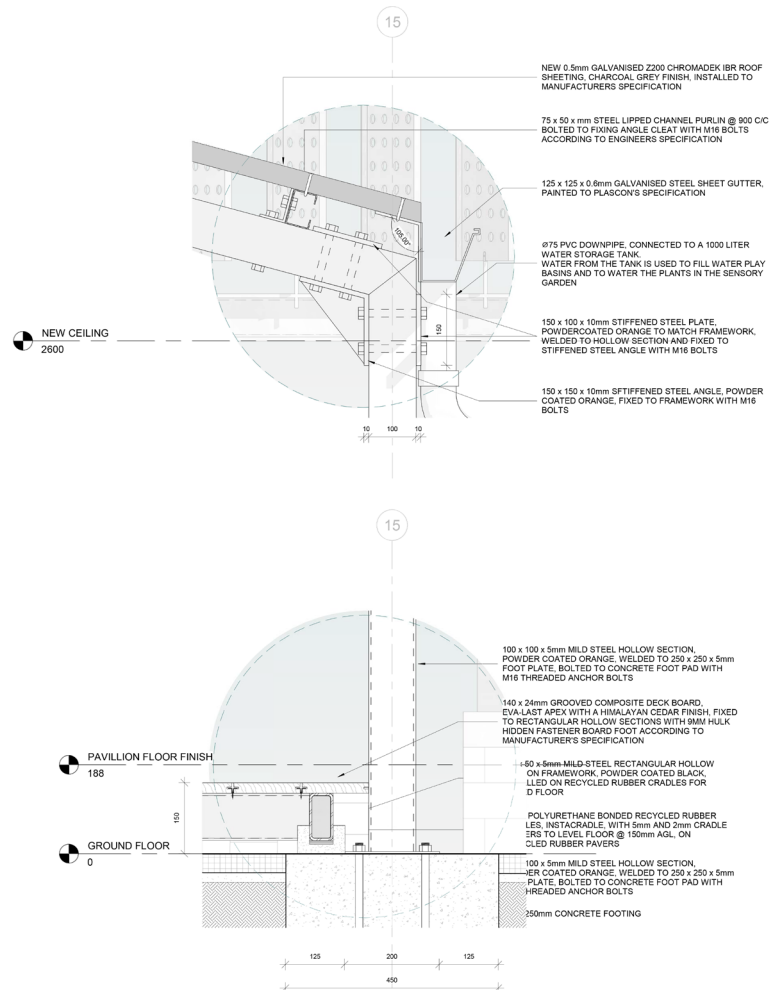
Clear glazed panels creating a visual connection between the creative studio and the sensory garden

Figure 113. Creative studio assembly (Author, 2020)

Figure 114. Studio panel variations (Author, 2020)



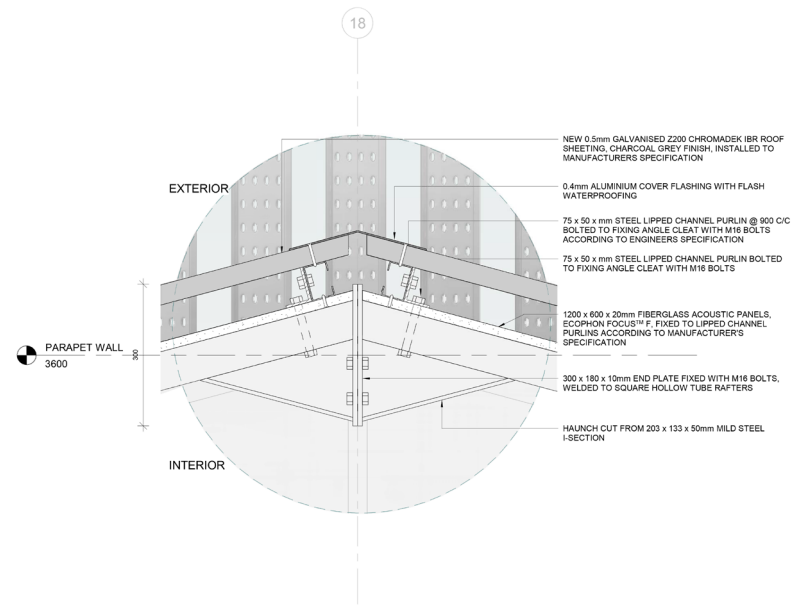
Section BB_ High-stimulus learning environment, n.t.s.



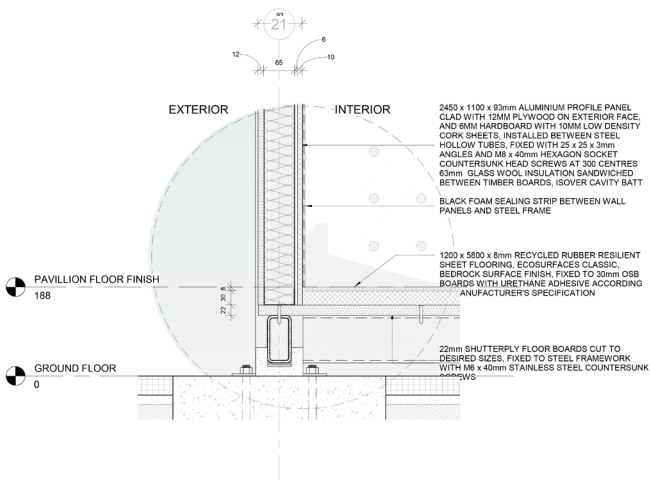
Detail 1 _ Concrete footing and composite wood decking, n.t.s.

Detail 2 _ Roof and gutter detail, n.t.s.

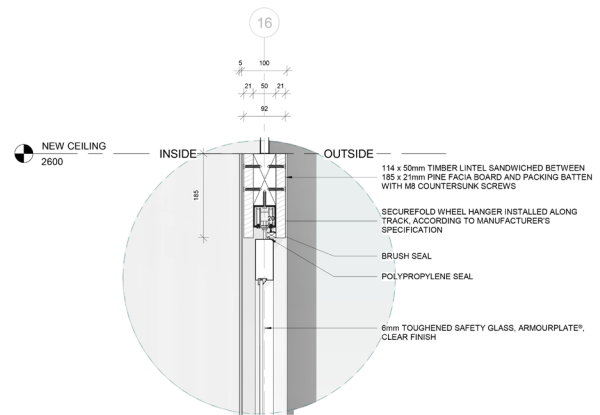
Figure 115. Creative studio detail (Author, 2020)



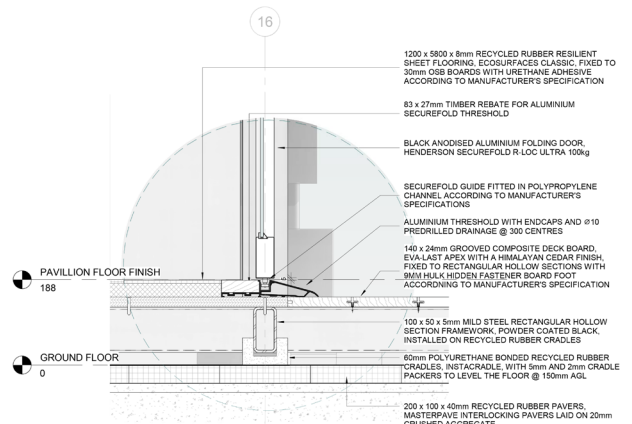
Detail 3 _ Apex haunch hollow square tube, n.t.s.



Detail 4 _ Panel and raised floor detail, n.t.s.



Detail 5 _ Folding door hanger, n.t.s.



Detail 6 _ Folding door guide rail and threshold, n.t.s.

Figure 116. Creative studio detail (Author, 2020)

6.13 Furniture

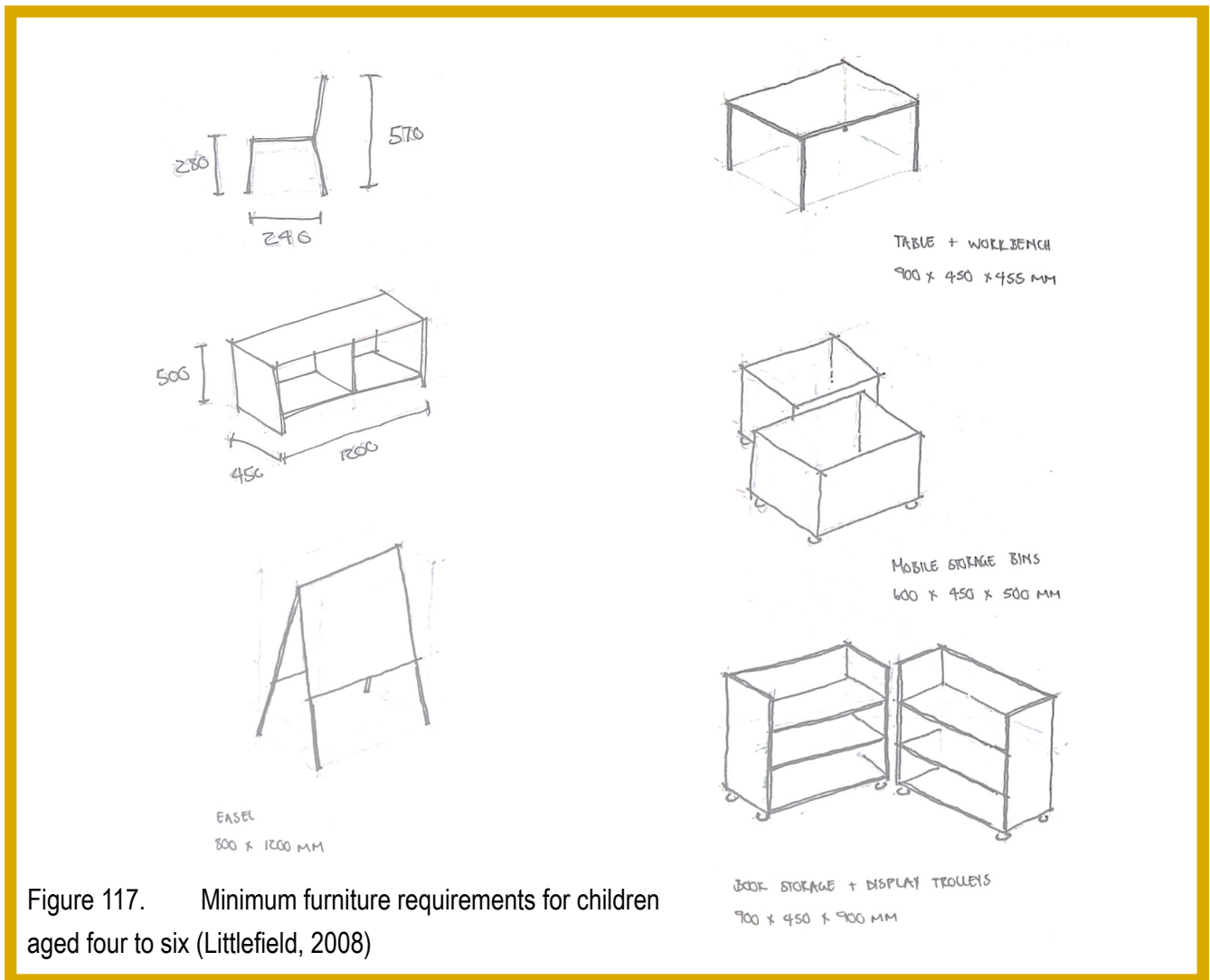


Figure 117. Minimum furniture requirements for children aged four to six (Littlefield, 2008)

Furniture for dynamic spaces _ stored flat or wall mounted



Figure 118. Flat storage and wall mounted furniture



Figure 119. Areas of specific learning (Author, 2020)



Figure 120. Areas of specific learning (Author, 2020)

Conclusion

The design and technical investigation responded to the physical environmental barriers faced by children with learning difficulties at Sunshine nursery school. This was achieved through the development of a pattern language for the design of an inclusive learning environment. The response to the design of Sunshine Nursery School is a new conceptualisation of the classroom, creating a programme for learning according to the level of stimulation expected with each learning activity.

07 CONCLUSION

7.1 Conclusion

The study aimed to address the barriers inherent in the classroom at Sunshine Nursery School, Hammanskraal, to inclusive learning for children with specific learning difficulties. Although the Department of Social Development provides guidelines for inclusion, the recognition of these specific difficulties has not been made explicit in the form of guidelines for the design of classroom supporting the needs of children with learning difficulties in mainstream schools. The proposed design illustrates the role of environmental psychology through the development of a pattern language for the design for specific learning. The objective of the programme for specific learning was to create a classroom providing the necessary support for intellectual, social, perceptual-motor and emotional development.

The study further illustrated strategies to enable the continued learning development of children hindered by sensory stimuli. Specific learning was layered in accordance with high and low-stimulation activities. The material and colour strategies, which have a significant role in the way children interact with the environment, were prescribed according to perceptual qualities in order to mitigate the potential of sensory overload resulting from visual stimuli. The existing acoustic quality, lighting and wayfinding were found to be problematic, therefore strategies to improve these were investigated, further reinforcing the perceptual qualities of the classroom.

Based on the theoretical inquiry and the teacher's perceptions, acoustic quality improves the ability to concentrate on tasks at hand, in turn contributing to the child's development. Thus, an acoustic wall and ceiling systems were applied to learning spaces to absorb the unwanted noise. Legibility in wayfinding was achieved through the provision of cues to navigate the learning environment independently, further reinforcing a sense of choice and control.

The layer of environmental principles in the design intervention act as a teaching aide for the teachers. This was achieved through the consideration of the child's active engagement with the environment. The concept for a 'kit-of-parts'

was adapted to enrich the learning experience through interaction and exposure to construction methods, provoking curiosity. This construction method provides opportunities to adapt the space according to stimulation and learning preferences. This was explored as a series of learning scenario's.

The study contributes to the need for adaptive learning environments to support the development of young children with learning difficulties and disabilities. The design rethinks the program in light of the principles of environmental psychology, to embrace a wider spectrum of needs in the learning environment with regard to sensory, cognitive and social difference. This approach ultimately proposes a guideline for the adaptation of a mainstream Early Childhood Development Centre. Although a great need for resources and teacher support in Early Childhood Development Centres exists, there remains an even greater need to address the developmental support required for children with learning difficulties in an inclusive learning environment.

Recommendations for future study:

- The development of design guidelines for the early intervention of children with neurological differences within mainstream schools.
- Designing learning environments to support the learning preferences of children, with the intention to encourage their active participation.
- The implementation of adaptable learning environments in Early Childhood Development Centres from conception.

To my family, thank you for supporting me throughout this journey. Thank you for your love and all your prayers.

To Zakkiya an Catherine, thank you for encouraging me through this challenging year. I am forever grateful.

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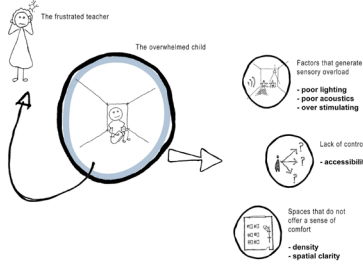
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APPENDIX

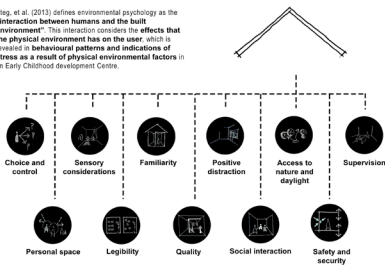
Exam presentation

OUTLINING THE PROBLEM

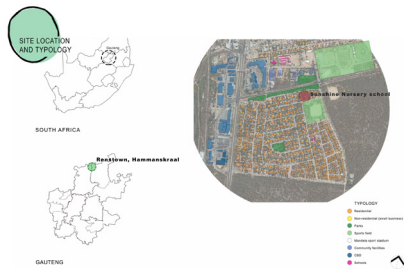


ENVIRONMENTAL PSYCHOLOGY

Step, et al. (2013) defines environmental psychology as the "interaction between humans and the built environment". This interaction considers the effects that the physical environment has on the user, which is revealed in behavioural patterns and indicators of stress as a result of physical environmental factors in an Early Childhood development Centre.



MACRO STUDY



MESO STUDY



PRIMARY USER

Grade R & RR Ages four to six - Neurotypical learner (considered normal developmental) - Atypical learner (children with learning difficulties) Needs: - Min. 1.5m ² free play area per child - Dedicated story, study and play areas - Furniture suited for age group - Sensory considerations: acoustics, lighting, material, accessible wayfinding	Sunshine Nursery School staff Principal - Teachers - Administrative staff - Cook - Cleaner(s) - Grounds man Needs: - Staff room - Breakout space	Teachers - Grade R teacher - Grade RR teacher with assistant teacher Needs: - 1 teacher per 25 learners - Assistant teacher for children with learning difficulties - Secure storage for teacher's belongings - Work station for teacher preparation

RESEARCH QUESTION

? How can the principles of environmental psychology be applied to support the developmental needs of children with learning difficulties at Sunshine Nursery School?

Theory
How do existing theories on environmental psychology and learning difficulties apply to the child as an active participant in the learning environment?

Context
Which environmental factors at Sunshine Nursery School hinder the active engagement required to assure the learning development of children with learning difficulties?

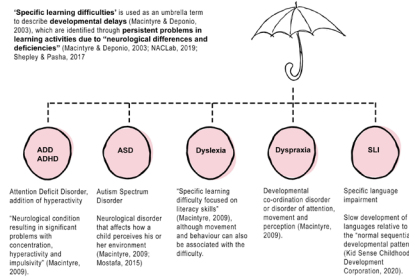
Design
How can the physical environment be adapted through an interior architectural intervention to benefit the developmental needs of children with learning difficulties?

Preparing the environment for active participation

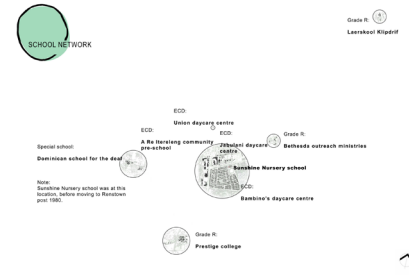
Enabling active engagement for development

Manipulating space to change perception

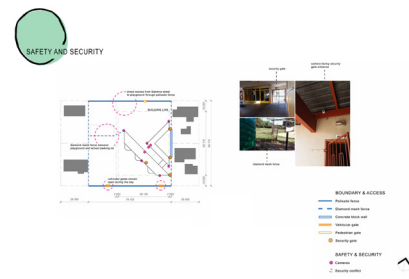
SPECIFIC LEARNING DIFFICULTIES



MACRO STUDY



MESO STUDY



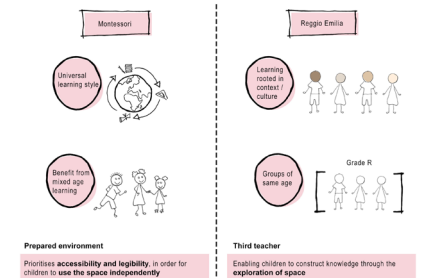
SECONDARY USER

Family Family members are encouraged to participate in the learning development of the children with learning difficulties - Encourage continued learning at home Needs: - Access to resources - Access to consultations with teachers, learning specialist and similar professionals - Support system	ECD school cluster Benetton's Daycare Centre - Jabulani Daycare Centre - A Re Learning Community Preschool - Union Daycare Centre Needs: - Access to resources - Community support facilities	Professional staff - Executive function coaches - Learning specialist and educational therapist - Occupational therapist Needs: - Dedicated work space at the nursery school - Rooms designed with sensory considerations in mind

PROJECT BRIEF

Theory The first aim is to develop guidelines from theories on environmental psychology and learning difficulties to generate a pattern language (Koolhaas, et al., 2010) for the design intervention at Sunshine Nursery School.	Context The second aim is through research to establish a method to provide an enabling learning environment	Design The third aim is to generate a new conceptualisation of "classroom" at a learning environment.
- to establish a dynamic learning environment - encouraging independent use	- for participation and active engagement	- with choice and control - a legible learning environment - a familiar environment for development

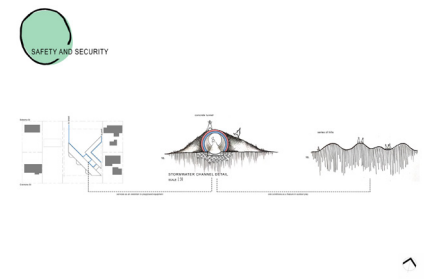
LEARNING PHILOSOPHIES



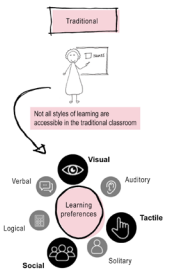
MESO STUDY



MESO STUDY



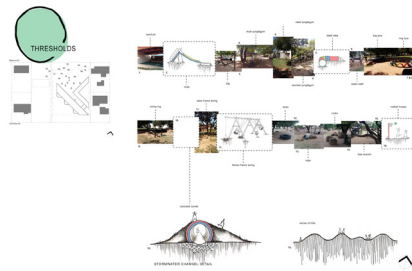
APPROACH TO LEARNING



MESO STUDY



MESO STUDY



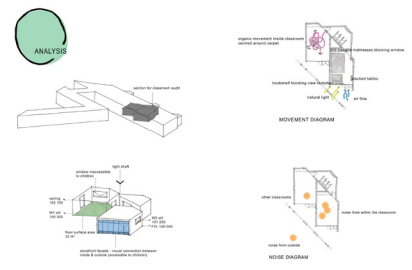
MESO STUDY



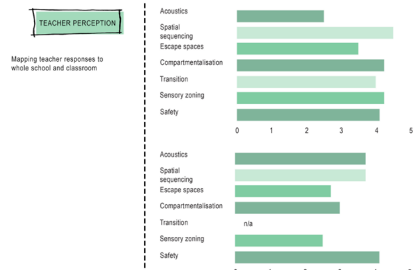
MICRO STUDY



MICRO STUDY







ASPECTSS INDEX RATING



PROGRAM

Classroom
- 1 set of two four area per class
- Classroom of lower development (2000)
- Dynamic learning space floor area needs to be flexible
- Storage and display of personal culture
- Storage for children's bags and personal belongings
- Storage and lock space for teacher needs to be flexible
- Note: Required activity areas for foundation phase is if required later
Children's WC
- Accessible by young children
- Type of WC and toilet to suit 4-7 yrs
- Wheelchair accessible WC
Circulation route
- Clear path for circulation according to SANS 10400-B
- Separation for independence use of space to children
- Space along the route for informal learning
- Spatial and transitional functions
- Note: Potential break-out space for professionals to work with small groups of 2-3 children
Playground
- Accessible from classrooms where possible (playground)
- Visual accessibility
- Potential spaces for outdoor learning (in-between spaces)
- Safety and security
- Suitable equipment for free play
Sensory garden
- Informative learning environment that promote participation
- Safety and security

BEHAVIOURAL ARCHETYPES

<p>the introvert</p>  <p>Children are five year old girl in Grade R who is shy and reserved and does not like to be the center of attention and does not like to be touched. She is reserved and does not like to be the center of attention. She is uncertain about welcoming Nthabiseng into her personal space. She is uncertain about welcoming Nthabiseng into her personal space. She is classified as 'different'.</p>	<p>the extrovert</p>  <p>There is a six year old boy in Grade R who is very energetic and likes to be the center of attention. He is frustrated on the part of those around him because he is interrupting learning activities. He is frustrated with the confines of the classroom because he is struggling to keep up to their level of cognitive, physical and social development.</p>	<p>the anxious child</p>  <p>There is a six year old boy in Grade R who is very energetic and likes to be the center of attention. He is frustrated on the part of those around him because he is interrupting learning activities. He is frustrated with the confines of the classroom because he is struggling to keep up to their level of cognitive, physical and social development.</p>	<p>the patient teacher</p>  <p>Teacher Chika is a Grade R teacher who has been teaching the Grade R class at Sunshine Nursery School for 10 years. She is teaching one or two children with learning difficulties. She is finding resources within the natural environment to help the children learn. She is struggling to keep up to their level of cognitive, physical and social development. She is struggling to keep up to their level of cognitive, physical and social development. She is struggling to keep up to their level of cognitive, physical and social development.</p>
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CONCEPTUAL DEVELOPMENT

The concept approaches opportunities to learn through play by identifying the value of in-between spaces that support the development of children with learning difficulties. For the purposes of this proposal, in-between refers to the spaces or objects that enable active engagement required by children in order to gain a sense of control of their environment.

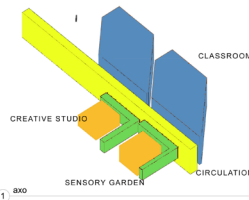


Enclosure **Threshold** **Meeting space**

The three in-between conditions can be translated into the learning environment through scale, control and spaces for interaction.




The intention is to: **Adapt the physical learning environment of Sunshine Nursery School, to benefit the learning development of children with learning difficulties by addressing the existing barriers to inclusive design.**

AREA OF INTERVENTION



CONSTRUCTION

- Methods of construction are used as an opportunity to enrich a child's learning experience
- The main focus of the details that follow is to provide dynamic spaces that offer a sense of choice and control
- Control is exhibited through the extent to which a child with learning difficulties engages in social interaction

 <p>Module based</p> <p>the use of scale to create a sense of place that supports the needs of children with learning difficulties</p>	 <p>Panel based</p> <p>the perception and function of materials, which defines the properties of objects and how we interact with them</p>	 <p>Joint based</p> <p>the construction of structures that they inhabit and/or its systems</p>
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COLOUR AND MATERIAL

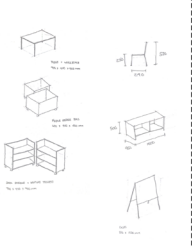
Colour and material work hand in hand, focusing on the child's perception of space

- Colour is used as a **wayfinding tool** to identify spaces according to their level of stimulation
- The materials are selected based on their **visual and haptic characteristics**. Natural materials are perceived as being warm to the touch and calming. Where materials perceived as being 'cold and hard are used', colour may be introduced

<p>Low - High</p> <ul style="list-style-type: none"> - Art and craft - Home corner 	<p>Harmonious</p> <ul style="list-style-type: none"> - Low stimulus - Book and story corner - Nap time 	<p>Birch plywood</p> <ul style="list-style-type: none"> - Use: Furniture, Furnishings, Studio wall panels 	<p>Oriented strand board</p> <ul style="list-style-type: none"> - Use: Furniture, Studio floor panels, Circulation bulkhead 	<p>Cork (fine and medium grain)</p> <ul style="list-style-type: none"> - Use: Pin-up boards
<p>High - Low</p> <ul style="list-style-type: none"> - Problem solving - Table-top - Sand and water play 	<p>Productive</p>	<p>Black paint</p> <ul style="list-style-type: none"> - Chalk board surface 	<p>Recycled rubber</p> <ul style="list-style-type: none"> - Creative studio floor 	<p>Vinyl</p> <ul style="list-style-type: none"> - Classroom floor
<p>High</p> <ul style="list-style-type: none"> - Movement and music corner - Snack and lunch time 	<p>Stimulating</p>	<p>Note: Steel is powder coated in respective colours</p>		

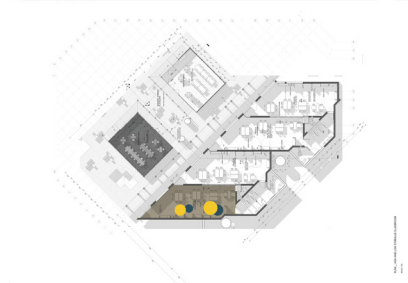
FURNITURE

Furniture requirements for children aged four to six



- Hanger chair - Philippe Malouin**
 - chair is adapted according to ergonomic requirements of children aged four to six
- Folding table**
 - tables are mounted on walls or stored flat
- Wall mounted desk**
 - teacher work station

FLOOR PLAN



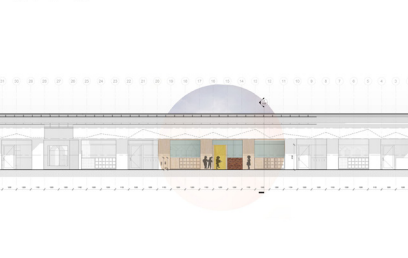
THE NEW ROOF AND CIRCULATION



CREATIVE STUDIO



CIRCULATION



Technical investigation as given in chapter 6 part 2.

Consent forms

Informed consent form [Form for research participant's permission]

1. Project information

1.1 Title of Research Project:

Masters Professional Dissertation: Using Environmental Psychology to support the development of young children with learning difficulties through the design intervention of an early childhood development centre in Hammanskraal. [working title]

1.2 Research Field: Environment Potential [EP]

1.3 Researchers details: Mkandla, VN _ 29190275

1.4 Research Study Description:

In the Department of Architecture, the students of the Professional Master's Program annually engage in research activities related to specific areas in Gauteng (or area outside this region that has been well motivated). The students investigate specific architectural issues related to their chosen contexts, to enable them to respond to these conditions through a design proposal. These design projects, while resulting in real life recommendations, are neither implemented nor built.

The physical environment of the classroom, and the elements thereof can convey important information about how children learn. The study will focus on the development of children aged 5 and 6, as it aims to understand and respond to the physical environmental cues within the ECD that affect the normative behavior of these learners. An emphasis is put on children with learning difficulties in the classroom, and the eventual recognition of the ECD as a full-service/inclusive resource centre.

The conversation will be recorded. Some of the results may be published and although participants will remain anonymous some of their words might be quoted in the publications.

I will remain anonymous my comments may be used without giving any specific geographic or personal references (name, address, ID, occupation, age, income etc.) that may accidentally imply my identity

- I give permission for the interview to be recorded: / N
- I give permission for notes to be taken: / N

Signed:  Date: 28/02/20

Witness:  Date: 28/02/2020

Researcher:  Date: 28/02/2020

I will remain anonymous my comments may be used without giving any specific geographic or personal references (name, address, ID, occupation, age, income etc.) that may accidentally imply my identity

- I give permission for the interview to be recorded: / N
- I give permission for notes to be taken: / N

Signed:  Date: 28/02/20

Witness:  Date: 28/02/20

Researcher:  Date: 28/02/2020

Interview questions

M(Prof) Department of Architecture **[research questions]**

1. Describe the typical layout of the classroom, where learning, play and other activities take place.
[draw a quick diagram]
2. Describe the typical routine followed by the learners on a typical day.
3. Do you think the physical learning environment of Sunshine Nursery school has a negative or positive influence on the development of young children?
4. Which environmental cues within the classroom typically affect the behavior of the learners during lessons? [indicate the location of these elements on the diagram]
5. Do these environmental cues affect all of the children?
6. Describe the exterior environment directly outside your classroom.
What distractions are there that typically affect the learning of children, if any?
7. Which elements in and around the classroom influence whether or not children can maintain class rules?
8. Do your learners participate in learning activities outside the classroom?
9. If yes to question 8, do they follow instructions or are they easily distracted by objects/elements around them?
10. In your opinion, what or where is the most productive space for the average learner in the school?

Ethics approval



Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en
Inligtingtegnologie / Lefapha la Boetšenera,
Tikologo ya Kago le Theknolotši ya Tshedimošo

Reference number: EBIT/53/2020

Ms C Karusseit
Department: Architecture
University of Pretoria
Pretoria
0083

Dear Ms C Karusseit

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Conditional approval is granted.

This means that the research project entitled "Masters Professional Dissertation in Architecture, Landscape and Interior Architecture" is approved under the strict conditions indicated below. If these conditions are not met, approval is withdrawn automatically.

Conditions for approval

Approved based on the summaries provided.

Applications from each student (including application forms and all necessary supporting documents such as questionnaire/interview questions, permission letters, informed consent form, etc) will need to be checked internally by the course coordinator/ supervisor. A checklist will need to be signed off after the checking.

All of the above will need to be archived in the department and at the end of the course a flash disc / CD clearly marked with the course code and the the protocol number of this application will be required to be provided to EBIT REC administrator.

No data to be collected without first obtaining permission letters. The permission letter from the organisation(s) must be signed by an authorized person and the name of the organisation(s) cannot be disclosed without consent.

This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Ethics Committee.

If action is taken beyond the approved application, approval is withdrawn automatically.

According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.

The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof K.-Y. Chan

Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY