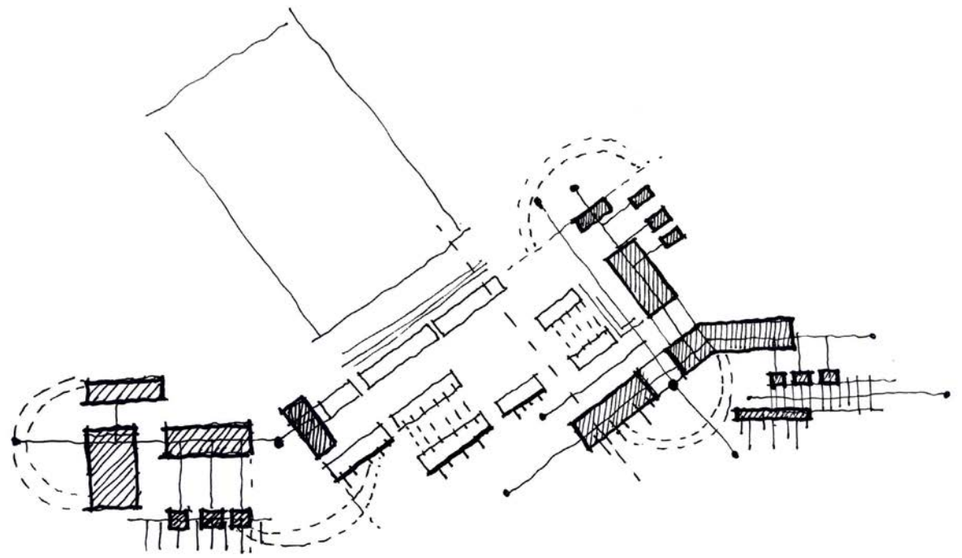

REDEFINING SOUTH AFRICAN GOVERNMENT SCHOOL TYPOLOGIES TO ENCOURAGE LIFELONG LEARNING POTENTIAL

PURLL NAIDOO

2020

DECLARATION

In accordance with regulation 4[e] of the General Regulations [G.57] for Dissertations and Theses, I declare that this dissertation, which I hereby submit for the degree of Masters of 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 dissertation has already been, or is currently being, submitted for any such degree, diploma or other qualification. Moreover, I declare that this dissertation 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.

–

Purll Naidoo

ABOUT

“Through my postgraduate studies, under the Unit for Urban Citizenship, in the University of Pretoria, I found passion within Architecture. Having lived and studied in multiple cities across South Africa, I have been exposed to numerous contexts and approaches to the spatial discipline. This journey has guided my architectural approach for urban citizenship. It challenges conventional attitudes to the discipline, by focussing on user-centered design through the processes of co-design. Through this approach I have become fascinated with the use of design games as a mediating tool in assisting the co-design process. I am grateful that, through my postgraduate studies, I was able to put this approach into practice and explore the potential it has to offer the discipline. This accumulation of experiential wealth has shaped my perspective of the role of architecture within society. I intend this dissertation to serve as an imprint of discovered passion and an ignition for further development.”

- Purll Naidoo

ACKNOWLEDGMENTS

God, for the blessings and guidance throughout my life.

My parents, for never sacrificing the quality of education I have received that afforded me this opportunity. For always supporting and believing in me through this journey.

My brothers and grandparents for the prayers and faith you have in me.

Lauren Konstantinou and Kelsey Smith, for the shared memories, passion and strength.

Dr Carin Combrinck, for going beyond what it means to be a study leader and focusing on holistically guiding and supporting your students.

Juliana Achi, Reginald Venter and the friends I have made throughout my studies, for sharing this journey with me and making the challenges enjoyable together.

The team and learners at Tsako Thabo Secondary School, for welcoming and embracing us

And to the family and friends who have been with me throughout, silently and vocally supporting me, I Thank You.

ABSTRACT

This document serves as a mini dissertation in the professional Master of Architecture degree in the Department of Architecture at the University of Pretoria. It focuses on the educational ecosystem within the context of South Africa, with emphasis placed on the economically distressed environment of Mamelodi East. Mamelodi is a township situated in the north east of the City of Tshwane, Gauteng. Due to the location of the University of Pretoria's Mamelodi Campus, this area has been a study of investigation for many faculties over the years.

The spatial consequences of architecture on the educational ecosystem are questioned, with focus placed on the shift in the learning environment towards lifelong learning. The dissertation deals with this concept from the perspective of the holistic development of a person through the qualitative social activities of learning.

Lifelong learning is explored throughout the dissertation from a spatial and non-spatial point of view. The spatial conversation deals with the intersection between architecture and education, whilst the non-spatial conversation advocates for a relationship between a community and its school, as integral in achieving lifelong learning.
The study is grounded in a typological understanding of the schooling environment that arises as a result of South African educational policy documents. A critical stance is taken where the resulting school typology is challenged in relation to context.

The intention is to redefine the current teacher-centric classroom and corridor typology. It is proposed that the schooling environment should be publicly redefined and serve as a support structure within its context, instead of isolating the educational experience. This is explored through the concepts of building as a boundary and building for pedagogy with the resulting development of a spatial matrix to provide architectural definition to South African educational policy.

Tsako Thabo Secondary School was used as a case study school for the application of the matrix principles, however it is intended that the developed principles could be applied to other schools within similar contexts and typologies to achieve lifelong learning potential.

Both the research and design process of the dissertation has been directed through the lens of Participatory Action Research (PAR) involving co-design and spatial agency theories. Particular focus within the co-design process was given to the development of design games as a mediation tool. An intimate use of both analogue and digital design games has been applied throughout.

PROJECT SUMMARY

Purll Naidoo

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Institution & Faculty
University of Pretoria: Engineering, Built Environment and Information Technology

Department
Architecture

Course Coordinator
Prof. Arthur Barker

Study Leader
Dr Carin Combrinck

Research Field
Urban Citizenship

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

Title
Redefining South African Government School Typologies to Encourage Lifelong Learning Potential

The Site
Tsako Thabo Secondary School, Mamelodi East, City of Tshwane, South Africa
13415, Mamelodi 608-Jr, Pretoria, 0122
25°42’33.4”S 28°22’17.6”E

The Client
Department of Basic Education

Main Function of the Site
Educational Facility

Keywords
Co-design, Community-school relationship, Design games, Educational Ecosystem, Participatory Action Research, Pedagogy, Policy, Public Threshold, Typology

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Editor
Sharon Konstantinou (Volume 1)
Roshini Hiralal (Volume 2)

OVERVIEW

Understanding the role of architecture on the educational ecosystem has been an ongoing topic of investigation within postgraduate studies in the Department of Architecture at the University of Pretoria for several years. Through the Unit of Urban Citizenship studio, within the Department, Mamelodi East has been the site of investigation for this topic. Research has been conducted within this area since 2017, however personal involvement within this field began in 2019 (Honours year) and continued into 2020 (Masters year).

Multiple postgraduate students within the studio have continued conducting research under the studio's research and architectural philosophies. Due to this common ground, this document is presented in two volumes.

> The first volume contains a selection of co-authored chapters compiled by Professional Master of Architecture students from the Department of Architecture, Lauren Konstantinou and Kelsey Smith and myself, Purll Naidoo.

These chapters introduce:

- us as students
- our reasons for working within the educational ecosystem and its relevance to architectural discourse
- the context of Mamelodi East and the case study school
- the studios research and architectural approach that has been followed
- our involvement in a National Research Foundation (NRF) project that resulted in the collaborative development and application of a research methodology to capture qualitative data.

This volume one serves as an introduction and foundation for volume two which has been individually authored and directed towards the specific themes dealt with by each student.

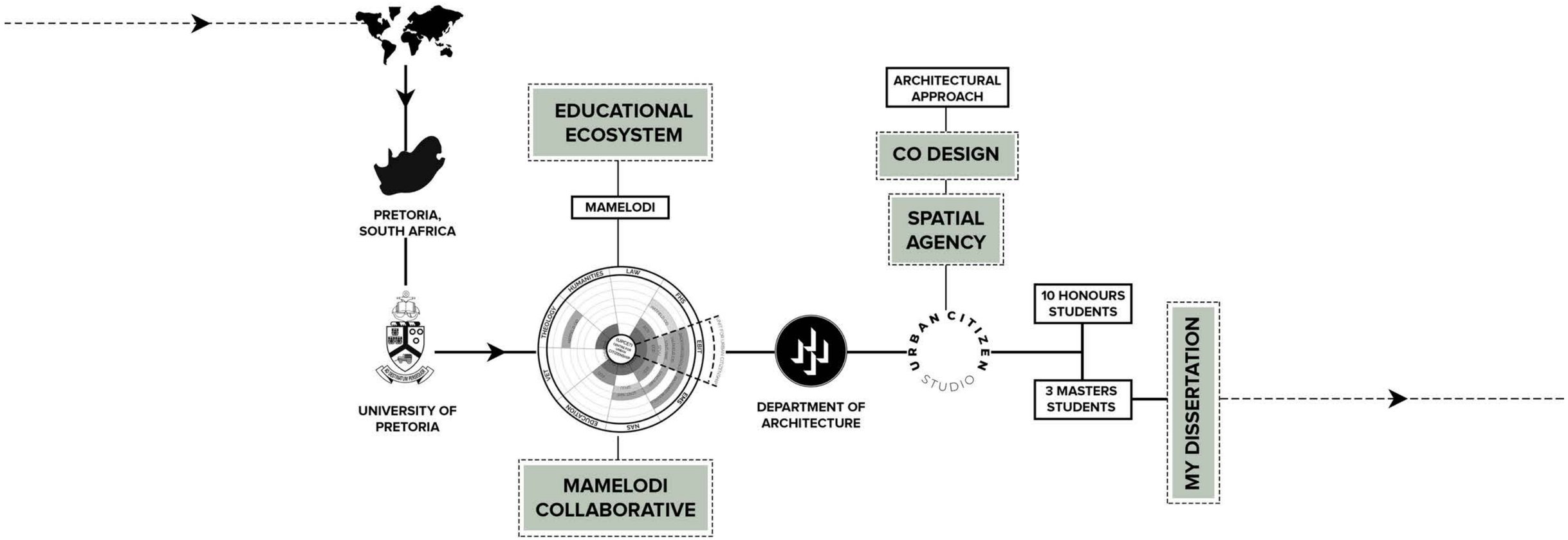
> Volume two continues to question the spatial consequences of architecture on the educational ecosystem, with particular emphasis placed on the shift in the learning environment towards lifelong learning.

Lifelong learning is positioned within the dissertation as the qualitative social activity of learning that contributes towards a person's holistic development. This volume intimately deals with the spatial (tangible) and non-spatial (intangible) conversations surrounding education: an understanding of pedagogical typology (spatial conversation) as well as the importance of a community-school relationship (non-spatial conversation) in encouraging lifelong learning potential.
These two topics have been investigated through the lens of the South African educational policy for public school infrastructure, to understand the role that policy has on the resulting public school typology.

The intention of the dissertation is to develop the limited architectural language within current schooling policy and to align the educational built environment with the South African government's intention to promote lifelong learning for its people.

This volume is structured according to:

- an introductory chapter to ground the study
- a literature review and data collected on site using the studio's research and architectural methodology
- a reflective chapter on the use of analogue and digital design games as a mediating tool in the co-design process
- a design development chapter focusing on the creation of a spatial matrix for policy
- technical development chapter
- a reflective chapter illustrating the developed spatial matrix and its application to the case study school.



Locating the dissertation (Naidoo 2020)

Dissertation document overview (Naidoo 2020)

VOLUME 01
KONSTANTINOU, NAIDOO & SMITH 2020

Investigating the Spatial Consequences of Architecture on the Educational Eco-system through the Approach of the Unit for Urban Citizenship

COMMON FOUNDATION TO THE DISSERTATION

VOLUME 02
NAIDOO 2020

Redefining South African Government School Typologies to Encourage Life-long Learning Potential

FOCUSED THEME OF THE DISSERTATION

01 INTRODUCTION

02 BACKGROUND

03 CONTEXT

04 ARCHITECTURAL APPROACH
Challenging traditional architectural research and design approaches through the use of Participatory Action Research and co-design methods

INFLUENCE OF THE UNIT FOR URBAN CITIZENSHIP

05 RESEARCH & METHODOLOGY
Involvement in an international collaboration that resulted in the development of a methodological framework for collecting and storing qualitative data

INVOLVEMENT IN A NATIONAL RESEARCH FOUNDATION PROJECT

06 RESEARCHER'S INTENTIONS

01 INTRODUCTION

02 EDUCATIONAL ECOSYSTEM

03 DESIGN GAMES IN CO-DESIGN
Comparing the Application of Digital Design Games Against Analogue Design Games in the Architectural Co-design Process

RESEARCH ARTICLE

04 DESIGN DEVELOPMENT

05 TECHNICAL DEVELOPMENT

06 REFLECTION

07 CONCLUSION

JAN - MAR
Participatory Action Research

Macro data collection

Mamelodi East

21-29 SEP
STINT Research project

Collaboration with Chalmers University of Technology

Testing qualitative data collection methodologies

Hammarkullen, Sweden

FEB
Participatory Action Research

Micro data collection within research focus

Application of ukuDoba Methodological framework

Mamelodi East

Desktop Research

APR - JUN
Co-design

Digital design game application

Micro data collection
Design informants

Online

Desktop Research

Design development

AUG - DEC
Technical development

2019
B.Arch (Hons)

APR - JUN
Co-design

Analogue design game application

Micro data collection
Design informants

Tsako Thabo

2020
M.Arch (Prof)

27 JAN - 7 FEB
STINT Research project

Collaboration with Chalmers University of Technology

Development of ukuDoba Methodological framework

Mamelodi East

27 MAR
COVID-19 Lockdown

On site work prohibited

X

JUL-AUG
Design development

Timeline of involvement (Naidoo 2020)

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5.2 Construction: Structural Hierarchy and Materiality

5.3 Building Systems
- 5.3.1 Acoustic Considerations
- 5.3.2 Water
- 5.3.3 Circulation
- 5.3.4 Ventilation

5.4 Building Performance
- 5.4.1 Solar Intensity: Daylight Capture
- 5.4.2 Glare: Visual Comfort
- 5.4.3 Thermal Comfort

5.5 Sustainability
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Appendix 2B; Dots Analogue Design Game

Appendix 2C; Stacked Analogue Design Game

Appendix 2D; AutoCorrect Digital Design Game

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01

V O L U M E

Investigating the Spatial Consequences of Architecture on the Educational Ecosystem through the Approach of the Unit for Urban Citizenship

CO-AUTHORS
KONSTANTINOU, NAIDOO & SMITH 2020

FOREWORD

We dedicate this volume to the Urban Citizen

Herewith lies our discovered passion,
Wherein we hope to inspire like-minded
creatives.

“Architecture is about people, [...] it can do more than we expect.” - Francis Kéré

Agents of change,
Kelsey, Lauren & Purll


Kelsey Smith


Lauren Konstantinou


Purll Naidoo

GLOSSARY

GLOSSARY

MCLC: (Mamelodi Community of Learning Collaborative) Through the University of Pretoria (UP) Mamelodi Campus, the university has engaged with multiple community upliftment projects. The MCLC is funded by the Kresge Foundation.

Educational Ecosystem: a concept through which there is a large focus on the educational sector of a community, identifying and understanding the interrelationships between stakeholders and how these can be enhanced in order to uplift the educational quality of the community as a whole.

UUC: (Unit for Urban Citizenship) Within the Department of Architecture, this unit involves agents of change, engaging deeply with under-served communities through participatory-based projects.

Tsako Thabo Secondary School: Part of the MCLC's effort to uplift the educational ecosystem within Mamelodi East. The principal is Mr Clement Gama who has worked closely with us during the participatory process of both 2019 and 2020.

JCP: Community engagement course that makes provision for university funded community service projects to be completed by undergraduate students in the EBIT faculty during their second year of study.

STINT: National Research Foundation project titled, Stitching the city: From micro-data to macro-views (STINT), aimed at establishing a "transdisciplinary collaboration" to develop a methodology for collecting and sharing non-traditional types of information, on a digitized platform.

STEM & STEAM: approach to learning and development that integrates the areas of Science, Technology, Engineering and Mathematics. STEAM was recently created to incorporate the Arts as well, to ensure an all-rounded and inclusive educational system.

PAR: (Participatory Action Research) An approach to investigation that involves participants and researchers working together in order to uncover issues and solutions within a community or topic.

ukuDoba Method: A methodological framework that has been developed for the collection and sharing of non-traditional types of spatial and socioeconomic data at a street and precinct level in an online platform. All three researchers were actively involved in the creation of this method.

Chapter One

INTRODUCTION

01

CHAPTER
Introduction

01

INTRODUCTION

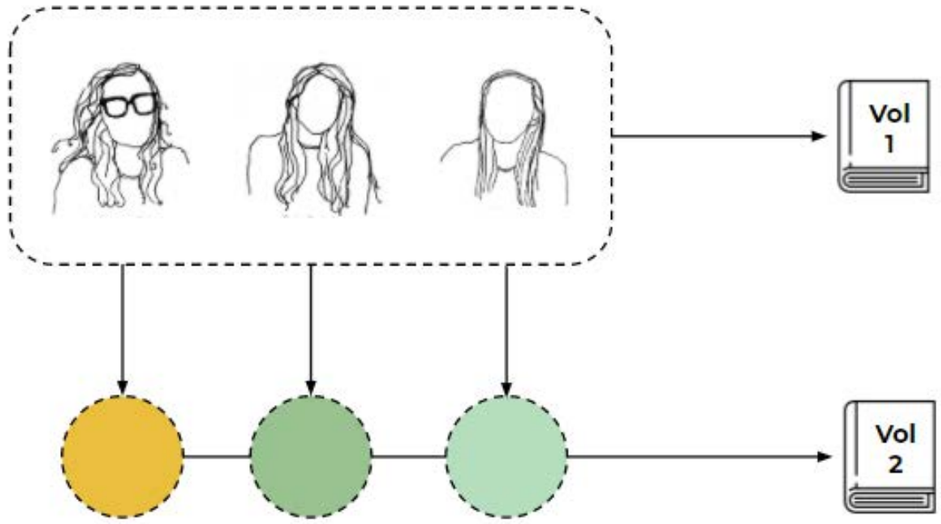

Fig. 01. Dissertation Structure Division (Authors 2020)

This document is inclusive in three mini-dissertations in the professional Master of Architecture degree in the Department of Architecture at the University of Pretoria: Lauren Konstantinou, Purll Naidoo and Kelsey Smith. We have collectively been a part of the University of Pretoria's (UP) Unit for Urban Citizenship, in the Department of Architecture, since our Honours year in 2019. As part of our involvement, we have engaged with the topic of investigating the spatial consequences of the architectural discipline on the educational ecosystem, through the approach of the Unit for Urban Citizenship. This engagement began in 2019 and occurred over the year within Mamelodi East, as a collaboration with the Mamelodi Community of Learning Collaborative (MCLC). This resulted in a focused study of Tsako Thabo Secondary School and a continued collaboration into the 2020 Master's year.

The 2019 experience highlighted the power of alternative architectural processes and the depth that can be added to a project when engaging in participatory design methods. There is a desire and need, within us, to challenge conventional architectural processes by focusing on the end-users as knowledgeable and tangible assets to design projects. We were all captivated by our experience during the 2019 Honours year and sought to continue our engagement in the Master's year, 2020. Due to our common foundation and architectural approach, we have closely collaborated during the Master's year. As an outline, each researcher's dissertation is made up of two parts (Fig. 01): Volume One being the co-authored chapters and Volume Two outlining our individually authored chapters. Volume One of this dissertation document engages in our collective experience and foundation that contributed to our individually focused chapters in Volume Two.

Our research methods and architectural approach to the dissertation are influenced by our involvement in the Unit for Urban Citizenship (UUC). The UUC is a collaboration within the Department of Architecture and is currently headed by Dr. Carin Combrinck. Both students and staff from the department form part of the UUC, as well as identified community members who are integral to the success of the unit.

The unit is intended to be used as a platform for civic engagement and participatory development within disadvantaged communities. This is done in an effort to gain real-world understanding and result in community upliftment (Kilfoil 2019). The particular research method, carried out in each dissertation, is the outcome of the unit's involvement in a National Research Foundation (NRF) project, titled 'Stitching the City" (STINT). This project is a joint effort between the University of Pretoria in South Africa and Chalmers University in Gothenburg, Sweden. All three researchers were integral to the research project from 2019 to 2020 (See appendix A) and contributed towards the development of the ukuDoba Method, a methodology for both data collection and sharing on an easily accessible digital platform. Together with the ukuDoba research method (See appendix B), participatory design processes are integral to the approach of the unit, therefore all three dissertations place particular emphasis on this in the design process.
From the start, we set out to change the way we tackle the architectural discourse at UP from a Master's point of view. We intended to actively engage with our participants, site, community members, architectural professionals and peers as well as to be part of a movement of students who actively challenge the standardized process of a Master of Architecture (Professional) degree. We started the year with the intention of adapting the prescribed design format of the Master's year-end exam. This included hosting a winter studio in July that would involve a live-build in partnership with the community and other active participants in our respective projects. The winter studio was to be implemented so that a part of our designs could be physically built and form part of our technical resolution and design outcome for our dissertations. This was to extend and consciously involve ourselves in the participatory design process. Due to the nature of the COVID-19 pandemic and lockdown restrictions within the country, the possibility of a live-build was short-lived. Our shift in thinking happened

immediately concerning producing a piece of work that could still possibly be executed in smaller increments and thus contribute to potential future implementation.

The end goal remains for us to be proactive in developing platforms and ways of engaging the end-user under any given circumstance. COVID-19 has posed its set of challenges regarding interaction and design development regarding participatory design processes. The impact of the circumstances surrounding this pandemic has been inevitably consequential to our design process. However, it has encouraged us to think out of the box while remaining in the box more so than ever. Most importantly it has challenged us, as researchers and designers, to become resilient in our architectural approach. To ensure that, even when obstacles present themselves, we are still able to adapt and ground ourselves in our approach, instead of accepting the traditional approach to architecture. The pandemic has also shed light and caused reflection on the outcome of our designs and the role we play as designers going forward into our careers as young architects.

Collectively we adjusted to online engagement to continue our paths and include participants in the design development process. Our resilience as researchers and designers has remained intact throughout our journey to obtain our Master of Architecture (Professional) degree and we have continued and will continue to learn and adapt along the way.

The following information provides the foundation for our three dissertation topics. Lauren Konstantinou's study has a focus on the spatial decentralization of music-making as a platform for positive self-expression to enhance collective community identities. Purll Naidoo considers the redefinition of South African government school typologies to encourage lifelong learning potential and Kelsey Smith explores the role of architecture and its intersection with food sovereignty in an attempt to rehabilitate secondary school feeding schemes within South Africa. Overall, we hope that Volume One of this dissertation document will provide a deeper understanding of the context we are engaging with, our approach to architecture and rationale for our individual dissertations.

Chapter Two

BACKGROUND

02

CHAPTER
Background

02

BACKGROUND

2.1 Educational Ecosystem

It was Nelson Mandela who declared that “Education is the most powerful weapon which you can use to change the world” (Mandela 2003). To equip children with an engine for development (Mandela 2007) is to equip them with the knowledge and practical learning to maintain a sustainable life.

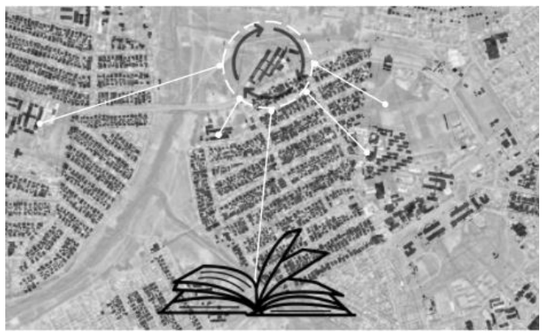

Fig. 02. Educational Ecosystem (Authors 2020)

The educational ecosystem (Fig. 02) is a concept in which there is a large focus on the education sector of a community (Kurshan 2015). “Ecosystems are defined by the network of interactions among organisms, and between organisms and their environment” (Mueller & Toutain 2015: 6), therefore when looking at the educational ecosystem it becomes important to understand the interrelationships within that environment. There has been a focus on education as a means to direct a cultural shift, where the school is seen as the medium for moulding the society we envision. It is recognised that an effective educational ecosystem is seen as a nodal point to connect people and to address societal challenges. However, even though it is recognised that our educational ecosystem has the largest impact on society, it, unfortunately, remains the most fragmented (Luksha et al. 2018). Real-world case studies, stakeholders and implementations are used to see how relationships between educational facilities can benefit “urban education environments” (Kurshan 2015). Within a well-

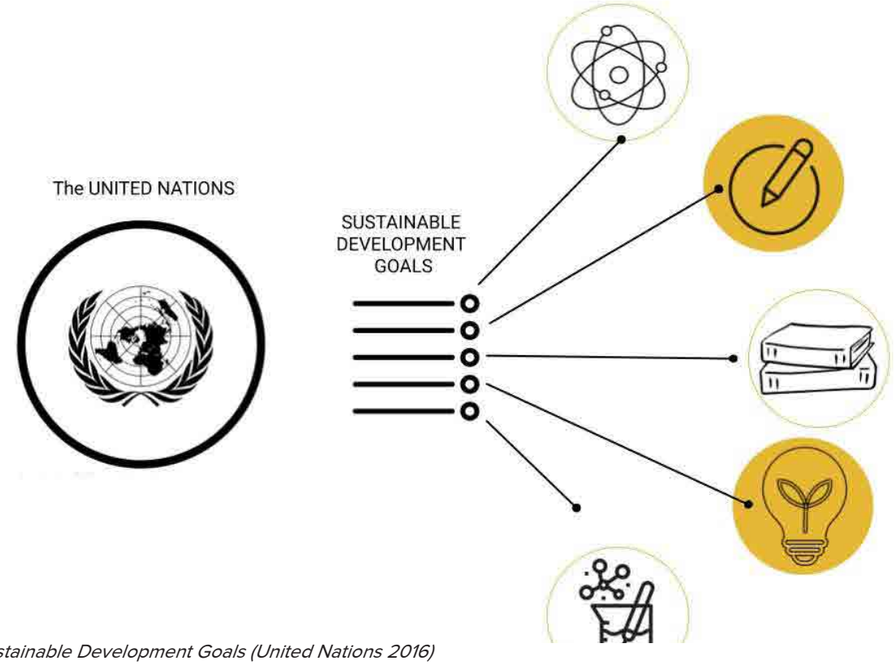

Fig. 03. Sustainable Development Goals (United Nations 2016)

functioning ecosystem, educational institutions have the opportunity to work together to improve the current curriculum, equip staff and teachers with more knowledge and skills, and create a more enhanced and engaging learning environment (Kilfoil 2019). Referring to the educational environment as an ecosystem is to understand the impact of educational institutions as nuclear agents. They have the capabilities of reinforcing existing and creating durable connections within networks in their context. For this reason, it becomes increasingly important to address the role of education within an ecosystemic context.

As part of the United Nations (UN) Sustainable Development Goals (SDG), education is seen as a priority (Fig. 03). The vision of quality education for all is stressed as an important aspect in the development of better lives and social sustainability, by the year 2030 (United Nations 2016). Education is a primary focus of the UN as it is essential to achieving numerous goals on the SDG list. Importantly, education is seen as the key to addressing the world’s poverty cycle. In the same light that education is seen as a determining factor in achieving multiple SDG’s, it also functions widely within poverty-stricken areas. Schools serve, not only as a medium for knowledge transfer but are integral in the support they provide to learners and communities, such as the provision of a learners’ daily meal source (Peterson 2020).

In 2020, the COVID-19 pandemic resulted in the temporary closure of schools across the majority of the world’s countries (United Nations 2020). Specifically, within underprivileged and marginalized areas, the underlying issues of the current education system were suddenly exposed, both globally and locally (Carte Blanche 2020; United Nations 2020). As stated by Basil Manuel from the National Professional Teachers’ Organisation of South Africa (NAPTOSA), in South Africa the nation-wide lockdown exposed and exaggerated the inequalities of the education system almost overnight. The issues discussed are particularly related to inclusivity, participation, equality and transformation (Peterson 2020). These issues proved that middle to upper-class

learners were able to continue their education through online platforms. However, those who are financially disadvantaged, could not. This stems from a general lack of technological knowledge and skills to the lack of finances to buy internet data or even print notes (Carte Blanche 2020; Peterson 2020). Parents are also often unable to help their children learn from home as in most households, their child is the first to go to school, leaving the rest of the family illiterate (Peterson 2020). As the schools have closed, many are left without a safe learning environment to attend daily, resulting in increased stress and anxiety for both learners and parents (Peterson 2020). Exposing this significant gap in both the economy and the knowledge of these citizens truly highlights the importance of the evolution of the current education system.

When engaging with the educational ecosystem it is important to be aware of the influence of STEM (Science, Technology, Engineering and Mathematics). Both globally and locally, the focus on STEM has a major influence on the educational ecosystem, in terms of curriculum. Since 2009, in South Africa, the subjects Mathematics and Science were seen to result in public schools being in a state of "national crisis" (Pols 2019). This affected the qualitative outcomes of scientists, engineers and health practitioners in the workforce. The concept of STEM was introduced into schools as a way to increase the critical thinking capacity of current school generations (White 2014), ultimately leading to a stronger workforce that is more employable, setting up South Africa's society for success (World Economic Forum 2017). This would contribute to breaking the poverty, crime and unemployment cycle of underprivileged communities within the country (Pols 2019).

However, there have been numerous debates and much research conducted regarding the addition of the arts into STEM to expand scientists' knowledge from critical to humanitarian and empathetic (Lachman 2018). STEAM (Science, Technology, Engineering, Arts and Mathematics) education allows for learners to be critical and

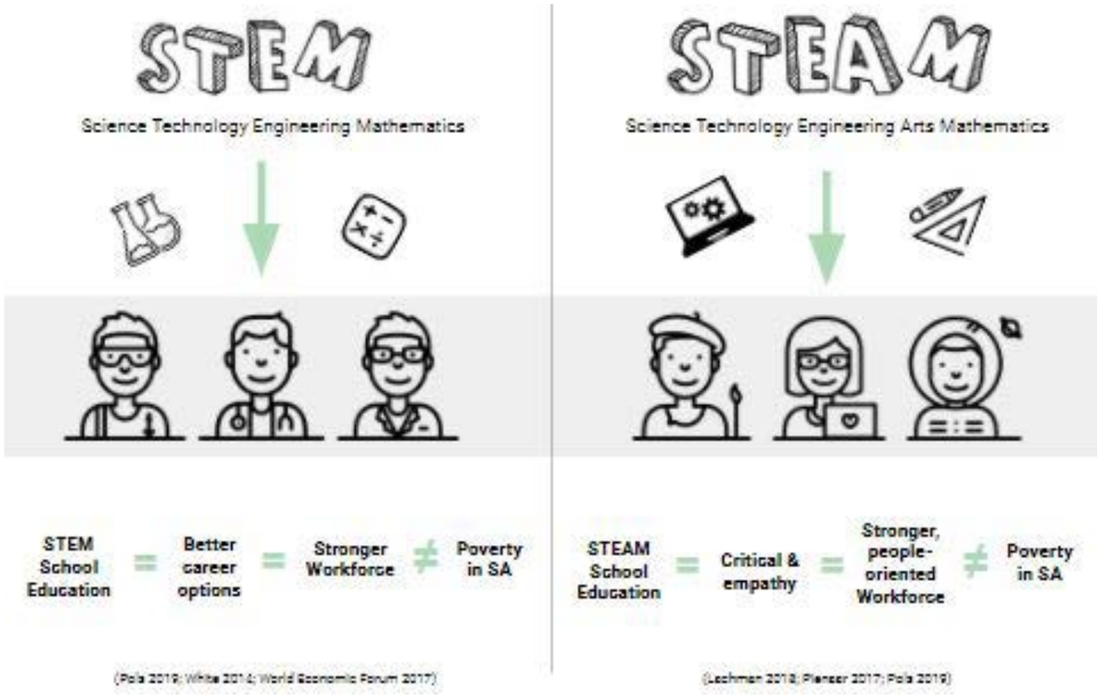

Fig. 04. STEM vs. STEAM (Authors 2020)

analytical while recognizing the personal, social and cultural potentials of what they are doing (Pienaar 2017) (Fig. 04). Such pedagogical methods align and challenge school curricular reform to challenge the current education model.

Psychologically, this educational concept teaches learners self-expression, wider forms of criticism and ultimately helps to develop them for the working world where they would be more susceptible to taking risks and developing new ideas (Lachman 2018; Pienaar 2017). Initiatives such as Leap Science and Maths schools are a chain of non-fee paying schools that aim at offering quality education to underprivileged, low-income communities. Sustainable models like these are imperative to empowering people as they focus on the fostering of learners' cultural and communal identity while ultimately creating a pathway to future employment (LEAP 2017). Robinson (2010) emphasizes that schools are currently failing to acknowledge and encourage multiple types of intelligence. He states that the traditional standardization of education needs to be revised to develop the youth's ability for creative and practical thinking. This type of curriculum change impacts the educational ecosystem by allowing more opportunities for the inclusivity of all students, not only those that fit the critical-thinkers mould. As designers and researchers, this is the standpoint from which we approached the educational ecosystem. Robinson (2010) highlights that the future of our economy is dependent on innovation and a person's ability to anticipate future concerns and have the skills and capability to implement solutions. This way of learning encourages students to engage realistically with skills that will help them sustain their lives in the future (Carson 2016).

Fig. 05. Interrelation Between People and Their Environments (Authors 2020)

Within the educational ecosystem, it is crucial to understand the relationship between people and their environments and to engage in how/why these relationships are created and exist (Mueller & Toutain 2015: 8) (Fig. 05). An understanding of these relationships is crucial to inform our approach as designers. As designers and researchers with a major interest in developing social cohesion within communities, the educational ecosystem becomes a significant influence on design considerations. This is due to thinking beyond the case of standard systems within a community, but rather considering a number of deeper and interconnected themes that accumulate and influence the way communities work. It is about looking beyond surface observations and engaging in uncovering the social interrelations making up a community.

2.2 Relation to Architecture

The importance of addressing the educational ecosystem has already been established across various disciplines. However, as designers and researchers within the architectural discipline, we must ask ourselves how we can contribute to educational ecosystem discourse. The educational ecosystem has largely been discussed from a non-spatial point of view, however, the role that architecture plays within that discussion is limited in comparison (Cleveland & Fisher 2013:1) (Fig. 07). The spatial constructs of the educational

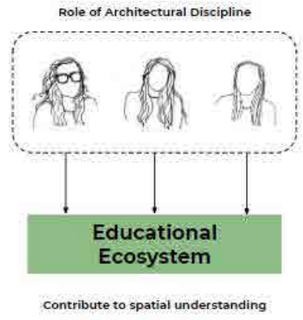

Fig. 06. Relation to Architecture (Authors 2020)

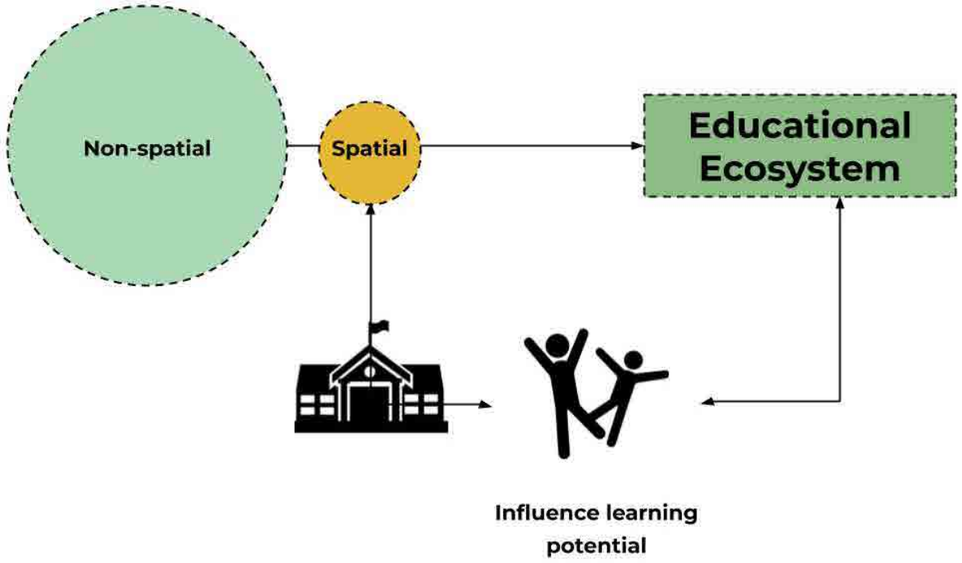

Fig. 07. Non-Spatial and Spatial Contribution (Authors 2020)

ecosystem affect a child's ability to learn, however, the design consideration given to these learning environments is significantly under-developed (Higgins et al 2005). Our project motives align with the Action Plan towards schooling 2025 released by the Department of Basic Education (DBE) which focuses on giving priority to the wellbeing of the learner. Goal 24 emphasizes the need to "ensure that the physical infrastructure and environment of every school inspires learners to want to come to school and learn, and teachers to teach "(DBE 2014).

One of the biggest challenges facing South Africa is the development and improvement of the knowledge and skills of its learners, primarily amongst disadvantaged and low-income sectors of the population (Albertyn 2015).
Although access to education has improved significantly since the educational reform in 1994, the equality of access does not yet translate to opportunity. According to Dr. Jonathon Clark, director of the Schools Development Unit and Schools Improvement Initiative at the University of Cape Town, the quality of learning outcomes has not escalated in parallel (Albertyn 2015). Clark states the importance of building a network of innovators and educators who are "like-minded change-makers", who are actively willing to transform the educational ecosystem in South Africa to improve the quality of education. We see our dissertation proposals not only contributing to this network but also stretching its outlook to understand the impact of this type of architecture.

An ecosystem, in an academic environment, constructively frames the need for interdependency and sustainability. A schools' functioning through a facility and built environment point of view, is a result of its infrastructure and resource management (NEIMS, 2014). The control and implementation of these elements allow for the creation of a safe and enabling learning environment. Networks are catalysts used to enhance knowledge as well as provide support for innovators. A shift in paradigm that fosters an educational ecosystem is necessary to advocate for education that is facilitated by a network of teachers. Educators are lifelong learners, so to improve learning, the commitment to educator development is crucial. Our research and dissertations unpack key educators and

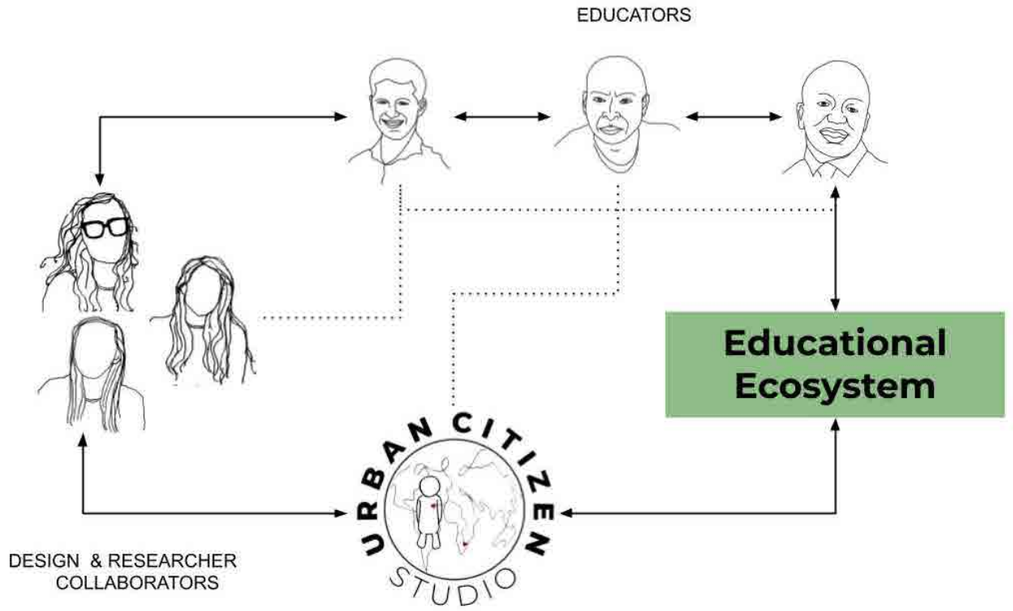

Fig. 08. Educational Ecosystem Collaborators (Authors 2020)

knowledge innovators in the community that form part of a larger educational ecosystem used as part of lifelong learning within the schools, as well as the surrounding communities (Albertyn 2015) (Fig. 08).

Through investigating the relationship between architecture and education with specific relation to our case study, Tsako Thabo, we found a need to go further into exploration and design, to create a significant change in the education environment. This can often be perceived as a place that is confining and static. Herman Hertzberger (2008:169) unpacks this concept further when he discusses the culmination of multiple schools within a neighborhood mutually benefiting from their shared resources. Bringing together multiple schools, all of which have different aspects to add to the success of the ecosystem, results in flexibility, social cohesion and saving of funds (Hertzberger 2008). The learning between the schools becomes far more inclusive for all. Through an architectural lens, to contribute towards a well-functioning educational ecosystem, "new, more stimulating spatial conditions and forms" need to be considered (Hertzberger 2008: 57). Our dissertations serve to contribute to that discussion and engage in the impact of architecture on the educational ecosystem.

Fig. 09. Tsako Thabo (Naidoo 2019)

Fig. 10. Tsako Thabo (Naidoo 2019)

Fig. 11. Tsako Thabo (Naidoo 2019)

Fig. 12. Mamelodi (Naidoo 2019)

Chapter Three

CONTEXT

03

CHAPTER
Context

03
CONTEXT

3.1 Mamelodi Community of Learning Collaborative

The following chapter provides the foundation for the contextual understanding of the dissertations. Our dissertations are based within the context of Mamelodi East, where the University of Pretoria's Mamelodi Campus serves as an anchor institution. As such, the Campus has increased its awareness of the role it plays within its context by contributing to overall community upliftment and individual student success within schools (Kilfoil 2019). The Campus has engaged in multiple community projects within Mamelodi since 2008 (Ogude 2019). These projects are conducted in an effort to uplift the community as a whole and to socially, academically and economically impact the larger society of South Africa.

A relationship was established between the UP Mamelodi Campus and Rutgers University in Newark, United States, when the universities recognised that their ambitions, as anchor institutions within their contexts, aligned. An outcome of this relationship is the Collaborative of Learning Community (CLC), funded through the support of the Kresge Foundation. In 2017, the initiatives were officially founded in both Newark (NCLC) and Mamelodi (MCLC) (Ogude 2019). The involvement of the MCLC is influential within the dissertations. The MCLC is composed of numerous faculties within UP, each investigating the educational ecosystem from the perspective of their discipline. The collaborative has identified key partners within the Mamelodi educational ecosystem to engage with, including Early Childhood Development centres (ECDs), Primary and Secondary schools as well as the local and provincial departments of Basic Education. Tsako Thabo Secondary stood out within this selection of partners due to the growing relationship the university has with its principal and MCLC member, Mr. Clement Gama. The school has been open to engaging with the university and its students and is, therefore, a significant collaborating partner.

The Department of Architecture, within the

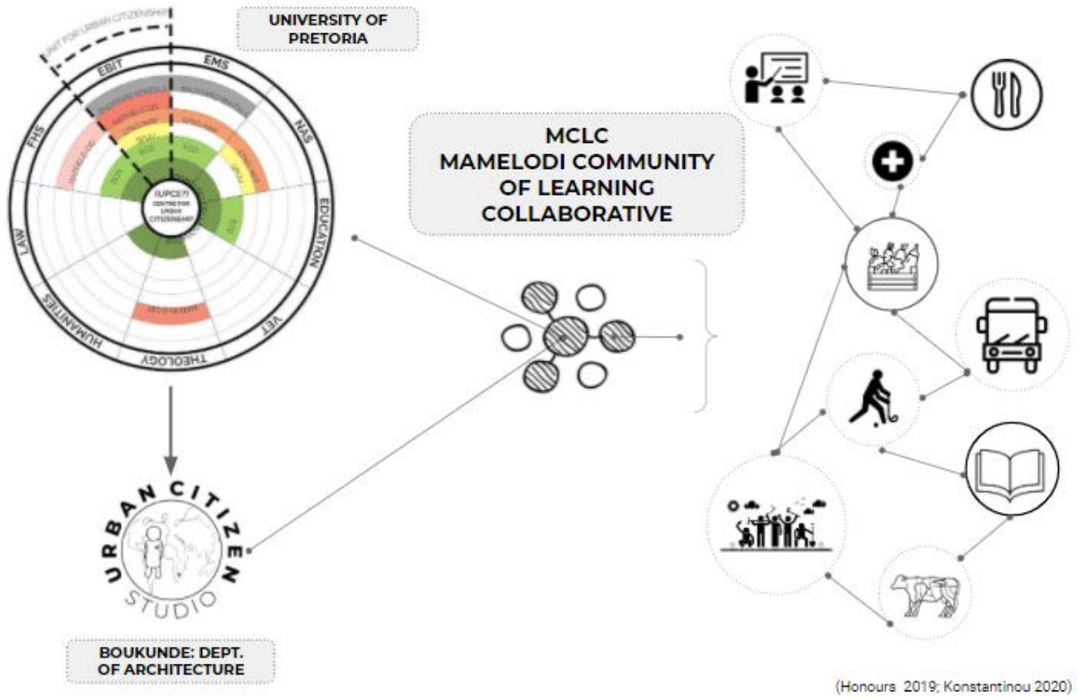

Fig. 13. MCLC Diagram (Authors 2020)

Engineering, Built Environment and Information Technology (EBIT) Faculty is represented in the MCLC through the Unit for Urban Citizenship (UUC). The Unit's contribution to the collaborative is to investigate the educational ecosystem within Mamelodi from the perspective of the architectural discipline. Numerous projects undertaken within the Unit have contributed to our spatial knowledge database of Mamelodi's educational ecosystem. Throughout the Unit's investigations, smaller nodes of activity are recognized as active educational nodes that could potentially contribute to a lifelong learning process within the community.

The MCLC actively intends to contribute to its hyper-local context. As part of its initiative, the collaborative is also involved in the Joint Community Project module (JCP), situated within the EBIT Faculty. This course makes provision for University-funded community service projects to be completed by undergraduate students in the EBIT faculty during their second year of study. The volume of these students makes this course a powerful tool within community action initiatives. Many schools in the Mamelodi East community have collaborated with students from the JCP course. Tsako Thabo is amongst the schools to have received support from these projects, in the form of personal protective equipment (PPE) to maintain health standards for the reopening post-2020 COVID-19 lockdown. Due to our long involvement in Mamelodi, we have become acquainted with pressing areas of concern that have the potential to be addressed through the JCP course. Using this knowledge, we intend to produce directed JCP project briefs for students to undertake at Tsako Thabo.

3.2 Mamelodi East

The MCLC provided the direction towards the township of Mamelodi East in the City of Tshwane as our context for the investigation. This township was formed during the Apartheid regime for the African population in 1945 (van der Waal 2000). Like most disadvantaged communities in South Africa, this settlement has a history of government neglect and social struggle. The oldest part of

Fig. 14. Mamelodi Context Map (Authors 2020)

Mamelodi runs along Tsamaya Road and the Moretele River (van der Waal 2000), including the area surrounding the case study school.

The UUC has been actively involved in investigating the spatial qualities of the educational ecosystem in Mamelodi East since 2017. Our engagement began in February 2019. The following timeline sets out our period of involvement.

In 2019, the following themes were uncovered through the participatory process of mapping conducted by the UUC Bachelor of Architecture Honours group:

Routes: pedestrian access and movement in terms of safety and trade (Du Bois and Mulder 2019) (Fig. 18, 19 & 20)
Recreation: sports as a platform for social cohesion and ownership (Ras 2019) (Fig. 21)
Social capital: relationships and networking that strengthen the community (vd Hoven 2019)
Food culture: informal and formal distribution of food (Smith 2019) (Fig. 22 & 23)
Informal Economy: the value of trade and trends of income (Mlambo 2019)
Education typologies: quality of school typologies and the impact on education (Achi 2019) (Fig. 24 & 25)
Cultural aspects: social cohesion through music, dance and the arts (Konstantinou 2019) (Fig. 26 & 27)
Sacred space: understanding ownership and the role sacred space has within the community (Motshabi & Naidoo 2019) (Fig. 28)

These themes were all thoroughly unpacked through mapping, unstructured interviews, community action planning and participatory sessions. This information moved beyond the surface of simple observation and assisted in our directed understanding of the context we are dealing with.

All data accumulated over the period, as indicated in the timeline above, has formed a database of information for our dissertations. The type of information mapped and recorded includes patterns of movement, the evolution of the space over the years, activity and program mapping as well as public and private space indicators.

To better understand architecture and the story we are trying to tell, we have to contextualize the environment, the people and the process. These elements involved in our research have influenced our perspective on the community itself and provided us with insightful knowledge on how certain systems, groups and programs function. We have had the privilege to work in and with such a culturally rich community who's potential and passions have remained the drivers during our process of development.

Fig. 15. Mamelodi Transect Walk (Honours 2019)

Fig. 17. Mamelodi Context (Honours 2019)

Fig. 16. Mamelodi Context (Honours 2019)

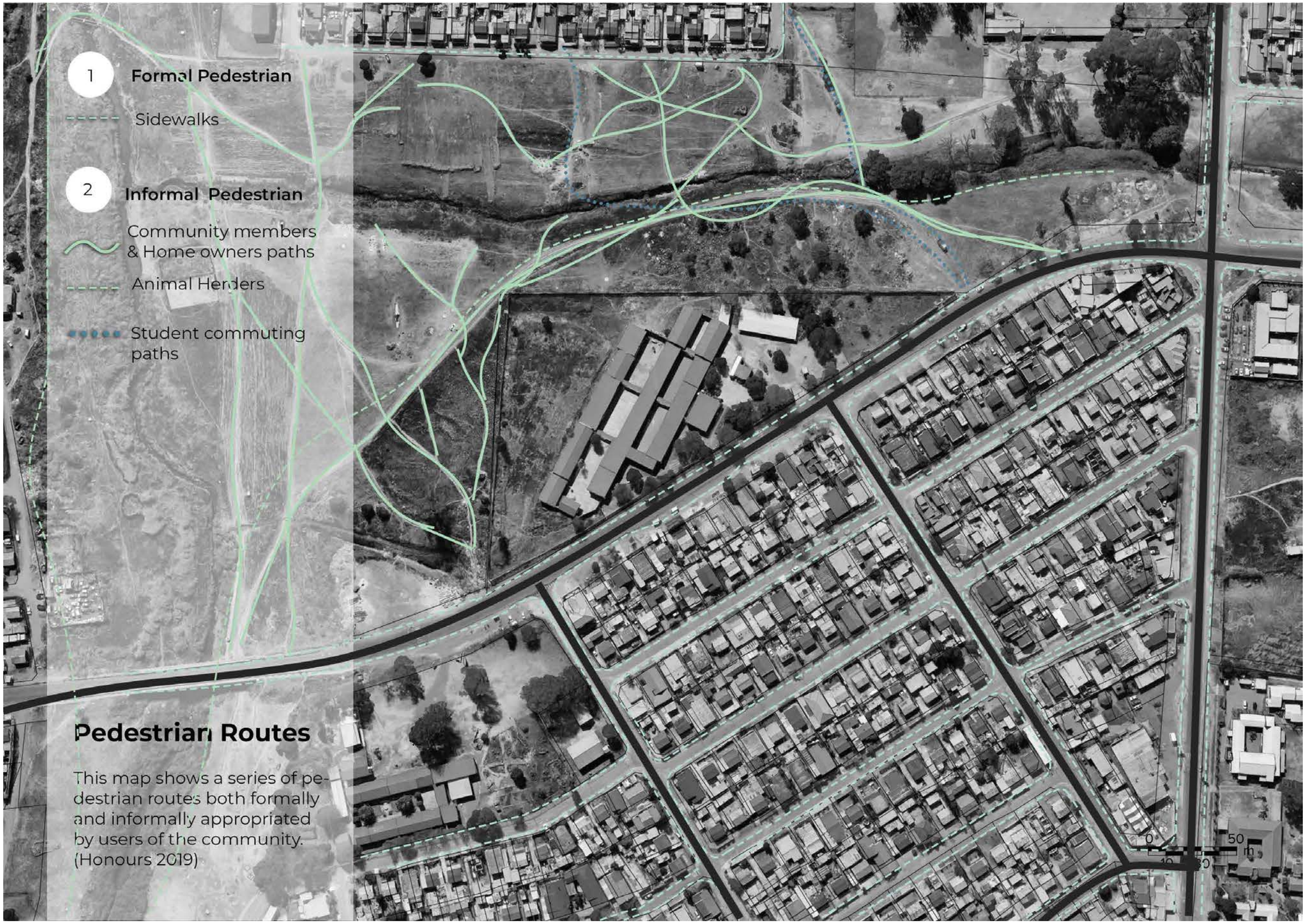

Fig. 18. Pedestrian Routes Mapping (Authors 2020)

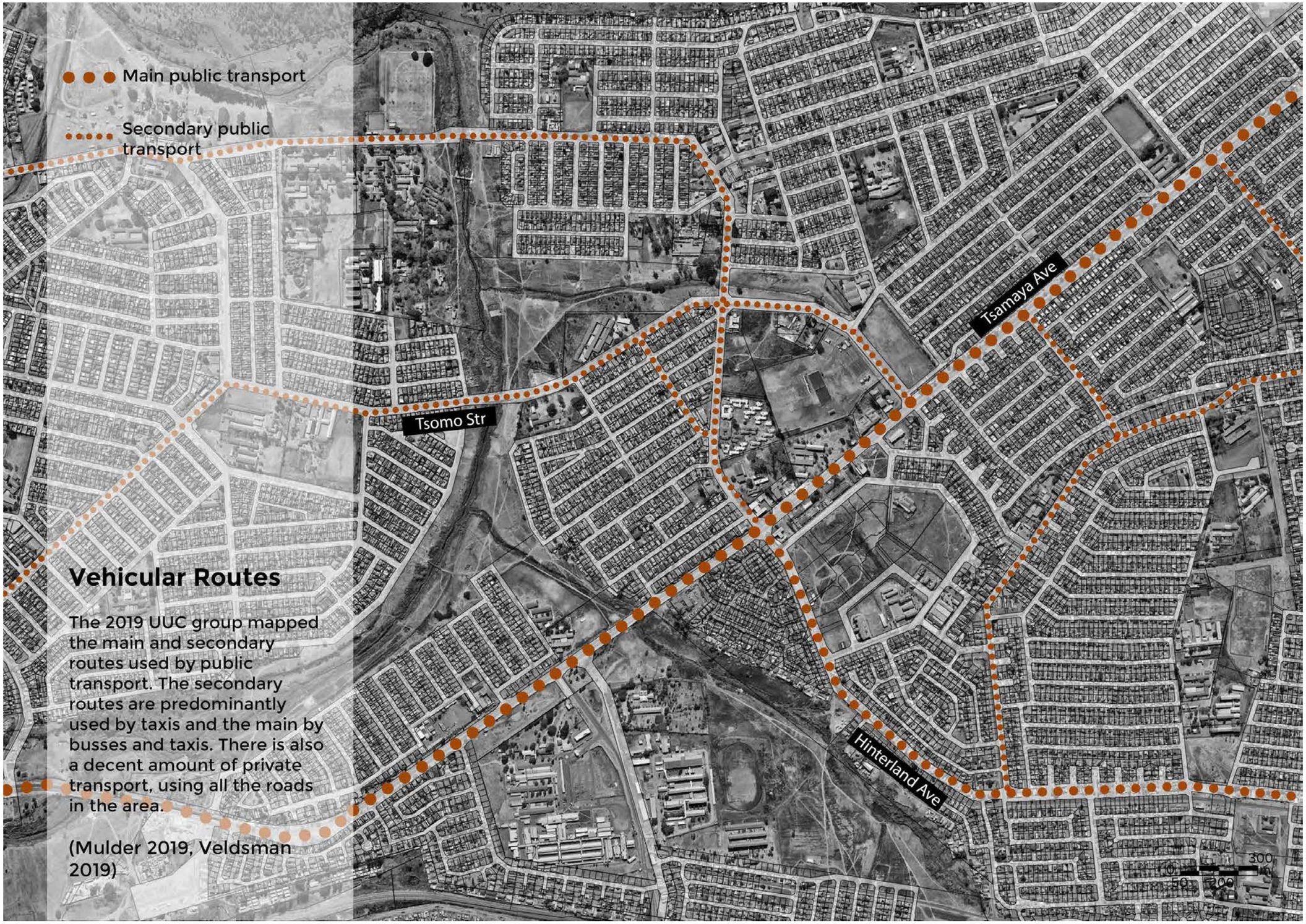

Fig. 19. Vehicular Routes Mapping (Authors 2020)

Fig. 20. Safety Mapping (Authors 2020)

Fig. 21. Recreational Mapping (Authors 2020)

Fig. 21. Recreational Mapping (Authors 2020)

Fig. 22. Food Culture Khalambazo Mapping (Authors 2020)

Fig. 23. Food Culture Tsako Thabo Mapping (Authors 2020)

Fig. 24. School Typologies Mapping (Authors 2020)

Modern classroom school typologies

Throughout Mamelodi East, there are numerous public schools that have been identified that reflect the modern classroom typology and share numerous characteristics

1. Reneilwe community learning centre
2. Mononong primary school
3. Motheo primary school
4. Balebogeng primary school
5. Zakhele primary school
6. Pula difate primary school
7. Tlakukhani & mveledzo primary school
8. Sindawonye primary school
9. Tsako thabo secondary school

(Achi & Venter 2019)

Fig. 25. Classroom Typologies Mapping (Authors 2020)

Fig. 26. Cultural Aspects Mamelodi Mapping (Authors 2020)

Fig. 27. Cultural Aspects Tsako Thabo Mapping (Authors 2020)

Fig. 28. Sacred Space Mapping (Authors 2020)

3.3 Tsako Thabo as a Case Study

Due to the relationship with the MCLC and the open engagement with UP, Tsako Thabo Secondary School was identified as a base case study for our dissertations. The intensive mapping conducted within Mamelodi East provided us with contextual grounding for our investigation into the school. Thereafter, the school provided a platform to observe, investigate and explore the current educational ecosystem within Mamelodi East. It was the foundation for identifying opportunities for an expansive educational network that could empower and contribute to the community.

At a postgraduate level, UUC architecture students have worked closely with Tsako Thabo Secondary School, since 2019 (Kilfoil 2019). The school is currently used as the anchor node for postgraduate architecture studies within the UUC. These students actively engaged within the school and the surrounding community, where school learners and community members participated in intensive mapping and participatory research. This methodology was a part of the process that resulted in community action planning strategies, urban visions and responsive architectural interventions (Kilfoil 2019).

Our personal involvement with the school began with our introduction to Mamelodi East, in 2019. From an introduction session with the current principal, Mr. Clement Gama, a brief overview of the school was conducted:

“The aim of the school is to be all-inclusive, however, it is difficult as the staff is not equipped or trained to do so. [...] They have the number one volleyball team in Tshwane but use the community hall to practice (not the school). Their goal is to have a proper art studio. [...] [The school] was built in 1981 in a train layout. Now it looks more like a jail because it has been fortified [due to the many break ins]. People steal metal (cooking pots, chairs, etc.), electronics and food. [...] There are eight or nine unused classrooms that could be used for other [community] activities. This is a good idea as community centres are far from this area. [...] There is a direct correlation between doing well in school and attendance (influenced by the parent’s input). Parents try to live their dreams through their children and give pressure in the wrong areas (therefore kids don’t enjoy school). However, most parents of the school are not involved (e.g. parent’s associations)” (Personal notes during 2019 introduction by L. Konstantinou).

Thereafter, we carried out intensive participatory research at the school. Previous engagements with students in the school ranged across a wide variety of themes.

Focusing on sport and the current facilities, ”Students of the volleyball team, in particular, are extremely proud and their involvement in the sport is a constant grounding and motivator to them” (Personal notes during 2019 introduction by R. Ras). Music focused workshops also took place within the corridors of the school, “the melodies generated from these participants were so evident of their passion and zest for life and clearly illustrates the power music instills for social inclusion” (Personal notes during 2019 introduction by L. Konstantinou). Food Sovereignty was unpacked through design activities involving the students interacting in games that illustrated what food types and proportions are consumed daily [...] “ Entrepreneurial activities of food selling ignited negotiators and good sales people within the participant group” and kitchen conversations were welcomed by the kitchen staff as they prepared lunch daily (Personal notes during 2019 introduction by K. Smith). Transect walks in and around the school led by the students provided a perspective of the unseen activity that exists between transition times within the school..... (Personal notes during 2019 introduction by P. Naidoo).

The Mamelodi East mapping as well as the collected sources of information from the above formed the basis for our dissertations. With this information we hoped to layer on our specific dissertation focus through our 2020 participatory action research (discussed in volume 2 of our individual dissertations), to inform our design interventions that are rooted in the school’s ethos and are catalytic contributors to the school and surrounding community.

As a primary participant target group, the dissertations focused on high school learners, between the ages of 13 and 20, that attend Tsako

Fig. 29. Tsako Thabo as a Case Study (Honours 2019)

Thabo Secondary School. Each of the student participants was specifically identified through the Honours mapping of 2019, through unstructured interviews and word of mouth through social groups within the school. Within our individual dissertations, we have expanded on this focused target group to include participants related specifically to our dissertation topics. It is important to note that due to each researchers' specific topic and the COVID-19 nation-wide lockdown of 2020, additional participants from other schools and elsewhere, were identified to partake in certain stages of the research and design.

From observations, mappings and analysis done over the last few years within Mamelodi East, a common spatial language was found between most schools in the area (Achi & Venter 2019). This is specifically related to their social context and built form. Although our dissertations are based at Tsako Thabo, it is important to note that we intend to not spatially resolve surfaced issues at a single school. Tsako Thabo Secondary School has been used as a case study to represent other schools in Mamelodi East. Although each school still has its unique characteristics, issues and opportunities, Tsako Thabo has been used as a basis to understand and test the researchers' solutions through proposed design interventions. These proposals are then not limited to the school and can be proposed for other schools across the area, addressing similar social issues. We intend that the lessons learned, information captured and designs developed, through our dissertations, will contribute to the knowledge base for addressing similar issues existing within our country and even globally.

Chapter Four

ARCHITECTURAL APPROACH

04

CHAPTER
Architectural Approach

- 4.1 Unit for Urban Citizenship
- 4.2 Research Approach
- 4.3. Design Approach
- 4.4 Reflection

04
ARCHITECTURAL APPROACH

4.1 Unit for Urban Citizenship

The Unit for Urban Citizenship (UUC) has provided a much-needed platform, within the University of Pretoria's (UP) Department of Architecture, to challenge conventional architectural discourse. It was once run as a studio within our Honours year in 2019 (Fig. 30) but has grown in recognition within the Department, in 2020. Urban Citizenship is now one of the three research fields in the department (Fig. 31), along with Heritage and Cultural Landscapes and Environmental Potential. During the Unit's introduction session, a question was posed to the staff and students of the department to construct a collaborative description of what it meant to be an "Urban Citizen". Collectively the "Urban Citizen" was described to be an agent of change, who strives to create sustainable relationships and maintain unity through diversity and social inclusion. The studio is run by urban citizenship enthusiast Dr. Carin Combrinck, who currently oversees both the Honours and Master's Programmes in Architecture at UP. Dr. Combrinck's active involvement in community-driven projects, engagement in the MCLC and passion for urban citizenship contributed to the foundation of the unit. The impact of the UUC is not isolated to postgraduate approaches to architecture. It has influenced all years within the architecture department, from small scale modules in undergraduate years to full-scale studios at a postgraduate level. UUC has been the driving force for our dissertations and has provided the foundation for our research and architectural approach. Urban Citizenship values the diversity of people, cultures and environments and aims at encouraging citizen participation throughout the design process to establish a framework for architecture that is inclusive and empowering to the user.

Fig. 30. Qualitative Research at Tsako Thabo (Konstantinou 2019)

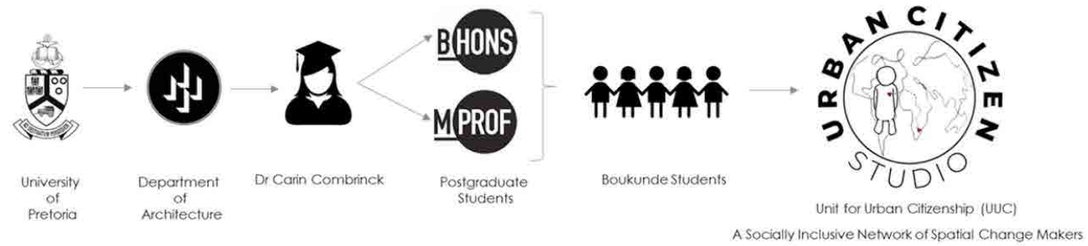

Fig. 31. UUC Programme Development (Authors 2020)

4.2 Research Approach

Due to the nature of the UUC, the approach to our research was through the interpretive paradigm by collecting and analyzing qualitative data of the real-world context of Mamelodi East. Our particular focus was on participatory action research (PAR) to expand the discourse of architecture. PAR allowed for the process of analysis and critical reflection to happen simultaneously at intervals throughout the design and engagement phase.

Fig. 32. Qualitative Research at Tsako Thabo (du Bois 2019)

Fig. 33. Qualitative Research at Tsako Thabo (Greyling 2019)

The research approach values diversity and is focused on positive social change as an outcome (Macbeth 2020). It constantly kept us grounded on the basis to create greater awareness for citizen participation to address issues with a greater sense of agency (Awan et al. 2011). The spatial agency defines the process as working at the intersections between the individual and the collective, the virtual and reality realm (Awan et al. 2011). Qualitative data collection has been integral to our PAR approach. Collecting qualitative data allowed us to study end-users' lives from a direct and engaged perspective within their own environments, resulting in contextually relevant data sets. This represented the real-life views of the people who would directly be affected by the research conducted (Merriam 2009, Yin 2011) and the potential outcomes that the dissertations posed. This method is supported by professionals, researchers and creatives that use collaborative design strategies from a conceptual approach to the tangible outcome phase.

Mapping and unpacking qualitative data allow researchers to contribute to existing and current emerging ideas within the human social environment. This allows for trends to be noticed and certain events to be explained through existing social concepts (Yin 2011).

It is vital for researchers to be completely transparent with their methodologies when taking a qualitative approach. This is necessary for future researchers to contribute to the data or test the mapped trends for credibility (Merriam 2009, Yin 2011). To do this, analysis of data must be taken from a grounded framework that allows focused reflection and removes the researcher's personal bias (Merriam 2009, Yin 2011). Describing fieldwork should also show that the researcher was "really and fully present - physically, cognitively and emotionally" (Yin 2011: 574). Using the actual

Fig. 34. UUC Studio (Unknown 2019)

Fig. 35. Qualitative Research at Tsako Thabo (Greyling 2019)

Fig. 36. Qualitative Research in Mamelodi East (Combrinck 2020)

language quoted in interviews and collecting data from multiple sources aids in finding patterns and contradictions which ultimately strengthen the credibility and value of qualitative research (Yin 2011).

Through our engagement in the context of Mamelodi East over the two years, qualitative research was conducted through fieldwork observations, interviews and engaging conversations (Yin 2011). Our process was incremental and built up our qualitative data sets through a series of interactions with the context. Firstly, we documented our first impressions through our observations of the site. This set up our biased opinion which was important to reflect upon once we accumulated richer information. Thereafter, we conducted transect walks with community members to gather an educated outlook on the context and to assist us in organising our first impressions of the site. Once this was done, we moved onto semi-structured and formal interviews for more background information on our observations, as well as the intangible information we missed (Hamdi 2010:69). This type of data collection involved asking, watching and reviewing (Wolcott 1992). Data that was collected in the field was run in parallel with desktop data collection of literature and case studies (Merriam 2009). All of these data sets helped develop a deeper understanding and discover insights relevant to our research problem.

The collective processes and data resulted in the development of the Ukudoba Method, further described in chapter 5, which serves as our research methodology for our dissertations.

It is important to acknowledge that this type of research is only based on a sample of people within the area the researcher is investigating. It does not represent all extents of the issue uncovered but allows for future addition and comparison of research and trends (Yin 2011).

4.3. Design Approach

As architects, we use design to unpack, understand, translate and address issues and opportunities. However, this process is usually biased to the individual outlook of the design practitioner. The process of design starts to evolve when the emphasis is placed on certain characteristics of design thinking methods and tools. Our particular focus on design was through the processes of co-design. Co-design explores a parallel narrative that emphasizes engagement and collaboration. Within the design thinking process, this method of engagement favours participatory involvement throughout the design process, from the discovery of the project to the delivery of a solution (Muller 2002, Steen et. al 2007). This collective nature often includes a variety of stakeholders and participants involved in the design process, from design practitioners to end-users (Zamenopoulos et al. 2018). Involving the end-user in the design process is an integral part of effective and efficient design decision-making (Hamdi 2010). Co-design encourages user participation and aids in transferring the power of decision-making from design practitioners, who traditionally have it, to the affected marginalized target group within society. It is acknowledged that every participant around the co-design table holds tacit knowledge, integral to the success of the project. Vital contributions from the marginalized group result in higher quality outputs (Ehn 1993, Schuler et. al 1993, Spinuzzi 2005) that are socially inclusive and able to live beyond the years of the project development.

Co-design contributes to the design process as well as the lives of the participants involved. The methods are aimed at a specific context and require the input of spatial agents through citizen participation. It uses participatory action research to mediate and facilitate the process of engagement, knowledge sharing and problem-solving. The hope is to create a collaborative approach that democratizes societies and allows citizens to take ownership and control of their environment (Zamenopoulos et al. 2018). Participants benefit from this approach through social interaction and developing a sense of community, through shared values and interests (King 1983). It provides citizen attachment to the particular site of investigation within the community, inspiring action and motivation to protect and improve the location at an individual and community scale (Sanoff 2011).

Professor Nabeel Hamdi, along with other key theorists advocating for co-design processes, has impacted our positioning as researchers.

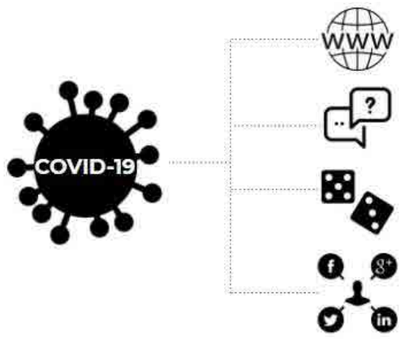

Fig. 37. COVID-19 Impact (Authors 2020)

These theorists move away from the traditional approach to design and suggest “other ways of doing architecture” (Awan et. al 2011). Co-design moves towards socially engaging architecture. This alternative approach aims to use architecture to uncover existing potentials within communities that can be harnessed for upliftment overall and act as mediators to improve the conditions, wellbeing and functioning of societies. Architecture becomes more about spatial agency and collaboration, focusing on the social implications of the built environment rather than the typical aesthetic and monetary value. Each individual’s interpretation of architecture is challenged and criticism is invited into the practitioner’s design process, resulting in constant iteration and reflection on the value of social architectural work (Spatial Agency Online n.d.). Hamdi focuses on “small-scale change at a grass-roots level” (Spatial Agency Online n.d.), where he aims to work with the given, having small changes over time that lead to agency and success in the long run, rather than a quick solution led from the outside.

There are numerous methods to co-design engagement. Model building, sketching, writing, role-playing and design games are amongst the list of interactive and collaborative tools to mediate the co-design process between stakeholders, participants and designers. These are traditionally held face-to-face, to form relationships with one another (Kensing 2003, King 1983, Simonsen and Robertson 2013), that allows for mutual understanding and respect to create an open and supportive environment amongst the group (Markus and Mao 2000). As participatory researchers, we aimed to have multiple face-to-face participatory and co-design sessions. This would add to our co-design workshops that were conducted in our 2019 Honours year. However, due to the COVID-19 pandemic, our co-design methods were adjusted (Fig. 37). The circumstances of the pandemic, and the resulting country-wide lockdown, pushed the need for digital engagement to interact with participants and collaborate on the design development of our projects. These platforms and methods of engagement included websites, participatory games, conversational platforms and social media platforms to maintain our ability to co-design through social distancing restrictions. Having to adapt to changing circumstances widened our spectrum of co-design experience. Our varied engagement spoke to the resilience of co-design discourse, as we were able to adapt our process along the way, without losing sight of the importance of collaboration.

This method of collaborative design thinking challenges architectural discourse, particularly within our department. Co-design encourages the design practitioner to act as a spatial agent and to look beyond familiar contexts. It focuses on marginalized communities that are often discriminated against and deals with real-life issues present within less fortunate, rural contexts (Zamenopoulos et al. 2018). As we are trying to challenge the current discourse, it is important to point out that small steps are required to incur big change. According to Hamdi (2010:19), “Clever projects have a small number of meaningful indicators”. Therefore, throughout our dissertations, co-design has been used at particular stages of our design processes to enrich a design response that is true to the context and community involved.

4.4 Reflection

Layers of rich information were uncovered through our PAR approach within Mamelodi East, highlighting the untapped goldmine of opportunities for upliftment. Numerous qualitative data collection methods were tested throughout our process. Through reflection and iteration throughout the process, we were able to learn and grow in our understanding of how to efficiently and effectively approach participants during our limited time in the area.

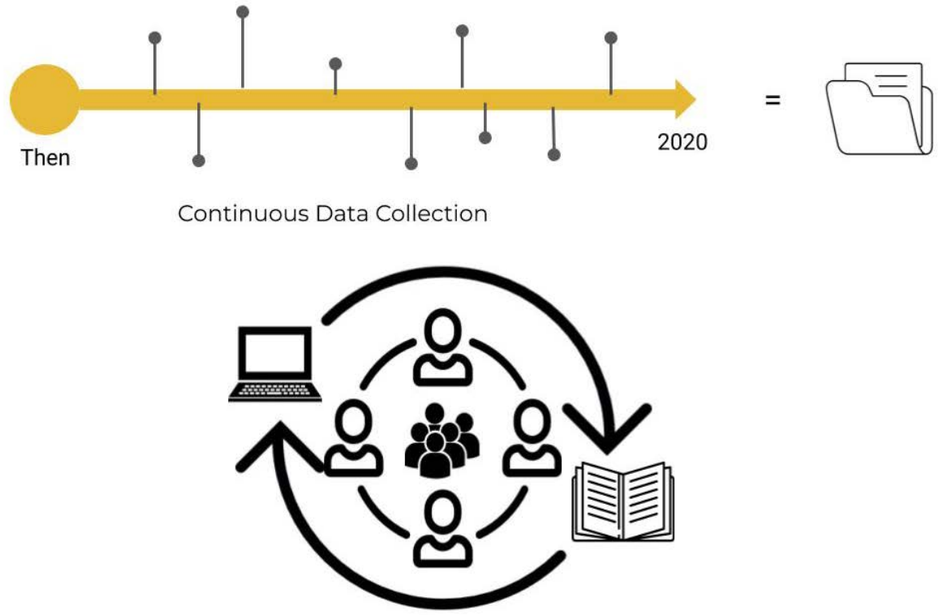

Fig. 38. Continuous Data Collection (Authors 2020)

Due to the UUC’s continual engagement in Mamelodi East, layers of data had accumulated over the years (Fig. 38). Year after year students aimed at building on the previous years’ work to contribute to the existing data collected and to inform a richer design response. Amongst the data set, recurring themes and observations were presented, however, the storage of the data in unorganised folders on a *Google Drive™* hindered access to the information. This made it difficult, during our dissertations, to collate the collected information and fully grasp the richness of the layered data. This stagnant method of data storage led to the need to change the format (later discussed in Chapter 5) and method in which we were capturing this intangible qualitative data, to assist future researchers.

Chapter Five

METHODOLOGY & RESEARCH DESIGN

05

CHAPTER
Methodology & Research Design

5.1 STINT Research Project

5.2. ukuDoba - The Methodological Framework

05

METHODOLOGY & RESEARCH DESIGN

5.1 STINT Research Project

In 2019 we were afforded the opportunity to be involved in a Departmental National Research Foundation (NRF) project. The NRF project titled, Stitching the City: From micro-data to macro-views (STINT), aimed at establishing a “transdisciplinary collaboration” to develop a “methodological framework and digital platform for the collection, storage, and sharing of spatial, socio-economic data at a street and precinct-level” (Roussou, Brandao, Adelfio & Thuvander 2019). The STINT project was a collaborative effort between the University of Pretoria (UP), South Africa (Departments of Architecture and GeoInformatics) and Chalmers University in Gothenburg, Sweden (Department of Architecture) from 2019 to 2020. In particular, the collaboration was between the Unit for Urban Citizenship (UUC) and the Social Inclusion Studio (SIS) from Chalmers University’s architecture department. For many years, both studios worked within similar contexts that were socially marginalised and segregated (Chalmers 2018). The two contexts under investigation were

Fig. 39. Hammarkullen: First immersion walk (Konstantinou 2019)

Mamelodi East in the City of Tshwane, South Africa and Hammarkullen in Gothenburg, Sweden.

Due to UP’s architecture Head of Department,

Fig. 40. Hammarkullen: Analogue data collection from first immersion walk (Konstantinou 2019)

Fig. 41. Hammarkullen: Run-through of digital data collection methods using KoboToolbox™ (Konstantinou 2019)

Prof. Chrisna Du Plessis’ working relationship with members of SIS, this collaboration was born. To understand the complex layers of cities and communities of today, it is vital for multiple components of involvement, as a way to inform and shape the social and built environment (Roussou, Brandao, Adelfio & Thuvander 2019). University students routinely collected quantitative and qualitative data. Both studios found common ground in their methods of data collection. This took the form of visual and spatial data from immersive field research sessions. Over the years, this data revealed many significant trends and patterns related to the real-world context and use of the environments investigated. We shared in the issue that layers of rich data were being collected by students within both studios, critical to the holistic understanding of the contexts in question. However, this information piled up in printed notes or shared folders on an online server. These invaluable discoveries were lost due to the ad hoc storage of data in multiple formats. This made it increasingly difficult to effectively access, layer and share the collected data with decision-makers and the end-user to effect change. It became frustrating that the methods of data collection invoked static data storage methods. The STINT project was therefore developed in response to this common issue.

The Department of GeoInformatics, at UP, involvement in the STINT/NRF project resulted in the creation of an online server (Geonode™), to store the collected data. This platform allows the digitalisation of collected information and the database will continue to develop for future endeavours. The information contributes to a large collaborative database and forms the basis for many design projects and research initiatives. The collaboration between the universities, allows the developed platform to be tested in two areas, to compare the effectiveness of the platform in capturing non-traditional data sets (Chalmers 2018). Part of our involvement in this process was the testing of this through field research for our dissertations.

Collectively, we needed to change the way data was collected, translated, stored and shared within our department, to make a greater contribution to society and research. By acknowledging these shortcomings and actively engaging in the STINT/NRF project we collectively contributed to the development of a framework (ukuDoba Method). The framework allows non-traditional information types to be collected using digital and geospatial tools, thereafter, stored and shared on an online platform. It allows for local and global collaboration between researchers and designers on shared issues and similar contexts (ukuDoba manual

Fig. 42. Hammarkullen: Social Inclusion Studio (Unknown 2019)

2020). The aim of collecting and sharing data of this nature is to allow informed and responsive urban and socio-economic transformation policies for future development (Chalmers 2018) and identification of contextually relevant development interventions.

5.2. ukuDoba - The Methodological Framework

The ukuDoba Method was created from a collaboration between three Master of Architecture students from Chalmers University of Technology, Sweden (Robin Eskilsson, Mumtaheena Rifat and Markus Zorn) and three Master of Architecture students from the University of Pretoria, South Africa (Lauren Konstantinou, Purll Naidoo and Kelsey Smith). All authors were actively involved in the STINT/NRF research project and have a background in participatory design, social inclusion and urban citizenship within architecture. This background influenced the interest in the creation of the ukuDoba Method. In Zulu, the word ukuDoba means 'fishing'. This methodological framework aims to assist users in 'fishing' for non-traditional types of data that can be collectively

Fig. 43. Pretoria: Digital Tool Analysis (Naidoo 2020)

stored, openly shared, layered over and analysed qualitatively over time. The ukuDoba Method was developed in response to the STINT/NRF project, to guide researchers, from various fields, in the methods of data collection and translation to efficiently store and access the data thereafter.

ukuDoba - the methodological framework, has been developed for the collection and sharing of non-traditional types of spatial and socioeconomic data at a street and precinct level in an online platform. Cross-disciplinary micro-data can be added over time and easily accessed by researchers from different disciplines as well as students and community members. This makes it susceptible to comparison and trend studies, as well as documenting the rich histories of communities. The developed methodology can eventually replace hard-copy storage that is limited in accessibility and fragmented in data.

The UkuDoba method was developed through multiple trials and tests during the process of collaboration between the two universities. For the duration of the research project, two exchange trips were planned between the two contexts, to test the effectiveness of a digital method. The first exchange trip was hosted by the Social Inclusion Studio from Chalmers University in September 2019. The UP Masters students (Lauren Konstantinou, Purll Naidoo and Kelsey Smith) and supervisor (Dr. Carin Combrinck), involved in the project, travelled to Sweden intending to test the developed data storage platform (Geonode™) in Hammarkullen, Gothenburg. The platform was first tested according to its ability to capture traditional analogue methods of data collection. Thereafter, it was tested against its compatibility with various digital data collection tools. The information and feedback gathered from these sessions were used for further development of the Geonode™ platform. This part of the project was developed further for the remainder of 2019. In January 2020, the continuation of the STINT/NRF investigation was given a trial in the City of Tshwane, South Africa. The team from SIS joined the UUC's STINT/NRF team in South Africa. The main aim of the exchange in South Africa was to build on the testing of the various tools for data collection and the effectiveness of the storage platform. This was done within Mamelodi East. We intended to see if Geonode™ was able to store the information collected without losing the richness of the data. A recurring issue was the understanding of these tools by the research team. Thereafter, it was decided that due to the complex nature of the process, it needed to be broken down into streamlined steps. This resulted in developing an instruction manual, referred to as ukuDoba - the methodological framework, dictating a simplified but guided process from data collection to storage.

Multiple data collection tools were considered and tested, each against their accessibility and usability. It was important for the research team that the tools selected allowed for the inclusivity of researchers from various fields and the consideration for the use of the framework by the end-user. This consideration widened the contribution that a project of this nature could make. Providing allowance for wider use, meaning that the data collected could not only be layered by time, but also by discipline and community perspective.

The ukuDoba method makes use of three platforms and functions in a three-step systematic process, to make the data capturing and sharing process seamless and productive. Firstly, Kobo Toolbox™ (Data collection tool) was used as a digital platform to geospatially capture information, such as interviews, surveys and conversations. Secondly, QQIS™ (Data translation tool) was used

Fig. 44. Pretoria: Testing the effectiveness of KoboToolbox™, on site, in the data collection process (Brandao 2020)

as a “middle-man” to translate collected data into an appropriate format to be imported into the third platform, Geonode™ (Data Storage Platform). This platform was used to document all the geospatially collected data. Having Geonode™ as the single platform for data storage allows for the layering of data year after year by researchers from various fields of research.

As part of the Participatory Action Research (PAR) approach of the UUC, the ukuDoba method, allows researchers to do justice to the rich information collected. Using this methodology also provides the opportunity for community members to collect real-time information within their communities and this contributes to their social empowerment, providing them with opportunities to uplift their own surroundings.

The developed framework has been workshopped by postgraduate students, within the UUC, by the student research team. Feedback from these workshops influenced the refinement of the manual, which later guided the beginnings of our PAR approach within our mini dissertations, in 2020. This method was used for mapping and analysis of existing social trends in Mamelodi East as a way to gain a hands-on understanding of the area and its community. As this method is an iterative process over months and years, it is important for us to reflect on our process and experience with the application of the framework to continuously update the methodology to the current research conditions and development in technology. As Master’s students, we have constantly engaged with the method alongside our peers and colleagues. The framework has encouraged this interaction of fieldwork. We hope

Fig. 45. Pretoria: Composing Draft 1.0 of the ukuDoba Framework Booklet (Naidoo 2020)

Fig. 46. Pretoria: Presenting ukuDoba Framework Draft 1.0 to the Honours Urban Citizen studio (Naidoo 2020)

to influence other fields within the department to take to the method to create opportunities for collaborative data collection and sharing.

Being part of this collaborative process during the development and application phases has been crucial to our understanding of the importance of the data collected in the field. The information, often personal and engaged, allows for a greater perspective of the user and the people in a community and is vital in the field of Urban Citizenship. Collectively, during our Honours year in 2019, we had to recapture data and mapping that was conducted previously, rather than build on it. The STINT/NRF project gave us an opportunity to be part of creating a framework that would not only benefit ourselves but also contribute to the discourse of Urban Citizenship within architecture. Locally and globally we share similar contexts and issues. This project allowed us to collaborate, discuss and have a broader understanding of the issues and possible resolutions.

Fig. 47. Pretoria: Presenting ukuDoba Framework Draft 1.0 to the Masters Urban Citizen studio (Naidoo 2020)

Fig. 48. Pretoria: On site testing of ukuDoba Framework Draft 1.0 with the Honours and Masters Urban Citizen studio (Naidoo 2020)

Chapter Six

REFLECTION

06

CHAPTER
Reflection

06

REFLECTION

As active participants in the Unit for Urban Citizenship, we consider ourselves to be Urban Citizens. The Urban Citizen is proactive for change; they challenge rules and constraints and are intentional about their involvement. We strive to be agents of change and to not fall victim to the star architect mindset, but to be receptive to the knowledge that exists within others (Awan et al 2011). It is important for us that we continue to rewrite our own professional code of conduct as we are exposed to the values attached to participatory action methods.

Including participatory action methods in the architectural design process needs to be distinguished from a community outreach project. Participation of all stakeholders is integral, adding to the efficiency and resulting in the effectiveness of the overall project (Hamdi 2010). Architects and other built environment practitioners have loosely implemented community projects over the years. However, these projects deal with surface-level issues due to their lack of engagement with the end-user. Therefore, the intervention is

Fig. 49. Researchers collaboration (Smith 2019)

Fig. 50. The Team (Unknown 2019)

Fig. 52. Dr Carin Combrinck, our supervisor, in the field (Zorn 2020)

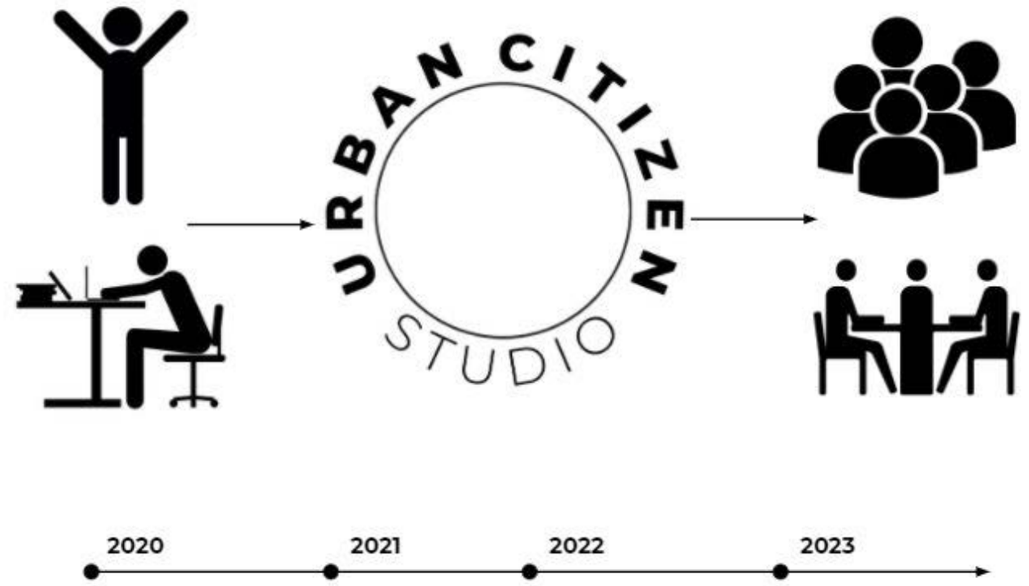

Fig. 51. Recognition of the PAR approach (Authors 2020)

a product of the 'outsiders' interpretation of the community needs. Often these interventions fail due to the lack of ownership and pride by the targeted community. Challenging the conventional methodologies of architecture can be highly influential in the creation of higher-performing interventions that address multi-issued layers (Awan et al 2011, Hamdi 2010, Sanoff 2011).

Ultimately, the dissertations following this Volume One, unpack alternate ways of 'doing architecture' that result in an increased social responsibility within communities, causing upliftment and a stronger sense of belonging for community members (Sanoff 2011). Unfortunately, within the Department of Architecture at the University of Pretoria, there is no precedent for this approach being undertaken by a Master of Architecture (Professional) student. We hope that the participatory design process that we have undertaken in our dissertations opens the conversation within our discipline (Fig. 51).

Our contribution to the establishment of the Unit for Urban Citizenship is the hope that we have helped create a foundation for future like-minded students to collectively participate and take on real projects that impact communities in need. The Unit has encouraged us to challenge the authorship of architecture in the design process (Hamdi 2010) and prioritize the participatory action research approach. Our ambition is to encourage others to start thinking and designing by acting as spatial agents who effect change through the empowerment of others (Awan et al 2011). Our research collectively aims at emphasizing architectures' role and capacity in contributing to social inclusion and transformative action (Awan et al 2011:33).

Ultimately we aspire to widen and embrace young, innovative designers' perspectives on the true definition of community engagement in architecture and the opportunity for architecture to be socially inclusive. Our dissertation outcomes intend to pave the way for projects of this nature in the future. Projects that combine elements of interdisciplinary discourse to actively make a change to the community, as well as to contribute to the research development of spatial design within the co-design context locally and globally.

Fig. 53. Authors (Combrinck 2019)

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02

V O L U M E

Redefining South African Government School Typologies to Encourage Lifelong Learning Potential

NAIDOO 2020

Chapter One

INTRODUCTION

01

CHAPTER
Introduction

01
INTRODUCTION

1.1 Background

Nelson Mandela once proclaimed that “Education is the most powerful weapon which you can use to change the world” (Department of Basic Education 2019). Although our educational system has the largest impact on society, it unfortunately still remains the most fragmented (Luksha et al 2018). The educational environment is undergoing exponential change and dormant learning approaches cannot keep up with this rate. A new culture of learning has emerged to respond to fast developing contexts. This concept is referred to as lifelong learning, which is multifaceted and encompasses the qualitative, social activities of daily life that contribute to our overall learning (Weeks 2012:1).

> “*Education has been hit particularly hard by the COVID-19 pandemic with 1.53 billion learners out of school ... Drop-out rates across the globe are likely to rise as a result of this massive disruption to education access*” (Education Cannot Wait 2020).

Lifelong learning has become increasingly relevant in light of the COVID-19 pandemic where education has been disrupted worldwide (Education Cannot Wait 2020). Due to the unreliability of traditional educational pathways, the relevance of alternative learning opportunities have been brought to the forefront (Education Cannot Wait 2020). These alternative pathways are critical to vulnerable groups where extended disruptions to the traditional learning process can have a detrimental impact (Education Cannot Wait 2020). With this outlook on lifelong learning, education goes beyond traditional knowledge transfer and includes a child’s holistic development as well as the growth of the communities around schools, through the support structure they provide. The dissertation deals with this topic within the context of South Africa, with a particular focus on mitigating the impact on economically distressed contexts such as Mamelodi East.

Fig. 2.1.1. Model of Tsako Thabo built by Honours Architecture Mamelodi Group (Naidoo 2019)

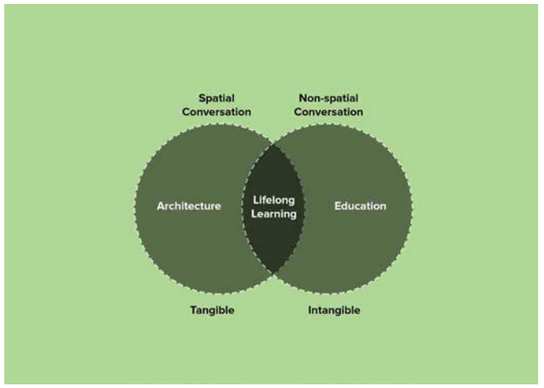


Fig. 2.1.2. Spatial and non-spatial conversation (Naidoo 2020)

There are two pertinent ongoing conversations, regarding the educational ecosystem. The dissertation classifies these conversations as tangible and intangible.
The tangible conversation deals with the spatial qualities of the built environment and its relation to learning and the intangible conversation deals with a non-spatial point of view of the relationships present within the educational environment.
The tangible conversation, within educational discourse, criticises the school environment and its lack of sufficient evolution since its inception in comparison to other architectural models (Hertzberger 2008).
The intangible conversation suggests that establishing a relationship between a school and its community promotes lifelong learning potential and enhances the holistic development of a person. It is seen that this relationship can be mutually beneficial where alternative education is received through the collective intelligence from the interaction between school and society (Global Education Futures 2018).

Designers and researchers within the architectural discipline must question the contribution architecture has to support the direction towards lifelong learning. The spatial constructs of our educational environment affect a child's ability to learn, however their design considerations are significantly under-developed (Higgins et al., 2005). Investigating the physical quality of the learning environment has gained momentum amongst design professionals and educators as a relevant topic in understanding architecture's role in education (Cleveland & Fisher 2013:1).

Fig. 2.1.3. PAR at Tsako Thabo (Naidoo 2019)

Therefore, the dissertation investigates the tangible and intangible intersection between architecture and education and the evident ways in which the built environment affects learning potential.

> "*Our vision is of a South Africa in which all our people will have access to lifelong learning, education and training opportunities, which will, in turn, contribute towards improving the quality of life and building a peaceful, prosperous and democratic South Africa.*" (Department of Basic Education 2019)

The concept of lifelong learning is not new, however it is increasing in relevance as societies rapidly change and embrace their dynamic quality. Organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations (UN) have started to incorporate the concept into their practice (Jarvis 2004:29) and we are starting to see this reflected in global and local policies regarding education. Lifelong learning is a priority within South African educational policy documentation (Department of Statistics South Africa 2019:53).

However, policy for public school infrastructure fails to stipulate how, through the built educational environment, lifelong learning will be achieved. This observation reiterates Former President Thabo Mbeki statement that South Africa's educational sector is convoluted with too many words and too little action (Weeks 2012:2). Policy for public school infrastructure lacks spatial definition and is thinly composed of architectural guidelines to achieve the intentions set out by the government. As a result, the dissertation intimately deals with South African policy for public school infrastructure to align the government's intangible intentions for lifelong learning with the tangible spatial environment achieved through policy guidelines.

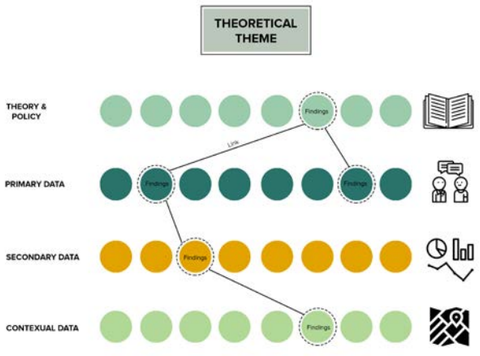


Fig. 2.1.4. Method of data analysis (Naidoo 2020)

To direct the study and provide spatial definition, the dissertation is grounded in a typological understanding of the schooling environment that arises as a result of South African educational policy documents. A critical stance is taken where the resulting school typology is challenged in relation to context. The intention is to redefine the current teacher-centric classroom and corridor typology. The dissertation argues that the tangible (spatial) environment should encourage lifelong learning through stimulating a community school relationship as well as acknowledging the qualitative social activity of learning outside of traditional means. It is proposed that the schooling environment should be publicly redefined and serve as a support structure within its context, instead of isolating the educational experience. This is explored through the concepts of building as a boundary and building for pedagogy with the resulting development of a spatial matrix to provide architectural definition to South African educational policy.
Tsako Thabo Secondary School, within Mamelodi East, is identified as a case study school for the application of the matrix principles, however it is intended for these principles to be applied to other schools within similar contexts and typologies to achieve lifelong learning potential.

1.2 General, Urban and Architectural Issue

1.2.1 General issue

South Africa is dealing with a struggling educational system, where high dropout levels and low learning levels of children within the system have been recorded (Department of Basic Education 2019:16). The country currently measures its learning capabilities of its educational system through three international studies focussing on maths, science and literacy

Fig. 2.1.5. Tsako Thabo Secondary School (Naidoo 2020)

(Department of Basic Education 2019:17). These skills are the focus of the South African educational system (Department of Basic Education 2019:43). However, basic life skills for holistic child development are not included as a factor.

1.2.2 Urban Issue

Community engagement becomes an important aspect in the success of the school. This is particularly true within the South African context, where a study found that the social context impacted the schools' culture of learning (Weeks 2012:4). Integrating a school into its context allows it to function as a learning environment and community support structure (Higgins et al 2014:30). Therefore, it is disappointing to see, through interaction with the school and community members, that this relationship is strained. This unfortunately is the case for multiple Township schools across South Africa (Lebesa 2015:9)

Multiple schools across Mamelodi East reflect the teacher-centric classroom and corridor model as a result of educational policy within South Africa. The impact of this model isolates schools from their context, creating a detachment between the community and school. The detachment results in school facility vandalism. Furthermore, the mono programmatic function of schools within Mamelodi East, bypass the opportunity to serve their context as a community support structure. This is problematic for the context of Mamelodi which already lacks community facilities.

Fig. 2.1.6. Model of Tsako Thabo built by Honours Architecture Mamelodi Group (Naidoo 2019)

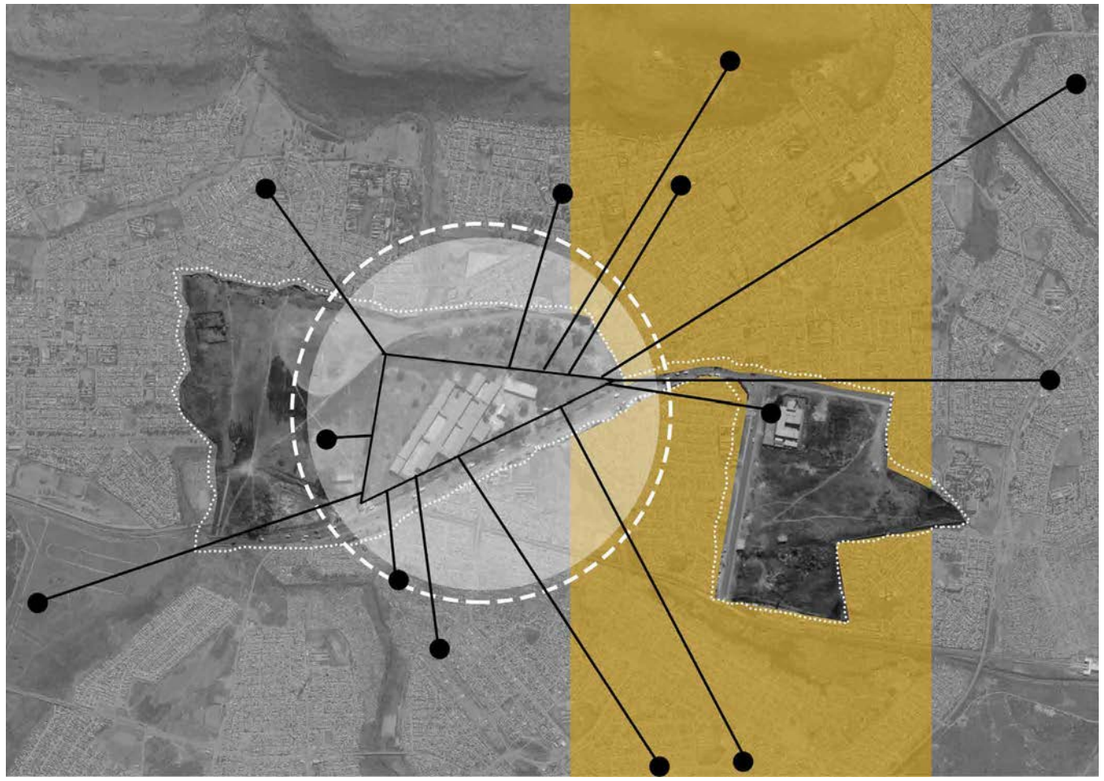


Fig. 2.1.7. Education as public node (Naidoo 2020)

1.2.3 Architectural issue

There are two core architectural themes dealt with in the dissertation: building in relation to pedagogy and building in relation to threshold. It has been established that education and architecture have an influence on each other (Hertzberger 2008). However, the tangible design of our learning environments is significantly under-developed (Higgins et al 2005). The school environment is criticised for its lack of sufficient evolution since its inception in comparison to other architectural models (Hertzberger 2008). The typology of the educational environment has progressed over time, however Mamelodi schools reflect an outdated school typology based on a teacher-centric classroom and corridor model. The dissertation closely deals with the synergy of the tangible moves we make to the built educational environment and the resulting intangible social implications that affect lifelong learning.

The theme of building as a threshold aims to address section 12 on school safety and security in the policy for public school infrastructure which addresses the interface between community and school with strict fencing guidelines (Department of Basic Education 2012). This stipulation is acknowledged as a deterrent to stimulating a community school relationship, which is advocated for within policy documentation (Department of Basic Education 2012).

1.3 Problem Statement

The spatial consequences of the architectural discipline on the South African educational ecosystem have not been afforded the level of importance that it needs. Architectural guidelines within South African policy documents for public school infrastructure remain loosely defined (Department of Basic Education 2012). The spatial configuration of the schooling typologies within South Africa affect a child's ability to complete their education (Jimenez 2018).
"Our vision is of a South Africa in which all our people will have access to lifelong learning, education and training opportunities, which will, in turn contribute towards improving the quality of life and building a peaceful, prosperous and democratic South Africa." (Department of Basic Education 2019)

Throughout South African policy documents, the concept of lifelong learning is constantly advocated for as integral to the development of the country and its people (Department of Basic Education 2019; Department of Statistics South Africa 2019:53). However, once we seek out spatial definition within policy for this concept there is a disconnect. Within the written policy for public school infrastructure there are 8 principles discussed (Department of Basic Education 2013):

- universal access
- school location
- classroom size and ratios
- electricity, water and sanitation
- library and laboratory
- sports and recreation
- security and safety
- lights, ventilation and acoustics

Within the guidelines of these principles there is an overall lack of spatial definition as to how the concept of lifelong learning is to be achieved. Therefore, understanding the implications of written policy on lifelong learning is a point of concern within the dissertation.

1.4 Research Aim, Objective and Questions

The main research aim is to address this major gap within South African policy documentation. The dissertation seeks to understand the educational ecosystem within the South African context, with the objective of redefining the typology of the public school environment.

This redefinition of the typology will be in relation to the research question:

- How does the typology of a school influence its tangible and intangible integration into its context to promote lifelong learning?

The sub questions:

- How does school typology affect learning potential
- How does school boundary affect the relationship between a school and its community
- How does school typology contribute towards lifelong learning?

The dissertation objective is to develop a spatial matrix that addresses the redefinition of typology in relation to building for pedagogy and building as a threshold to achieve lifelong learning. This spatial matrix is intended to inform policy for public school infrastructure to address the gap. The design objective of the dissertation is to provide an example of how the developed design principles from the spatial matrix can be applied to a case study school, such as Tsako Thabo Secondary School in Mamelodi East.

Fig. 2.1.8. Typologically similar schools within the study area (Naidoo 2020)

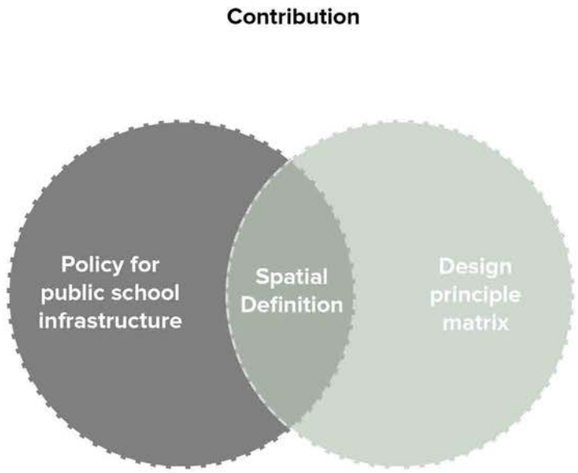


Fig. 2.1.9. Dissertation contribution (Naidoo 2020)

1.5 Justification for the Topic

Education is a primary concern in South Africa, with the government allocating 19.7% of the country's budget towards this. This figure is considered to be high in comparison to international cases (Craddock 2017). Improving education and training, expanding infrastructure and transforming urban and rural communities are amongst the list of top focus areas of South Africa's sustainable development goals (Department of Statistics South Africa 2019:53). Part of the country's social goals is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG 4)" (Department of Statistics South Africa 2019:53). Therefore, we need to look at the contribution of the architectural discipline, so that allocated funds to the educational built environment are impactfully spent.

1.6 Delineations & Limitations

The dissertation deals with how the typology of a teacher-centered classroom and corridor model, within an economically distressed context, such as Mamelodi East, affects lifelong learning potential. Research focused on a typological study of the resulting spatial qualities from South African policy for public school infrastructure and is limited to South African policy on education. Tsako Thabo Secondary School is used as a case study to understand the spatial implications of South African policy on the relationship between a school and its community. Primary data was collected within and around the boundaries of Tsako Thabo Secondary School, with the study area limited to Ward 23, Mamelodi East. This is due to the fact that Participatory Action Research (PAR) was conducted, therefore the site was limited to a walking radius to carry out PAR data collection methods on site.

The two themes of building for pedagogy and building as threshold were used to develop design principles for the dissertation to achieve lifelong learning.

Building for pedagogy was analysed through a developed set of principles according to recurring themes present in school typology analysis:

- plan type
- circulation
- spatial configuration

Building as threshold was investigated under the guidelines of Boettger (2015) parameters for threshold analysis:

- spatial delimitation
- spatial sequence
- spatial geometry
- spatial topography
- spatial materiality

These parameters guided analysis of both the current site and precedents and was used as the guiding principles for the development of the spatial matrix intended to inform policy.

1.7 Contribution

1.7.1 Architectural Profession and Spatial Design

The research engages with an understanding of the spatial consequences of architecture on the educational ecosystem. Within this broad spectrum, an intimate investigation of the relationship between space, pedagogy and threshold is conducted. This investigation collates themes addressed across literature to provide the architectural profession with further insight on its impact on education and the potential for achieving lifelong learning through the built environment.

1.7.2 South African Educational Built Environment

South African policy documents mention that the educational environment should encourage the lifelong learning potential of a person (Department of Basic Education 2012), however it is not stipulated as to how the written policy sets out to achieve this potential. Therefore, there is a detachment between the aims of the government for South African education and the implementation of those aims (as discussed in 1.3 Problem Statement). An important outcome of the dissertation is to provide much needed spatial definition to South African Policy for Public School Infrastructure that aligns with the Government's intentions for achieving lifelong learning, through the development of a spatial matrix according to the dissertation theme parameters (as discussed in 1.6 Delineations and Limitations). This is intended to also assist the government in impactfully spending the allocated funds towards the educational built environment (see 1.5 Justification for the Topic).

1.7.3 Co-design Discourse: Design Games

Throughout the dissertation, design games were utilised as a tool to mediate the co-design process. Engaging with this process over a two-year period saw a shift in approach from analogue design games to digital design games, to adapt to the changing circumstances surrounding the COVID-19 pandemic lockdown. Through this adaptation a series of design games were accumulated, which ranged in inventive game mechanics, to continue the co-design process despite challenging circumstances (see chapter 3). This alternative approach to co-design through the use of design games in various formats has the potential to contribute to subsequent studies, as well as the overall co-design discourse.

Chapter Two

EDUCATIONAL ECOSYSTEM

02

CHAPTER
Educational Ecosystem

02

EDUCATIONAL ECOSYSTEM

2.1 Lifelong Learning

2.1.1 Lifelong Learning and its Relationship to Social Activity

Our educational environment is undergoing exponential change and dormant learning approaches cannot keep up with this rate. A new culture of learning, referred to as lifelong learning, has emerged to respond to fast developing contexts (Weeks 2012:1). The dissertation takes a stance on education and acknowledges that social and academic activity are integral in the lifelong learning process. Therefore, lifelong learning is defined within the dissertation as an emergent concept of learning which is multifaceted and encompasses the qualitative social activities of daily life that contribute to our overall learning and holistic development.

The need to learn is a fundamental aspect of the function of a human being (Jarvis 2004:35). Children are born with a mind ready to absorb information. For learning experience to become beneficial, they need contextual stimulation that encourages exploration and curiosity. This contributes to their holistic educational development (Weeks 2012:6). A child's universe is under constant expansion and with that growth comes multiple questions of meaning. However, through the learning taking place in the confines of a classroom, answers to the list of growing questions may go unanswered or remain irrelevant to the pressing questions of a child (Jarvis 2004:36). The new culture of learning moves further than the linear learning process from teacher to learner. Rather, learning is seen as circular where learners are encouraged to learn from each other and through interaction with their context (Weeks 2012:7). "Higher functions of learning originate as social relationships" (Dovey & Fischer 2014:45). Particular focus is given to the term 'learning communities' where interaction with the world is through a collaboration between learner and community (Weeks 2012:7). Therefore, this new culture of learning is closely associated with social interaction (Weeks 2012:10).

Learning is discussed as a journey rather than a linear process limited to the narrow period of school years. Education is seen as a lifelong learning process with benefits for the student and the community (Global Education Futures 2018:50).

In this model, education is mutually beneficial and received outside of the traditional classroom set-up. Rather, alternative education is received through the collective intelligence from the interaction between school and society. With this approach to education, the school becomes more relevant within society. It provides a second chance to those out of the schooling system to continue the lifelong learning process. This model increases cognizance of society's role within the educational ecosystem, therefore tying the school back into its context.

2.1.2 Lifelong Learning within the South African Context

The concept of lifelong learning is not new; however it is increasing in relevance as societies rapidly change and embrace their dynamic quality. Organizations such as UNESCO and the UN have started to incorporate this concept into their practice (Jarvis 2004: 29) and we are starting to see this reflected in global and local policies regarding education. Lifelong learning is an ongoing mission within the South African educational context and is frequently mentioned throughout educational policy (Department of Basic Education 2019) as well as the country's Sustainable Development Goals (Department of Statistics South Africa 2019:53). This conversation has become increasingly relevant in light of the COVID-19 pandemic where education has been disrupted worldwide (Education Cannot Wait 2020). Due to the unreliability of traditional educational pathways, the relevance of alternative learning opportunities has been brought to the forefront (Education Cannot Wait 2020).

South Africa is currently facing a skills paradox, where the need for skills is prominent, however the knowledge transfer of skills at school level is non-existent and overshadowed by static knowledge transfer (Weeks 2012:1). Static knowledge transfer during schooling years is detrimental to the South African school learner (Weeks 2012:1). Therefore, learners who fall out of the spectrum of careers birthed from static knowledge transfer, contribute to the unemployment margin in the country. A culture of learning needs to be established to ensure that school leaving learners are prepared for a dynamic, changing world. The lack of a culture of learning has negatively impacted multiple schools around South Africa. These schools experience a multitude of socio-educational issues ranging from vandalism to high dropout rates (Weeks 2012:2). It is suggested that if South African schools actively engage through social interaction and sharing with key role players in their context, this can positively contribute to a culture of learning and therefore impact the learning potential of learners and community members involved (Weeks 2012:11).

Change is an inevitable factor, especially within technologically driven societies. Therefore, learning should not be halted during childhood years. Society recognised this need for education to keep up with new ideas and around the eighteen century, additional learning avenues were explored (Jarvis 2004). Growth through learning was encouraged within society. Education serves many functions, but a major factor to consider and highlight is the ways in which education equips learners to adapt to a dynamic and changing social environment (Jarvis 2004:25).

2.2 Tangible Conversation: Spatial Relationship between Architecture and Education

2.2.1 Relationship between Architecture and Education

It has been established that architecture and education have an influence on each other (Hertzberger 2008). However, the tangible design of our learning environments is significantly under-developed (Higgins et al 2005). The school environment is criticised for its lack of adequate evolution since its inception in comparison to other architectural models (Hertzberger 2008). This is disappointing considering the increased awareness that traditional learning environments are outdated (Jimenez 2018:21). The term 'learning environment' has been referred to numerously outside of architectural discourse. However, not much has been said for its spatial quality. Majority

of the research within the field has addressed the social and psychosocial aspects, however minor research has been conducted into the effects of the physical environment (Cleveland & Fisher 2013:1). Fortunately, the spatial conversation regarding the 'learning environment' has gained momentum amongst design professional's and educators as a relevant topic in understanding its role within education (Cleveland & Fisher 2013:1).

2.2.2 Relationship between Policy and the Built Educational Environment in South Africa

Policy and the built educational environment have an interesting relationship with each other. "Built policy helps to see how the meanings, constraints and opportunities of the built environment are shaped and when, by whom and with what resources" (Wood 2019:16). Wood (2019) suggests that we should look at policy with a wider lens to understand it beyond a verbal document and rather focus on how we can spatially communicate it.

The Department of Bantu Administration (Administration Boards) served a developmental role within townships and operated the building of schools for Black areas within South Africa pre-1980 (Candiotes 1997:18). During this time most of the schools within township areas were constructed according to standard types (Candiotes 1997:18) (See Fig 2.2.1). Candiotes (1997:20) also points out that there was minimal regulation guiding the physical realisation of these schooling environments and that no "particular module" was adhered to but rather "common sense" on general classroom sizes was a driving force.

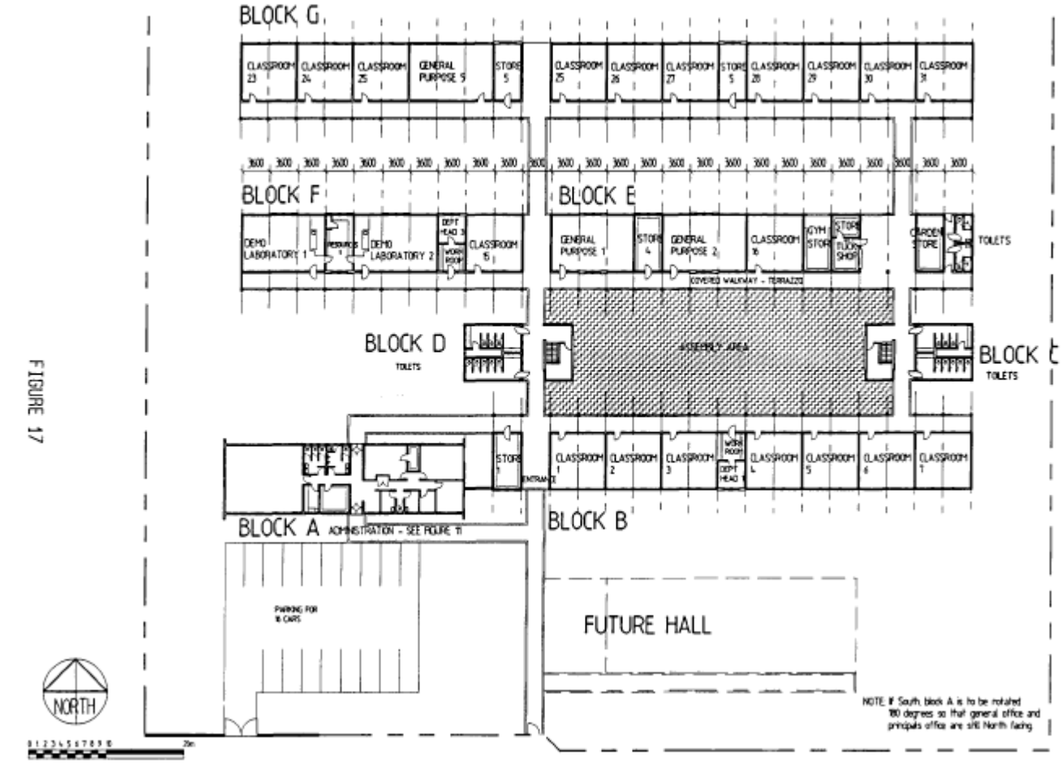


Fig. 2.2.1. Standard secondary school plan type (Candiotes 1997)

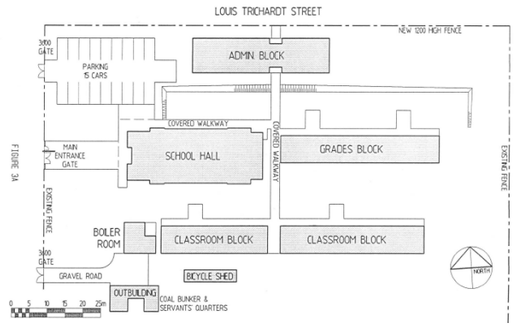


Fig. 2.2.2. Mayville primary school site layout (Candiotes 1997)

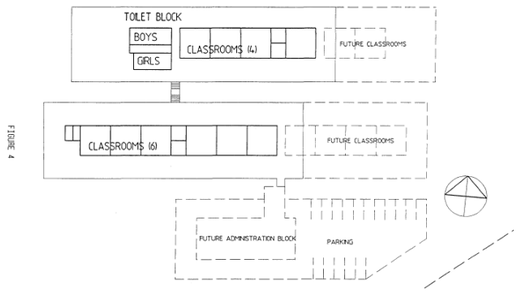


Fig. 2.2.3. Magaliesburg primary school site layout (Candiotes 1997)

During 1983-1994, the Department of Education and Training (DET) took over and guided the building of schools. "Space and Cost Norms" were introduced by the State Treasury Department which dictated public school design through restricting building to predetermined programmatic function (Candiotes 1997:24). The DET's standard building school type was influenced by the Transvaal Provincial Administration (TPA) school agency and the Transvaal Department of Works (TDW) school section (Candiotes 1997:24). Along with the TPA and TDW's developed and tested standard school type, two other schools within South Africa (See Fig 2.2.2 & Fig 2.2.3) were influential in the DET's final standard school type due to its low cost reduced plan, which is still evident today (Candiotes 1997).

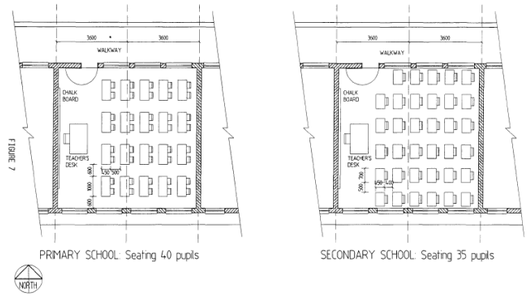


Fig.2.2.4. Standard classroom layouts (Candiotes 1997)

Fig. 2.2.5. Classroom at Tsako Thabo (Naidoo 2019)

These standard school types followed the teacher-centric classroom and corridor model where size was determined according to teacher instruction, with a ratio of 1 Teacher: 36 Learners per class. 3600mm remained the module in place to construct these classrooms as it resulted in the most cost-effective solution. Based on the pairing of modules, the classrooms ended up having a 50m2 floor area (Candiotes 1997:34) (See Fig 2.2.6). Decades later, we can still see the same standard plan type reflected within multiple schools across Mamelodi East (See Fig 2.2.7).

The South African government is protective of its people's right to education (South African Government 1996) and suggests that all should have access to lifelong learning (Department of Basic Education 2019) where the school should serve as a node for societal transformation (Department of Basic Education 2012). The spatial configuration of the schooling typologies within South Africa affect a child's ability to complete their education (Jimenez 2018), however from policy analysis there is minimal guidance provided regarding the importance of spatial configuration and mechanisms to achieve the government's intentions for education.

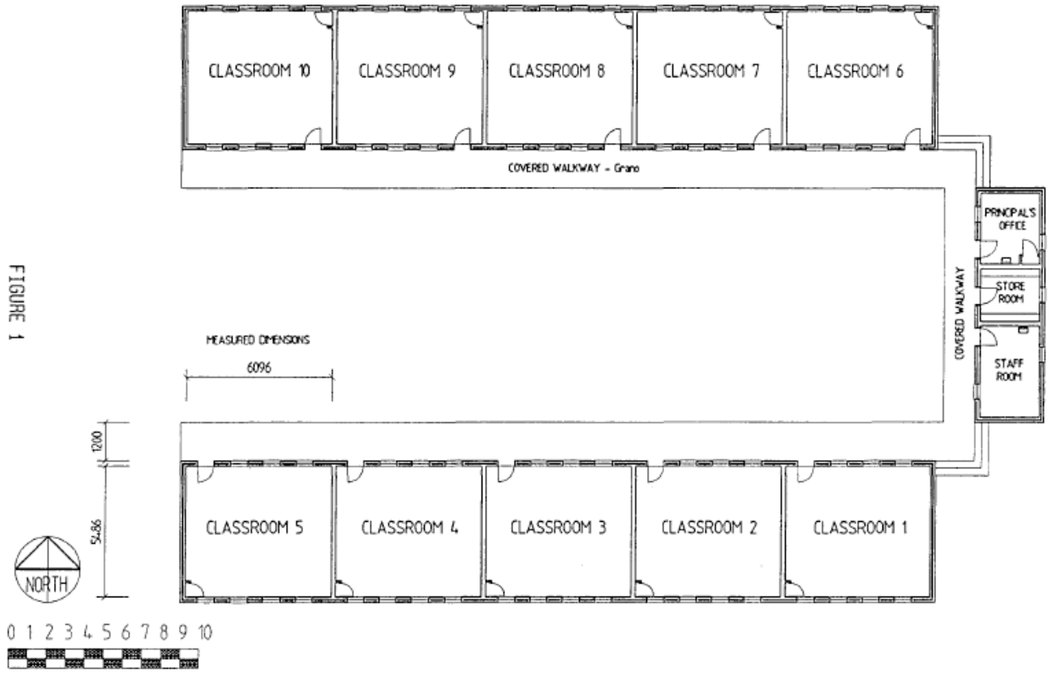


Fig. 2.2.6. Old administration board schools (Candiotes 1997)

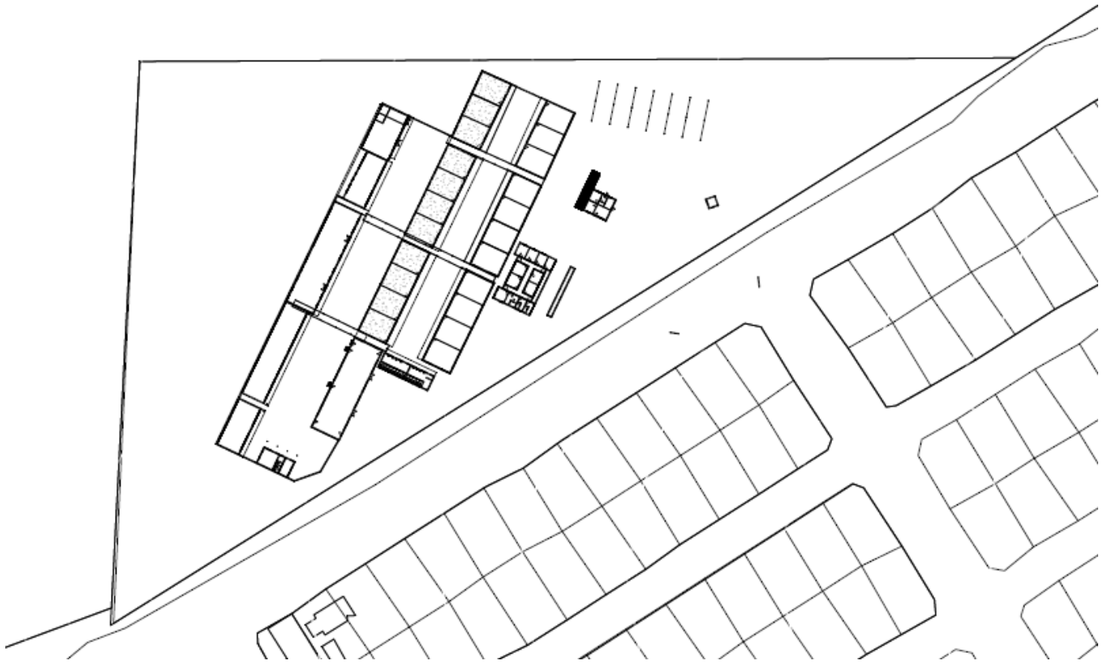


Fig. 2.2.7. Tsako Thabo floor plan reflecting standard model (UP Arch Hons Mamelodi Group 2019)

South African policy for public school infrastructure can be classified according to 8 principles (Department of Basic Education 2012):

- universal access
- school location
- classroom size and ratios
- electricity, water and sanitation
- library and laboratory
- sports and recreation
- security and safety
- light, ventilation and acoustics

These 8 principles reduce the built educational environment down to basic guidelines. Within these sub sections of policy, there is minimal spatial insight regarding how these elements are brought into fruition. The architectural guidelines (section 18) are limited, even in comparison to the general policy principles: classroom to learner ratio, classroom size, lighting and ventilation and durable construction (Department of Basic Education 2012). The policy documents remain vague in tackling the effect that architectural design has on the spatial configuration of educational space (Department of Basic Education 2012:13).

Built policy engages in the ways in which architecture embodies the philosophies of education (Wood 2019:2). Buildings take on a dynamic quality and start to represent policy as well as social constructs (Wood 2019:11). School is seen as a solution to address issues that arise around the educational environment. Addressing these issues at school level could potentially mitigate the resulting effect (Wood 2019:7).
Policy results in a standardised approach to form, therefore across contexts and communities, where the school building typology is evident, the resulting experience of that spatial form is shared (Wood 2019:6).
Therefore, even though the South African government has strong intentions for education, the policy that sees those intentions into fruition fall short. The resulting effect of the limited architectural and spatial definition results in the basic teacher-centric classroom and corridor model evident throughout Mamelodi East. With increased attention given to policy for public school infrastructure there is the potential to mitigate issues that arise at school level.

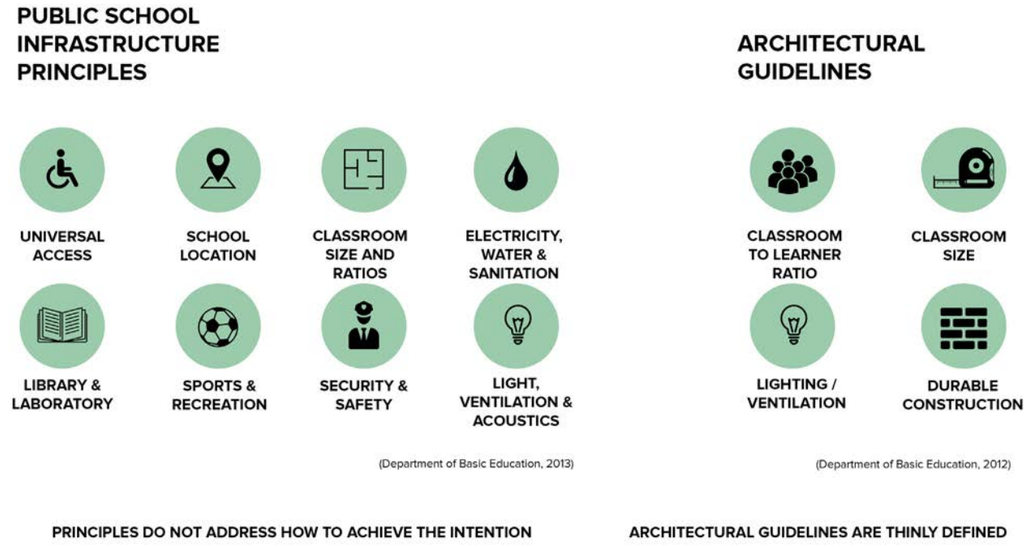


Fig. 2.2.8. Policy principles (Naidoo 2020)

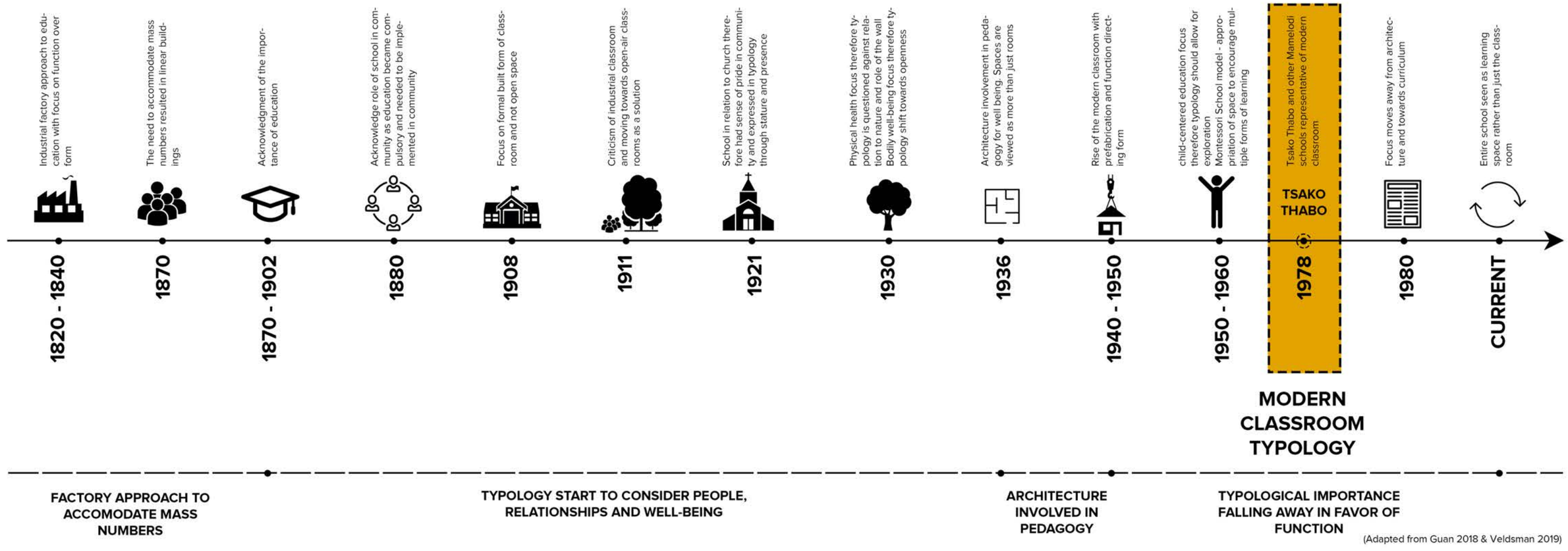


Fig. 2.2.9. School typology timeline (Naidoo 2020)

2.2.3 School Typology

2.2.3.1 Understanding Typology within Architectural Discourse

The word ‘type’ first appeared at the end of the eighteenth century and was later applied in the nineteenth century. Since then typology has received growing interest within the architectural profession (Rocha 2014:186). Typology can be defined as a ‘classificatory study of buildings with shared functional and morphological traits’ (Jacoby 2015:3). However, a deeper understanding of typology as ‘a system of relations’, allows us to make sense of the complex interactions between the spatial and non-spatial world (Rocha 2014:186). The latter being the basis for typological investigation within the dissertation.

There is value in understanding typological approaches within architecture as it places the architecture within its own historical context (Rocha 2014:186). Therefore, typological understanding provides insight into how architecture has developed. Questioning typology can be paralleled to questioning the architecture itself. Therefore, as time and societies progress, we need to rethink and redefine the nature of the architecture we are creating in order to answer the questions that arise when we question typology (Rocha 2014:186).

2.2.3.2 Typology and Pedagogy

A historical overview of the development of school typologies outlines the move from the industrial classroom with its functional typology, to the typological consideration of well-being, to prefabrication and the modern classroom. With the rise of the modern classroom, typological importance fell away in favour of function (Guan 2018). Majority of South African public schools, within the Mamelodi East area, are modelled on the teacher-centered classroom and corridor typology (Veldsman 2019). However, this typology is outdated and has not adapted to the shift in spatial and non-spatial discourse on education.

‘Schools have always been a reflection of a society’s stage of development’ (Kuhn 2012), therefore if schooling typologies do not progress over time to reflect pedagogical development, it opens up room for detachment between school and society.

A historical overview of the paradigms guiding schooling typology can be classified into three approaches. The first dealing with intentional building for pedagogical purposes. This paradigm guiding typology usually finds itself within a context bound by rules and regulations that guide the resulting pedagogical architecture. The approach shies away from focussing on the learner and rather aims to meet predetermined standards, resulting in limiting the educational experience of learners (Dudek 2015). The second being the adaptation of an existing learning facility to meet demands resulting from the progression of education. In comparison to the first paradigm, the second is not bound by a prescriptive approach and its architectural typology is rather guided by the dynamic learning process and the learners themselves (Dudek 2015).

Lastly, the influence of the architectural profession with its focus on learner centred design has resulted in the greatest advancements within pedagogical typology design. This approach is heavily influenced by the architect’s personal interactions with pedagogy (Dudek 2015). In this case the architect uses their experiences to guide the typology using the potency of their architectural strategy that they have accumulated through experience. By drawing on their personal experience, the architect can empathise with the learner and therefore uses this to guide their architecture (Dudek 2015:10). Although these paradigms exist, a common issue found across the globe is that schooling typologies largely reflect the standard model of teacher-centered-classroom-and-corridor design (Kuhn 2012)

2.3 Intangible Conversation: Non-spatial Relationship between Community and School

2.3.1 Background

The community-school strategy is rooted back to the 1800s and was supported by Jane Addams and John Dewey, who recognised that the school model was not living up to its full potential (Lubell 2011:5). Community-schools are environments of mutual support between communities, families and learners, that assist in strengthening the overall educational experience (Lubell 2011:1). The community school model engages with the role of a community within school and a school within its community (Lubell 2011:3).
This schooling strategy contributes towards transforming the educational experience. Community engagement becomes an important aspect in the success of the school. It allows for effective use of the built environment, allowing it to function as a learning environment and community support structure (Higgins et al 2014:30). Through the support structure this strategy provides and the integration between a school and its context, communities are more invested in the education of learners.
Overall, the model positively impacts the learning environment, by reducing the factors that inhibit learning, such as external disruption and vandalism. Therefore, it leaves valuable time for learners to engage in the learning process (Higgins et al 2014:30; Lubell 2011:18).

2.3.2 Relevance of Community-School relationships to the Educational Ecosystem

Due to the nature of the relationship between human beings and society, they are actively involved in the learning process for the duration of their lifetime (Jarvis 2004:24). Social interaction is an important driver in the educational ecosystem as it is through this engagement that a society’s knowledge wealth is transferred (Jarvis 2004:24). The Global Education Futures (2018:7) report draws our attention to the shift away from traditional forms of teaching to “higher functions of learning that originate as social relationships” (Dovey & Fisher 2014:45). Education and the schooling environment is seen as the node of societal transformation. Instead of education being in isolation from its context, it is becoming an integral part of establishing a connection within society. The school environment is seen as a support structure to the greater learning experiences from life, where students are able to build on what they know in terms of their “social construction of knowledge” (Dovey & Fisher 2014:43).

Learning is seen as both social and academic, where learners are made aware of their integration and relationship with their community. Schools no longer becomes inward and readjusts learners perspective of education as outward (Dudek 2015:18). Schools serve as support structures to their society and mould learners to become holistic individuals who understand that they are valued partners in their community (Community-based schools transform SA education 2018). Home, school and community form the three pillars of the urban context. This make-up of the urban context can be inhibiting or enabling to a student and thus affects their learning outcomes (Englert 1993:16). Community-schools assist in the transition of children from one phase of life into another. They provide academic and non-academic learning opportunities that assist in the holistic development of a learner, such as social, emotional and physical development (Lubell 2011:ix).

2.3.3 Community school relationship in the context of South Africa

Within the guidelines relating to planning for public school infrastructure (5.5.4), the Department of Basic Education (2012:6) states that the infrastructure of the schooling environment should contribute to transforming a school into a societal node. However, the policy documents fail to stipulate guidelines as to how this should be achieved. The guidelines contradict themselves by stating that infrastructure should establish this relationship between the school and community. However, Section 12 of Policy for Public School Infrastructure, on school safety and security, stipulates detailed fencing conditions to separate the community from the school premises (Department of Basic Education 2012:11). Although this is the case, South African educational policy supports the standpoint that schools are nodes for societal change and is seen as a supportive structure (Department of Education 2008:71)

The community-school model has been widely implemented throughout America, however adaptations of this model have also been brought into South Africa (Lubell 2011:15). Community-schools have gained momentum within South Africa. Several community schools are currently being implemented in and around the Gauteng province of South Africa. These schools have become integral in the communities they are located within and challenge traditional school models which sit in isolation from their community. (Community-based schools transform SA education 2018).

School context and the social interaction within that context play a significant role in promoting or inhibiting a culture of learning within the school environment. This is particularly true within the South African context, where a study found that the social context impacted the schools culture of learning (Weeks 2012:4). Schools that succeeded in their social context were able to establish a sense of pride in the school. In contrast to learners from privileged South African schools, who have the support of parents, disadvantaged schools in South Africa are heavily dependent on contextual support to establish a culture of learning (Weeks 2012:4).
Therefore, the community-school model within economically distressed contexts within the country has a greater potential contribution to the educational ecosystem and could play a vital role in lifelong learning.

RESEARCH & FINDINGS

Data collection date:
2017

Data collection time:
N/A

Researcher/s:
UP Architecture Honours Mamelodi Group 2017

Participant/s:
N/A

Location:
Mamelodi East

Collection method:
MapAble™

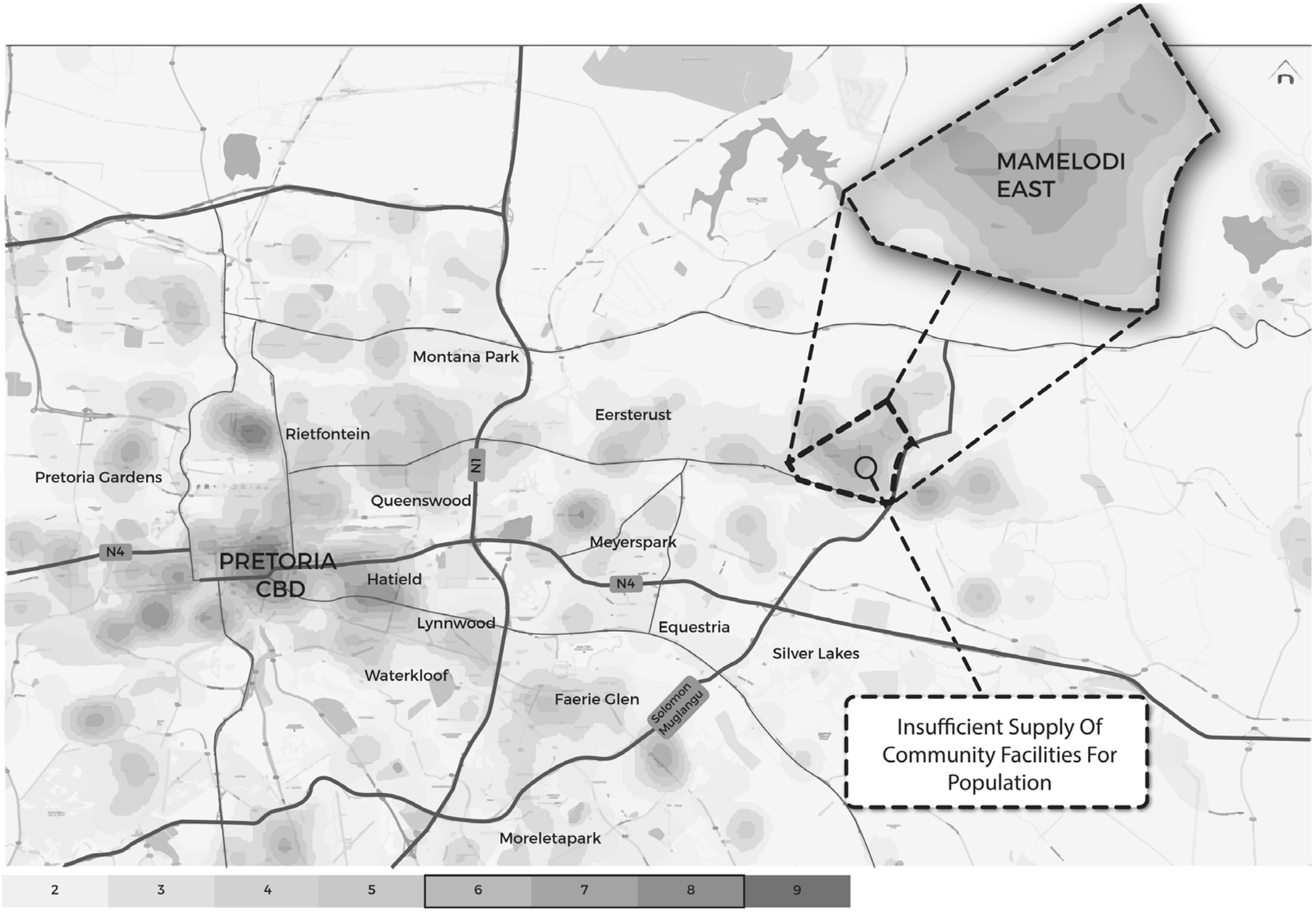


Fig. 2.2.10. Mamelodi East mapping illustrating community facility deficit (LeGrange UP Arch Hons Mamelodi Group 2017)

RESEARCH & FINDINGS

Data collection date:
2017

Data collection time:
N/A

Researcher/s:
UP Architecture Honours
Mamelodi Group 2017

Participant/s:
N/A

Location:
Mamelodi East

Collection method:
MapAble™

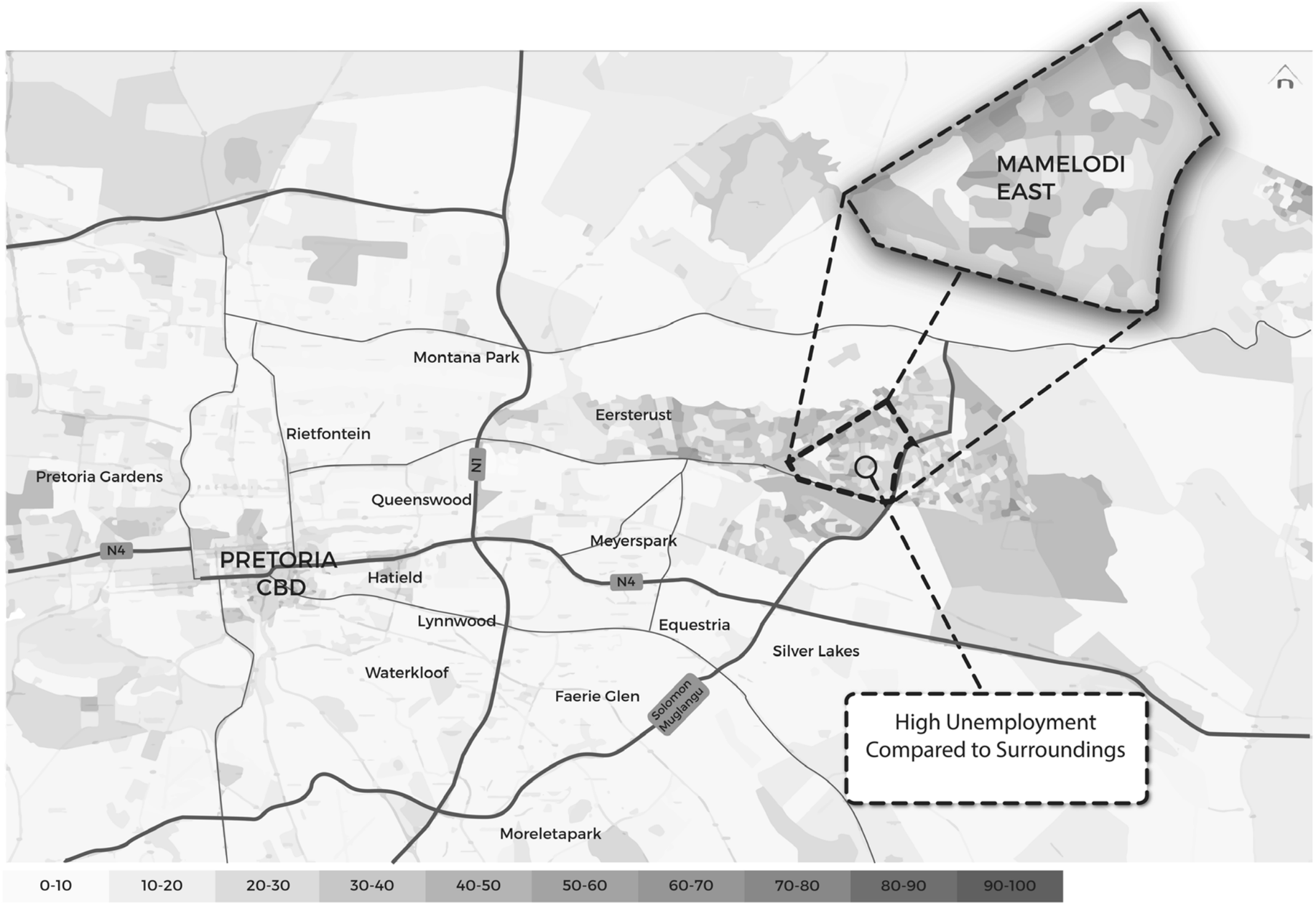


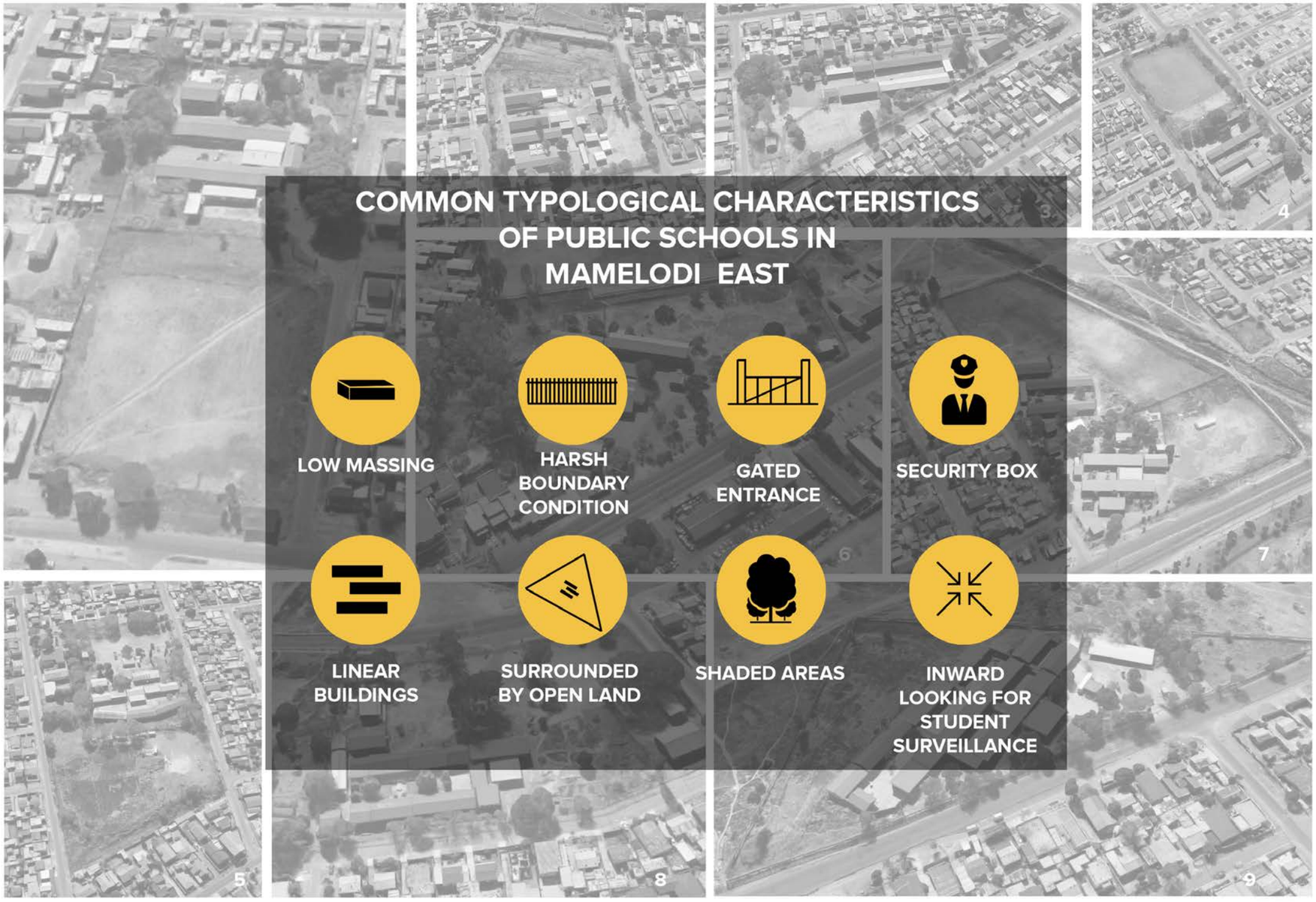
Fig. 2.2.11. Mamelodi East mapping illustrating high unemployment percentages (LeGrange UP Arch Hons Mamelodi Group 2017)

Fig. 2.2.12. Community facilities within Ward 23 Mamelodi East (Naidoo 2020)

Fig. 2.2.13. Typologically similar schools within the study area in Mamelodi East (Naidoo 2020)

(Adapted from Achi & Venter. Hons Mamelodi Group 2019)

Fig. 2.2.14. Typologically similar schools within the study area in Mamelodi East (Achi & Venter Arch Hons Mamelodi Group 2019)



(Adapted from Achi & Venter. Hons Mamelodi Group 2019)

Fig. 2.2.15. Typological characteristics (Naidoo 2020)

Fig. 2.2.16. Typological characteristics present at Tsako Thabo (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019

Data collection time:
11h00

Researcher/s:
UP Architecture Honours
Mamelodi Group 2019

Participant/s:
Community members and businessman from Mamelodi East

Location:
Area around Tsako Thabo

Collection method:
Transect walks, interviews & images

Fig. 2.2.17. Economic activity on the periphery of Tsako Thabo (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019

Data collection time:
11h00

Researcher/s:
UP Architecture Honours
Mamelodi Group 2019

Participant/s:
Community members and businessman from Mamelodi East

Location:
Area around Tsako Thabo

Collection method:
Transect walks, interviews & images

Fig. 2.2.20. Spathlo shop (Naidoo 2019)

Fig. 2.2.21. Car wash (Naidoo 2019)

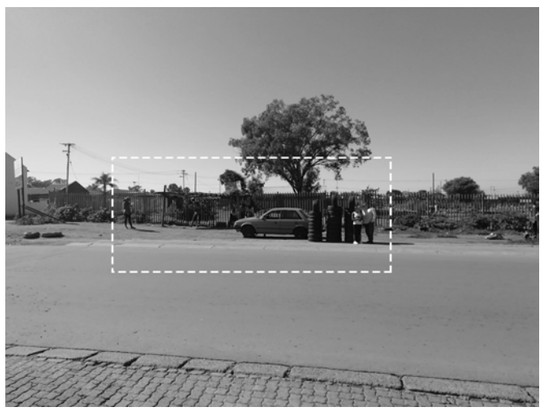


Fig. 2.2.22. Motor sales (Naidoo 2019)

Fig. 2.2.18. Spaza shop (Naidoo 2019)

Fig. 2.2.19. Motor repairs (Naidoo 2019)

RESEARCH & FINDINGS

Data collection date:
February 2020

Data collection time:
10h30

Researcher/s:
Author & UP Architecture Honours Mamelodi Group

Participant/s:
Mamelodi community members and Tsako Thabo staff & learners

Location:
Ward 23, Mamelodi East & Tsako Thabo Secondary School

Collection method:
ukuDoba framework: Interviews using KoboToolbox™

Fig. 2.2.23. ukuDoba interviews (Naidoo 2020)

"We don't have a relationship with the school"
-Community member

"sometimes the children come to my shop"
-Spaza shop owner

"I don't know anyone at the school"
-Community member

"They have no interest in what I do"
-Small business owner near school

"I've never been invited to any events at the school"
-Community member

"Many people have broken into the school and stolen"
-School staff

Fig. 2.2.25. ukuDoba interviews (Naidoo 2020)

Fig. 2.2.26. ukuDoba interviews (Naidoo 2020)

Fig. 2.2.24. ukuDoba interviews (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019

Data collection time:
11h30

Researcher/s:
Achi & Venter UP Architecture Honours Mamelodi Group

Participant/s:
5-6 Learners from Tsako Thabo

Location:
Tsako Thabo Secondary School

Collection method:
Participatory Action Research workshop involving learners allocating safety icons to a map of the school

Fig. 2.2. 27. Results of safety perception workshop by learners (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019

Data collection time:
11h30

Researcher/s:
Achi & Venter UP Architecture Honours Mamelodi Group

Participant/s:
5-6 Learners from Tsako Thabo

Location:
Tsako Thabo Secondary School

Collection method:
Participatory Action Research workshop involving learners allocating safety icons to a map of the school

Fig. 2.2. 28. Results of safety perception on the use of the school (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
February 2019 - March 2019

Data collection time:
10h45 - 11h45

Researcher/s:
UP Architecture Honours Mamelodi Group

Participant/s:
Tsako Thabo Learners

Location:
Tsako Thabo Secondary School

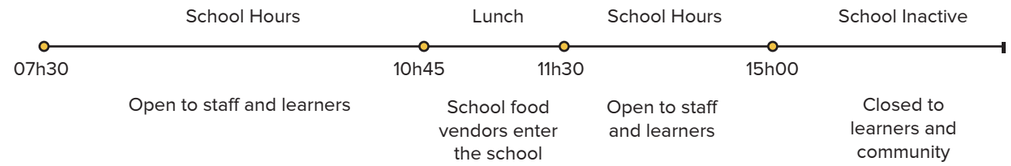
Collection method:
Participatory Action Research workshops and interviews

Fig. 2.2.29 Participatory Action Research workshop (UP Arch Hons Mamelodi Group 2019)

Some classrooms sit unused (UP Arch Hons Mamelodi Group 2019)

School experiences multiple acts of vandalism and break ins (Naidoo 2019)

Fig. 2.2.30. Participatory Action Research workshop (UP Arch Hons Mamelodi Group 2019)



Timeline of school day

Fig. 2.2.31 Participatory Action Research workshop (UP Arch Hons Mamelodi Group 2019)

RESEARCH & FINDINGS

Data collection date:
February 2019 - March 2019

Data collection time:
10h45 - 11h45

Researcher/s:
UP Architecture Honours
Mamelodi Group

Participant/s:
Community members and
Tsako Thabo Learners & staff

Location:
Ward 23 Mamelodi East

Collection method:
Participatory Action Research

Fig. 2.2.32. Participatory Action Research transect walks (UP Arch Hons Mamelodi Group 2019)

Fig. 2.2.33. Participatory Action Research community immersion (UP Arch Hons Mamelodi Group 2019)

Fig. 2.2.34. Participatory Action Research interviews (UP Arch Hons Mamelodi Group 2019)

Fig. 2.2.35. Participatory Action Research transect walks (UP Arch Hons Mamelodi Group 2019)

Fig. 2.2.36. Participatory Action Research interviews (UP Arch Hons Mamelodi Group 2019)

2.6 Reflection

As a result of the Participatory Action Research (PAR) conducted, it is concluded that the community of Mamelodi East receives minimal community support from its context. This is due to the low percentage of community support facilities to accommodate the population. When we reflect on the number of schools within the context that sit dormant outside of schooling hours, there is an acknowledged missed opportunity for these facilities to better serve their context.
As a result of interaction with members (community, school learners and teachers) of Mamelodi, this strained relationship became evident. A potential resultant effect of this strained relationship is the lack of care and respect afforded to the built educational environment within Mamelodi East. This is reflected in the vandalism and theft experienced by Tsako Thabo Secondary School.

This lack of relationship between school and community is also reflected in the tangible (spatial) environment. As a result of policy stipulations, the boundary of public schools maintains a rigid 1.8m fence around the periphery (Department of Basic Education 2012), which isolates the schools from their contexts. This condition, along with an inward-looking spatial configuration contribute to negative experience of the school edge, with the periphery of the school being perceived as unsafe by the learners. The most problematic element of school safety is the boundary condition as identified by most students. Tsako Thabo, along with multiple other schools within Ward 23 of Mamelodi East, reflect the same teacher-centric classroom and corridor typology and share multiple characteristics. According to Wood (2019:6), shared typological structures commonly emit the same resulting experience. A result of the safety perception within the school is the inefficient use of the physical educational environment. There is a missed opportunity in that the schools sit at key points around clusters of activity but have limited connection with them.

The strained relationship between school and community can be a potentially hindering agent to lifelong learning. Multiple interviewees acknowledged their inclination to continue their education that was halted at some point in their life due to arising issues. This finding, along with the high unemployment rate in Mamelodi East, emphasizes the importance of an educational environment in this context and for it to serve as a community support structure to mitigate the issues that arise.

Chapter Three

RESEARCH ARTICLE

Comparing the Application of Digital Design Games Against Analogue Design Games in the Architectural Co-design Process

03

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3.1 Abstract

Co-design has become a recognised approach within architectural discourse to challenge the role of the author in the design process. It has been the major architectural approach of a Professional Master of Architecture mini-dissertation. The dissertation focussed on Tsako Thabo High School in Mamelodi East, Tshwane and explored the spatial consequences of architecture on the educational ecosystem. In particular, the focus was on how South African government school typologies impact the tangible (spatial) and intangible (non-spatial) integration of a school into its context to promote lifelong learning potential. The engagement with participants throughout the process has importantly involved children due to the dissertation focus. Praise is given to co-design processes involving a collaboration with children due to their innovative outlook on life which contributes towards creativity.
However, for such collaboration to become useful, appropriate tools need to be considered to elicit creative responses.

Design games are supportive tools in co-design architectural processes. They provide an effective avenue in engaging with participants, particularly when children are the focus group. Conventionally, design games would be applied in analogue form on site. However, as technology advances, alternative online platforms present themselves that widen the spectrum of possibilities for the creation and application of digital design games for the co-design process.
This paper compares the application of analogue design games to digital design games. Both game types were compared according to their ability to contribute to the design process of the dissertation project.

This research contributes towards a Professional Master of Architecture dissertation, which under normal circumstances would be using analogue design games in the co-design process. However, due to the COVID-19 pandemic, alternative methods of engagement needed to be considered. Conducting analogue design games within this context presented multiple limitations and challenges, which were exacerbated in digital design game format due to the reliance on online communication tools. The paper explores methods for the creation and application of digital design games that deal with the presented challenges. Through the comparison of digital design games against analogue design games, the paper opens the discussion on how design games in various formats differ in their contribution to the co-design process.

3.2 Introduction

The practice of design is under constant progression with the involvement of the end user growing in importance (Lee 2008). Challenging the role of the author has been an ongoing discussion within architectural discourse. There is movement away from single authorship to a collaborative one, which includes the voices of those inevitably affected by decisions made from single authorship. The concept of user participation in the design process was first introduced in 1971 where the term “Design Participation” was conceived (Lee 2008). “Design Participation” is more notably identified as co-design in today’s context. Co-design is an acknowledged process, within Participatory Action Research, in tackling the debate on authorship.

This paper moves beyond the standpoint of why co-design should be considered, but rather how it can be approached. Co-design has been recognised as an essential process, however it can only become useful in the collaboration towards a creative design, if the appropriate tools are used. Design games are useful tools, structures and mindsets to include the participant in the co-design process (Vaajakallio & Mattelmäki 2014:2). They serve as tools to bridge the gap between design

Fig. 2.3.1. Analogue design game application (Naidoo 2019)

Fig. 2.3.2. Analogue design game application at Tsako Thabo (Naidoo 2019)

professionals and end users allowing for mutual understanding (Howard & Somerville 2014).

Within co-design there is limited research being conducted by design professionals themselves, who are actively participating in the process (Lee 2008). To contribute to this gap, the research was positioned from the standpoint of a Professional Master of Architecture student who actively engaged with participants in the co-design process, through the means of design games. Design games were used at varying points of the design process to assist in the development of the dissertation project. The dissertation explored the spatial consequences of architecture on the educational ecosystem. In particular, the focus was on how South African government school typologies impact the tangible and intangible integration of a school into its context to promote lifelong learning. Tsako Thabo High School in Mamelodi East, Tshwane was used as a case study for investigation within the dissertation. Various participants were involved at key points in the co-design process to engage in design games. Due to the focus on education and the involvement of the high school, participants included children from the school, to understand the impact of the school typology on education and their learning experience. Design professionals were also engaged to gather their views on the relationship between architecture and education in light of the dissertation focus.

Co-design processes were introduced in the Honours year, in 2019, at the University of Pretoria, as a way to challenge the discipline within the Department of Architecture. My engagement with co-design occurred over the period of two years from the Honours year and into the Masters, in 2020. Design games were used as a medium to

Fig. 2.3.3. Researcher (Author) on site for analogue design game application (du Bois 2019)

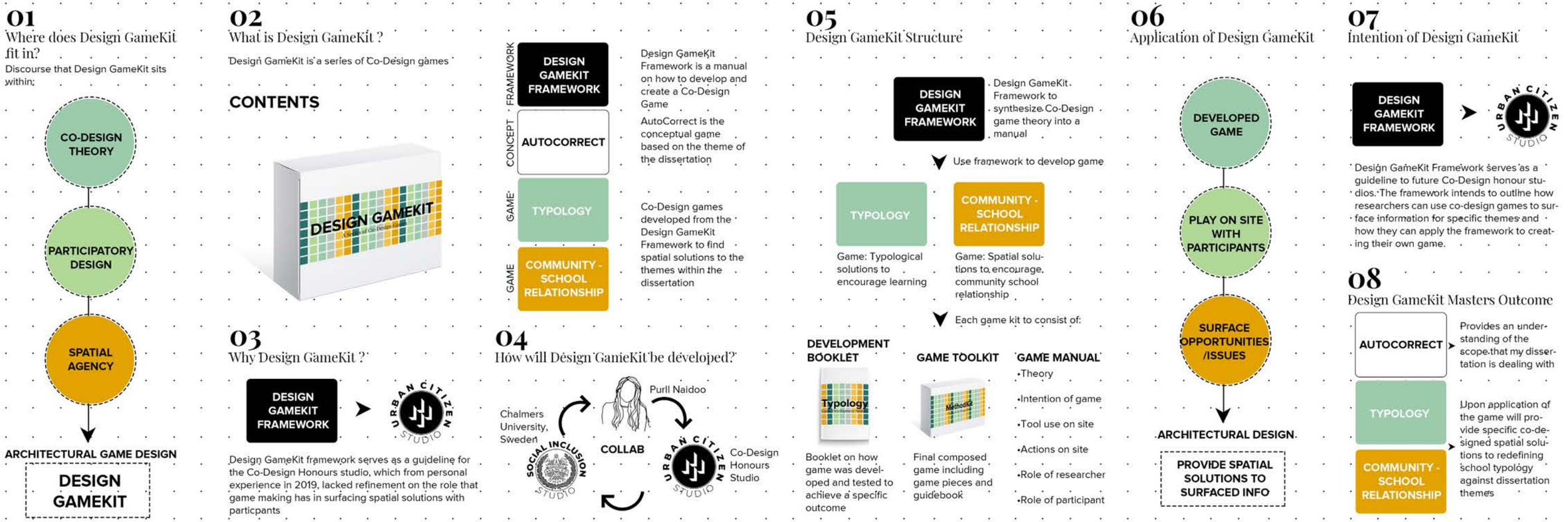


Fig. 2.3.4. Design GameKit intention (Naidoo 2020)

engage participants, ranging from professionals to the end user, in eliciting design informants to apply to the architectural development of my project. Upon introduction to the co-design process, various participatory workshops were engaged with by my peers. My focus shifted towards design games as a medium. I became fascinated by the mindset of using game play within architecture.

The Honours year of engagement focussed on the creation and application of analogue design games, due to my physical access to participants. However, in the Masters year, this access was limited due to the lockdown restrictions within South Africa in response to the COVID-19 pandemic. This created a new dynamic and a shift in mindset. Due to my commitment to the co-design process, I adapted to digital engagement to continue the creation and application of design games. This surfaced a range of issues that I had to tackle as a researcher and designer, in terms of appropriate digital channels for engagement, how to create a design game to function digitally, access to participants, participation in game play and so forth. In the absence of the pandemic, normal circumstances would have seen me continue engaging in analogue design games throughout the Masters year.
However, due to the challenges and being forced to adapt to alternative formats, I have become resilient as a co-design practitioner in advocating for design games as an effective medium. This paper serves as a reflection of that experience to compare the creation and application of analogue and digital design games to the co-design process of a Master of Architecture (Professional) mini-dissertation. Digital and analogue design games are discussed in terms of their contribution to different parts of the design process of the dissertation. The paper describes these two varying design game experiences to open the discussion on how design games in various formats differ in their contribution to the co-design process.

3.3 Design Games in the Co Design Process: A literature Review

Hamdi (2010) clarifies the notion of participation as an integral part in the design process. Participation is linked to three key aspects that are vital in the creation of community; namely ownership, sense of belonging and responsibility. Therefore, it should not be seen as an add-on but rather a vital step in efficient and effective design. As researchers and designers, we need to be cognizant of different levels of participation so that we do not manipulate the design process but allow the true nature of the participation to flourish (Higgins et al 2014). Design games allow for effective participation and have gone through significant evolution, being approached differently by various theorists (Vaajakallio & Mattelmäki 2014:2). It is important that the use of design games in the co-design process is to not achieve a finalised design, however it is about collectively understanding a situation in the present and providing potential design solutions for the near future. A design game should therefore allow collaborators to “share current and past experiences in order to envision future ones” (Vaajakallio & Mattelmäki 2014).

Design games, also referred to as ‘exploratory design games’ have made headway since the

1990's (Brandt, Messeter & Binder 2008:52). When dealing with co-design, it is important for the design practitioner to recognise that the end user is capable of making decisions about their environment due to their increased exposure and interaction with it. As designers, we therefore need to create a platform for engaging with end users that allows their views to surface instead of being overshadowed (Brandt, Messeter & Binder 2008:51). Habraken and Gross (1987) support the use of design games as an effective tool in the design process. Being able to communicate effectively throughout the co-design process, with end-users who usually do not have a background in design understanding, requires a medium to find common ground between those involved. Multiple projects, such as Hybrid Space Lab (2020) and Engagement Lab at Emerson College (2020), have found success in the use of design games as a medium to collaborate with the end user into guiding transformative design decisions about the built environment. These projects have been able to reach a multitude of participants to holistically inform design decisions.

Design games provide a conceptual world to engage in this conversation with a 'shared language' between practitioner and end user (Brandt, Messeter & Binder 2008:51). When engaging in a participatory process, it is important to understand the mindset of people. People 'reason in terms of concepts and principles' by connecting relationships (Devisch, Poplin and Sofronie 2016). Conceptual design games make use of abstractions, removing the design language of the physical design elements of a project, to create common ground between end user and practitioner (Brandt, Messeter & Binder 2008:58). The action of game play, through design games, has an interesting role in acknowledging the fluidity of real-life. Throughout game play, players' interpretations and understandings of the subject of the design game, usually adapt along the way, adding a dynamic element mimicking the way we socially construct reality (Brandt, Messeter & Binder 2008:53).

Engaging school users in the design process of their learning environment largely impacts the success of that school. School users offer a different perception in comparison to architects and through the process of engagement in the design process, they are often empowered (Higgins et al 2014). A child's imagination is not yet limited by adulthood (Hagen et al 2012:1), therefore their involvement in the design process is further praised due to their innovative outlook on life which contributes towards creativity and challenges the sometimes narrow views of adults (Higgins et al 2014). Excluding children in the design process of learning environments undermines the overall outcome and reduces the potential of design (Higgins et al 2014:14). Systems thinking speaks to the branch of problem solving that puts emphasis on the networks and links that exist between elements within dynamic models (Kaufman & Flanagan 2016:1). Systems thinking is a useful method for learners to engage in. They are able to understand complex scenarios involving the interaction between elements of various systems they engage with. When dealing with the educational ecosystem it is important to understand the "network of interactions among organisms, and between organisms and their environment" (Mueller & Toutain 2015:6).

The dissertation deals within a complex system of understanding, therefore it is beneficial to have a medium to bridge the background understanding when engaging with learners. This approach to thinking is considered difficult to engage with, however it is encouraged to be incorporated into the educational experience (Kaufman & Flanagan 2016:2). To bridge the difficulty, design games are currently being promoted throughout educational discourse as a way of engaging learners in systems thinking. Games naturally encompass complex systems that participants have to understand and interact with, which contributes to the development of a systems thinking skill set. Therefore, through the process of design game application, participants were better able to grasp the concepts dealt with in projects and they were better equipped to recognise and understand systems present in their personal lives.

3.4 Design GameKit

During the Honours year there was limited attention given to the documentation of our design game experience for future use. I believed that there was a missed opportunity to document our processes and how we were adapting existing or creating new games to cater to the participants

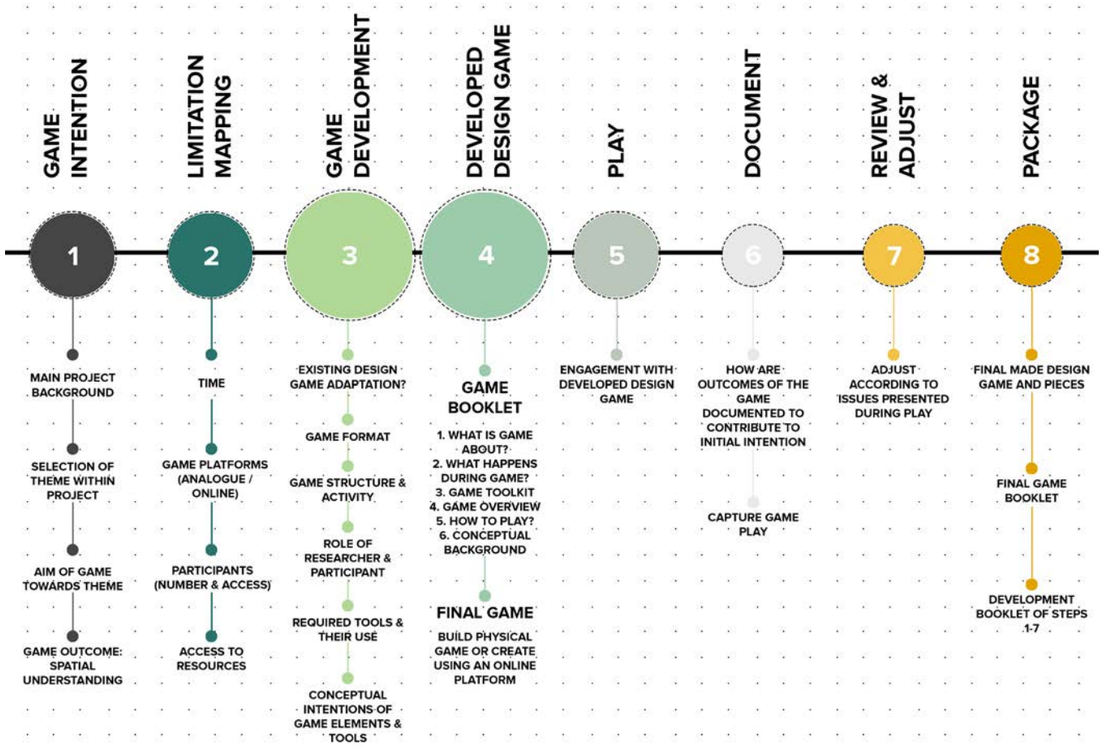


Fig. 2.3.5. Design GameKit framework development (Naidoo 2020)

we were engaging with. During the Masters year, I sought to continue exploring design games. It became important for me to document the creation and application of design games, so that it would better serve subsequent students in the department. This documentation was through the creation of the Design GameKit, which was intended to provide a foundation of methods for engaging participants through design games.

The Design GameKit contains a framework which serves as an outline to guide architecture students dealing with participatory design on how to create, document and apply design games to the co-design process. To assist in the creation of design games, it is beneficial to first outline your design goals in order to direct the process of development. Devisch, Poplin and Sofronie (2016:87) outline three design goals to develop design games that support understanding of spatial facts, spatial concepts and spatial principles. Once this is identified, it becomes easier to develop the game mechanics that respond to the design game goal. Therefore, the Design GameKit framework acknowledges this by including this consideration at the outset of the creation process. An outcome of applying

Fig. 2.3.6. Design GameKit (Naidoo 2020)

Design GameKit Framework		
1	2	3
Creation of Design Game	**Design Game Rule Book**	**Application of Design Game**
Format: Digital or Analogue Game	Design Game Title	Participants
Intention: Which part of the design process do I need assistance with through co-design	Design Game Objective/Overview	Participation
Precedent	Platform for Game Play	Challenges
Adaptation of precedent for research focus	Game Pieces	Opportunities
Challenges	Number of players	Documentation of game play
	Duration of play	Outcomes
	Game Play	Contribution to the design process
	Researchers role during game play	

Fig. 2.3.7. Design GameKit Framework (Naidoo 2020)

the framework, is to enable future researchers to build on, apply or adapt design games to other projects. Many games exist online for collaboration, however these games are generalised. Filtering these games through the Design GameKit framework contributes towards a library of contextually relevant design games. By synthesising the process and providing a framework on how to document and run co-design games, we are able to create a database of tried and tested design games. The Design GameKit library can thereafter be utilized or adapted by ensuing students.

Along with the framework, the Design GameKit consists of analogue and digital design games that have been created and applied within the dissertation. The digital design games are in response to the COVID-19 lockdown restrictions within South Africa that prevented physical contact with participants. These games exist to provide a basis for resilience within co-design processes, to provide future students with potential methods of engaging participants, when challenges arise.

3.5 Methodology

The research methodology was positioned within the interpretivist paradigm as it had a subjective nature and required the researcher to engage with their research through interpretation (Research Methodology 2020). The paradigm focuses on what was unique to the research where the knowledge generated from the research was rich in meaning and relative to a particular set of variables (time, culture, context) (Research Methodology 2020). Therefore, the paradigm is applicable to the intentions of the research in gaining an understanding of how design game creation and application were affected by the current context of Mamelodi East. Mamelodi East is located in the City of Tshwane, South Africa and is a township developed for the African population in 1945 as a result of the Apartheid regime (van der Waal 2000). The case study school where analogue design games were applied, is based within this context. Due to the research forming part of the interpretivist paradigm, it primarily involves qualitative data collection methods. Observation, during game play and researcher reflection of design game creation and application formed the primary methods of data collection.

Both analogue and digital participation involved learners from Tsako Thabo Secondary School, however separate groups of learners were used due to the time-frame of the research and accessibility to participants. A group of a minimum of 3 learners (ages 13 - 20) were selected at random to participate. Consent was received from the principal of the school before engagement with the learners. Analogue design game play occurred on site at the high school of the learners, during a 45 minute period from 11h15 to 12h00, when the learners were on their lunch break. Participation from these learners occurred due to their interest in the project, therefore not all participants were of the same age or previously acquainted. Digital design game play occurred during the Masters year, therefore due to the wider time-frame and intensity of the project, a wider range of participants engaged with digital design games in the co-design process. Participation was based on participants' ability to access digital devices and an internet connection.

Empirical data was gathered from 2019 to 2020. Research was conducted over the two-year period at the school, on the spatial consequences of architecture on the educational ecosystem. Analogue design game engagement was conducted during the first year of the study. Due to COVID-19 and lockdown restrictions within South Africa, digital platforms for design game play needed to be considered. Before digital design play engagement, an overview of platforms was done, by the 2020 Unit for Urban Citizenship Honours Studio, to find a suitable approach for digital design game creation and application (see Appendix 2H) . This investigation was considerate of the presented challenges and limitations. The major criteria dictating the selection of online platforms for use was determined according to:

- Accessibility/usability
- Interactive quality
- Academic Soundness

The following platforms were tested according to the above criteria:

- *Telegram*
- *Tabletopia*
- *Bubbl.us*
- *Facebook / Instagram*
- *Reddit*
- *Markup*
- *Samepage*
- *Zoom / Google Meet*
- *Kobo Toolbox*
- *Figma*
- *House Party*
- *Stormboard*
- *Explain everything*
- *Miro*
- *Padlet*
- *Mural*
- *Conceptboard*
- *Google Drive / Forms*
- *Whatsapp*

This assessment of digital platforms provided direction towards appropriate platforms for digital design games creation and application. A comparison between the application of design games types was made. According to:

- Participation
- Challenges
- Opportunities
- Documentation of game play
- Outcomes
- Contribution to the design process

The spatial outcomes of each design game interaction were distilled to the design indicators that were applicable to the dissertation design project. Lastly, the comparison according to the above-mentioned criteria, was used to engage in discussion on how the varied approaches to design games differed in their contribution to the co-design process.

3.6 Analogue Design Games in the Co-design Process

The application of analogue design games was the initial introduction into the co-design process for the dissertation in 2019. Access to the site allowed us to interact with the end user. Therefore, analogue games focussed on learners from Tsako Thabo Secondary School, as the participant group. Due to the context of the study, several challenges presented itself regarding the creation and application of these design games. In the

Fig. 2.3.8 Tour Guide design game path taken through school (Naidoo 2020)

application of varying analogue design games (Appendix 2A-2C), the site condition posed a particular challenge. A simple element such as an appropriate venue to carry out the design game held a great deal of influence on the outcome. Due to the site of focus being a school, interaction with the learners was limited to their break-time to not disrupt or impose on the schooling hours of the day. Our window for interaction was limited to a 45 minute period, which was further reduced to allow for the learners (participants) to gather their lunch from the school feeding scheme.

The venue for design game application had a heightened sense of activity during this period. It was a thrilling energy to be around, however it was disruptive to the application of the various design games. After a participant group was selected, it was difficult to hold their attention for the duration of the design game application. The audible volume of learners on break made it challenging to communicate with the participant group, further contributing to the initial challenge of the language barrier between primarily Northern Sotho speaking participants and English speaking researchers. Learners occupied the classrooms and external courtyards of the school during the break, therefore limiting the venue for design game application. In most cases, to carry out design game application, a table had to be carried to an outlying area of the school grounds to maintain communication whilst limiting distraction. For the most part, this was successful, however finding a solution to this initial challenge surfaced a series of others, such as fighting against the natural elements such as the wind and harsh sunlight. Given the challenges presented, participation during the design game application was encouraging. Participants were able to easily engage with the design games and fed off each other's energy during the process.

The experience with analogue design games in this case allowed for greater interaction amongst researchers and participants. The duration of design game explanation to the participant group was brief due to the ability to easily interact with participants and the game elements. Reading body language was an important component of analogue design game application. It was easier to recognise whether the participant group understood the intention and instructions of the game or if they were losing interest along the way.

The analogue design games were all composed of simple game mechanics which allowed for ease of play. This also made it efficient to explain on site and was fluid enough to adapt on site depending

Fig. 2.3.9. Tour Guide design game application on site at Tsako Thabo (Naidoo 2019)

on the dynamics of the participant group and the direction that game application was headed in. The lack of rigid structure to the design games allowed opportunity to surface a wider range of information that perhaps pushed the limits of the initial intentions set out during game creation.

Overall, the application of analogue design games went beyond the intended outcomes and a deeper understanding of learners' perception of their educational built environment was uncovered.

3.6.1 Tour Guide

See Annexure 2.A

The analogue design game, Tour Guide, was directed towards understanding the experience of the school through user perspective. The objective of the game was to understand the spatial points of impact of a learner's school environment and to gain further insight into the elements of their environment that they consider important to share.

For the dissertation application, the researcher role-played as a new student transferring to the school and learners had to show the new student around and point out what the new student should know about the school and its functions. The game did not require a lot of preparation beforehand and therefore did not create any challenges during the creation process. Due to the nature of the game, it can be easily applied by other researchers in several contexts to gain further insight into the perspective of the end user and the resulting experience of the physical educational environment.

The ease of game play made it a simple game to participate in. Throughout game play, it stimulated curiosity within other learners in the school. Participants were able to equally engage with the researcher and other participants during game play to collectively decide on the tour path for the researcher to take. The application of this analogue game resulted in a deeper understanding of the physical educational environment than originally expected during the design game creation process. This was achieved through the documentation process of design game application.

The use of video has been acknowledged as a useful medium in capturing the richness usually lost in other media forms (Brandt, Messeter & Binder 2008:54). Video recorded during game play on site captured dialogue and path taken within school. However, having to record the session and focus on the participants at the same time posed a challenge during game application. It would be useful to partner with another researcher for this game to ensure that the process is well documented. The other researcher can therefore scribe dialogue from participants onto the printed map according to their space associations.

3.6.2 Dots

See Annexure 2.B

Fig. 2.3.10. Dots design game application on site at Tsako Thabo (Naidoo 2019)

Fig. 2.3.11. Dots design game application on site at Tsako Thabo (Naidoo 2019)

The analogue design game, Dots, was created to understand learners' spatial association within the school. During game play, players were required to allocate a space on site to a question prompted by the researcher. In the design game creation process the challenging element was deciding on the questions to ask the participants (learners) beforehand. Having not based the game off a precedent, it was difficult to assess how much could be achieved during the duration of game play. Therefore, at the creation stage, there was minimal control over aligning the game creation with the game outcome. The variable of time was particularly challenging in this case as researcher interaction with participants was limited to the 30-minute duration of the school lunch break. The creation of the design game had to therefore consider what the most effective method of game play would be appropriate to render maximum output.

During the process of game play, players were easily able to engage with each other's choices. It was evident that game play with peers influenced players' decisions during game play. As a researcher, the main challenge was being able to facilitate game play as well as document it. Upon reflection of design game application, it would be beneficial to partner with another researcher who focuses on documenting the design game outcomes while the main researcher facilitates game play. Site choice for game play, in this case, was also important. Choosing a venue where researchers and participants can engage in clear dialogue is crucial, especially when language stands as an obstacle. For application by other researchers it is valuable to note that the order

Fig. 2.3.12. Stacked design game application (Naidoo 2019)

Fig. 2.3.13. Stacked design game application (Naidoo 2019)

of game play was fluid enough to adapt to the condition on site. In some cases, post discussion, alternative questions were raised which were easily incorporated into game play.

3.6.2 Stacked

See Annexure 2.C

Stacked was developed with the intention of engaging participants in the spatial construction of the educational built environment and to harness the potential of the existing site. During game play, players made use of model building materials to construct their envisioned learning environment according to prompts provided by the researcher. The challenging element to the design game creation was being able to predict the kind of tools that would be needed on site.

Participation from the group was incredibly fruitful with participants stimulating and interacting with each other through the decision-making process. An accumulation of simultaneous action of cutting building blocks, allocating space and decision-making made for successful participation.

The design game focussed on a spatial outcome and was therefore initially challenging to get participants to understand the intention of the game. Therefore, game play was slow to start, however with stimulation from the researcher, participants were able to engage and become comfortable with decision-making.

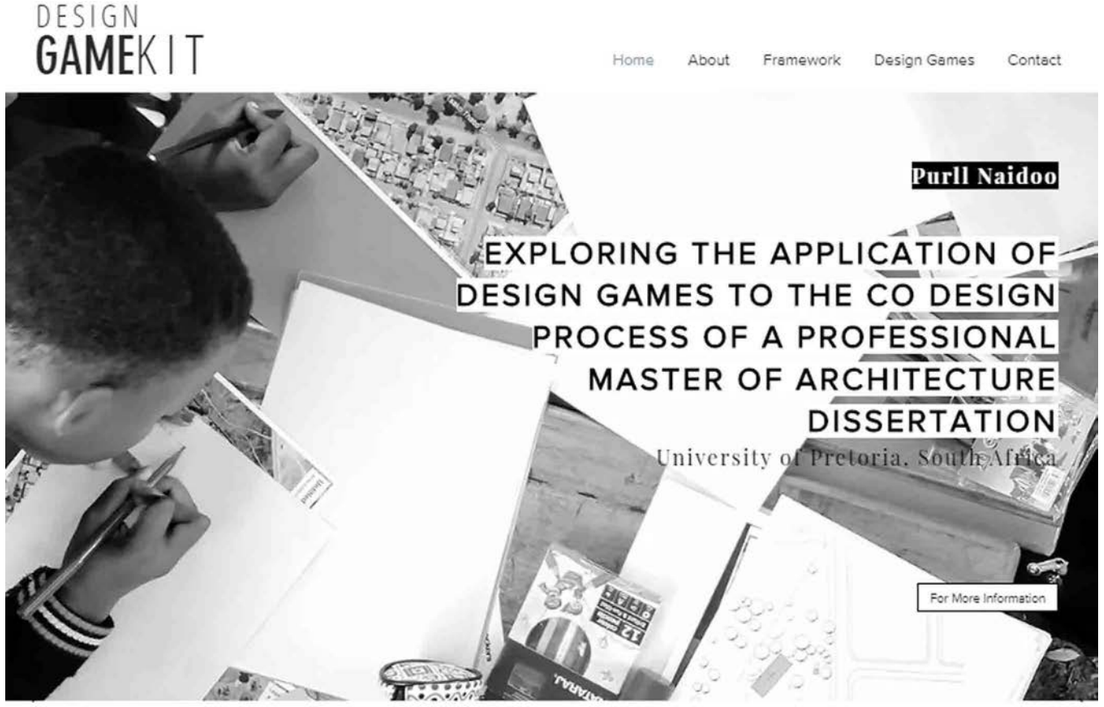


Fig. 2.3.14. Design GameKit digital presence through website (Naidoo 2020)

From the process of game play, the researcher was able to gather information on the quality of space learners desired. These spaces were lacking within the current context of the school. It was also evident of the potential within existing sites of the school that was not harnessed within the existing use. From the analogue design games applied within the dissertation, this was the most challenging to get participants to engage with in the beginning. This was potentially the case due to the design game focussed on spatial understanding throughout game play, instead of spatial interpretation by the researcher post game play. As a design game, should the researcher have an extended amount of time to acclimatise their participants to the spatial discussion, the game has the potential to result in greater co-design input from participants.

3.7 Digital Design Games in the Co-design Process

Digital design games made up the majority of the second year of engagement with the co-design process. This was in response to the COVID-19 pandemic which brought South Africa into a state of lockdown. Therefore, physical access to site and contact interaction with participants was not possible. As a result, a major issue arose regarding communication with participants to continue the co-design process for the dissertation. Numerous attempts to get into contact with learners from the school failed. Within this context, access to an internet connection as well as appropriate devices to maintain digital communication, was a challenge. To maintain resilience, we needed to adapt to the changing circumstance. Our participant group therefore widened to spatial professionals with a background in Urban Citizenship and Social Inclusion and who were familiar with the context of the dissertation.

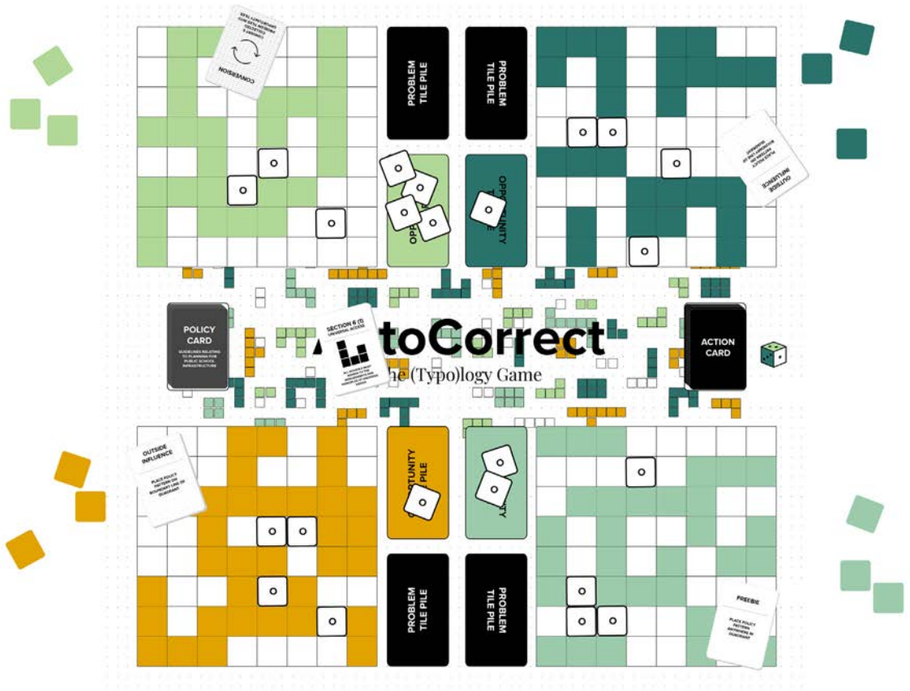
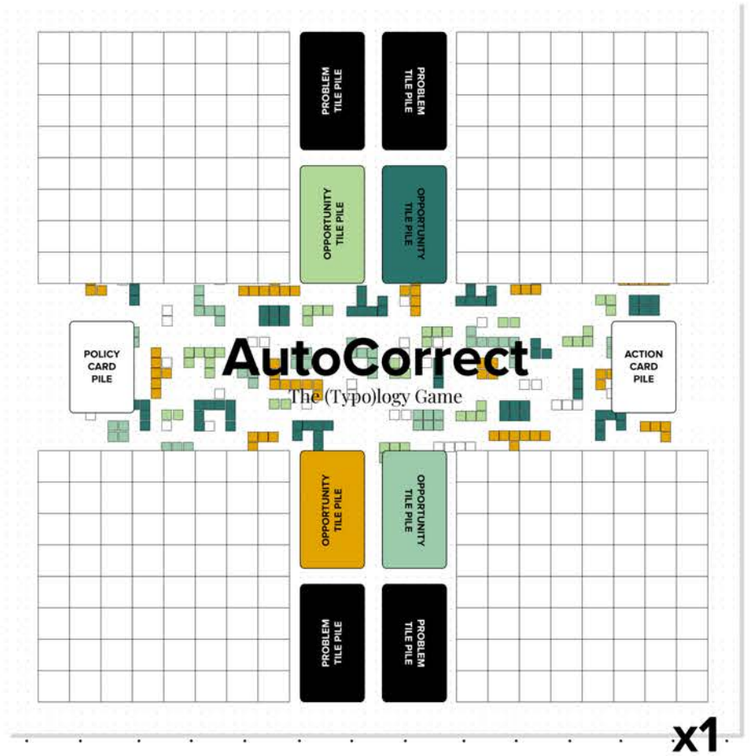


Fig. 2.3.15. AutoCorrect game board (Naidoo 2020)

Fig. 2.3.16. Screenshot from AutoCorrect Game Play using Tabletopia™ (Naidoo 2020)

TOOLKIT



x1

GAME BOARD

Each player constructs their school typology within their quadrant. Each quadrant represents a different context.

x30 x12 x6

ACTION CARD

There are 3 types of Actions Cards in the game.
The Action Cards play an individual role in each player's construction of their typology. This card represents the external factors from a school context that affect the educational environment.

x54 x54 x54 x54

BUILDING BLOCKS

Each player uses an individual colour set of building blocks to construct their school typology.

You have different layers of influence that affect the spatial and non-spatial environment of a school. Building blocks represent these spatial elements.

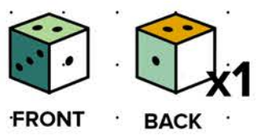
x48

x12

FRONT BACK

POLICY CARD

There are 12 Policy Cards in the game that dictate the number of rounds in the game. The Policy Cards represent the different guidelines within government policy for public school infrastructure



FRONT BACK x1

DIE

PROBLEM / OPPORTUNITY TILE

Problem / Opportunity Tiles are collected at different points during the game. These tiles affect a player's score.

You have different layers of influence that affect the spatial and non-spatial environment of a school. Problem / Opportunity Tiles represent these non- spatial elements.

Fig. 2.3.17. AutoCorrect design game elements (Naidoo 2020)

Throughout the digital design games user personas were developed based on accumulating character profiles from the interaction with the end user on site. These personas bridged the gap created by the lockdown. Access to participants, which was once a challenge, turned into an opportunity as we were able to interact with local and international collaborators within the co-design process. It was an interesting shift in mindset in the creation and application of digital design games. From personal experience, a greater deal of preparation needed to be made to ensure that the game was structured and working before engagement with participants. Due to this, game play during application increased in efficiency.

3.7.1 AutoCorrect

See Annexure 2.D

Conceptual design games focus on the decision-making process and conceptual understanding of the world in which design decisions are made, rather than being confined to specific project requirements. Throughout game play, concept design games are used to understand players' conceptual thinking process regarding specific decisions being made during game play (Habraken & Gross 1987). AutoCorrect was developed within this spectrum of understanding. The elements within the game were not intended to be constructed of physical design elements within the dissertation. Rather, they represent the conceptual framework of the relationship between varied influence and resulting action in an educational context.

AutoCorrect was intended to assist in the early stages of the co-design process to assist participants in the conceptual understanding of the role that different levels of influence have on how school typologies are constructed. Initially finding a digital medium to host the board game was a challenge, however once *Tabletopia*™ was identified, creation through the site was user friendly. Creating the game online was a time-consuming task as all the game pieces needed to be developed beforehand and loaded onto the platform. However, following the game creation process, the game remains digitally accessible to participants across the world to engage in the research process.

Tabletopia™ allowed for live game play by all participants on a single platform, therefore interaction was encouraged between players. The process of game play using the site was stimulating. Assisting this process with the use of *Google Meet*™ allowed for open dialogue amongst participants during game play. A downside to the design game application was its internet dependency. Participants needed a reliable internet connection for game play to flow smoothly and to engage in conversation throughout. Therefore, with the application to research projects where participants do not have access to internet or digital devices, the game reflected a shortfall.

3.7.2 Persona

See Annexure 2.E

The inability to actively engage with learners from Tsako Thabo reduced the qualitative concerns of the dissertation. User experience and the social and psychological quality of the programme lacked consideration within the dissertation. The intention of the design game was to contribute to understanding the user experience in relation to the programmatic considerations. Failure to successfully establish contact with learners from

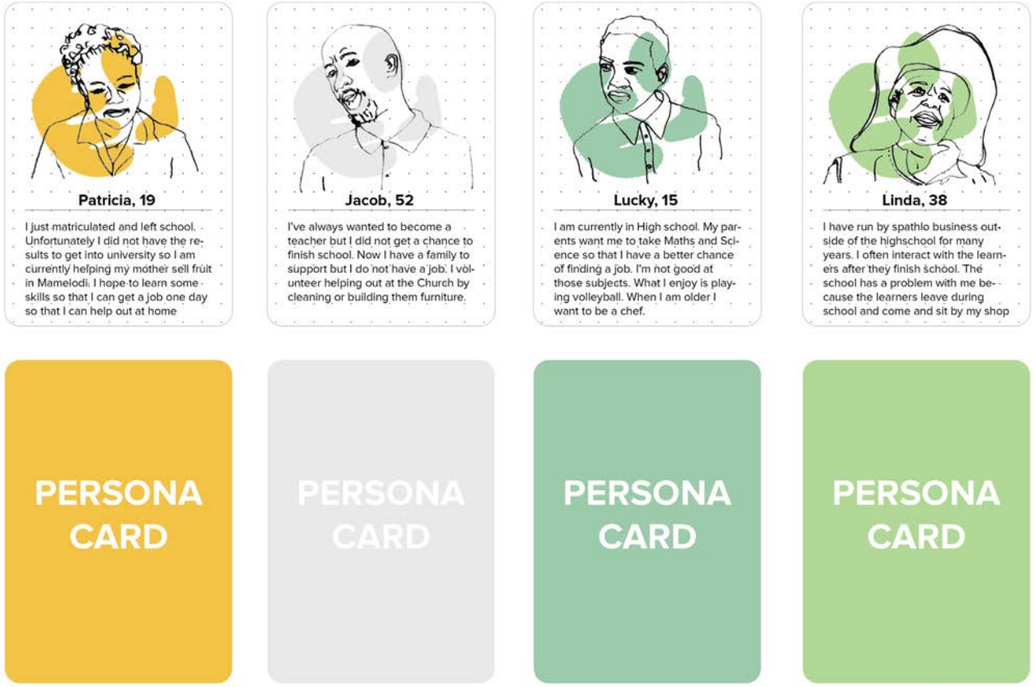


Fig. 2.3.18. Persona cards (Naidoo 2020)

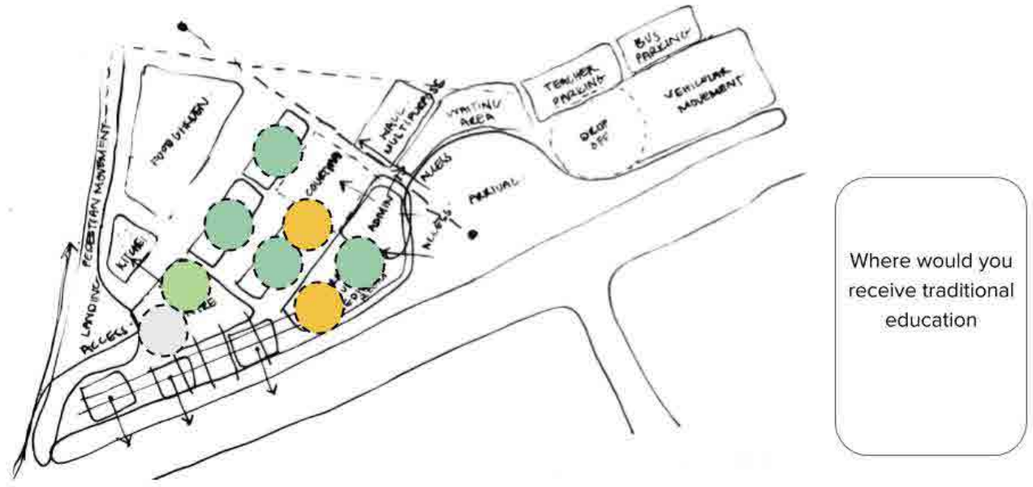


Fig. 2.3.19. Persona design game application (Naidoo 2020)

Tsako Thabo, resulted in the consideration of role play. Roleplay is a useful method to engage in participation. It can provide a voice for those who are not generally heard or considered in the design process (Hamdi 2010:74). The digital design game, Persona, was intended to understand the implications of the programme on user experience of the site through role play. Selected participants for design game play were chosen from a group of students who previously engaged with the site and users, and are therefore familiar with the context. User personas were created from collating collected primary data from interviews on site.

Throughout game play, players were able to place themselves in the position of the user profiles to guide their decisions. The game play, however, did not lend itself to stimulate discussion amongst participants but rather was directional between researcher and participant. However communication was fruitful throughout game play. To document the design game application, the use of the recording function on *Google Meet*™ to record the *Google Slides*™ was beneficial in capturing actions performed by participants during game play, as well as the discussion had throughout. Physical documentation was achieved

Fig. 2.3.20. Stakeholder design game (Naidoo 2020)

after each round using the *Google Slides*™. The digital platform of *Google Slides*™ allowed the opportunity to easily duplicate a slide to include extra questions that were not considered beforehand. *Persona* was successful in assisting the research process. Participants highlighted a shortcoming in that the clustered programmatic layout resulted in restricted movement throughout the site and negatively contributed towards creating inactive areas on site.

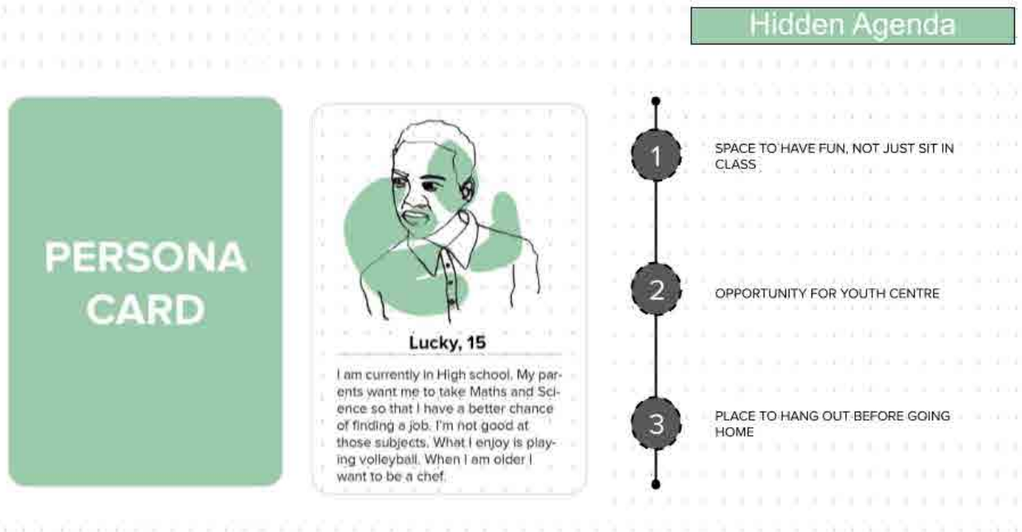


Fig. 2.3.21. Stakeholder design game player card (Naidoo 2020)

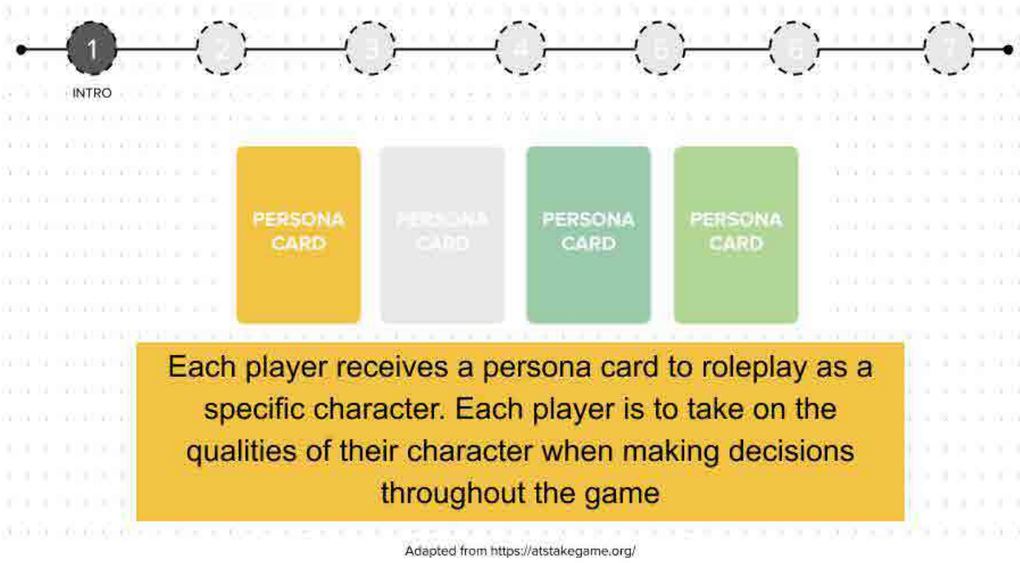


Fig. 2.3.22. Stakeholder design game play (Naidoo 2020)

3.7.3 Stakeholder

See Annexure 2.F

The intention of the Stakeholder game was to collectively involve participants in how we can potentially redefine the built environment of the classroom. Stakeholder is a role play game based on collective democratic decision-making (Engagement Lab @ Emerson College 2020). Throughout the game, players voice their opinions and solutions to issues within the built educational environment. Participants provide proposals that redefine an alternative learning environment that is cognizant of varied learning styles as well as the use for community. The game mechanics were influenced by @Stake (Engagement Lab @ Emerson College 2020). User personas, participants' hidden agendas during game play and the questions per round were adapted to directly relate to the users within Mamelodi East and questions pertaining to redefining the classroom.

Throughout game play, the game mechanics allowed for a stimulating discussion on the question posed per round. Participants were also prompted to question and challenge each other's proposals. This lent itself to a fruitful discussion and opened up a wider thought process regarding the game topic. The structure of play of the game was clear enough to be able to use the same game mechanics with other themes present in a project. The clear structure maximises time and game output, therefore when time constraints are an issue, this game is particularly useful in achieving a great deal within the time-frame.

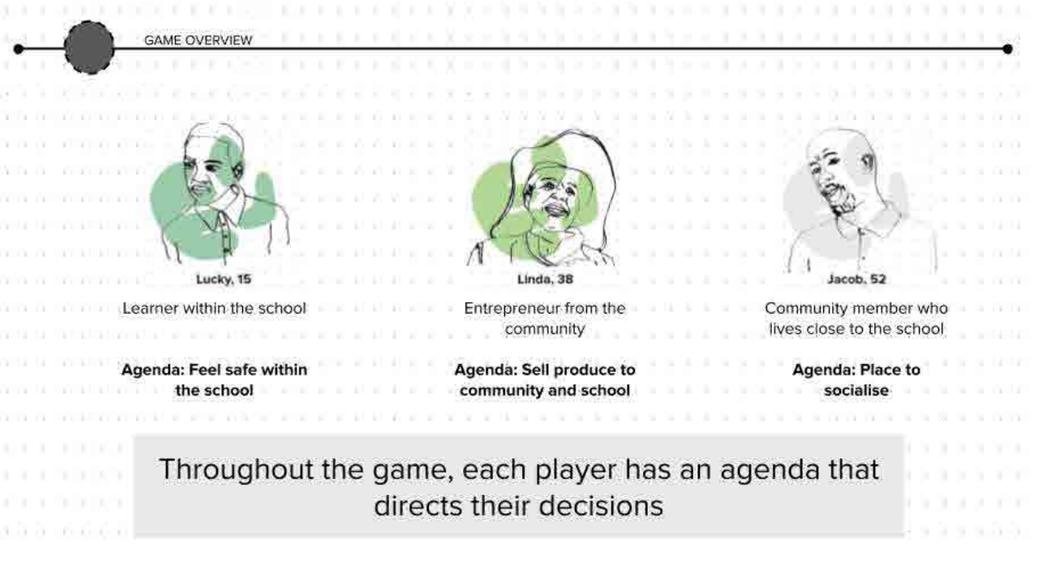


Fig. 2.3.23. Interface design game overview (Naidoo 2020)

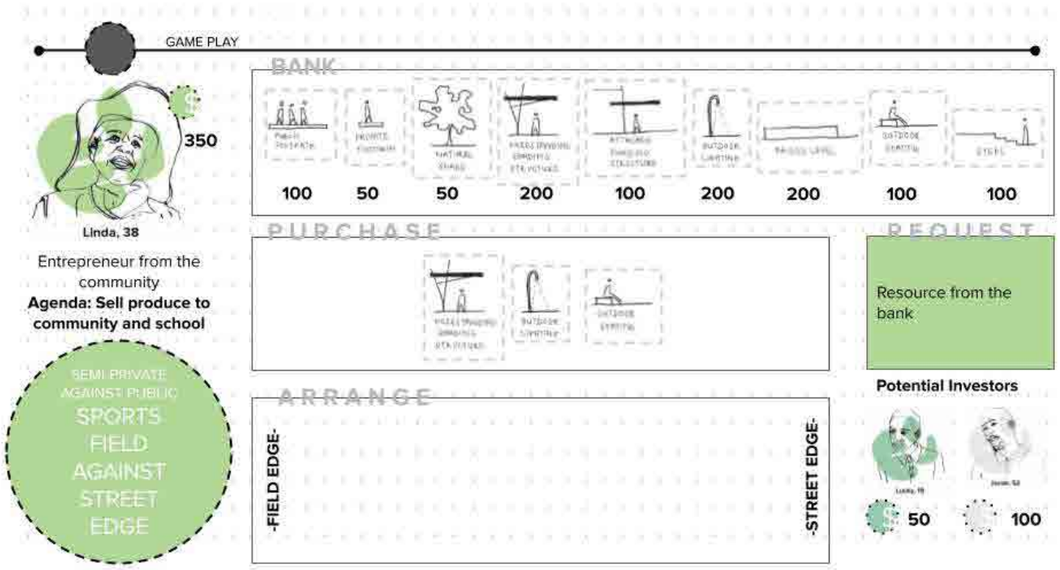


Fig. 2.3.24. Interface design game application(Naidoo 2020)

3.7.4 Interface

See Annexure 2.G

A part of the dissertation was repositioning the school environment within Mamelodi East as publicly accessible. Due to this, there needed to be cognizance of the interaction between varying degrees of public and private. The game intention is to collectively define the articulation of these urban edge interfaces that deal with the presented conditions. Interface is a design game directed towards constructing the urban edge interface between a school and its context. During game play, participants take on the personas of affected stakeholders to guide their decisions.

Throughout game play, the game mechanics allowed for a stimulating discussion. Participants were also required to interact with each other which allowed for a more fruitful game outcome. Time constraint was the biggest challenge. The game required in depth thinking from participants and interaction between them to guide decisions, therefore allowing a lengthier window of time would benefit the game outcomes. During game play, a round was dedicated for participants to challenge the variables presented to construct their urban interface. Having this round in game play widens the scope of the game to stimulate creativity from the participant group. Therefore, specific qualities that were not decided beforehand by the researcher can be introduced into the game and incorporated for future applications.

3.8 Discussion and Conclusion

The application of analogue and digital design games rendered two varying co-design experiences. Participation in the case of analogue design games allowed for greater interaction amongst participants and researchers. Physically interacting with each other during design game application was an important part of the co-design process and led to a richer experience. In the case of digital design games, participation was able to occur, but the focus was usually placed on a game interface, rather than on visual communication. Analogue design games, however, allow this to occur simultaneously. Both design game formats brought with them their own sets of challenges that made it difficult to effectively compare. In the case of analogue design games, the main challenge was due to the conditions of the context and will therefore differ according to varying contexts. However, in the case of digital design games, the challenges came from the use of online tools to host the games as well as the stability of an internet connection. The commonality between the challenges of the game format, was that in both cases, finding a solution to those minor issues would lead to much smoother design game application.

In terms of the opportunities provided by the formats of the design games, digital design games widened the scope for the dissertation. A variety of design games could be created with limited expense to the researcher, most of the effort that went into design game creation was based on time, rather than cost. The format also allowed for the ability to duplicate digital design games and alter them according to varying game intentions. Whereas, with analogue design games, the physical tools needed on site in most cases were not suitable to be reused. An interesting element to digital design games was the opportunity it presented regarding participation.

Analogue design games are limited to participants whom you have physical access to, however digital design games widen the range of access and collaborators. This allowed for another dimension to the project, to be able to engage with a variety of participants familiar with design game thinking and co-design processes.

From personal experience, the challenge regarding the application of design games, came from managing the process as a single researcher. Often, having to mediate the process of design game application, as well as focusing on documenting the process and outcome was challenging. This was a recurring issue within the application of analogue design games. It was often overwhelming to maintain focus on the participant group, as well as ensuring that the information uncovered during the application was well documented to be able to apply to the project.

This was not the case with the application of digital design games. With the process occurring online and the use of the *Google Meet*™ platform, documentation was as simple as recording the session using the site. Further documentation also occurred using *Google Slides*™. Moves made by participants were captured on each slide, which provided the option of accumulating those slides as an outcome of the design process through the design game.

The two varying formats differed in their contribution to the co-design process. In both cases, design informants were able to be distilled from the design game application to contribute to the dissertation outcome. The semi-structured nature of analogue design games provided a flexible approach that rendered a wider scope of information beyond the initial intentions for the design game. This was useful during the initial exploratory stages of the project. Thereafter once the project increased in direction the shift to digital design games was appropriate. The structured approach of digital design games allowed for efficient design game application. It is difficult to compare the formats to each other and it does not do justice to each to state one as being more effective than the other. The richness of the co-design process was elevated due to the interaction with both formats and with future interactions could complement each other.

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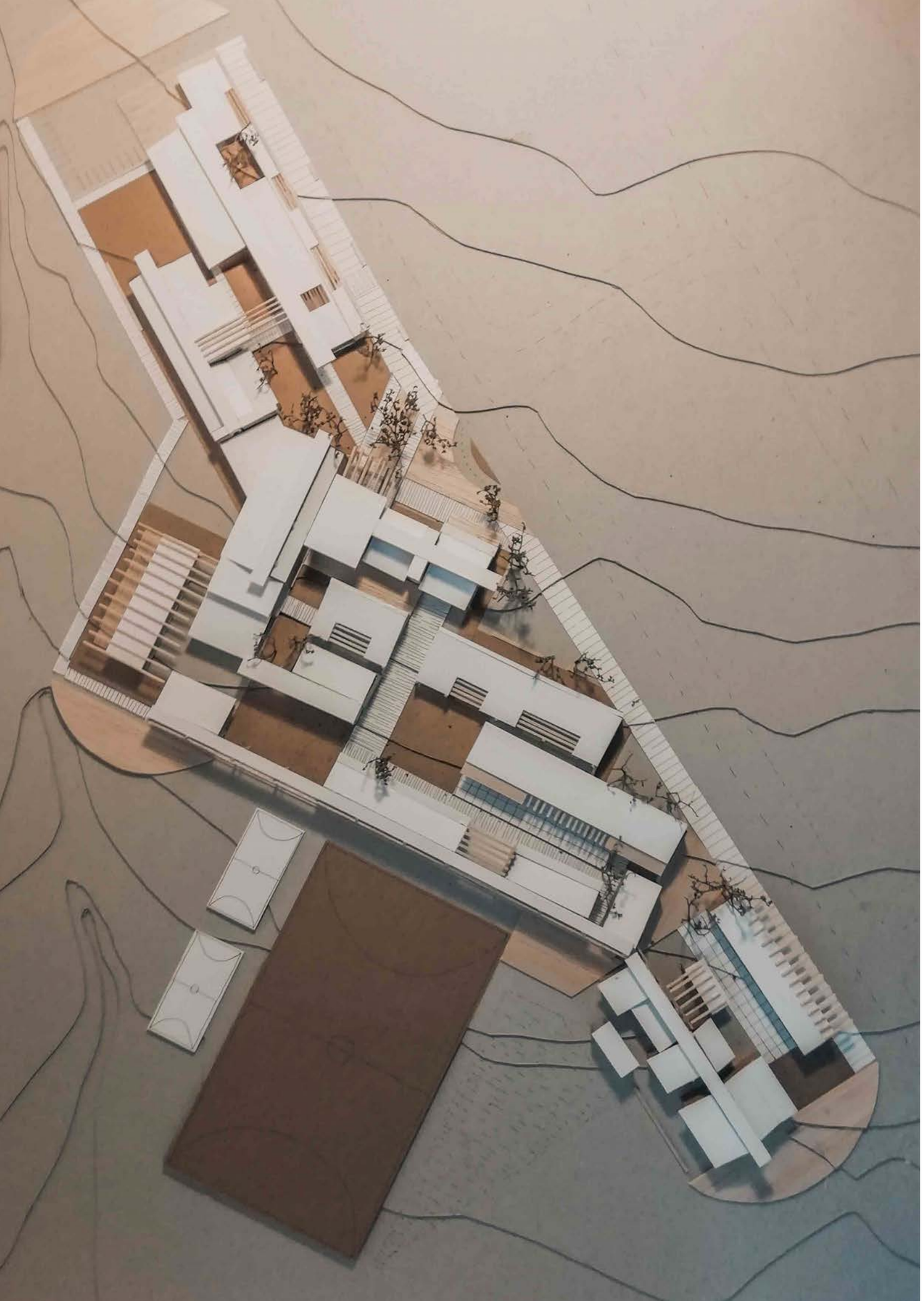


Chapter Four

DESIGN DEVELOPMENT

04

CHAPTER
Design Development

04

DESIGN DEVELOPMENT

4.1 Design Concept

The overall design concept is to move beyond isolating the educational experience. It is intended for this to be achieved through publicly redefining the schooling environment as a “collective urban entity” (Heitor & Alegre 2012) and societal support structure (Global Education Futures 2018). In this light, the design concept strives to create a societal structure that integrates the educational environment with its context.

Space is understood through a social lens as the culmination of a series of interrelationships (Wood 2019:5). Redefinition will therefore be done through investigation into the relationship between space, pedagogy and threshold to encourage the qualitative social activities of learning through establishing a community school relationship with the tangible (spatial) educational environment.

Within architecture we are constantly battling scalar interactions. On a building level we have the scale fighting from within and outward onto the

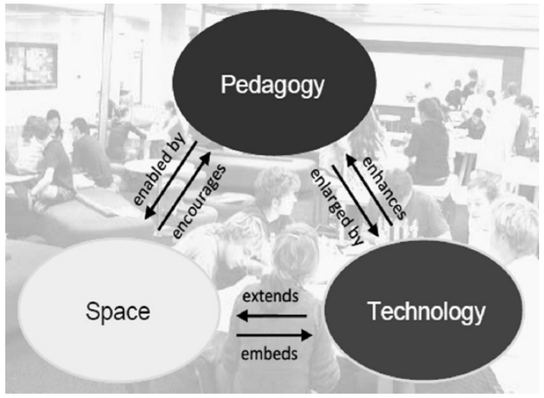


Fig. 2.4.1. Relationship matrix (Cleveland & Fisher 2013.11)

urban fabric. At a larger scale, we have the urban form imposing on the building. Rocha (2014:187) describes this phenomenon as an ‘internal logic’ and an ‘external logic’. Internal logic referring to the internal conditions and constraints of a building that guide its typological response in the condition of ‘form follows function’. Whereas, external logic references the constraints experienced by a

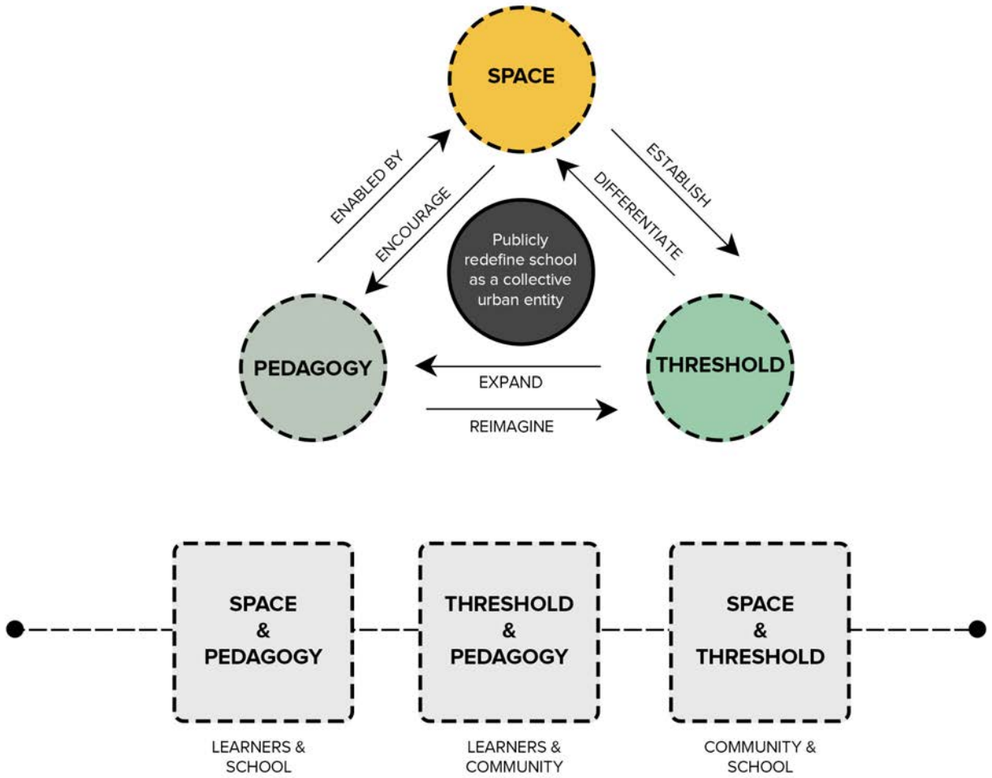


Fig. 2.4.2. Design concept relationship matrix (Naidoo 2020)

building due to a scalar condition larger than itself. The dissertation responds to ‘internal logic’ through the theme of building for pedagogy and ‘external logic’ through the theme of building as a public threshold.

The dissertation narrows down the analysis of space to two concepts. Space in relation to threshold and space in relation to pedagogy. An adaptation of Cleveland & FIsher (2013:11) relationship diagram has been used to guide the design process of the dissertation. This diagram assisted in understanding the intimacies of the relationship amongst the three themes. The relationship between space and pedagogy is intended to achieve a learning environment that challenges traditional approaches by allowing for the qualitative social activities of learning. Meanwhile the space and threshold relationship is directed towards stimulating a community school relationship. This relationship is intended to widen the interaction between learners and community members allowing for a mutually stimulating learning environment.

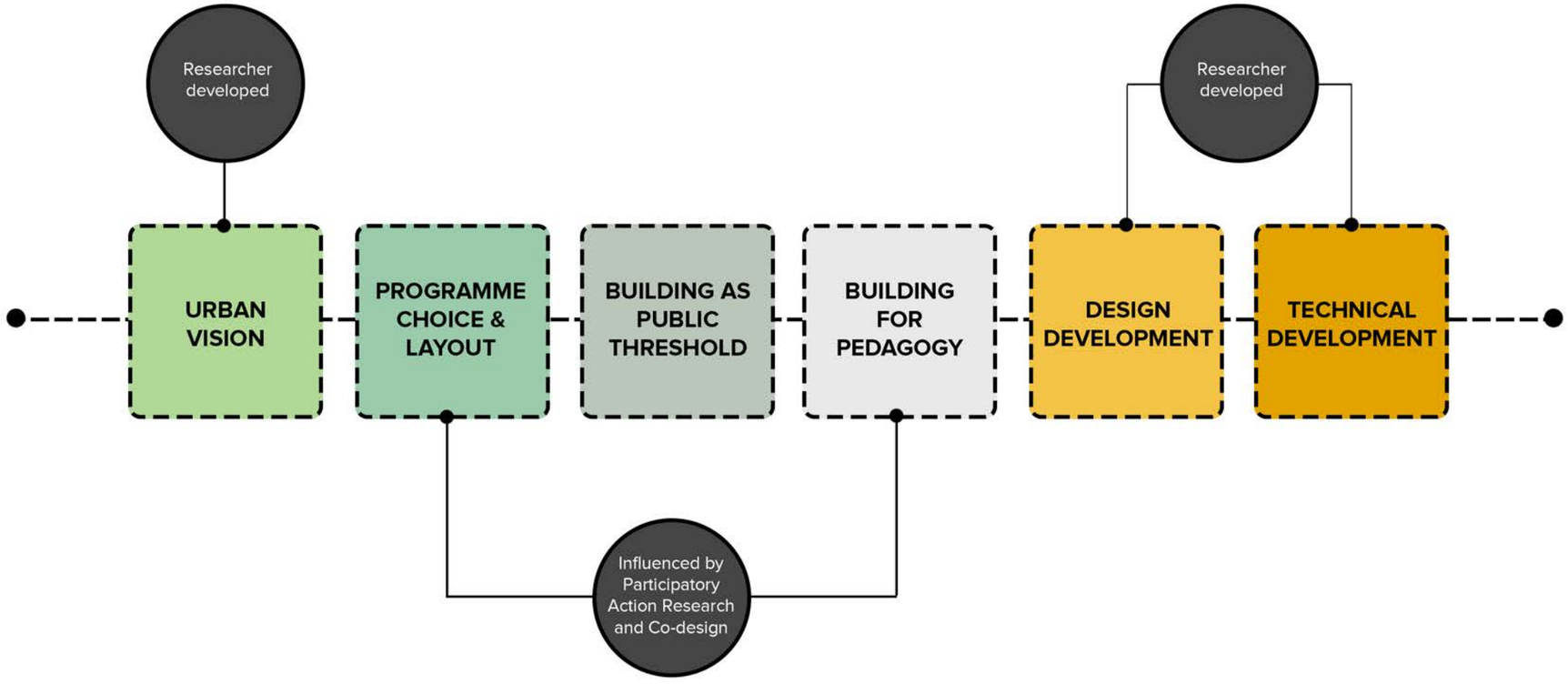


Fig. 2.4.3. Design concept relationship matrix (Naidoo 2020)

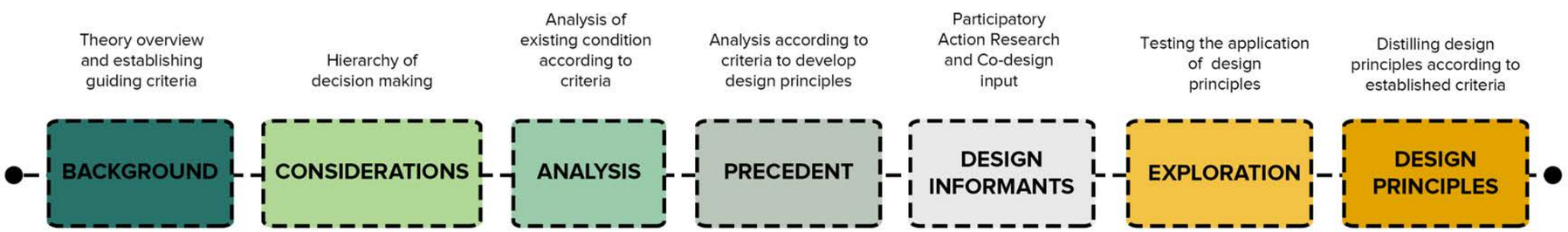


Fig. 2.4.4. Design process overview (Naidoo 2020)

4.2 Urban Vision

Before building schools and jumping to the how, we must first ask the question of why we are building schools. The building of schools across the world has pushed the limitations of education by using the building of schools as an instrument for greater change (Wood 2019:9). School context and the social interaction within that context play a heavily weighted role in promoting or inhibiting a culture of learning within the school environment. This is particularly true within the South African context, where a study found that social context impacts a school's culture of learning (Weeks 2012:4). Schools that succeeded in their social context were able to establish a sense of pride in their school (Weeks 2012:4).

> "*Ecosystems are defined by the network of interactions among organisms, and between organisms and their environment*" (Mueller & Toutain 2015: 6).

Tsako Thabo Secondary School, along with multiple other government schools with a shared typology, in Mamelodi East, sit as broken links within that ecosystem. An overview of contextual mapping done in the area, highlights the evident lack of community support structures and the large number of educational facilities. However, there is a missed opportunity in that these educational facilities are mostly isolated from the community. The infrastructure and facilities of these educational environments could serve as community support structures, instead of remaining dormant when the school is not active.

> *"This is the best time for us to be thinking creatively. We can't go back to thinking those old models are going to serve us in the same way."* (Campbell 2020)

The home environment for many of the students, are unsuited to home schooling and the increased capacity. We must rethink the role of the educational environment within its context (Campbell 2020) to prevent the disruption of education to learners and communities within economically distressed contexts.

Fig. 2.4.5. Shared typology schools in Mamelodi East (Naidoo 2020)

The urban proposal is to redefine the traditional teacher-centric classroom and corridor typology schools, within Mamelodi East, as nodes for lifelong learning. Schools that succeeded in their social context were able to establish a sense of pride in the school (Weeks 2012:4). Approaching schools as a node for lifelong learning has the potential to radiate a culture of learning into the context to establish lifelong learning as a network and element that ties communities together.

It is suggested that there is a direct link between the structure of society, quality of life and quality of education (Woods 1969). There is a thought process that sees school as urban context and urban context as school. Instead of schools serving as destinations within the urban context, they are decentralised and integrated into the urban fabric. Urban context and school tie into one another and each reinforce the structure of the other. Isolating education from its context, causes it to lose its relevance in society. School is repositioned as something that is accessible to everyone, much like the streets of the city that are accessible to the public (Woods 1969).

It is an interesting notion to think of the school as something that belongs to society. In the same way that economic activity, in Mamelodi East, sprawls out and takes ownership of the streets, the school environment can redefine itself to do the same and tie itself into its context. The school then becomes essential to the character and quality of that urban environment. Belonging is not limited to the thin layer of location. It is rather multi-faceted and constructed from meaning and association of place. Multiple layers of opportunities for engagement and exchange with one another contributes to the sense of belonging (Hamdi 2010:32).

Fig. 2.4.6. Urban vision (Naidoo 2020)

The approach supports Herbraken's theory of creating 'support structures' instead of buildings (Hamdi 2010). These support structures/systems have adaptable potential allowing "liberating range of choice". However, this range exists within limitations that are set by the affected parties involved. This approach supports the design intention of a school that starts to inform an urban grain to tie community and school together.

The built form is therefore not a building but rather a support structure that is descriptive in certain areas and non-descriptive in others. Positioning schools as societal support structures provides the Government with direction on the approach they should have to public school infrastructure. By providing base infrastructure and allowing communities, alongside the school, to grow and develop the educational environment it starts to create elements of a robust community through creating a sense of ownership and responsibility of the school environment. (Hamdi 2010).

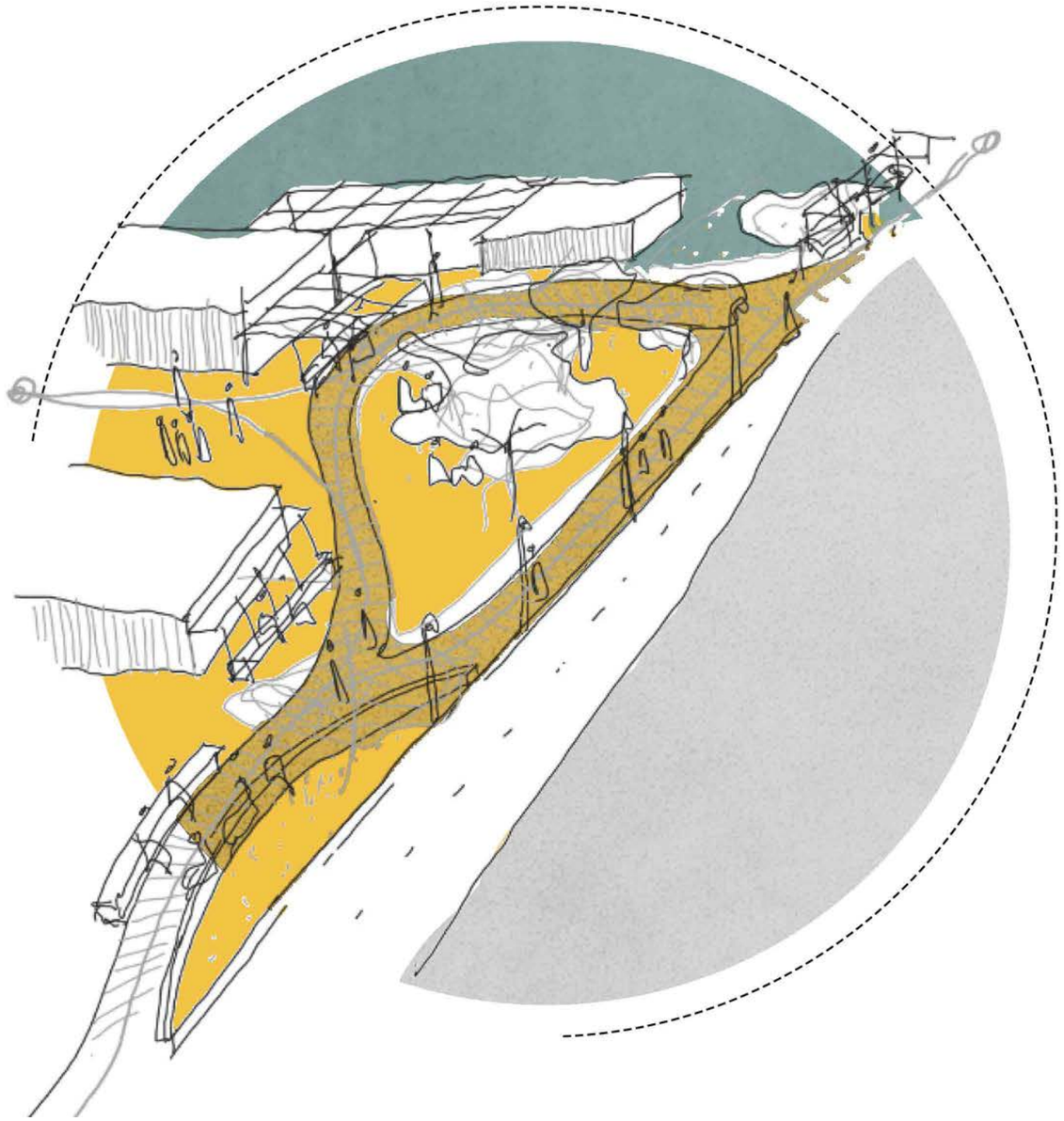


Fig. 2.6.7 Urban Vision (Naidoo 2020)

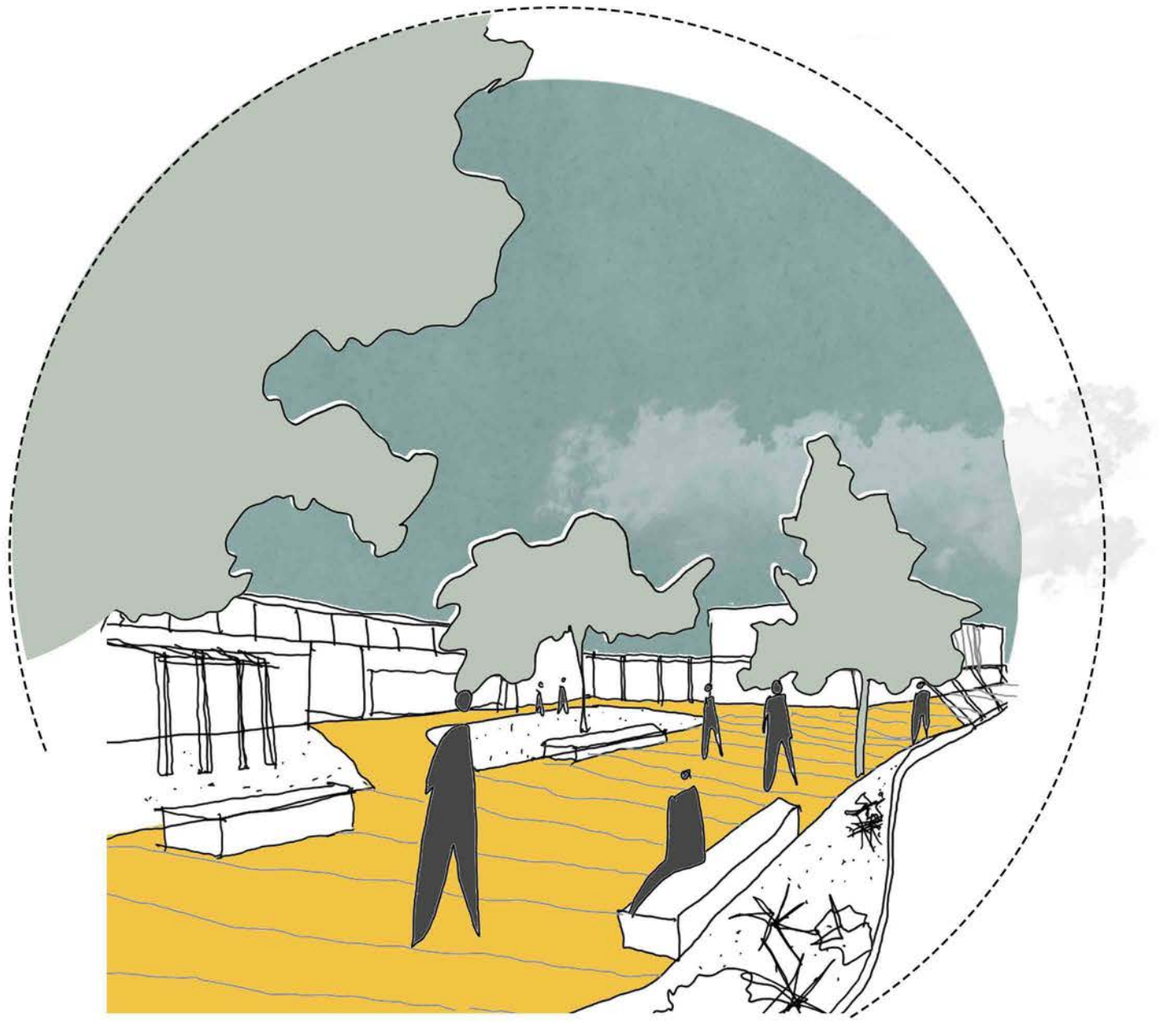


Fig. 2.6.8. Urban Vision (Naidoo 2020)

Fig. 2.6.9. Urban Vision (Naidoo 2020)

4.3 User and Programme

4.2.1 User

The programme is directed towards the core user being the High School learner and staff member. The secondary user is based on the Mamelodi East community member, with a specific focus on the unemployed. This is to address the unemployment margin within the country that is as a result of traditional static knowledge transfer (Weeks 2012:1).

Fig. 2.4.10. User groups (Naidoo 2020)

4.2.2 Programme intention

The programme supports the non-spatial conversation about promoting a community-school relationship. The intention is to reposition the role of public schools, in Mamelodi East, as a support structure for lifelong learning. Repositioning these schools in this context is intended to support the notion of a school as a node for societal transformation (Global Education Futures 2018:7).

On a contextual level the programme responds to the severe lack of community support facilities, the high unemployment rate and the high concentration of educational facilities in Mamelodi East (as reflected in 2.4 Educational Context). Redefining the role of a school within this context contributes to the need for community support structures.

4.2.3 Programme Structure

Programme structure can be classified according to primary, secondary and tertiary elements. The relationship between these programmes are addressed through a layered approach that speaks back to the urban vision (see 4.2 Urban Vision).

The layered approach deals with degrees of interaction between elements within the educational ecosystem and this way provides a structure to guide the spatial response to the programme.

The outermost layer interacts on an urban level and responds to the urban vision proposal with programmatic elements that branch off from the core school. These elements tie the school into its context and start informing the urban grain.

Programme Structure			
Structure	**Layer**	**Relationship**	**Programme**
Primary	Innermost layer	Learner engagement with education	Core school functions influenced by policy
Secondary	Middle layer	Learner interaction with community	Library/resource centre Skills development centre Sports grounds
Tertiary	Outermost layer	Community Interaction with context	Publicly accessible programme: Economic activity on school periphery

Fig. 2.4.11. Programmatic structure (Naidoo 2020)

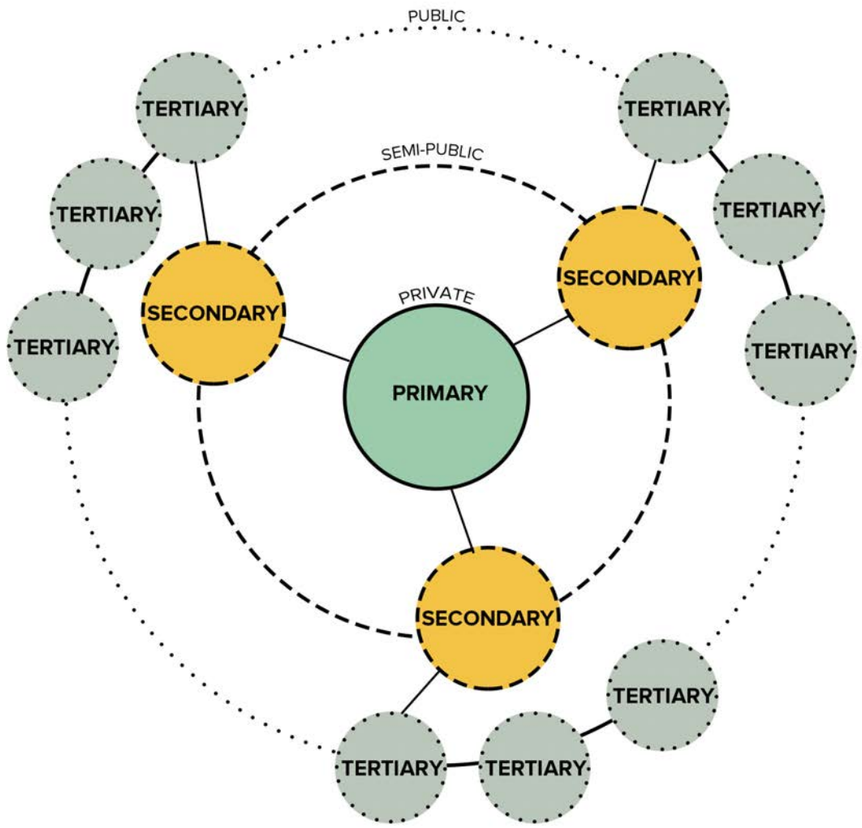


Fig. 2.4.12. Programme interaction (Naidoo 2020)

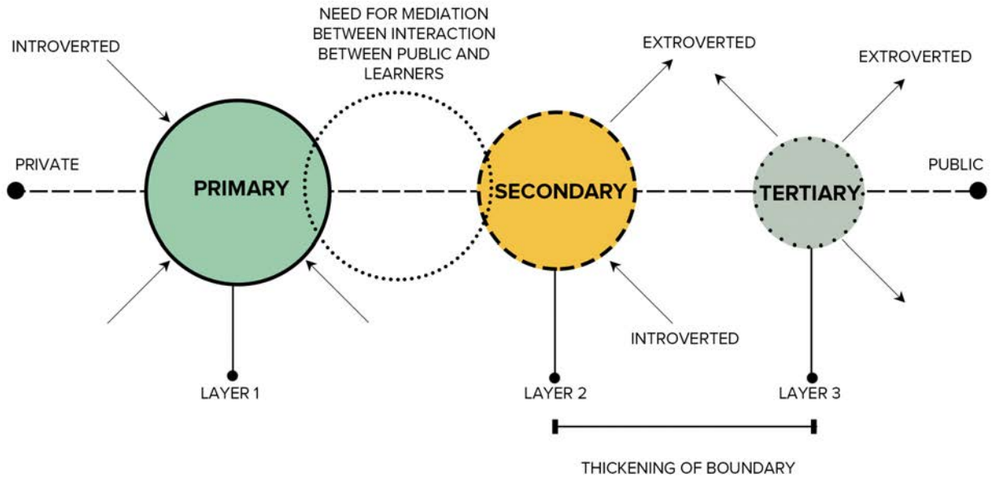


Fig. 2.4.13. Programme considerations (Naidoo 2020)

The middle layer is about introducing a wider learning dynamic through the social interaction between community member and learner. This layer opens up the school to the public to have access to education and resources. The focus here is on community education and learner alternative education, to challenge static knowledge transfer from traditional educational methods (Weeks 2012:1). The innermost layer is reserved for the core functioning of the school and limits interaction between community and school. The focus here is on learner education.

4.2.4 Programmatic Informants

Using Participatory Action Research and co-design games (see chapter 3 for detailed investigation), the programmatic choice and layout has been developed. These methods have assisted the dissertation in gaining further insight into the role of specific programmes in the school, areas that the school lacks in as well as the relationship of programmes to each other.

4.2.4.1 Programme choice

RESEARCH & FINDINGS

Data collection date:
2019-2020

Data collection time:
10h30-11h45

Researcher/s:
UP Architecture Honours Mamelodi Group 2019 & Naidoo 2020

Participant/s:
Tsako Thabo Learners

Location:
Tsako Thabo Secondary School & Online

Collection method:
PAR and co-design

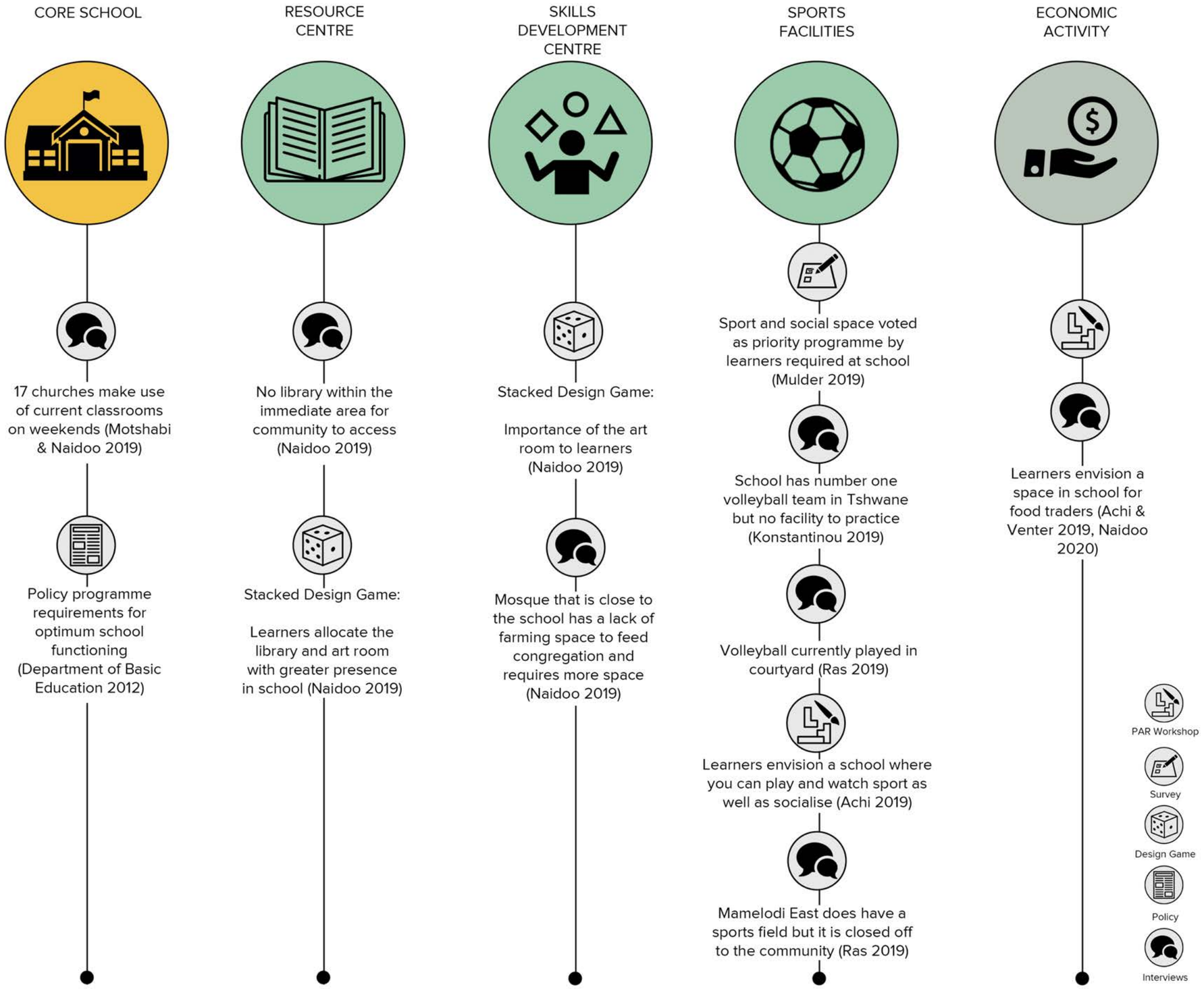


Fig. 2.4.14. Programme choice informants (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019-2020

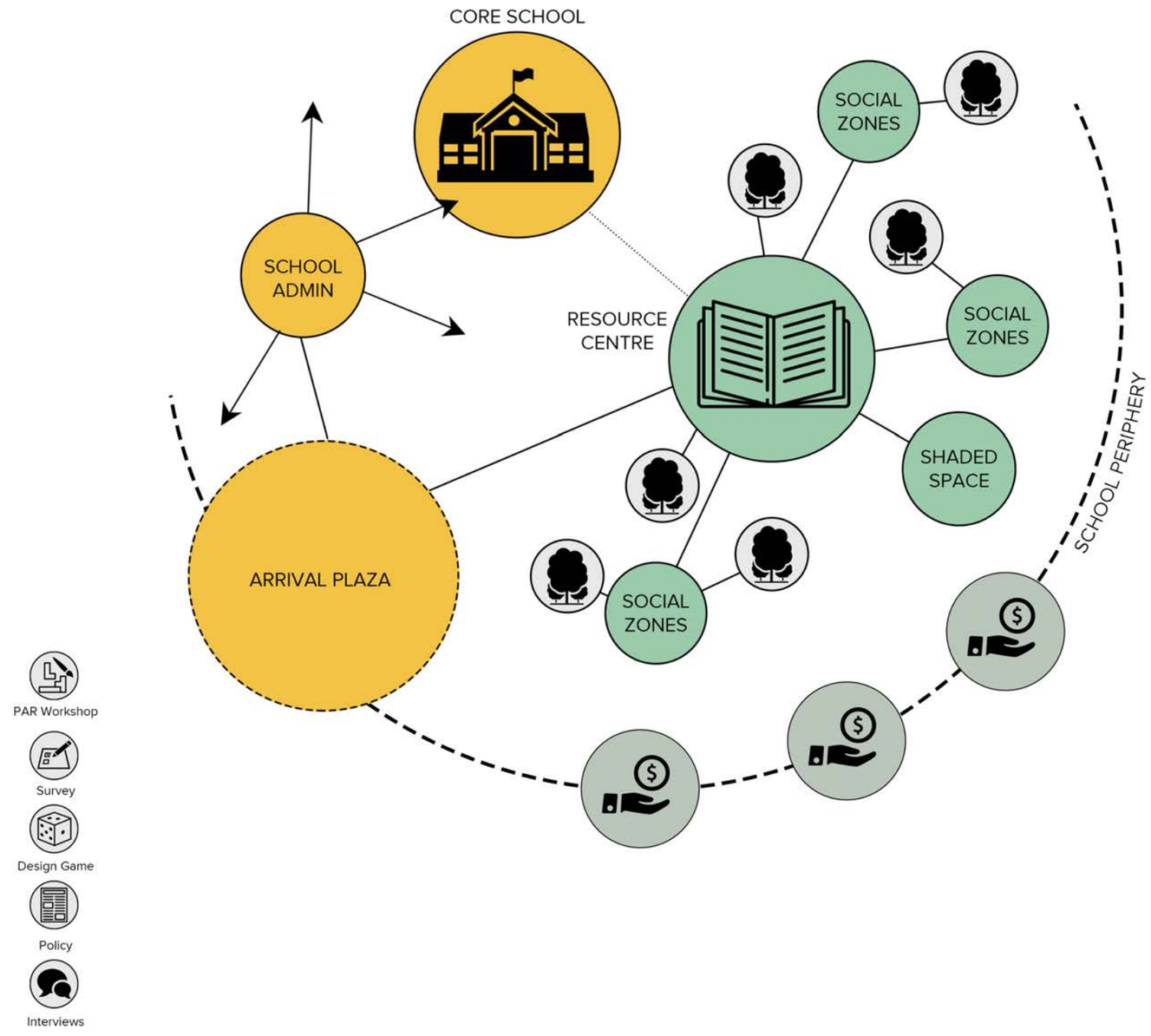
Data collection time:
10h30-11h45

Researcher/s:
UP Architecture Honours Mamelodi Group 2019 & Naidoo 2020

Participant/s:
Tsako Thabo Learners

Location:
Tsako Thabo Secondary School & Online

Collection method:
PAR and co-design



Tour Guide Design Game outcome:

Learners allocate library space around trees as the most relaxing space (Naidoo 2019)

Learners feel safer with passive surveillance to school by admin (Achi 2019)

Social zones in school around library (Achi 2019)

Vendors on school periphery to serve school and community (Achi & Venter 2019)

Learners envision shaded space around library through school design workshop (Achi & Venter 2019)

Pause space by transport waiting area (Achi & Venter 2019)

Persona Design Game outcome:

Explode programme to encourage movement around site and opportunities for interaction (Naidoo 2020)

Fig. 2.4.15. Programme layout informants (Naidoo 2020)

4.2.5 Programmatic requirements

The basic programmatic requirements are based on the outline provided by the Department of Education (2012: 14-18 Annexure A-E) for optimal school functioning according to the learner capacity of 600 students.

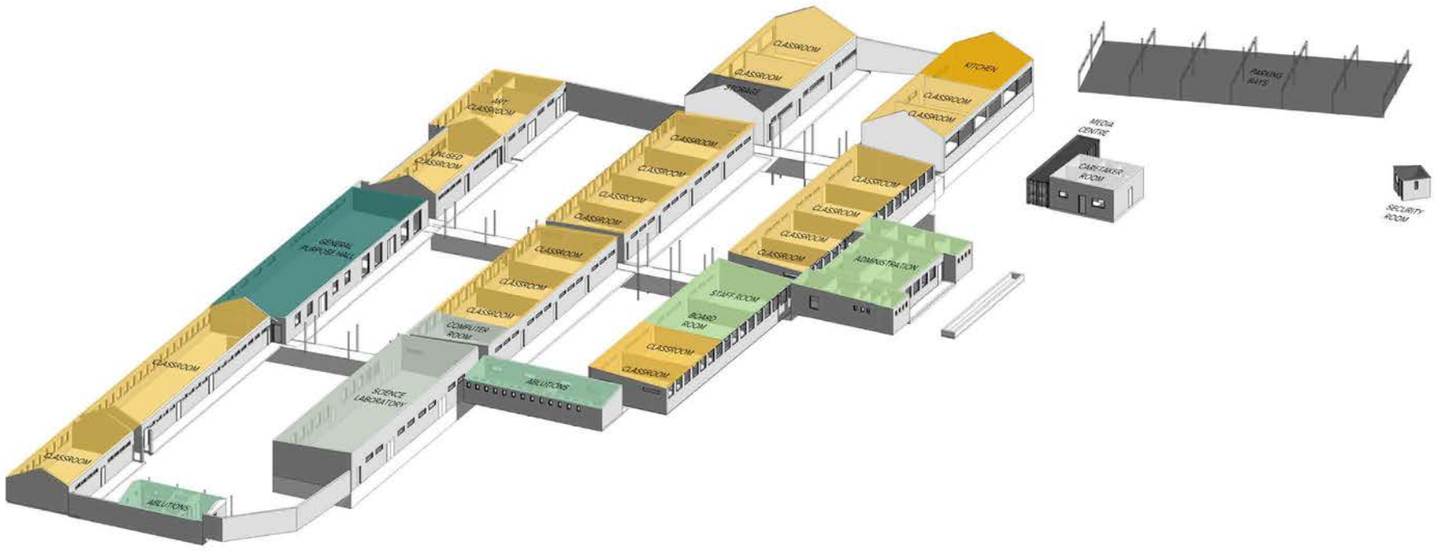


Fig. 2.4.16. Current programme allocation at Tsako Thabo according to policy requirements (Naidoo 2020)

Department of Basic Education 2012: 14-18 Annexure A-E		
Secondary School :Large Secondary (601-1000)		
Tsako Thabo: 692 Learners		
Spaces Required	**Optimum Functional Quality**	**Optimum Unit Size (m2)**
Educational Spaces		
Classrooms	25	60
Computer room	2	80
Media centre	1	120
Multipurpose classroom	2	80
Science laboratory	2	80
Social Science room	1	80
Storage areas/spaces	1	15
Administration Spaces		
Principal's office	1	20
Deputy Principal's office	2	15
Administration office	1	20
Reception area	1	15
Storage areas/spaces	1	15
Strong room	1	10
Printing room	1	15
Staff room	1	60
Pastoral care 1: Counselling rooms	1	15
Pastoral care 2: Sick rooms	2	15
Heads of Departments offices	6	15
Kitchenette	1	20
Supporting Spaces		
Food garden	1	20
Kitchen	1	20
Nutrition centre or food storage facility	1	15
Dining room	1	120
Security room	1	6
General purpose hall	1	180
Parking bays	27	Subject to school size
Caretaker room	1	15
Storage areas/spaces	1	25
Ablutions	34	-
Soccer/rugby field(optional)	0	60x100
Netball/ Volley ball court (optional)	0	16x31

Fig. 2.4.17. Policy Programme Requirements (Department of Basic Education 2012)

4.4 Building as Public Threshold

4.4.1 Background

4.4.1.1 The meaning of edge: Threshold and transition

> *"For the architect, the spaces or gaps between ground, walls and ceiling is not nothingness, quite the contrary: the very reason for his activity is to create the hollow in order to contain. He will give it a concrete form to offer that hospitality and relative freedom of movement which people require" (Von Meiss 1990:101).*

According to Gehl (2014:75), the edge refers to the interaction between building and city and has the power to influence the experience of that city. In the case of public schools within Mamelodi East, a harsh boundary has been established as a result of policy dictating a strict edge condition consisting of a 1.8m high fence surrounding the site (Department of Basic Education 2012). How the edge is dealt with is vital to the resultant effect felt by the interactor. Gehl (2014:76) breaks down the average walking pace of a person and concludes that humans need stimulation every 5 to 6 meters to maintain interest. However, in the case of flat vertical elements such as monotonous fencing, the experience lacks enticement to interact with the architecture (Gehl 2014:76). Rethinking boundary as threshold space allows for a connection to be established between previously detached entities (Boettger 2014:10). Threshold allows for the opportunity to "interrupt spatial boundaries" and creates a connection between those entities (Boettger 2014:10).

4.4.1.2 Boundaries within the South African context

Boundaries within a Western and African context differ significantly. In a westernised context, physical boundaries are used to demarcate space. In this scenario, this mechanism is used to distinguish ownership over private space. This varies when analysing the African context, where most of the space is classified as public and only under specific conditions will a space be defined as private (Rensburg & Costa 2008:32). Within the South African context, particularly under the Apartheid regime, boundary was used to display authority and is therefore experienced in a negative light (Rensburg & Costa 2008). Therefore, when addressing this within Mamelodi East we have to be cognizant of these conditions.

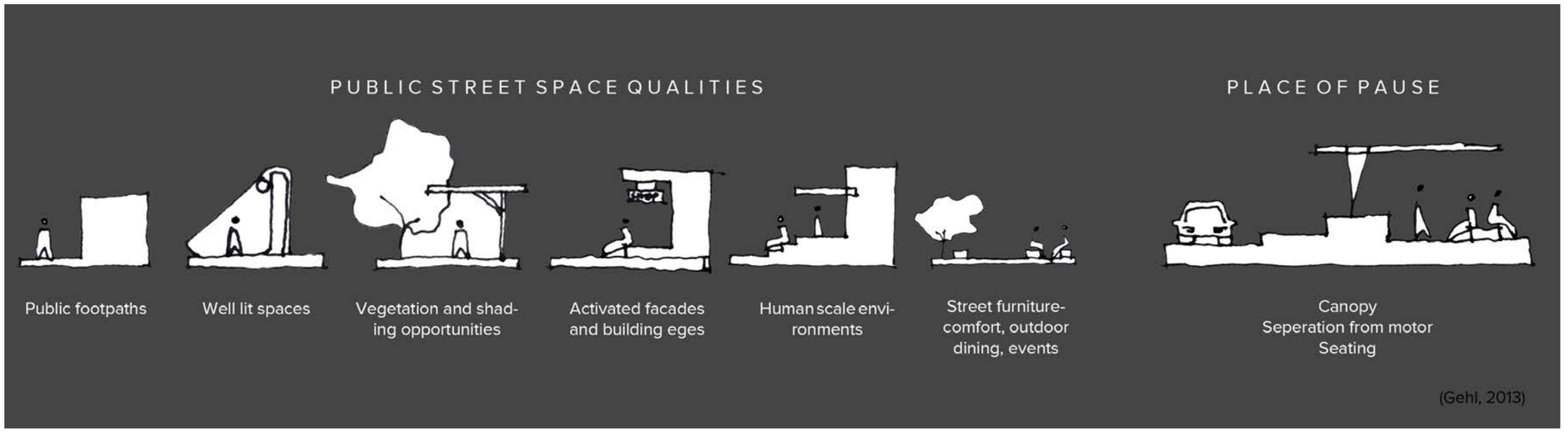


Fig. 2.4.18. Gehl (2013) principles for public space design (Naidoo 2020)

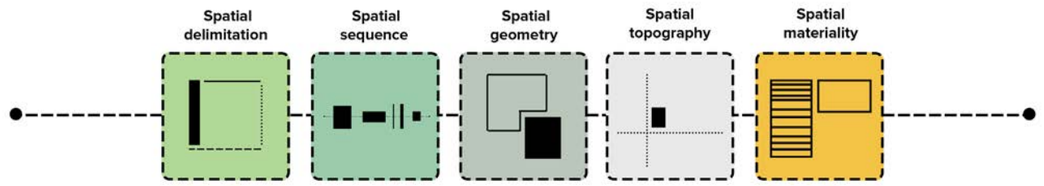


Fig. 2.4.19. Threshold parameters (Naidoo 2020)

4.4.1.4 Parameters for Analysis

Boettger (2014:25) pays homage to historical precedents from the Acropolis to the Pantheon and the lessons these built structures provide in furthering our understanding of threshold and transition mechanisms. As a result of the author's detailed investigation of multiple historical precedents, it can be understood that the spatial configuration and interaction between architectural elements, such as the vertical and horizontal planes, contribute to the experience of threshold and transition.

The dissertation adopts Boettger (2014:57) following parameters for threshold analysis to structure the development of design principles that deal with building as a public threshold, to encourage a connection between community and school:

- Spatial delimitation - edges and boundaries that encourage or prevent movement
- Spatial sequence - transition and movement
- Spatial geometry - organization of the threshold in relation to the rest of the architecture
- Spatial topography - positioning of architecture on the site
- Spatial materiality - Independence of threshold to the rest of the architecture

4.4.2 Considerations: Hierarchy of decision-making

Due to the focus and acknowledging that the proposal is to publicly redefine a schooling environment, the dissertation is cognizant of the factors that the architecture needs to address when allowing for interaction between the public and private realm. These factors have been collated into the following points to guide the design decision-making process:

- Vulnerabilities - Safety and security
- Mediation - Access and control
- User groups - Interaction with motor, pedestrian, learner/staff, community member
- Energy flux - inactive and active hours
- Opportunity - Incremental growth as a node and interaction

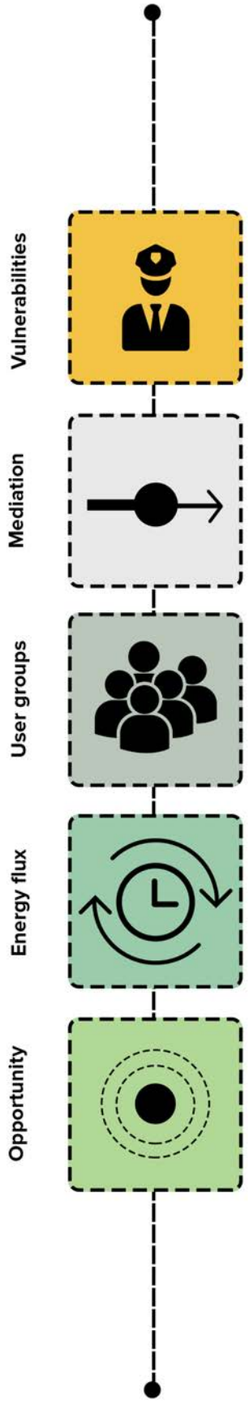


Fig. 2.4.20. Threshold considerations (Naidoo 2020)

4.4.3 Analysis of the Existing

Spatial delimitation of school

- Site bound by hard edge to public
- Inactive boundary
- Controlled access

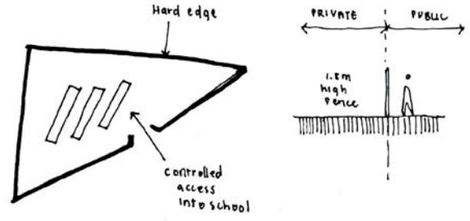


Fig. 2.4.21. Spatial delimitation analysis of Tsako Thabo (Naidoo 2020)

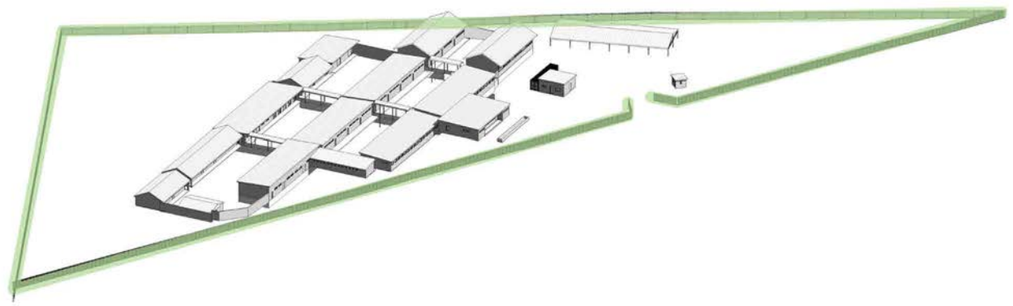


Fig. 2.4.22. Spatial delimitation analysis of Tsako Thabo (Naidoo 2020)

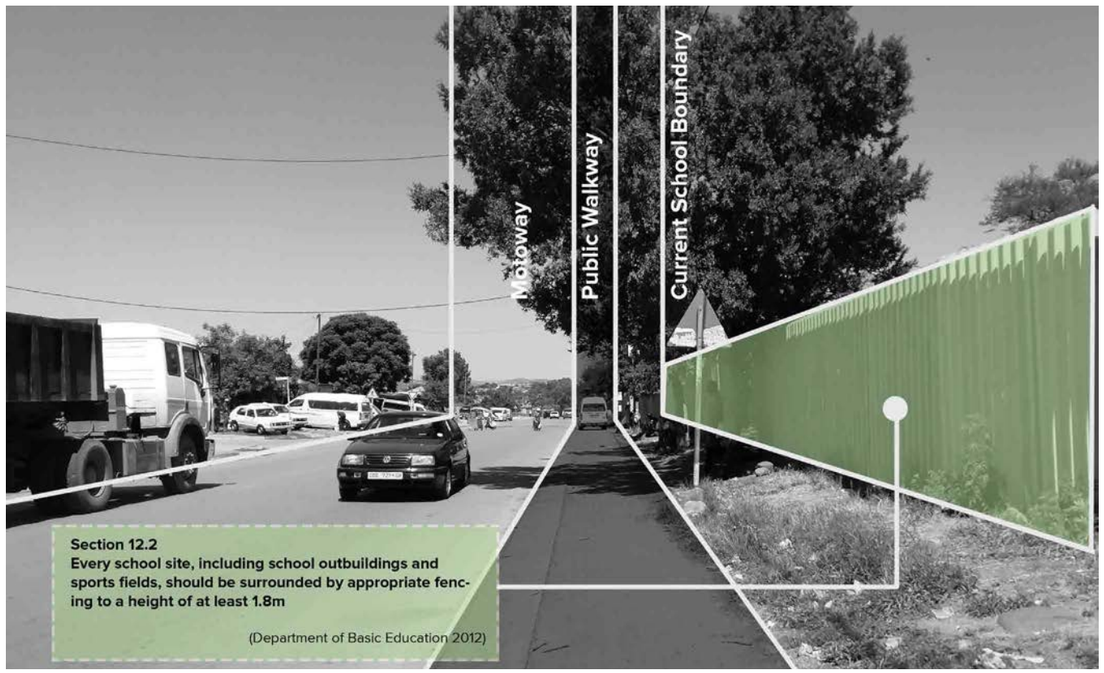


Fig. 2.4.23. Current boundary condition at Tsako Thabo (Naidoo 2020)

Spatial delimitation of economic edge

- Activated edge condition onto public
- Layering of activity as threshold between public and private

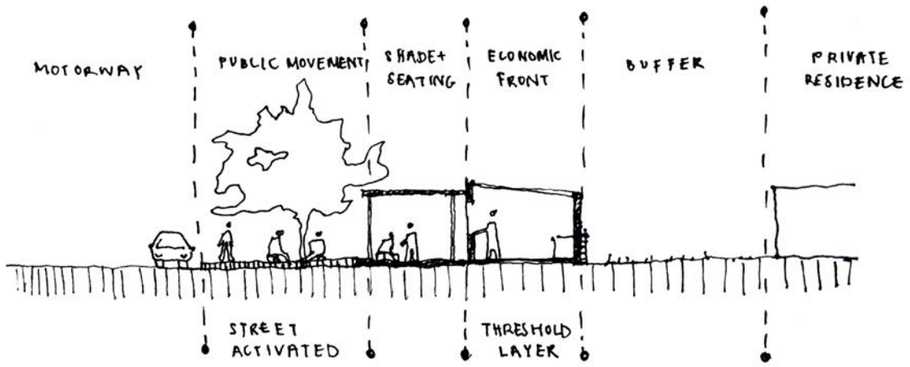


Fig. 2.4.24. Typical economic edge condition in Mamelodi East (Naidoo 2020)

Fig. 2.4.25. Typical economic edge condition in Mamelodi East (Naidoo 2019)

Spatial sequence

- Minimal progression and transition
- Drastic shift from public to private
- Lacks spatial differentiation

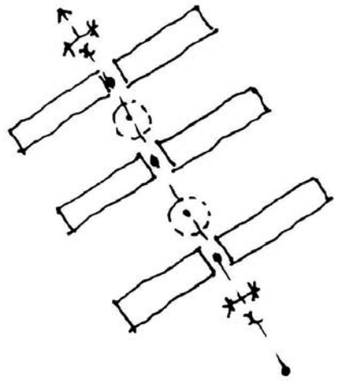


Fig. 2.4.26. Spatial sequence analysis of Tsako Thabo (Naidoo 2020)

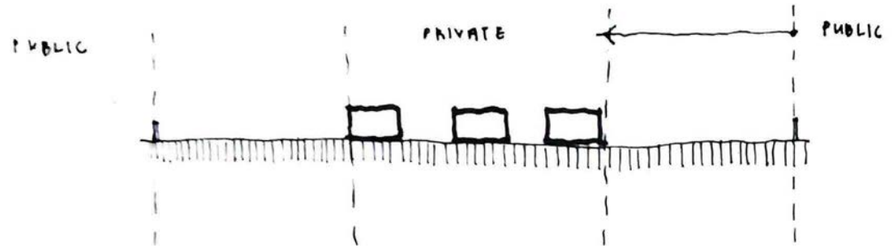


Fig. 2.4.27. Spatial sequence analysis of Tsako Thabo (Naidoo 2020)

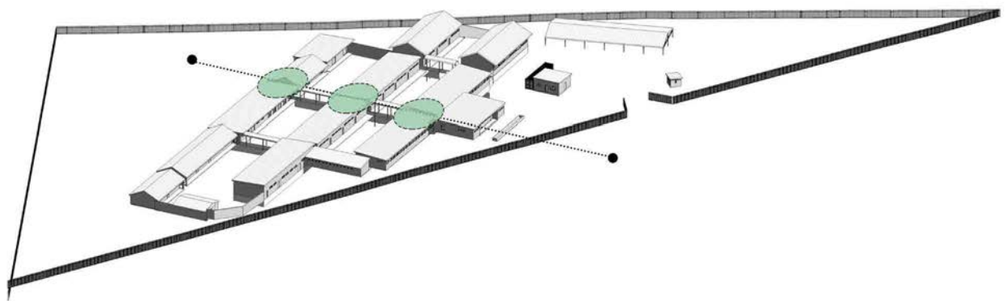


Fig. 2.4.28. Spatial sequence analysis of Tsako Thabo (Naidoo 2020)

Spatial geometry
- Uniform geometric condition
- Lacks threshold opportunity

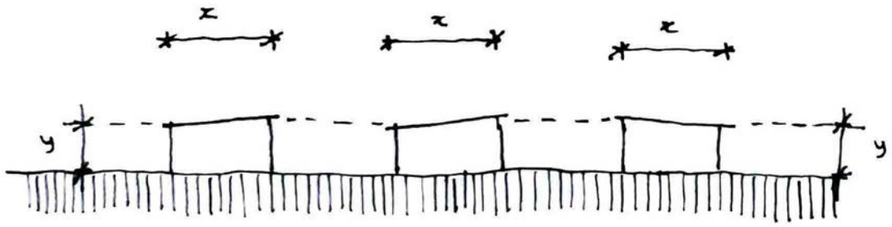


Fig. 2.4.29. Spatial geometry analysis of Tsako Thabo (Naidoo 2020)

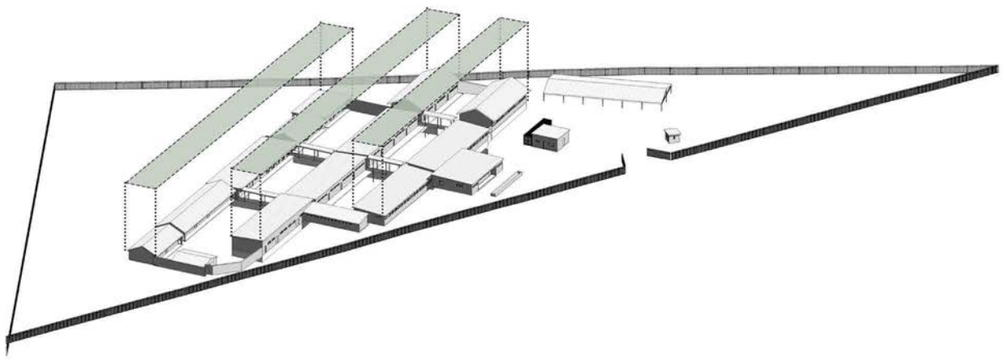
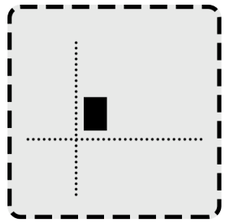


Fig. 2.4.30. Spatial geometry analysis of Tsako Thabo (Naidoo 2020)



Spatial topography
- Limited engagement with site boundary

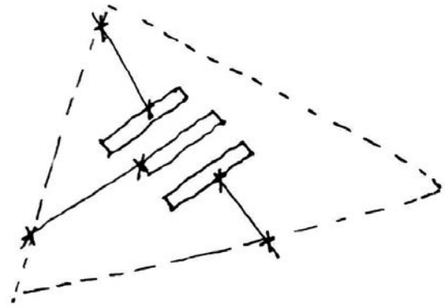


Fig. 2.4.31. Spatial topography analysis of Tsako Thabo (Naidoo 2020)

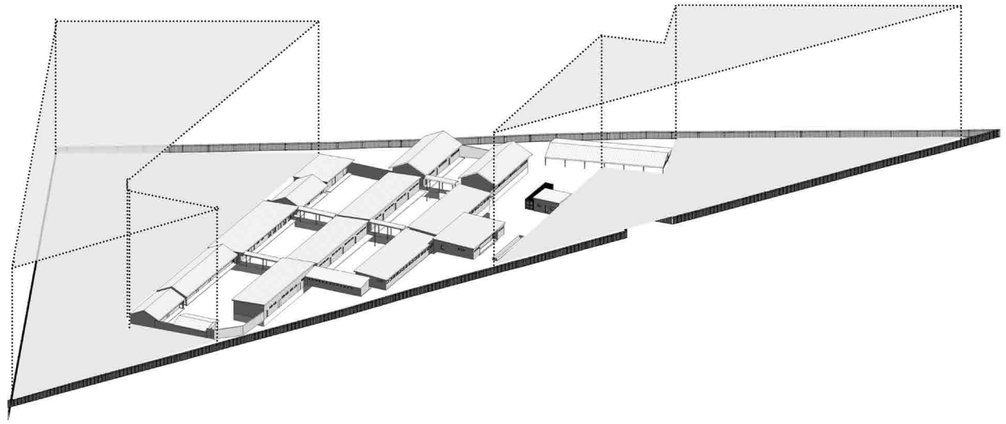
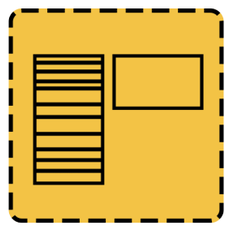


Fig. 2.4.32. Spatial topography analysis of Tsako Thabo (Naidoo 2020)



Spatial materiality
- Uniform material condition

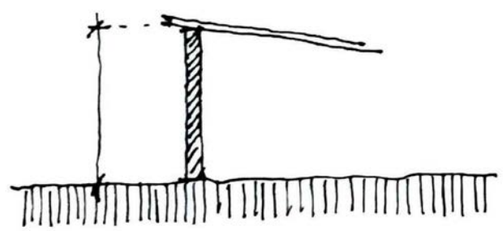
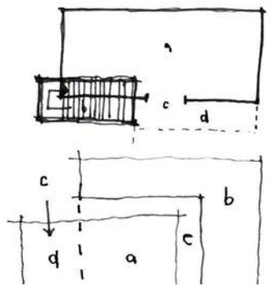
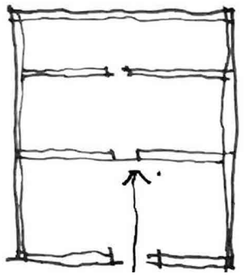
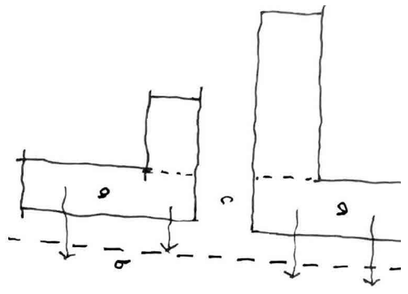
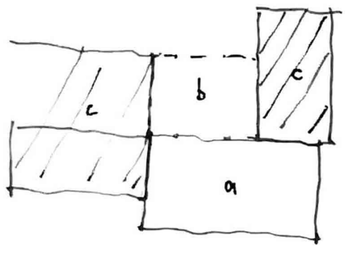
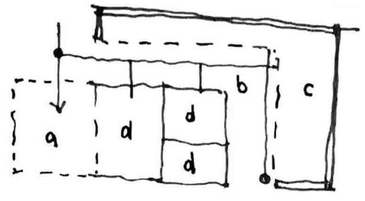
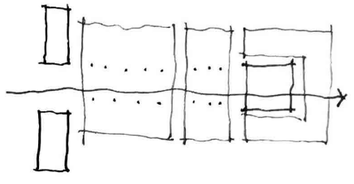
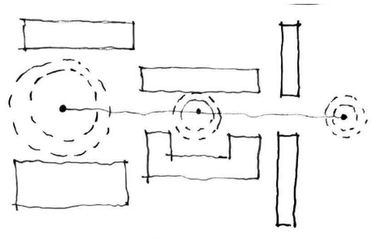
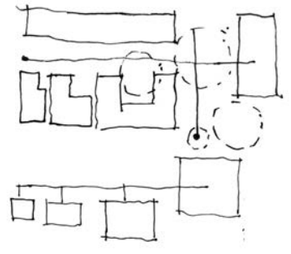
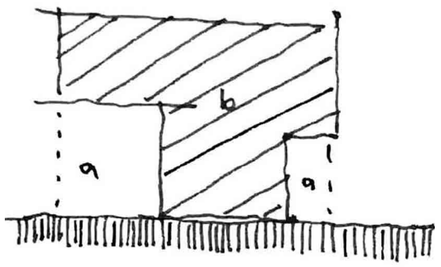
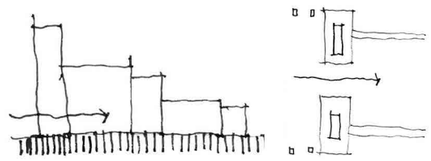
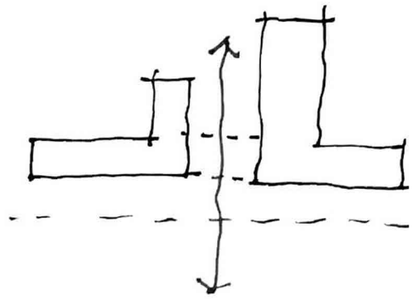
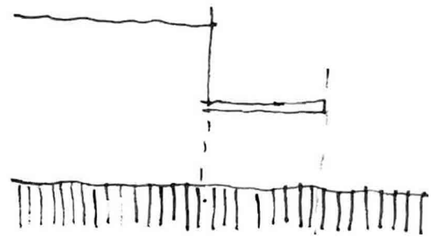
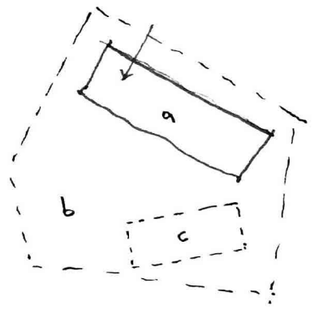
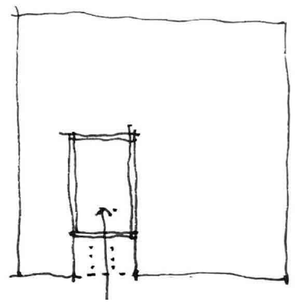
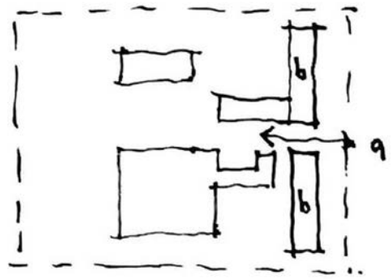
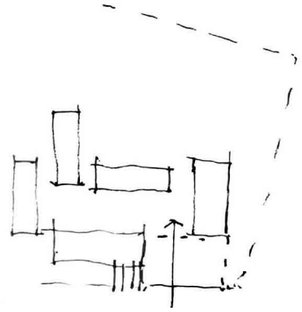
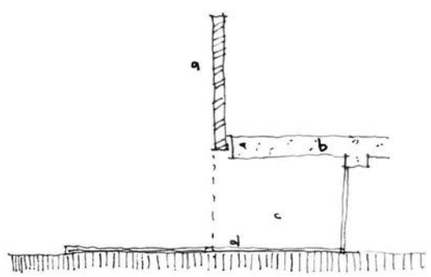
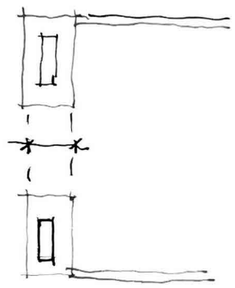
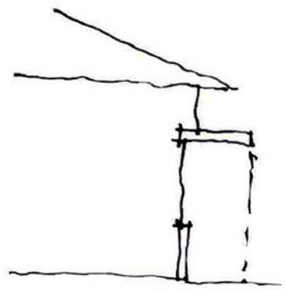
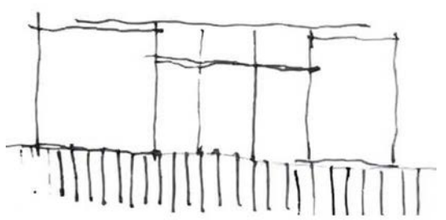
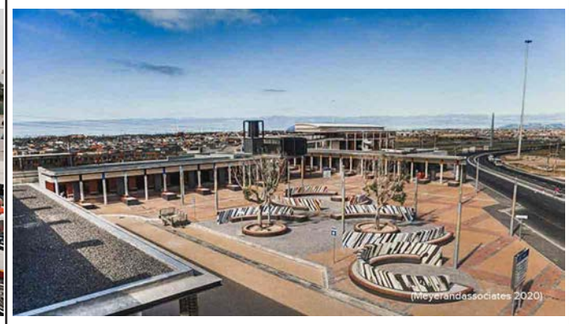
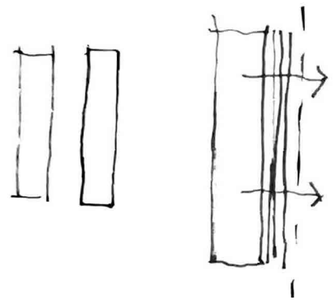
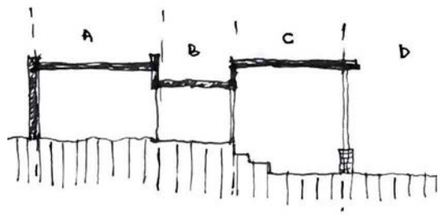
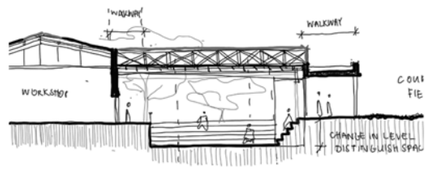
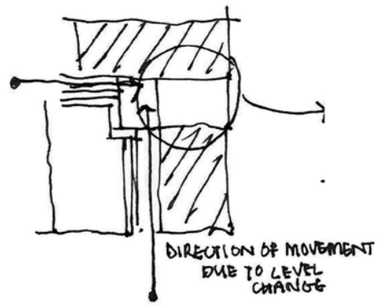
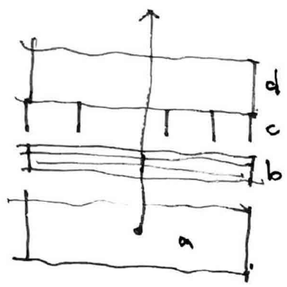
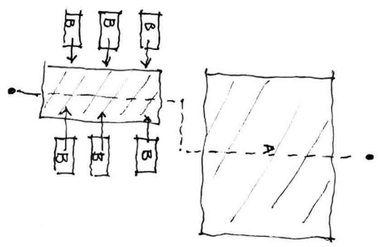
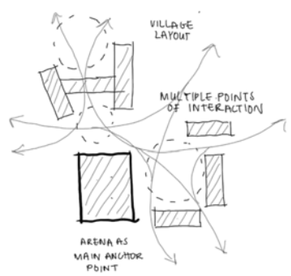
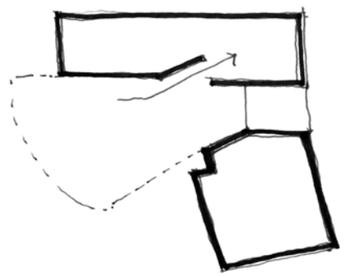


Fig. 2.4.33. Spatial materiality analysis of Tsako Thabo (Naidoo 2020)

4.4.4 Precedent

	Curtin University Midland Campus	Temple of Karnak	Usazazo	Hermanus Community Day Centre
	• Type: Educational facility • Architect: Lyons, Silver Thomas Hanley • Location: Midland, Australia • Year: 2019	• Type: Temple • Location: Karnak, Egypt	• Type: Secondary school • Architect: Wolff architects & Jo Noero • Location: Khayelitsha, Cape Town, South Africa	• Type: Community centre • Architect: Gallagher Lourens architects • Location: Hermanus, Cape Town, South Africa • Year: 2015
				
Spatial Delimitation				
	• Top image: Service space (b) serves as threshold to the rest of the architecture (a) and frames the threshold entrance (c). The framing creates an external zone (d) • Bottom image: The core building/served space (a) is layered with a boundary of serve spaces (b) and circulation (e). The break in this boundary allows for entry (c) into the lobby of the building (d). Lobby sits unbuffered to the public	• Impenetrable boundary on periphery • Break in boundary at threshold	• The classrooms (a) of the school serve as boundary to the site, with openings onto the street edge)b) to encourage interaction	• Building (c) forms a hard edge with the site and frames the forecourt (a) to establish point of arrival • Break in buildings (c) forms the threshold (b) into the site
Spatial Sequence				
	• The permeability of the lobby (a) allows for movement through	• Space progressively reduces as you transition from public to private.	• Buildings hold internal space along a transition route • Path narrows and widens to control movement and pause	• Main spine used with the progression of public waiting areas. Waiting areas reduce in size as you transition from public to private

	Curtin University Midland Campus	Temple of Karnak	Usazazo	Hermanus Community Day Centre
Spatial Geometry				
	• Threshold (a) cuts away at the massing b) to form entry/arrival zone	• Geometry cascades down and reduces in size as you transition from public to private • Threshold entrance has hierarchical presence	• Break in geometry distinguishes threshold into the site	• Entrance overhang lowers at public level for intimate arrival
Spatial Topography				
	• Entrance to building sits in close relation to site boundary	• Positioning of buildings (b) on site establishes intimate connection with street (a), allowing for building to form the edge	• Building entrance positioned in close relation to the site edge and provides frontage onto the street	
Spatial Materiality				
	• Brickwork facade (a) punctured with exposure of concrete elements (b) at the threshold (c) • Paving (d) differentiated in pattern and colour at the threshold	• Thickening of material at threshold allows for a deeper opening • Break in material massing highlights entrance threshold	• Breaks in the facade that interact with the street are articulated with an overhang and change in surface finish of the brickwork	• Visually permeable material at threshold allows for visual access i

	Taxi Rank No. 2	Kuyasa Transport Interchange	Liv Village	Kuyasa Library
	• Type: Taxi rank • Architect: 26'10 South architects • Location: Diepsloot, South Africa	• Type: Transport interchange • Architect: Meyer and Vorster Architects • Location: Khayelitsha, Cape Town, South Africa	• Type: Mixed use • Architect: Design WorkshopSA • Location: Cottonlands, Kwa-Zulu Natal, South Africa • Year: 2015	• Type: Public library • Architect: CCNI • Location: Khayelitsha, Cape Town, South Africa • Year: 2013-2016
				
Spatial Delimitation				
	• Building sits on edge of site to interact with street • Stairs front the public facade further stimulating interaction	• Building publicly accessible • Spatial differentiation achieved through level change	• Walkways used as threshold mechanism to buffer individual space • Level change establishes spatial differentiation	• Direct access to entrance is prevented through greater difference in level change. Longitudinal access is encouraged by making the arms of the massing accessible
Spatial Sequence				
	• Layered approach to the public • Landing (a) is fronted by stairs (b) which transitions towards intimate seating bays (c) and into the building (d)	• Arrival plaza (a) captures public • Movement stimulated through narrowing of pathway. Economic activity (b) takes advantage of this opportunity by fronting the movement route	• Series of courtyards hold space and allow for pause before entrance into individual buildings	• Movement is directed through angles in wall

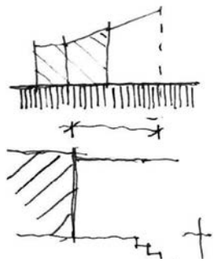
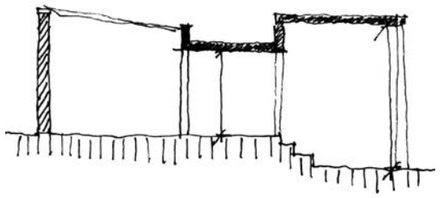
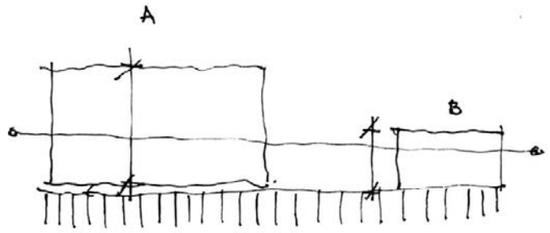
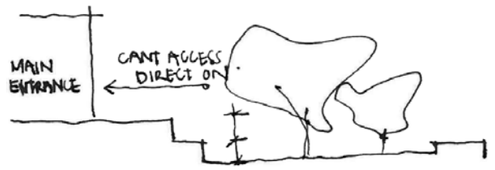
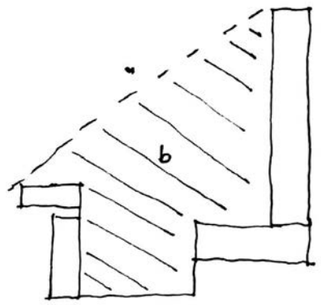
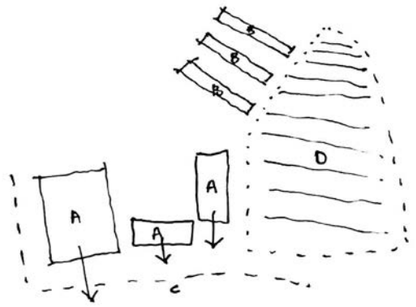
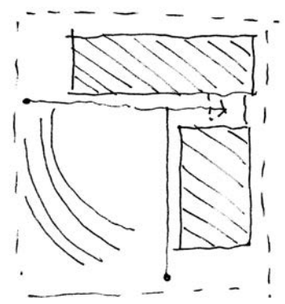
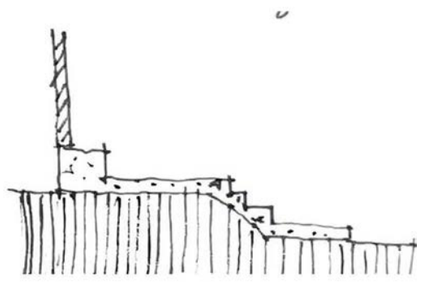
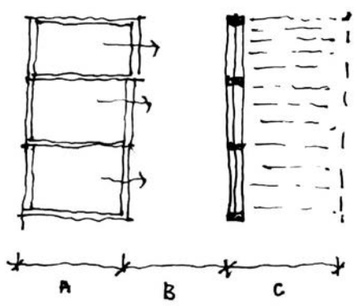
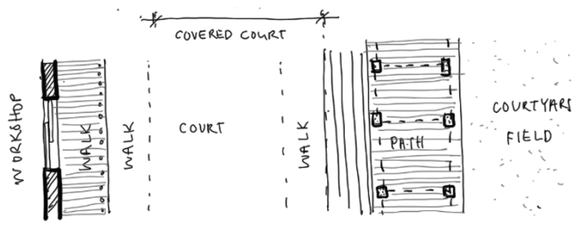
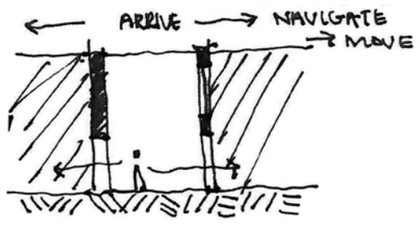
	Taxi Rank No. 2	Kuyasa Transport Interchange	Liv Village	Kuyasa Library
Spatial Geometry				
	• Top image: break in massing where roof exposes itself to form threshold space on public edge. Allows for opportunity for public to engage with the building • Bottom image: building lifts off street level to form threshold between public and private. Change in level contributes to public engagement and serves as active threshold	• Height difference used as mechanism to distinguish space and establish layers of threshold. Roof lowers over trading platform and heightens over public pathway	• Public space (a) serves a hierarchical role through the massing in comparison to private space (b)	• The roofs of the adjacent masses slope down towards the entrance to reduce the volume.
Spatial Topography				
	• Building on edge of public site boundary along arterial movement route to stimulate interaction	• Buildings capture public with a plaza (b) by setting back from the site boundary (a)	• Public activity (a) sits in close relation to site boundary (c) with private space (b) buffered by natural elements (d)	• Buildings hold site on the public edge and create framed landing space before arrival at the threshold
Spatial Materiality				
	• Material changes to robust concrete where public interacts with the architecture	• Floor finish variation between trading platform (b) and public footpath (c)	• Pathways make use of varied floor finish and create a spatial break	• The two main masses remain solid with access into the building more translucent. Material variation when the building is permeable

Fig. 2.4.34. Precedent study table conducted according to Boettger (2014:57) parameters for threshold analysis (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2020

Data collection time:
10h30-11h45

Researcher/s:
Naidoo 2020

Participant/s:
Social Inclusion Studio Lecturers from Chalmers University of Technology, Sweden

Location:
Online

Collection method:
Co-design digital design game: Interface (See Chapter 3 & Appendix 2G)

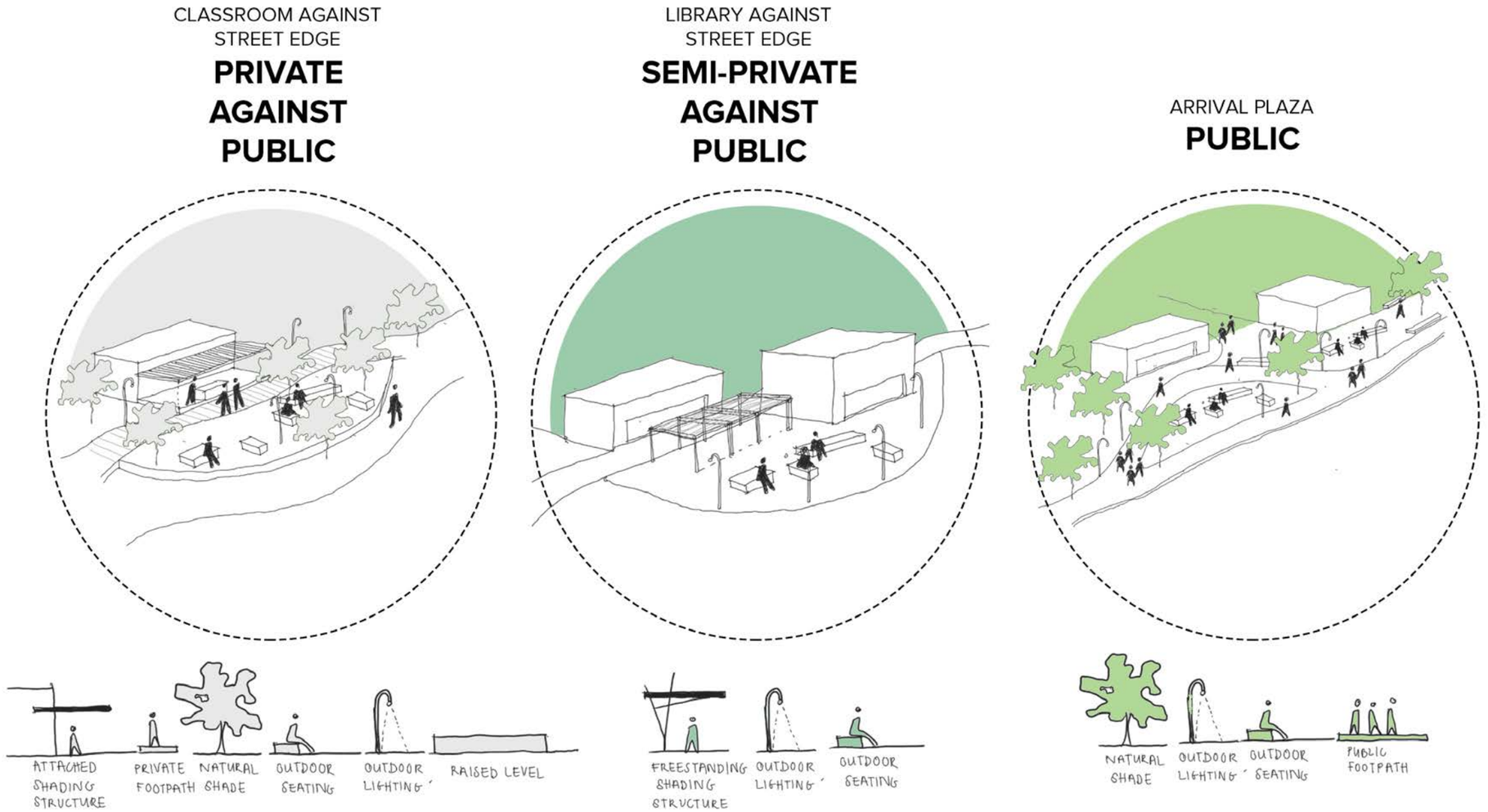


Fig. 2.4.35. Results of the interface Design game for methods of addressing varying edge conditions

The Interface digital design game resulted in a series of co-designed responses to how to deal with the edge condition. This response considered the interaction between a school and its community within the context of Mamelodi East. Each consideration was based off addressing degrees of privacy and activating the edge condition.

RESEARCH & FINDINGS

Data collection date:
2019

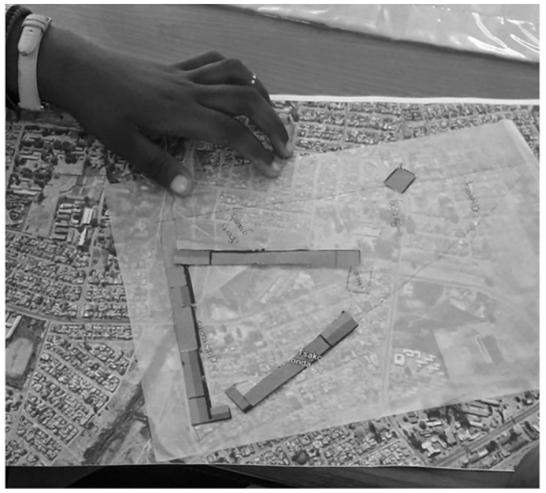
Data collection time:
10h30-11h45

Researcher/s:
UP Architecture Honours Mamelodi Group 2019 - Achi & Venter

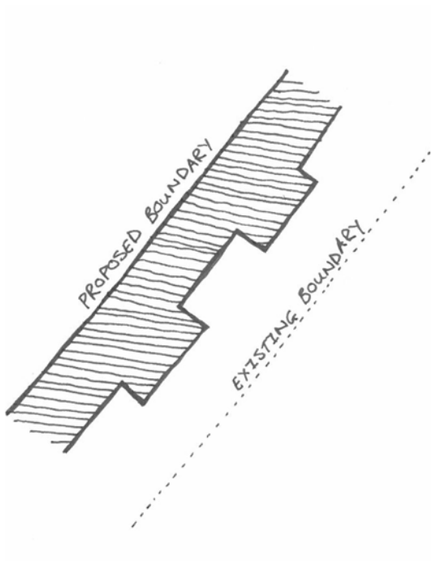
Participant/s:
Tsako Thabo Learners

Location:
Tsako Thabo Secondary School

Collection method:
Participatory Action Research workshop: Learners design their ideal school



Outcome 1: School building as boundary



Outcome 2: Activities as boundary and passive surveillance

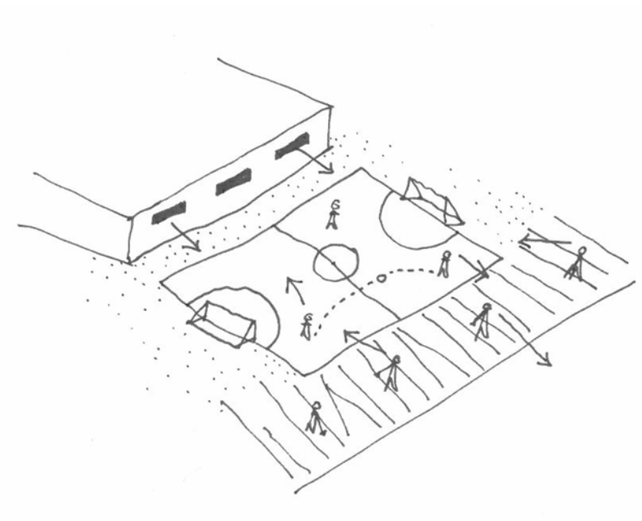


Fig. 2.4.36. PAR workshop informants on mechanisms to deal with edge (Adapted from UP Arch Hons Mamelodi Group 2019 - Achi & Venter)

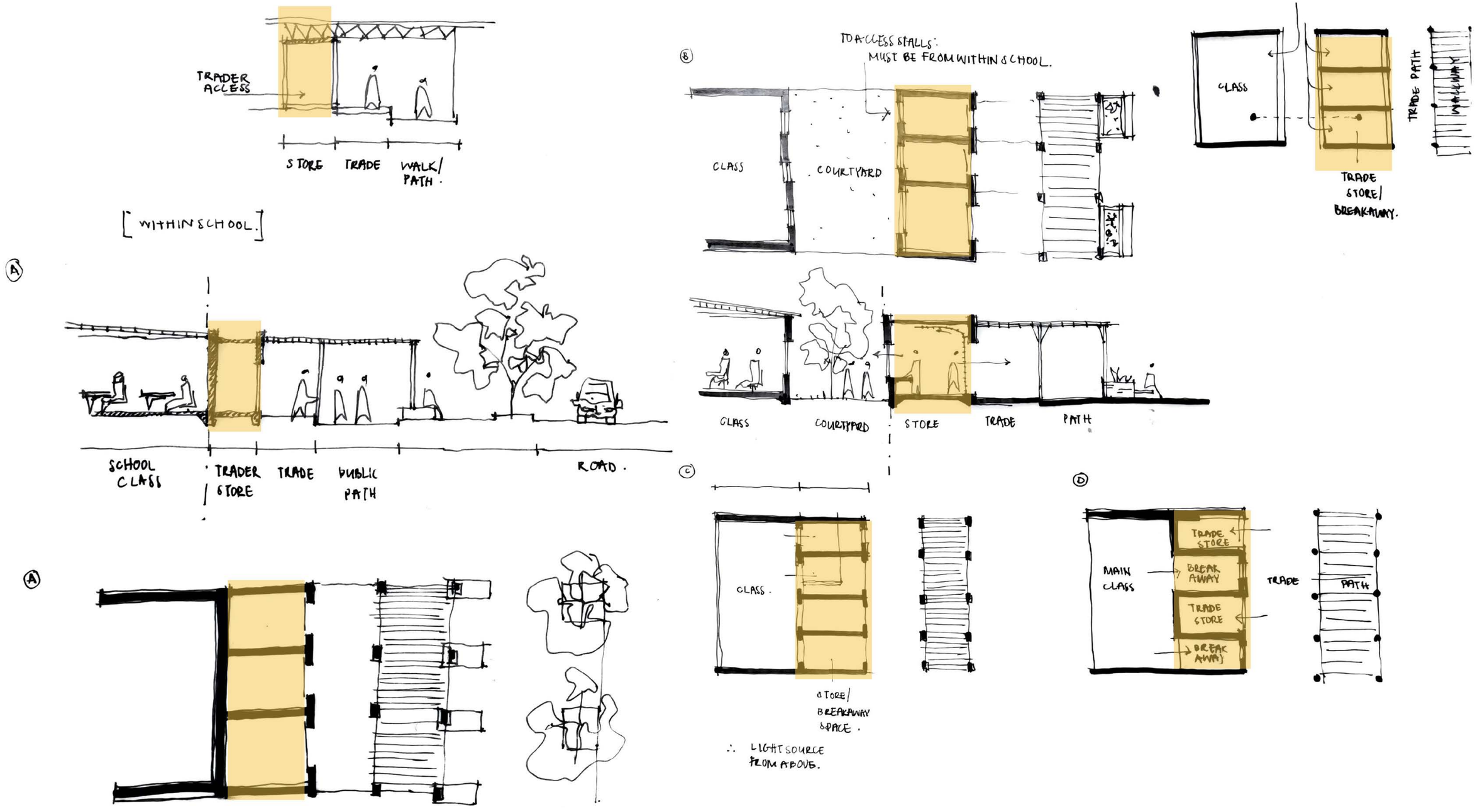


Fig. 2.4.37 Building as public threshold design exploration (Naidoo 2020)

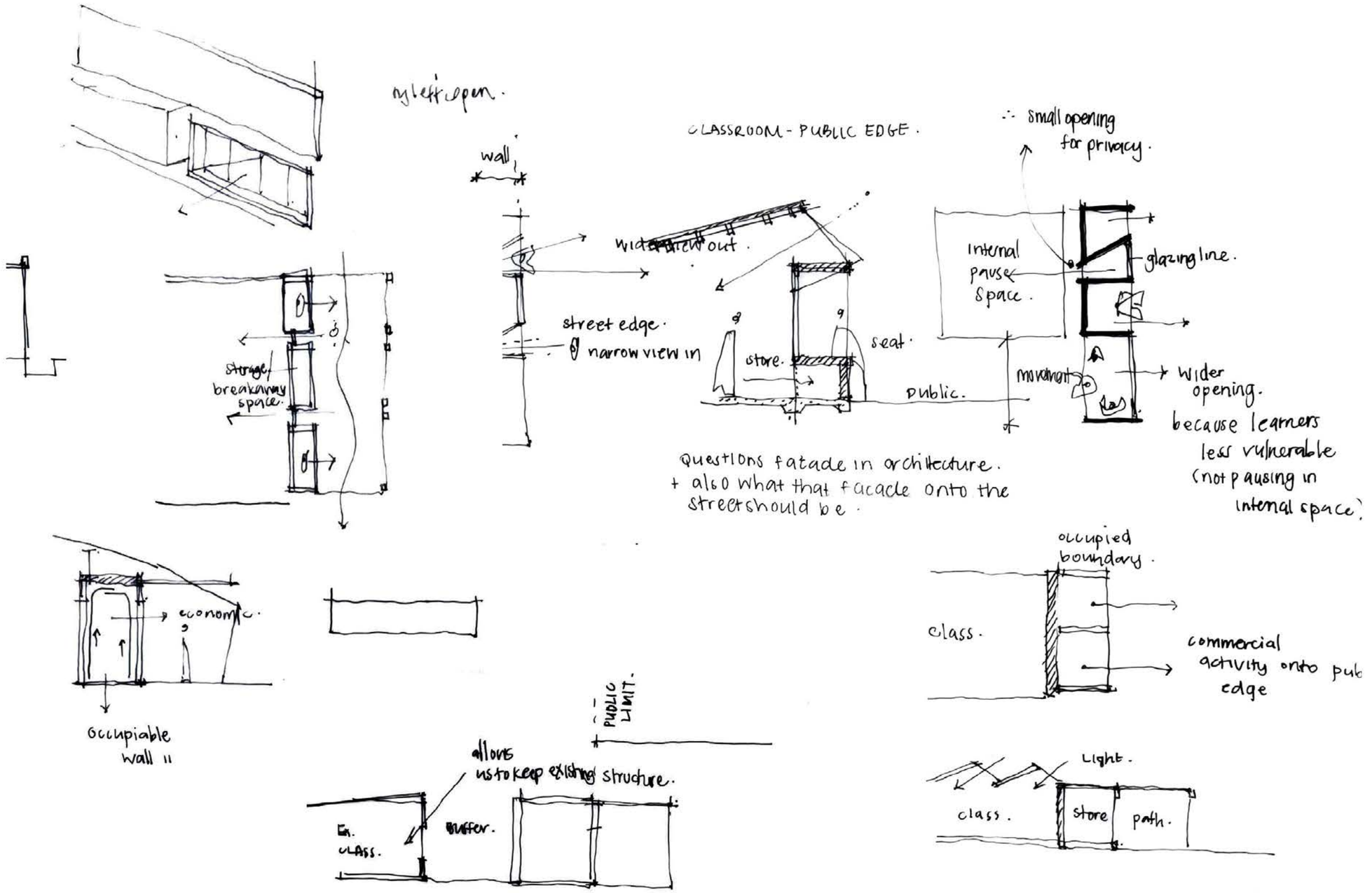


Fig. 2.4.38. Building as public threshold design exploration (Naidoo 2020)

4.5 Building for Pedagogy: Redefining the Teacher-centric Classroom and Corridor Typology

4.5.1 Background

Due to the dissertation focusing on a typological study of the schooling environment, parameters needed to be established to guide the analysis and design process for typological redefinition. The following parameters have been selected based on a literature overview (Barret et al 2015, Candiotes 1997, Dovey & Fisher 2014, Hertzberger 2008, Kuhn 2012 & Wood 2019) of the common themes arising when schooling typology is brought into question. These parameters are:

- Plan Type
- Circulation
- Spatial Configuration

In this investigation, the dissertation positions these parameters according to architectural responses that challenge the conventional educational environment. The learning environment should stimulate holistic learner growth through providing opportunities to acquire life skills (Dudek 2015) and social learning through interaction (Kuhn 2012).
“Higher functions of learning originate as social relationships” (Dovey & Fisher 2014:45). The school environment is seen as a support structure to the greater learning experiences from life. Students can build on what they know in terms of the “social construction of knowledge” (Dovey & Fisher 2014:43).

4.5.1.1 Plan Type

There are three main plan types when it comes to secondary schooling typologies:

- Street plan
- Campus plan
- Linked pavilions

The street plan is distinguished by its linear volumes that are guided by circulation, which makes a metaphor of the street condition. This circulation space serves dual function and becomes social space within the school.

The campus plan type is made up of individual buildings on open land with external circulation. These buildings relate to one another however they can be set apart through their purpose dictating their architectural expression. The third plan type is a hybrid of the first two and consists of a series of linked spaces bordering a central core (Dudek 2015).

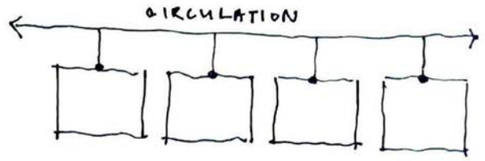


Fig. 2.4.39. Street Plan Type (Naidoo 2020)

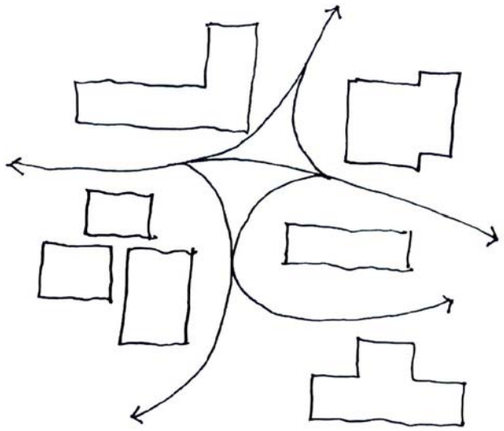


Fig. 2.4.40. Campus Plan Type (Naidoo 2020)

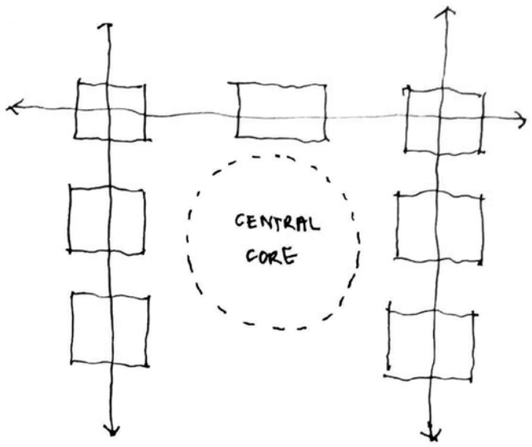


Fig. 2.4.41. Linked pavilion Plan Type (Naidoo 2020)

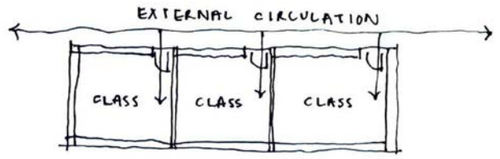


Fig. 2.4.42. Basic classroom plan (Naidoo 2020)

Tsako Thabo Secondary school, along with multiple other schools in Mamelodi east reflect the first plan type of the street plan.

Within this plan type, these schools in Mamelodi east reflect basic classroom layouts according to policy stipulations dictating a uniform classroom unit (Department of Basic Education 2012). This has been the inherited plan type for public schools in South Africa (see 2.2.2 Relationship between Policy and the Built Educational Environment in South Africa). Hertzberger (2008) criticises this basic classroom. An articulated classroom decentralises the traditional education experience and provides multiple learning opportunities conducive to varied learning styles (Hertzberger 2008:25).

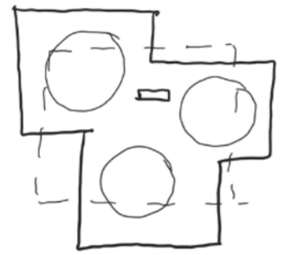


Fig. 2.4.43. Articulated classroom plan (Naidoo 2020)

Varied articulation of learning spaces allows for a range of individual to group activities (Hertzberger 2008). Barret et al (2015) acknowledges this allowance for individualisation through flexibility as a key variable of the physical educational environment that enhances the learning experience. Flexibility can be achieved by using movable partitions and variations in classroom sizes (Kuhn 2012). Varied plan shapes are suggested for younger learners and larger simpler plan shapes for older learners (Barret et al 2015). In summary, plan type should accommodate differentiations in learning style through variations in room size, classroom articulation and flexibility of plan.

4.5.1.2 Circulation

Dovey & Fisher (2014:43) and Hertzberger (2008) draw our attention to the approach to educational circulation as the ‘learning street’. Informal and formal learning environments are starting to be recognised as integral in the holistic learning development of a child. This approach challenges the traditional, standard application of circulation as mono-functional external space with little contribution to the learning experience (Kuhn 2012). The ‘learning street’ redefines corridors for interaction and provides multiple opportunities to learn in a variety of ways.

This space is intended to prevent distraction by others but be visible to encourage learning interest from others. Movement through this space should create curiosity within the passer by. This concept of circulation sits as the primary artery where the main elements are concentrated, allowing for passive surveillance of the school and learners to feel included (Hertzberger 2008).

4.5.1.3 Spatial Configuration

The learning environment is suggested to represent that of a micro city with multiple opportunities for learning (Hertzberger 2008:69). This approach offers a stimulating learning environment that encourages interaction as well as cultural, political and intellectual exchange (Hertzberger 2008). Break out space, specialised learning environments, multi-functional space that supports the community and the relationship between the interior and exterior become key factors in understanding the spatial configuration of schooling typologies (Dudek 2015). Easy access to attached breakout spaces, well defined learning zones and wider corridors are some of the main physical elements that affect the learning experience (Barret et al 2015).

Emphasis is placed on social space to draw a parallel to the public space of the city (Hertzberger 2008). This social space forms part of the core of the school and serves as ‘an informal meeting place and a melting pot’ (Kuhn 2012). Kuhn (2012) speaks to the spatial configuration of the learning environment and suggests the relevance of hierarchy by allowing for an intermediate learning space between the ‘classroom’ and school. Overall, these strategies for handling the spatial configuration of the learning landscape allow learners to fluidly obtain varying avenues of knowledge (Kuhn 2012).

4.5.2 Considerations

- Opportunities of the current typology in relation to context
- Limitations of the current typology in relation to context
- Relationship of the current typology and programme

4.5.3 Analysis of the Existing

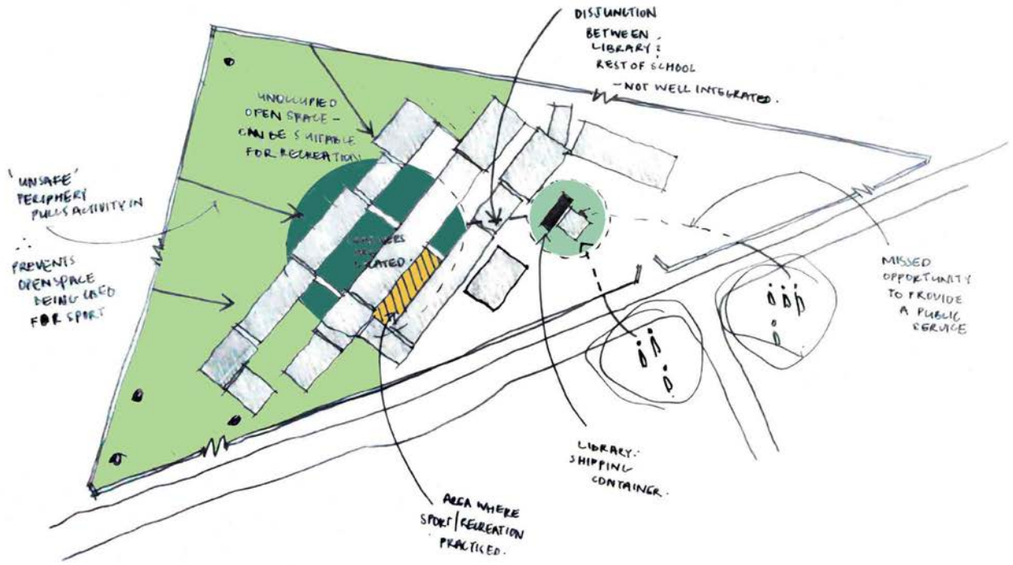


Fig. 2.4.44. General analysis of Tsako Thabo (Naidoo 2020)

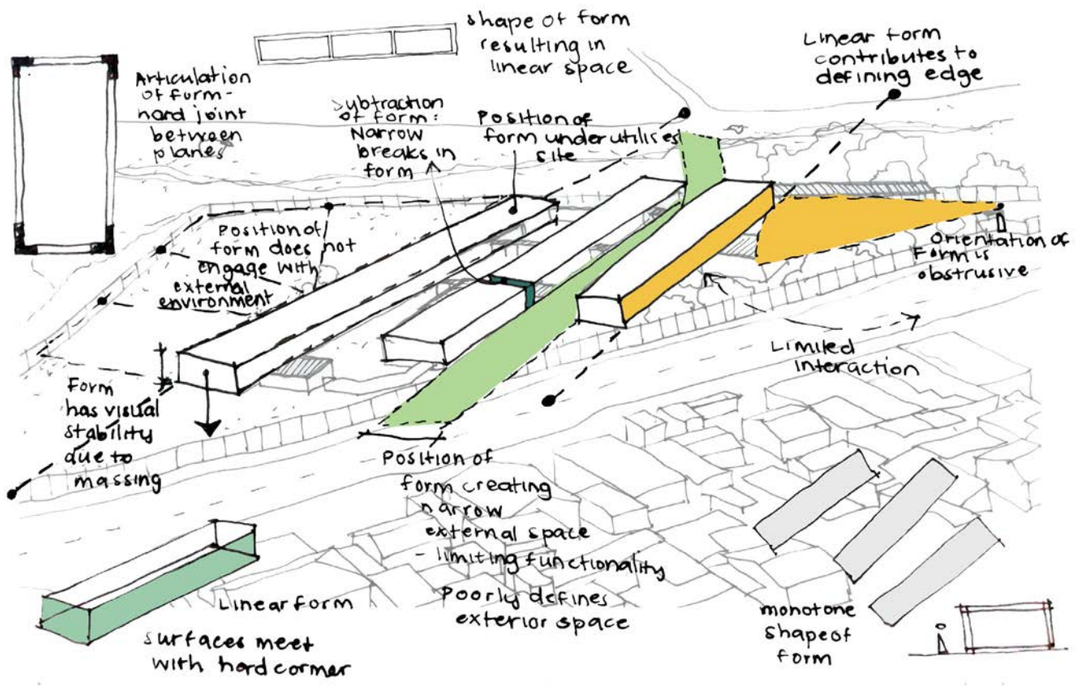


Fig. 2.4.45. Plan type analysis of Tsako Thabo (Naidoo 2020)

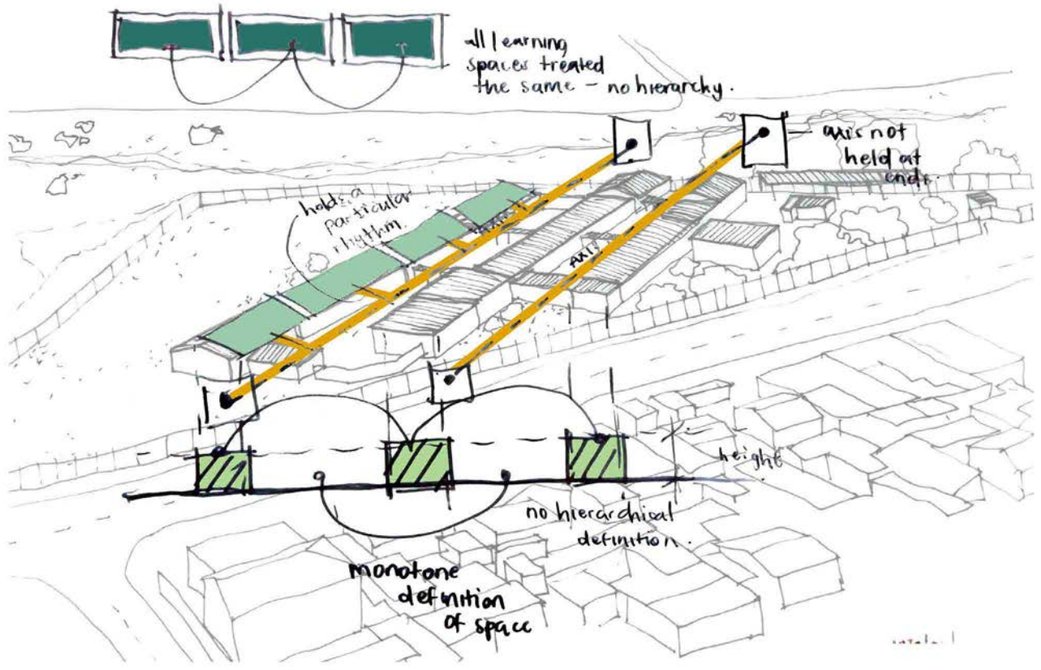


Fig. 2.4.46. Plan type analysis of Tsako Thabo (Naidoo 2020)

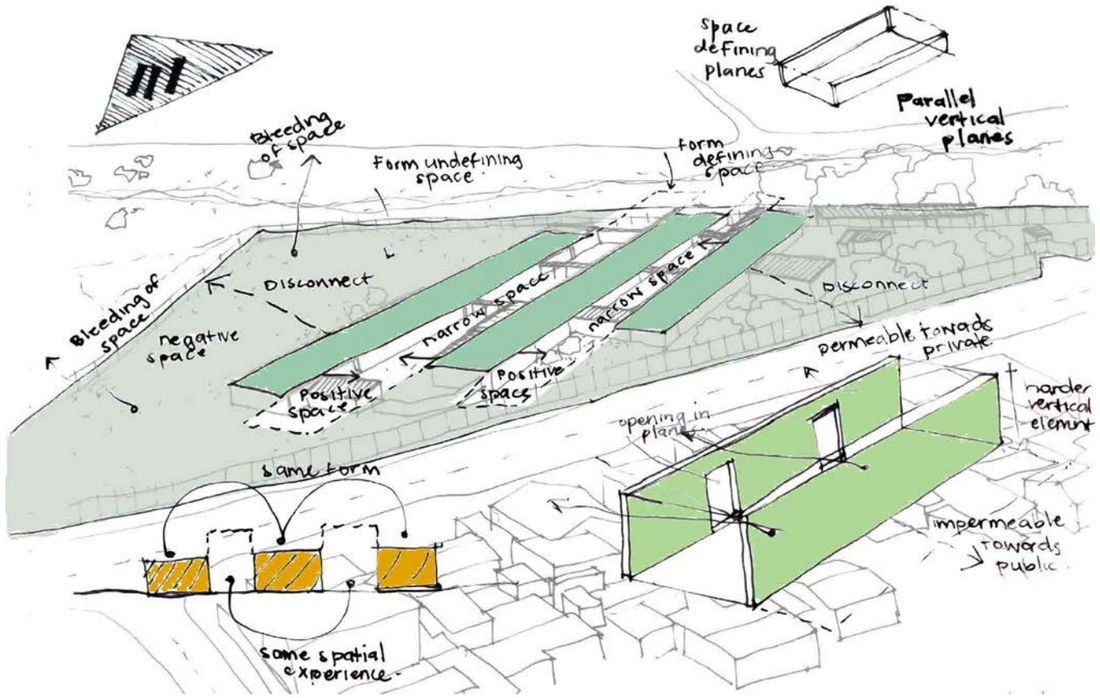


Fig. 2.4.47. Spatial configuration analysis of Tsako Thabo (Naidoo 2020)

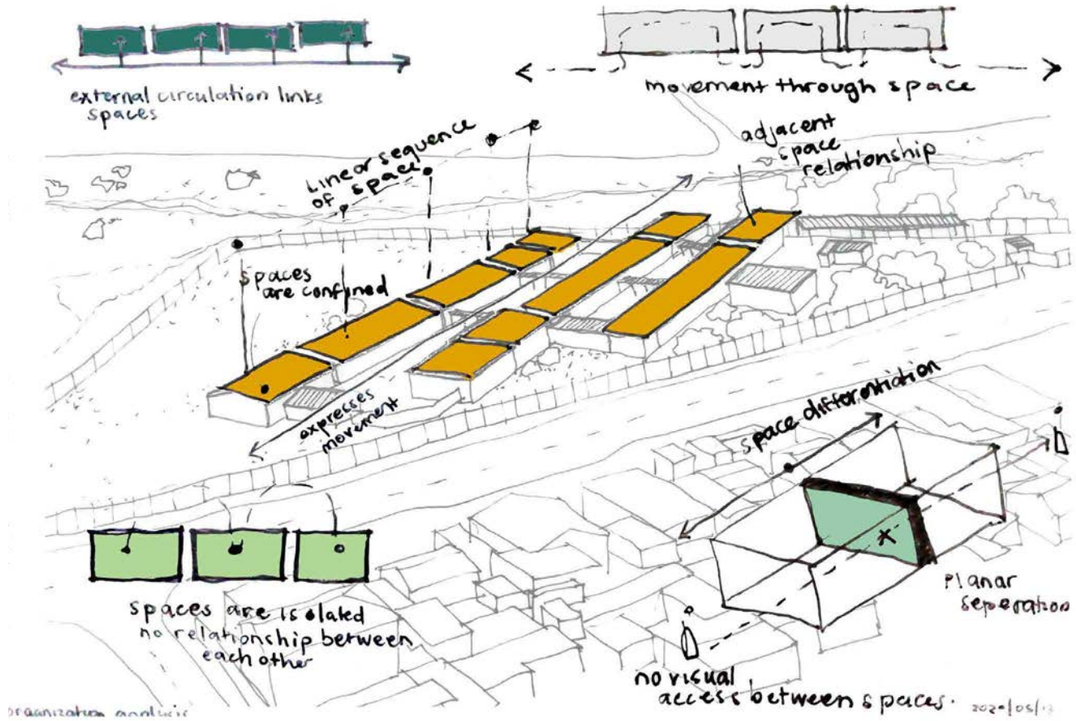


Fig. 2.4.48. Spatial configuration analysis of Tsako Thabo (Naidoo 2020)

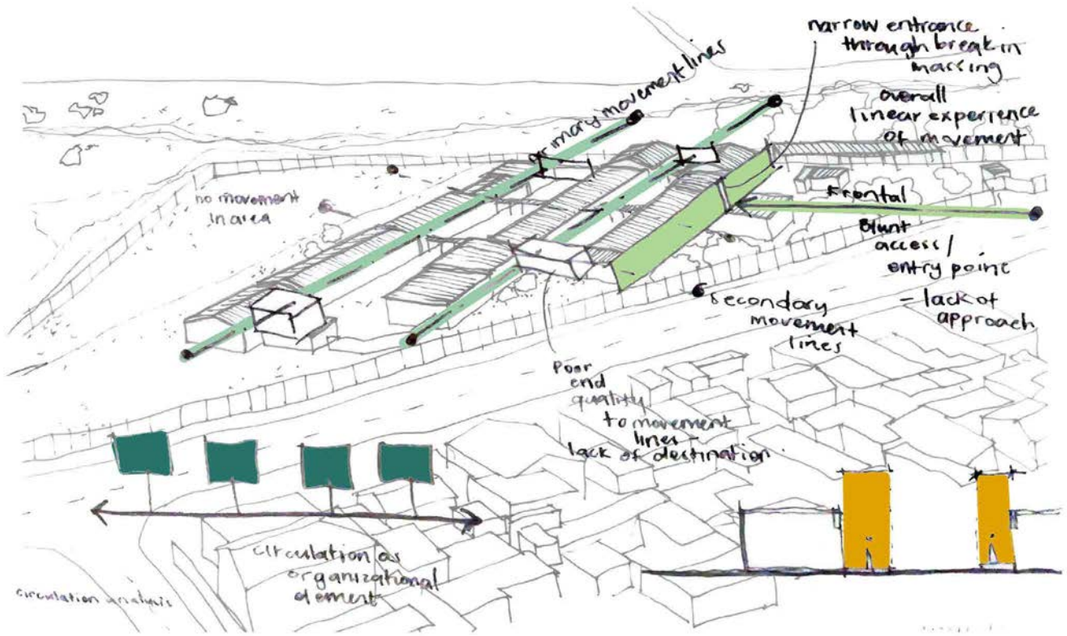


Fig. 2.4.49. Circulation analysis of Tsako Thabo (Naidoo 2020)

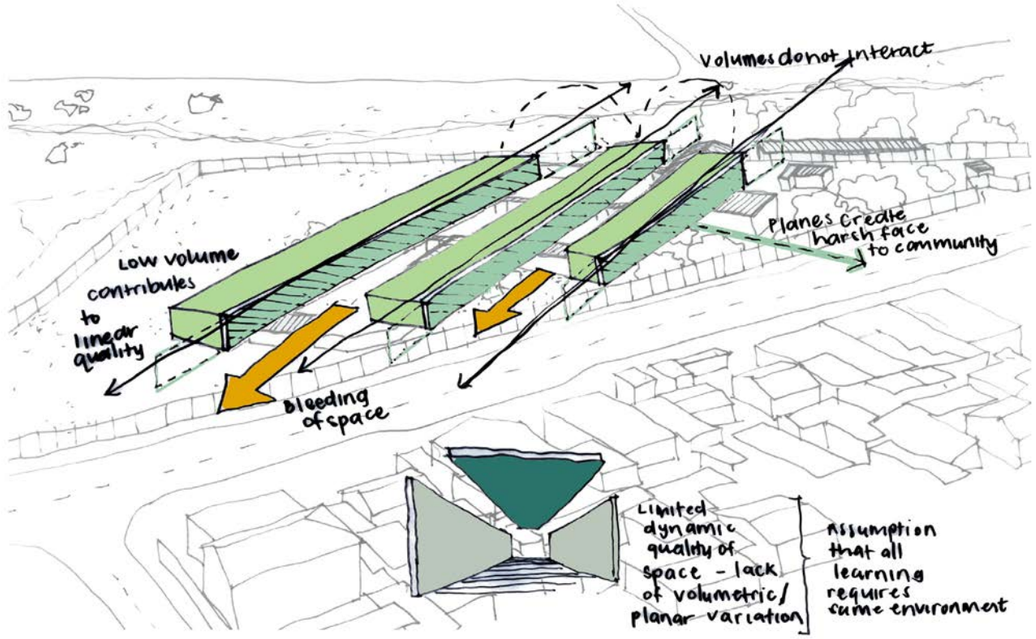


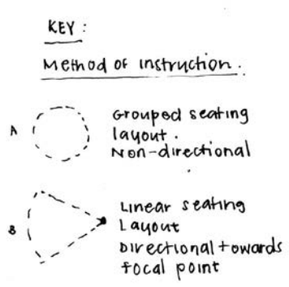
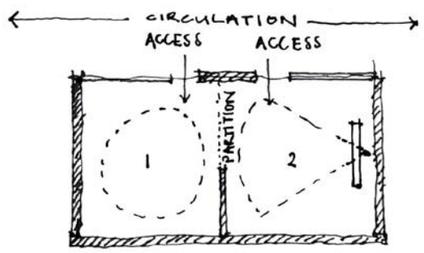
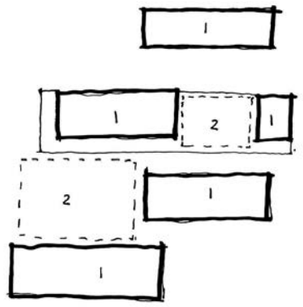
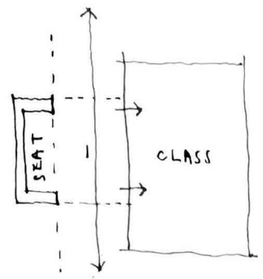
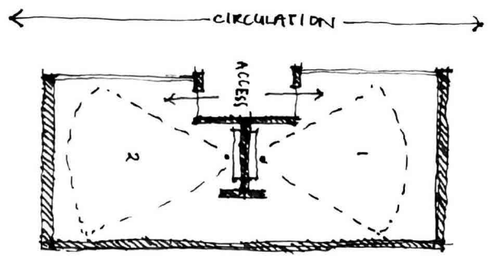
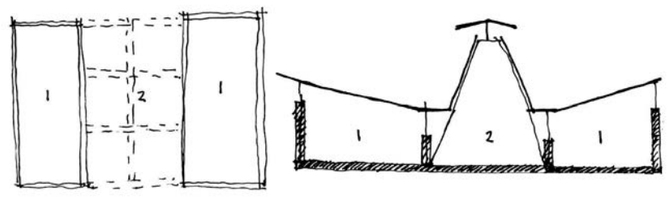
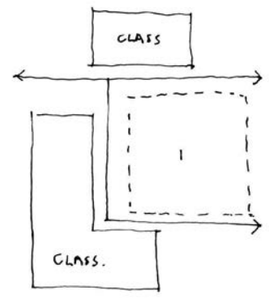
Fig. 2.4.50. Form analysis of Tsako Thabo (Naidoo 2020)

Precedent Selection

1. Christ Church Grammar School	2. Rafaello Primary School	3. School in Gando
• Type: Preparatory school • Architect: Architecture Studio • Location: Perth, Australia	• Type: Primary school • Architect: Herman Hertzberger • Location: Rome, Italy	• Type: School • Architect: Diébédo Francis Kéré • Location: Gando, Burkino Faso • Year: 2012
		
(Archello 2020)	(AHH 2020)	(Archdaily 2020)
4. Swawou Girls School	**5. Chere Botha School**	**6. Meeste-a-Bophele**
• Type: School • Architect: Orkid Studio • Location: Kenema, Sierre Leone • Year: 2016	• Type: School • Architect: Wolff Architects & Jo Noero • Location: Western Cape, South Africa	• Type: School • Architect: Humphries Jooste • Location: Mamelodi, City of Tshwane, South Africa
		
(Archdaily 2020)	(Wolff Architects 2020)	(Constructalia 2020)

Fig. 2.4.51. Table of precedents (Naidoo 2020)

Precedent Analysis

	Plan Type	Spatial Configuration	Circulation
			
01			
	• Precedent 1: Allows for zone 1 and zone 2 to function independently with variation of layout A or B. Alternatively the partition can be opened to connect zone 1 and 2 for an alternative layout	• Precedent 4: Staggering of the classroom blocks (1) frame external spaces (2), creating new zones for learning outside the classroom	• Precedent 1: Pause space of circulation in relation to entrances of classrooms form zone 1
02			
	• Precedent 1: Zone 1 and 2 function independently, however a shared programme can interlink and occupy the plan layout	• Precedent 5: Spatial configuration promotes interaction and communal space. Communal space (2) establishes a hierarchy within the school and serves as the connector space between the adjacent classrooms	• Precedent 1: Circulation widens to form landing to create a central hub (1). This creates a new spatial dynamic of external space within the school

Precedent Analysis

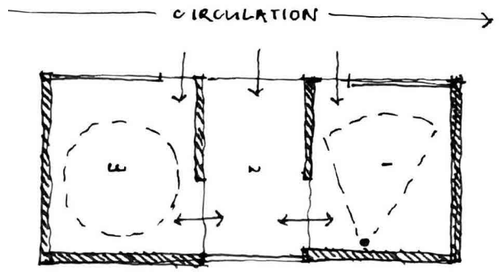
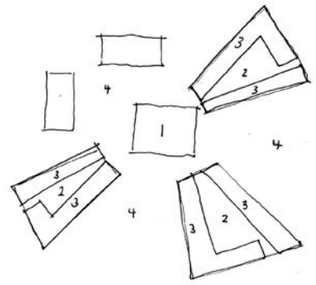
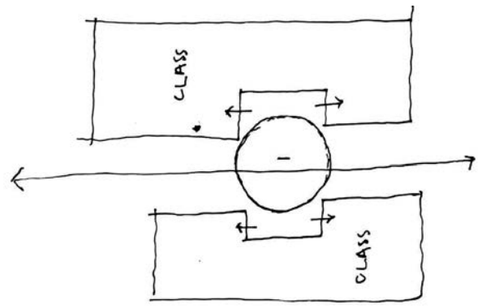
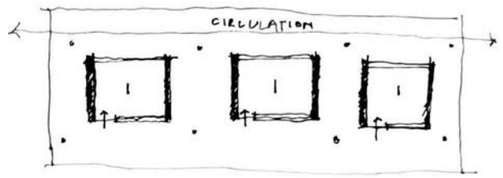
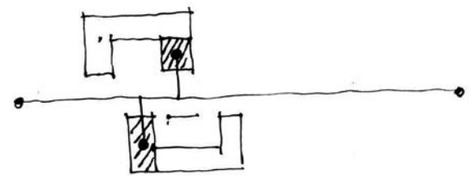
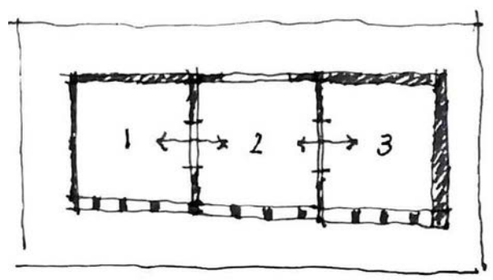
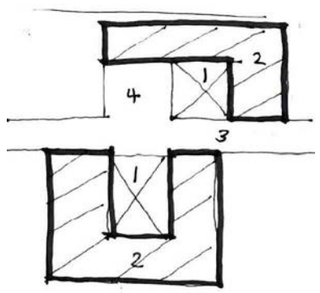
	Plan Type	Spatial Configuration	Circulation
03			
	• Precedent 1	• Precedent 6: Spatial configuration makes use of linear forms spiraled around a central core of the school (1). The angle of the classroom blocks (3) form private courtyards (2) which can be utilised by specific user groups. General shared space is maintained (4)	• Precedent 1: Circulation widens at entrances into classrooms for form internal space 1
04			
	• Precedent 3	• Precedent 2: Central axis with adjacent blocks forming framed internal courtyards	• Precedent 2: Circulation absorbs the arm of the built form (classrooms) to form landing space which serves as shared, communal space
05			
	• Precedent 4: Zone 1 and 3 form the main spaces with zone 2 serving as the communal connector space. The wide access points between the zones allow for the spaces to open up and form a single larger space	• Precedent 2: Configurations of classrooms (2) create external court-yards (1) in relation to widening of the circulation (3) to form landing space (4)	

Fig. 2.4.52. Precedent analysis table (Naidoo 2020)

RESEARCH & FINDINGS

Data collection date:
2019-2020

Data collection time:
10h30-11h45

Researcher/s:
UP Architecture Honours Mamelodi Group 2019 & Naidoo 2020

Participant/s:
Tsako Thabo Learners

Location:
Tsako Thabo Secondary School & Online

Collection method:
PAR workshops and co-design (see chapter 3)

Fig. 2.4.53. Participatory action research workshops (Achi 2019)

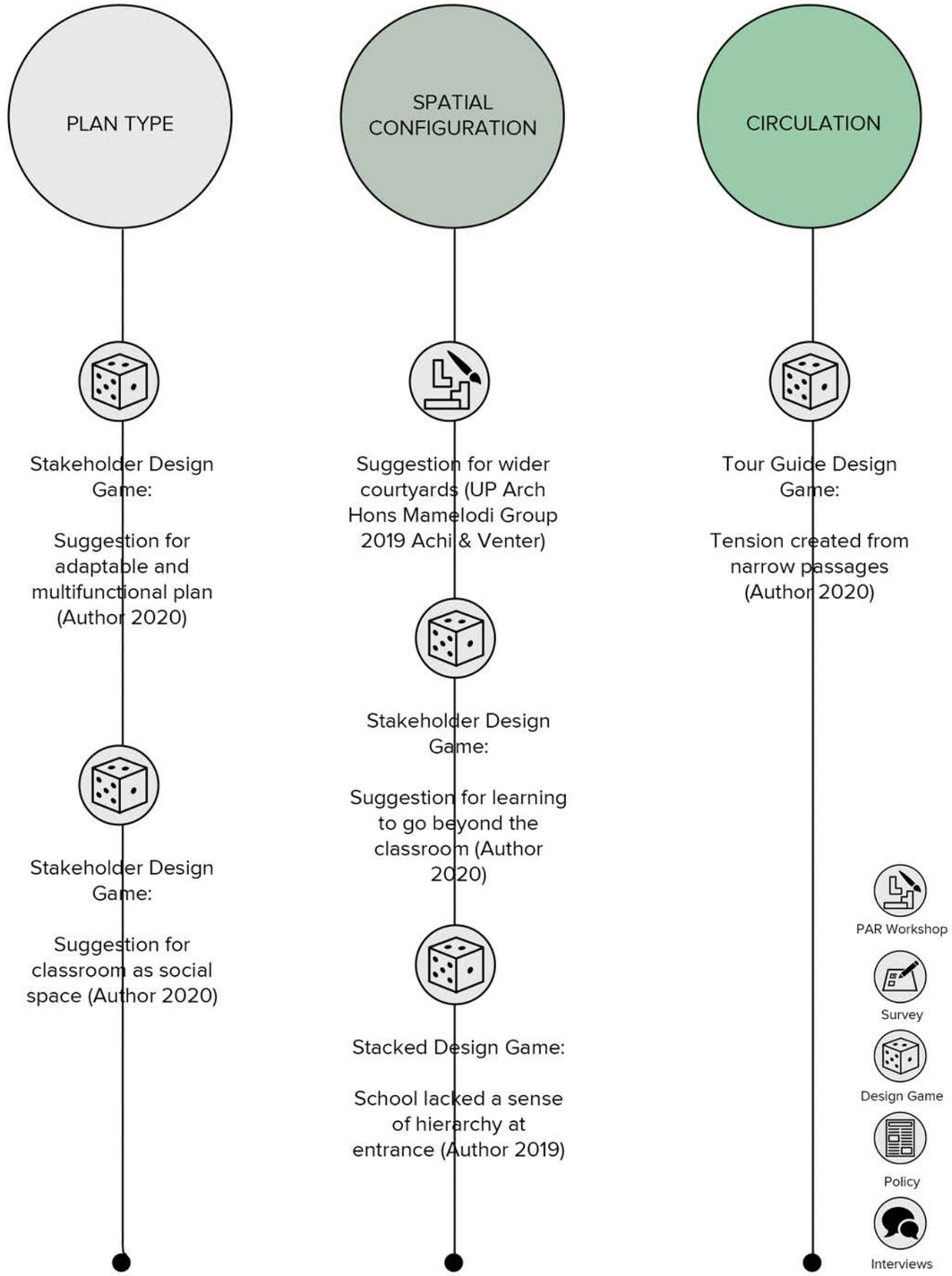
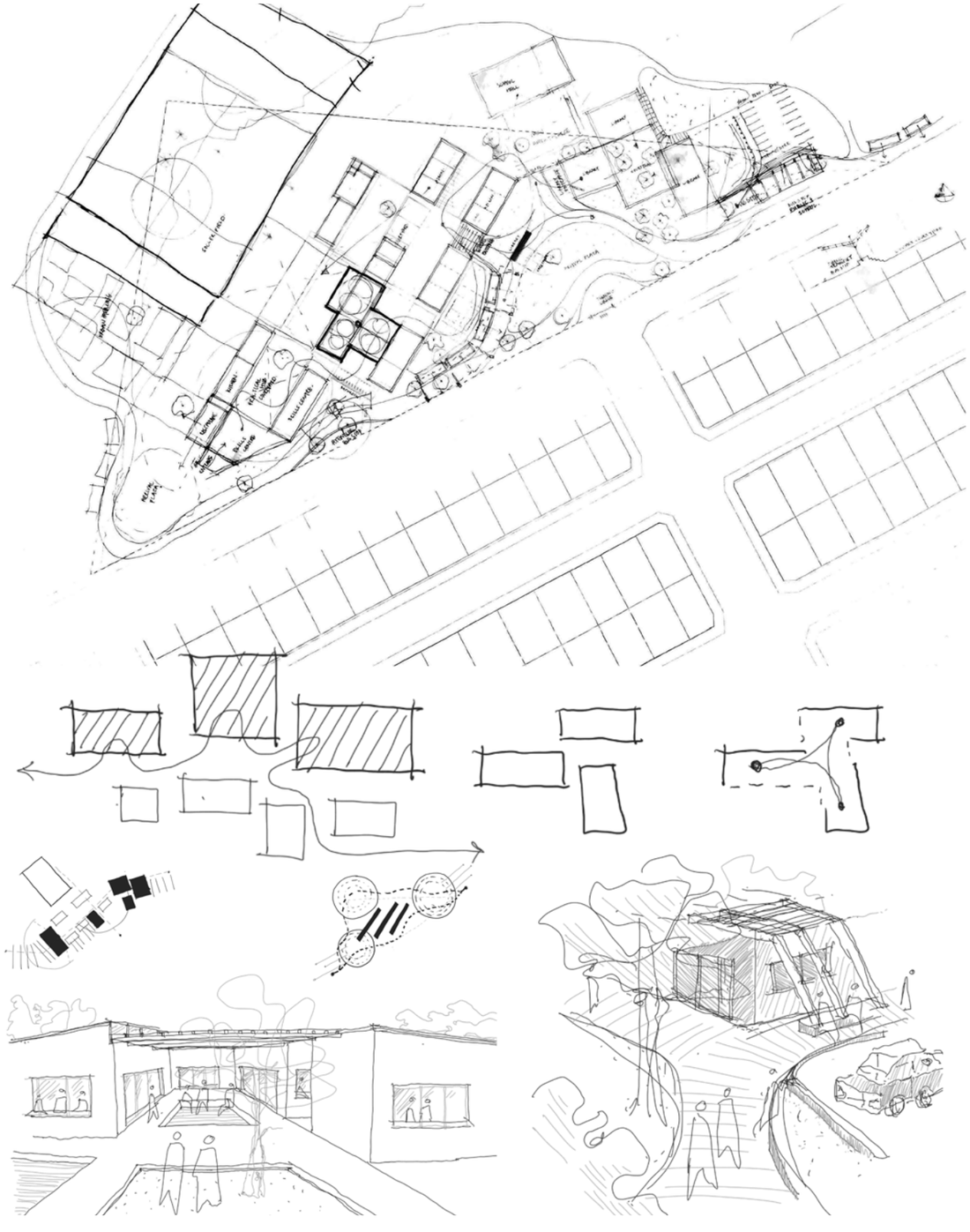


Fig. 2.4.54. Building as pedagogy informants (Naidoo 2020)

4.6 Design Development



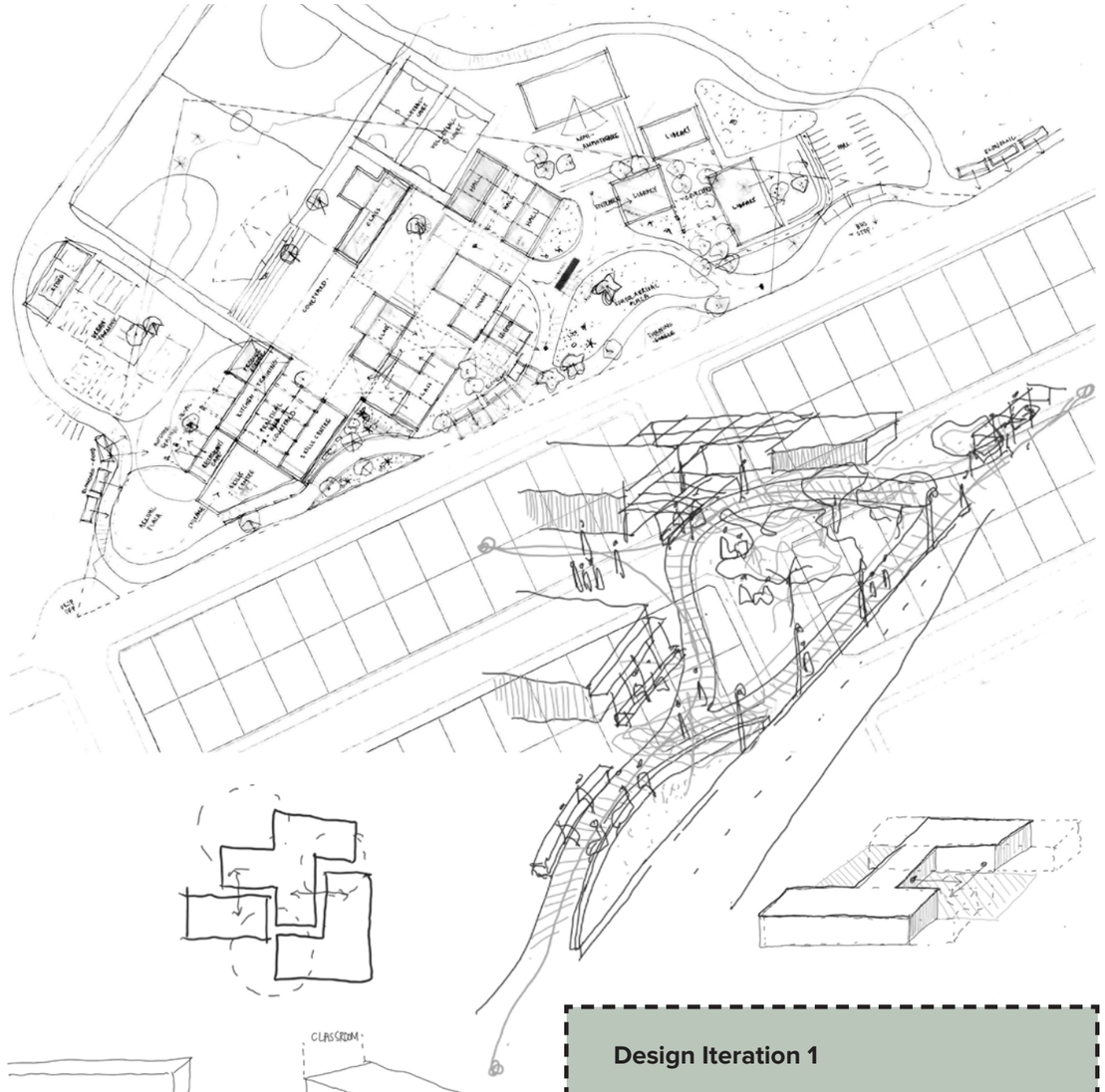


Fig. 2.4.55. Design Iteration 1 (Naidoo 2020)

Design Iteration 1

- Exploring adaptable learning configurations
- Softening school public edge
- Interactive edge condition
- Merging of classroom blocks to allow for multi-functional space
- Public presence

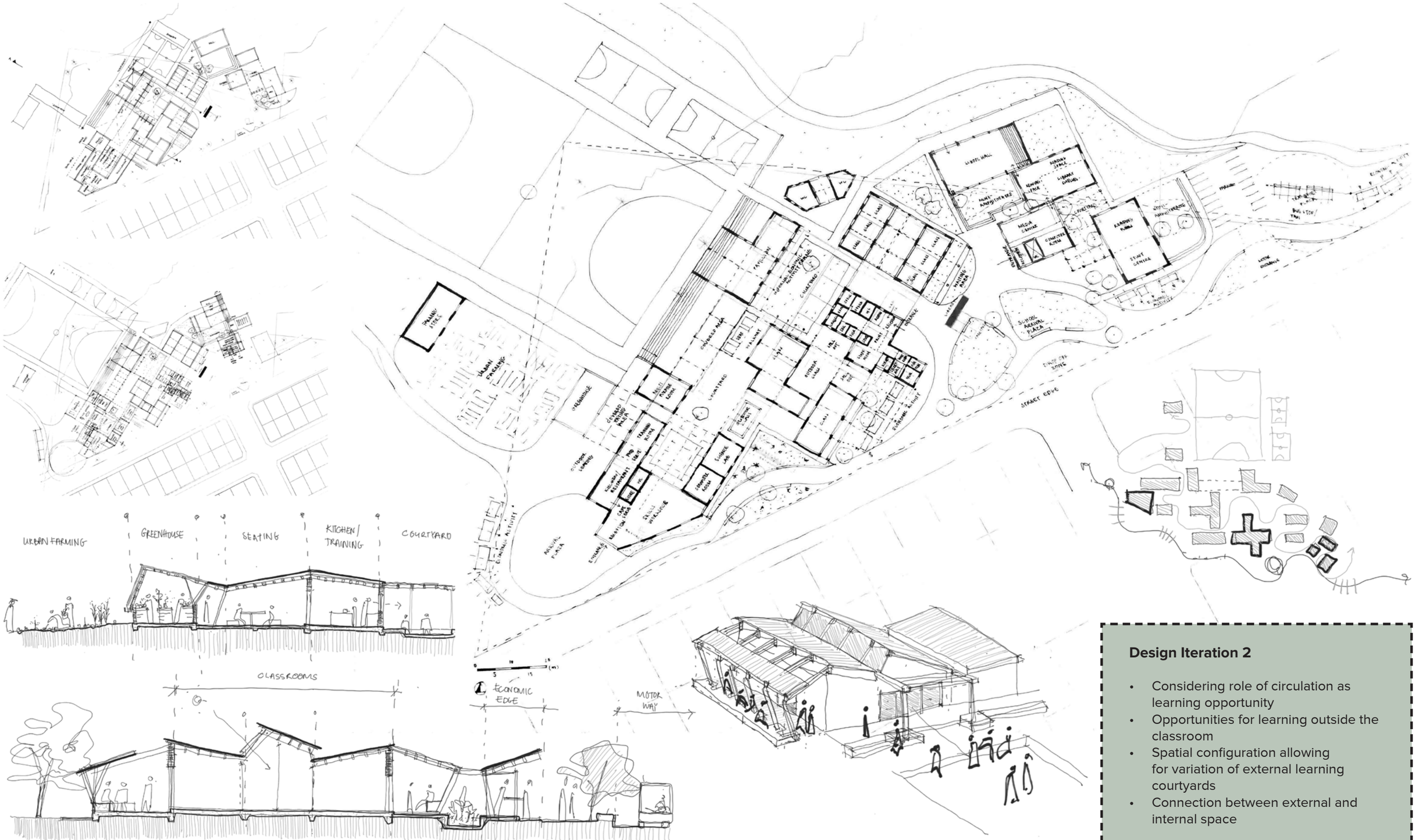


Fig. 2.4.56. Design Iteration 2 (Naidoo 2020)

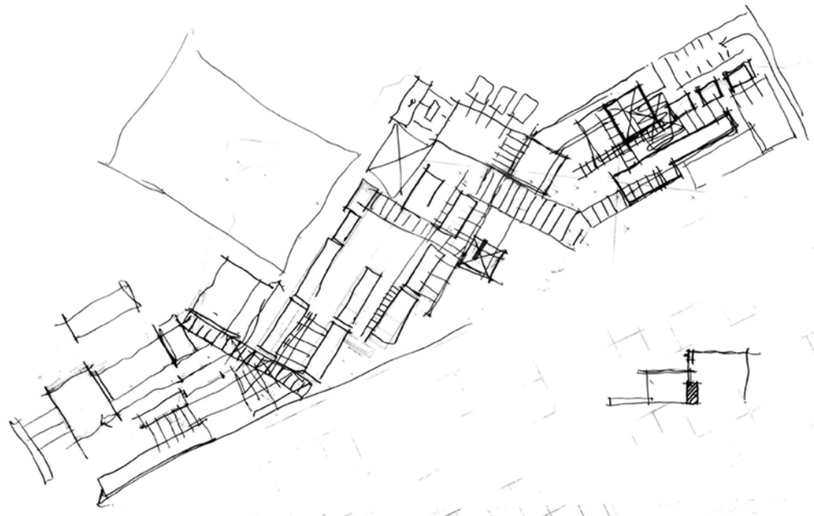
Design Iteration 2

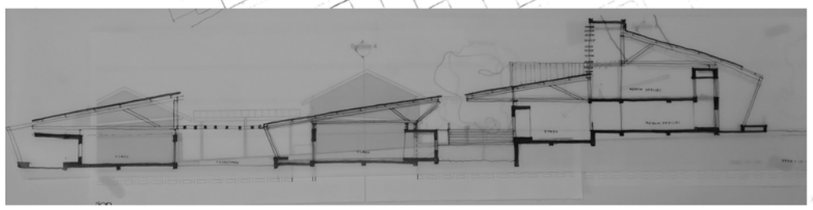
- Considering role of circulation as learning opportunity
- Opportunities for learning outside the classroom
- Spatial configuration allowing for variation of external learning courtyards
- Connection between external and internal space

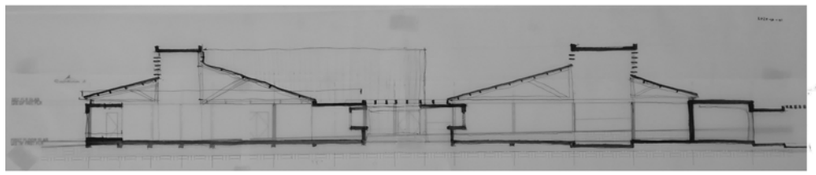
Fig. 2.4.57. Design Iteration 3 (Naidoo 2020)

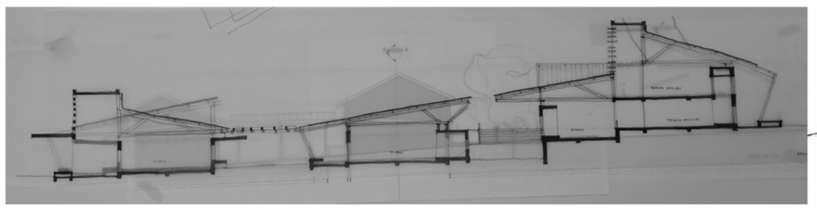
Design Iteration 3

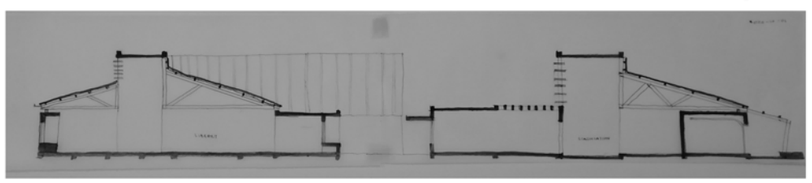
- Reconsidering the impact of additions to the school
- New form to interact with the edge and activate the public street condition
- New form to connect onto existing school as linkages
- Linkages tie school and context and serve as threshold into school











Design Iteration 4

- Pulling programme towards the street edge
- Layering of threshold through built form and programme
- Variation in roof to speak back to programme use

Fig. 2.4.58. Design Iteration 4 (Naidoo 2020)

Fig. 2.4.59. Design Iteration 5 (Naidoo 2020)

Design Iteration 5

- New form frames existing school
- New form extends to form layered threshold
- Interaction with public
- Established public presence

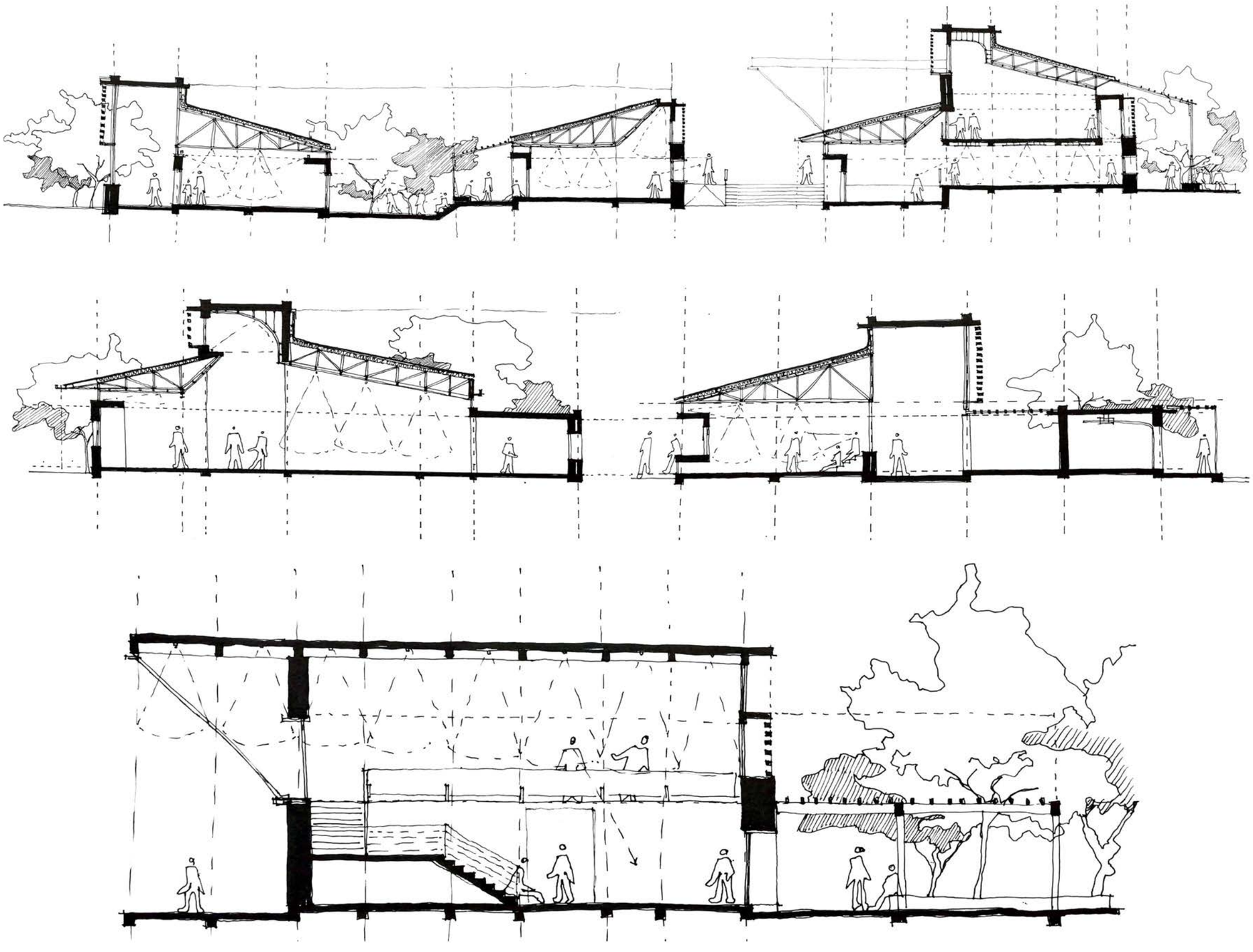


Fig. 2.4.60. Design Iteration 5 (Naidoo 2020)

Design Iteration 5

- Circulation plays a hierarchical role
- Entrance threshold established through flat roof structure
- Articulation of roof structure

Chapter Five

TECHNICAL DEVELOPMENT

05

CHAPTER
Technical Development

05

TECHNICAL DEVELOPMENT

5.1 Technical Concept

There are multiple influences on the language of architecture. Architecture maintains a dialogue between functional and technological limitations. However, the relationship it has with construction takes on a symbolic and interwoven nature. This is not to say that this relationship is void of the concerns of external factors determining architectural language. It is the symbolic nature of the dialogue between construction and architecture that intensifies the meaning behind the built form (Rocha 2014:138).

The technical concept of the dissertation looks at the symbolic nature between construction (connection, materiality and structure) and architecture to develop an architectural language that reflects pedagogy (adaptable and multi-functional) and threshold (Robust, interactive and reflecting transition).

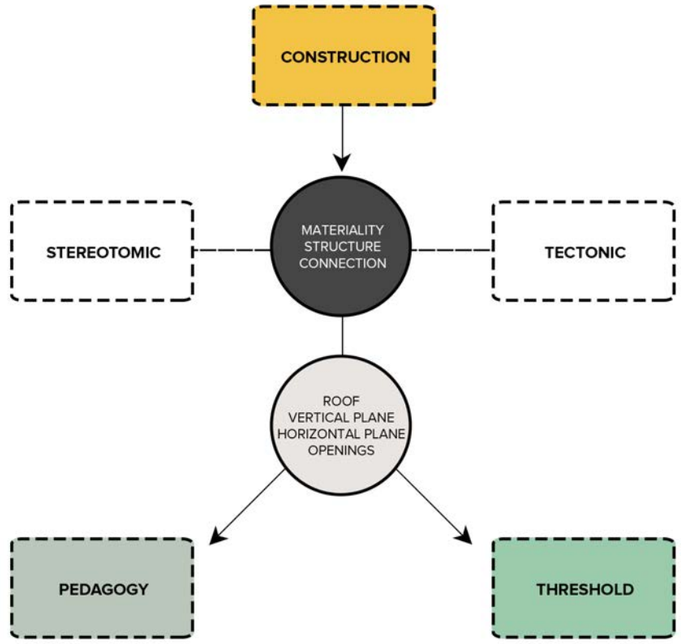


Fig 2.5.1.1. Technical concept diagram (Naidoo 2020)

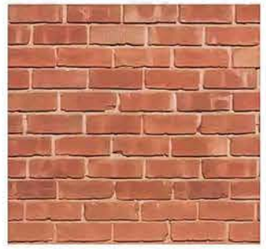
5.2 Construction: Structural Hierarchy and Materiality

5.2.1. Materiality

To reinforce the technical concept, the structural and material approach was used to reflect this interaction between public and private. Robust elements of concrete and brick engage with the public and establish the school as a community facility. These heavier elements sit on the edge of the site to thicken the threshold condition. The lightweight internal elements, such as the steel roof structure, interact with the learning spaces.

Concrete, brickwork and steel have been the selected material palette that speaks to the current condition on site. The approach to materiality was to explore the potential of this simple material palette through the configuration of the building elements.

Configurations of brickwork consider the public interaction with the architecture. This approach aligns with the conceptual intentions of the relationship between construction and threshold. Surface finish, such as the brick patterns, concrete and breaks in finish articulate threshold and transition.



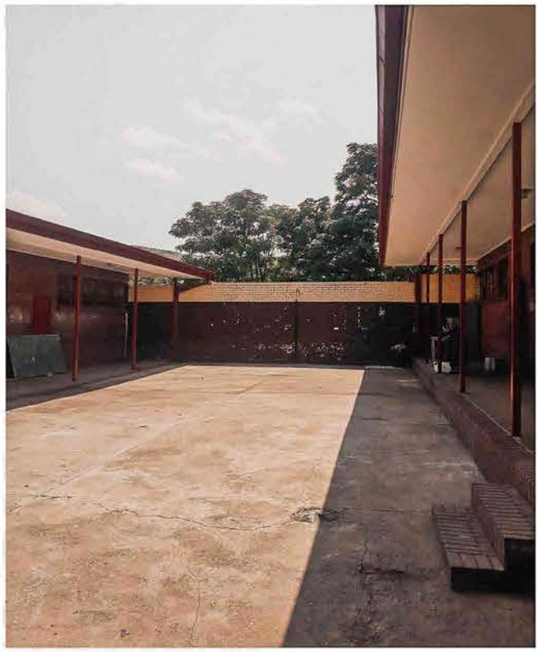
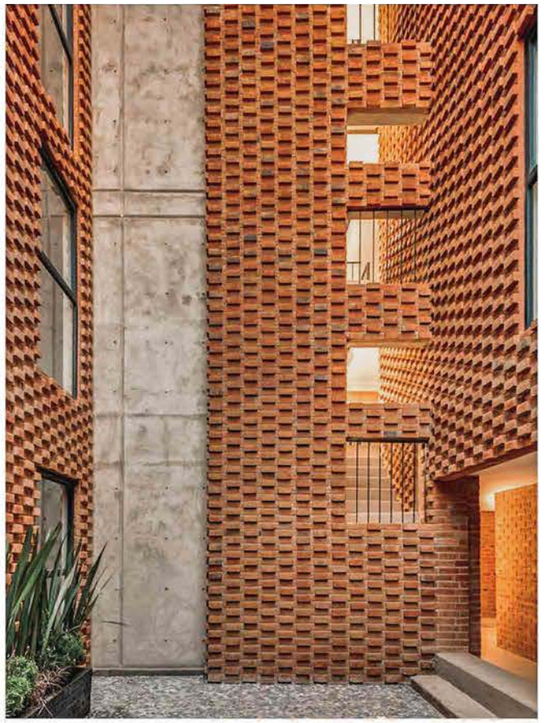
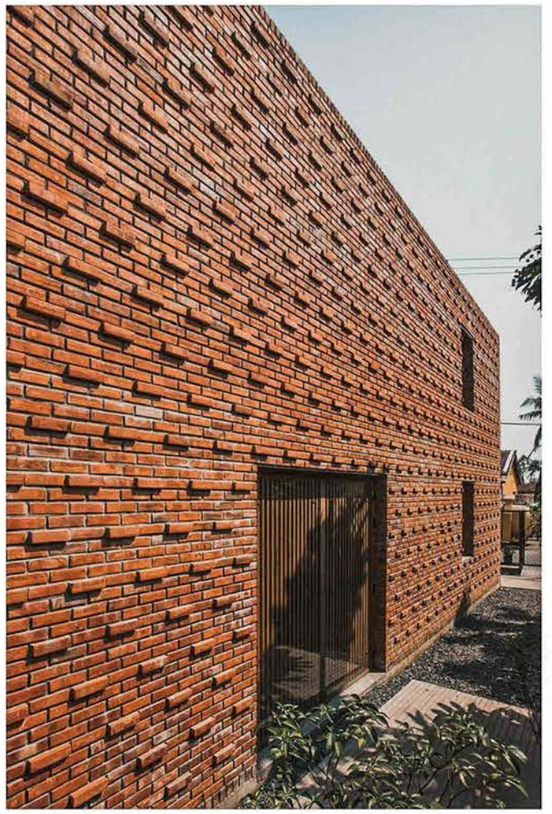


Fig. 2.5.2.1. Existing material palette (UP Arch Hons Mamelodi Group 2019)

Extruded brick bonds serve as a mechanism for preventing physical interaction with the architecture by resulting in uncomfortable surfaces. Perforated brick opens up the architecture to the exterior articulating light and public interaction. This provides a softer approach by opening the building up to the public but maintains privacy. Simpler brick bonds are used within the facade when attention is placed on other elements in the architecture, such as the structural system. Overall the construction of material is used to strengthen the architectural language.





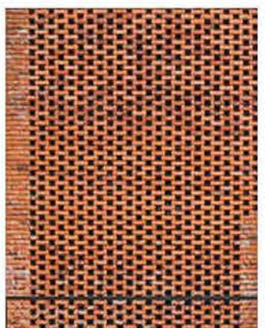


Fig. 2.5.2.2. Proposed material palette (Archdaily 2020 & Architizer 2020)

Fig. 2.5.2.3. Structural timeline (Naidoo 2020)

5.2.2.Structure

5.2.2.1 Structural hierarchy

New intervention onto the site adopts a hierarchical approach to the structure. The primary structure consists of a concrete column and grid system based on the current modular unit of 3750x4500mm, present within the school. Brick infill and concrete slabs make up the secondary structure of the building. The tectonic use of a lightweight steel roof sits within this structural composition and forms part of the tertiary structure.

Overall the structure is an interaction between the stereotomic elements of concrete and brick with the tectonic use of lightweight steel, to reflect the interaction between public and private. The primary concrete column structure with brick infill holds a robust edge whilst protecting the delicate steel roof structure within.

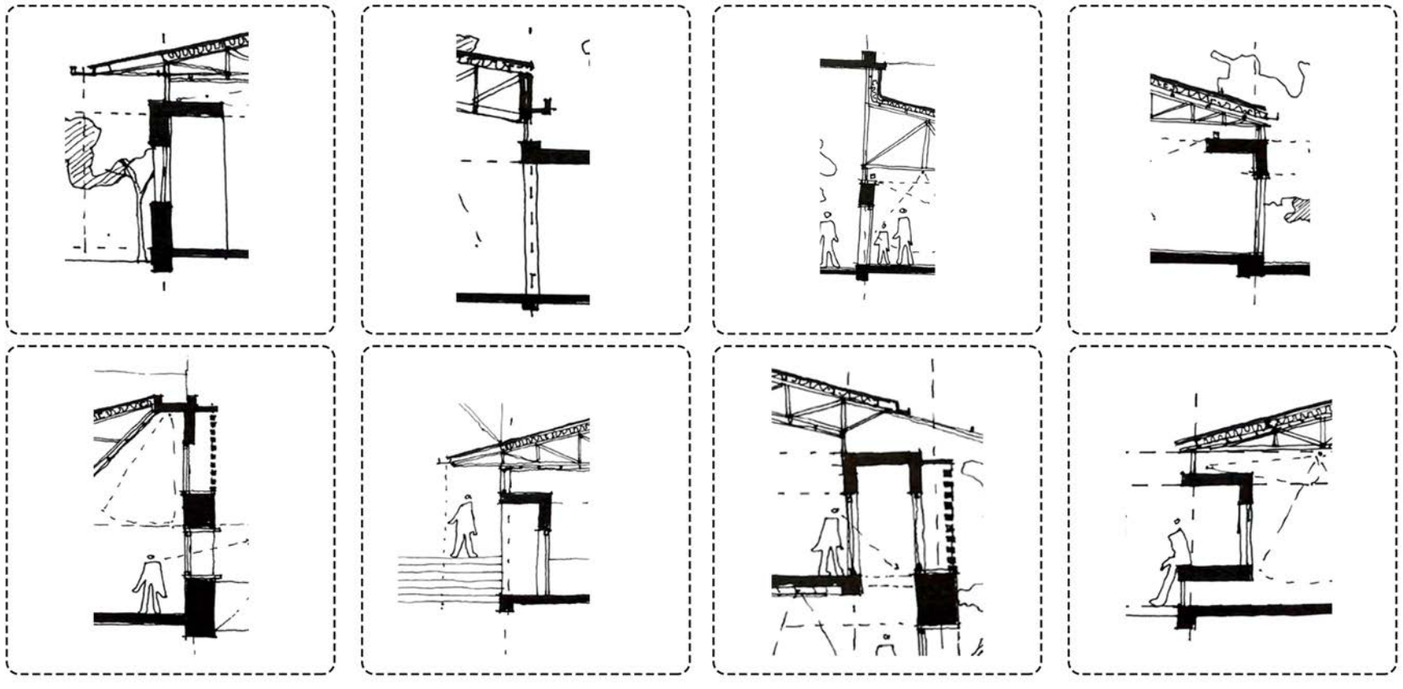


Fig. 2.5.2.4. Interaction between tectonic and stereotomic elements (Naidoo 2020)

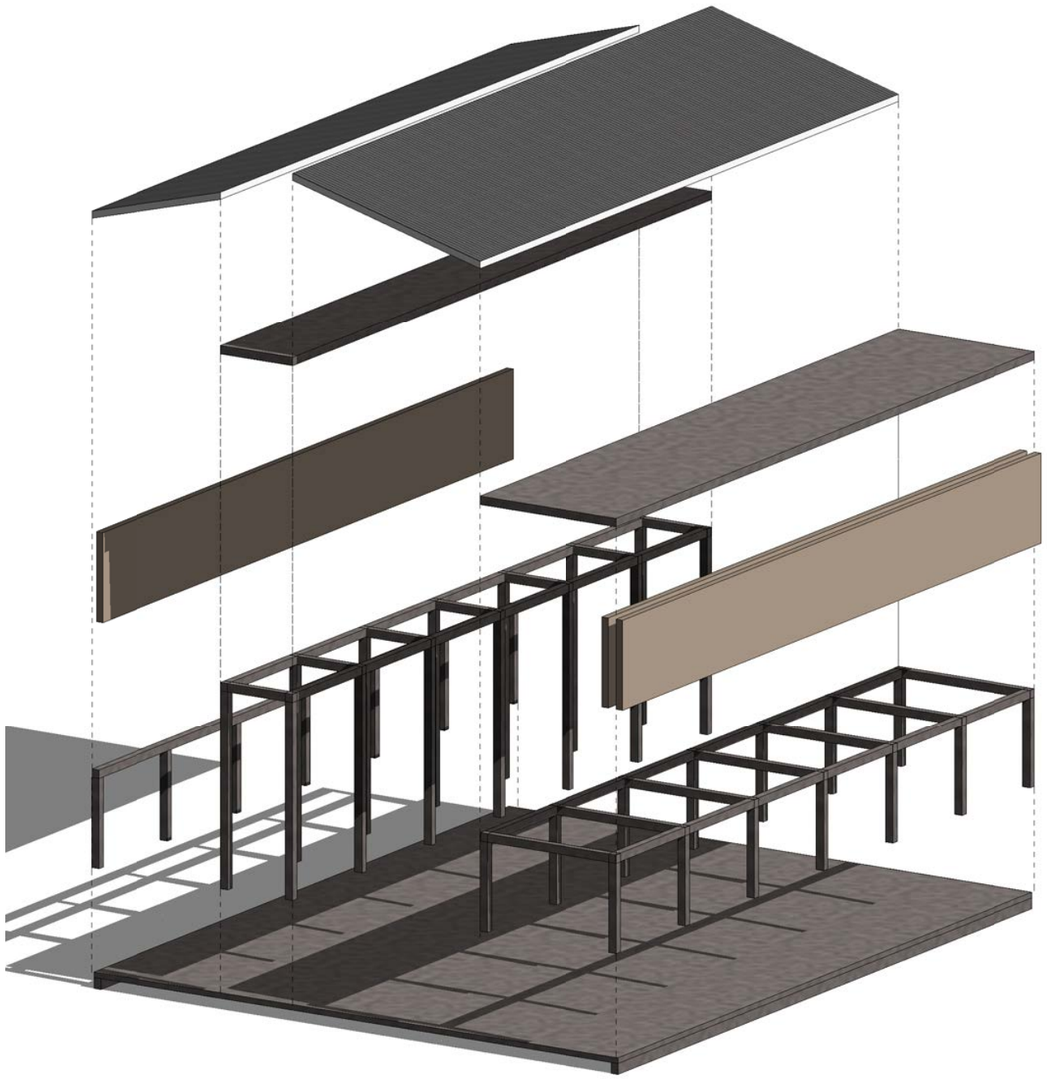


Fig. 2.5.2.5. Structural layers (Naidoo 2020)

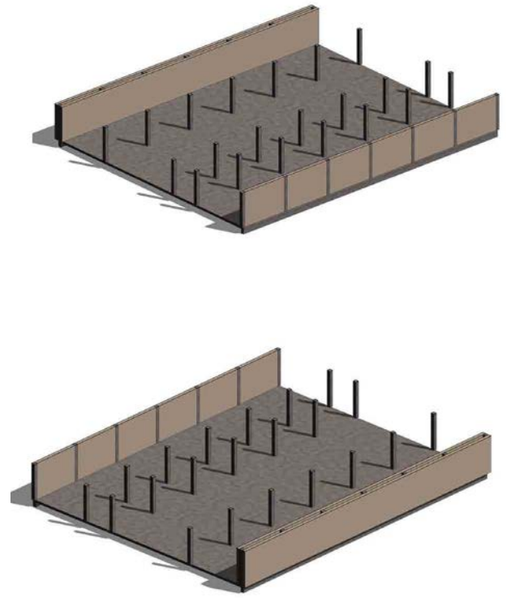


Fig. 2.5.2.6. Role of structure (Naidoo 2020)

5.2.2.2. Primary structure in relation to the architectural approach

Three approaches were adopted to dealing with the interaction between primary and secondary structural elements. These approaches were intended to assist the architectural language developed within the project. The primary structure of the concrete column module is expressed in the architecture within the private space of the building. The secondary structure of brickwork sits as infill in this approach. Revealing the structural element is intended to provide the visual indication of distinguishing private learning zones in an open plan arrangement. The primary column structure is concealed by the secondary structure in the internal, communal public area of the building,

This structure therefore sits within the cavity wall to limit interruption in the continuity of space. The secondary structural mechanism of the cavity wall guides the concealment of the primary structure according to the internal and external conditions. When rhythm needs to be established to distinguish space, the primary structure is revealed.

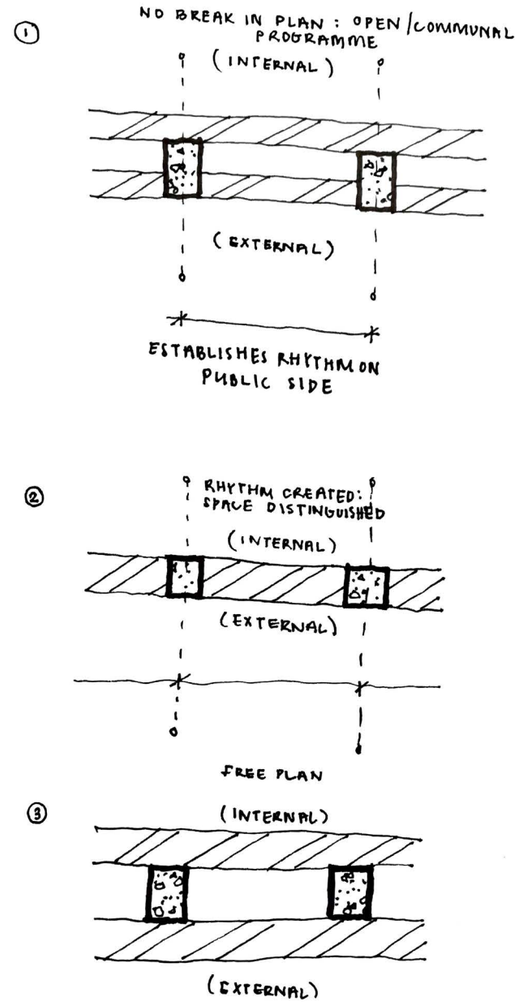


Fig. 2.5.2.7. Relationship between structure and plan (Naidoo 2020)

5.2.2.3. Secondary structure in relation to the architectural approach

The secondary structure aimed to provide an architectural language to the threshold and programmatic response of the architecture. A series of flat roofs and steel trusses have been the acquired architectural language of the site. Points of entry into the school are differentiated in the roof plane with the use of horizontal elements. This threshold response is also reflected within the circulation system. The circulation serves a hierarchical role with the tertiary roof structure transitioning up towards the flat roof structure. Breaks within this language provide opportunities to be expressed within the architecture, such as the change in direction of circulation reflecting on elevation.

The secondary structure allows the architecture to interact with the external condition and consists of the layering of stereotomic elements to establish the edge approach of the site with deep openings. In the current condition, the vertical plane of the classrooms bluntly addresses the exterior. However, the thickening of this vertical element provides a threshold opportunity to stimulate connection. It also serves a functional role in contributing to the quality of circulation space by creating multiple opportunities for interaction and thus learning outside of traditional means. The tectonic elements are expressed to create interaction with the context and establish external space.

5.2.2.4. Tertiary structure in relation to the architectural approach

The tertiary structure consists of a series of lightweight steel trusses that articulates the space below. Three steel truss types have been applied within the project to develop an architectural language between the building and its construction. Variations in the roof structure speak to the programming of the space below. The first truss type follows the slope of the roof and peaks up towards the secondary circulation structure. The intention behind this approach is to accommodate the public, communal aspects of the programme through the increase in volume. The shorter truss spans with horizontal members are employed over the private aspects of the programme, which speaks to the intimate quality of the programme. Considering how these elements interact have distinguished the spatial experience of the building

5.2.3 Connection

Frascari (1984) states that construction lies in the detail and allows for the ‘architectural production of meaning’. Therefore detail resolution of a building takes on a deeper role. Detail resolution of the building was an investigation into the art of the connection between the building components. Exploration into their various configurations allowed for an understanding of the opportunities they presented.

The articulation of junctures and joints between elements allowed for opportunity to highlight the intersection between tectonic and stereotomic elements. The lightweight steel roof is lifted off the heavier elements below expressing the connection between the two. This was intended to express the interaction between public and private. These junctures were expressed in the architecture as moments to let light into the building. Approaching the connections with this conceptual intention contributed to the ‘character and style of the building’ (Frascari 1984:3).

5.3 Building Systems

5.3.1 Acoustic Considerations

When publicly redefining the school as a collective urban entity, acoustic factors needed to be considered. Building acoustics, including external noise, is a contributing factor that affects learning performance (Barret et al 2015). Therefore, to mitigate arising issues from adjacent public and private programmes, an acoustic investigation was done to understand mechanisms to reduce noise transfer.

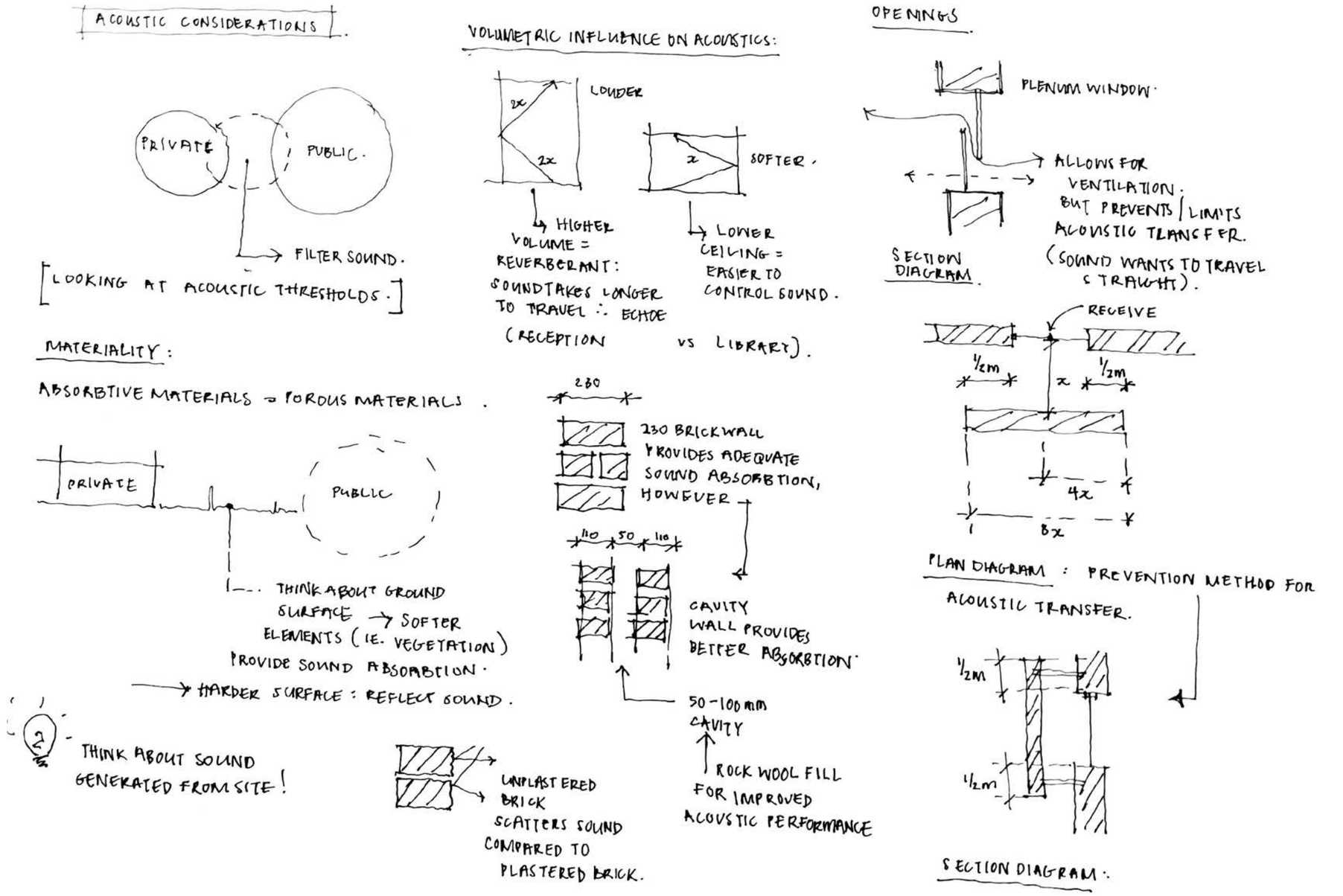
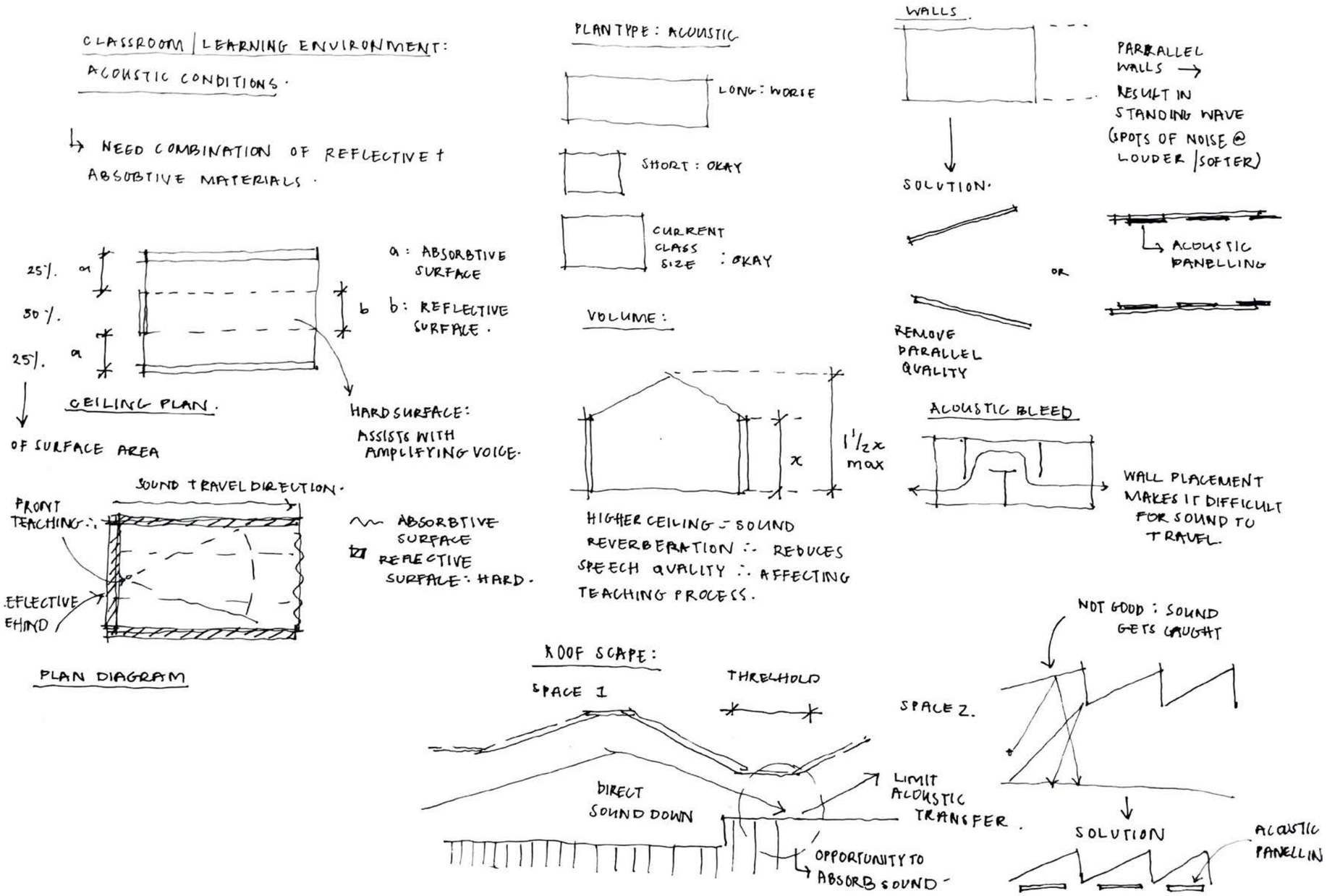


Fig. 2.5.3.1. Acoustic considerations (Naidoo 2020)



The current condition of the existing classrooms were also considered in terms of their acoustic performance. Whilst the current form of the classrooms are not acoustically problematic, their performance can be improved through acoustic panels.

Fig. 2.5.3.2. Acoustic considerations (Naidoo 2020)

5.3.2 Water System

Tsako Thabo Secondary school is located in close relation to a water body, however this is not the case for all the schools in Mamelodi East. The building makes use of a rainwater harvesting system to illustrate how typologically similar schools can adapt a similar method to sustaining the increase in programme to the school. The proposal for schools, in Mamelodi East, to publicly redefine themselves as collective urban entities increases the water dependency. Therefore, the water system is directed towards maintaining the schools increased capacity to function as a public facility.

Process:

1. Rainwater is harvested from roof surfaces
2. Roof gutter to collect rainwater
3. First flush diverter- diverts the first flow of water, with sediment and debris, away from the storage tank
4. Above ground, polyethylene rainwater storage tank chosen as a cost effective option in South Africa
5. Diverter for debris
6. Pump to transfer water to point of use.
7. Filter and UV disinfection within the line
8. Overflow system

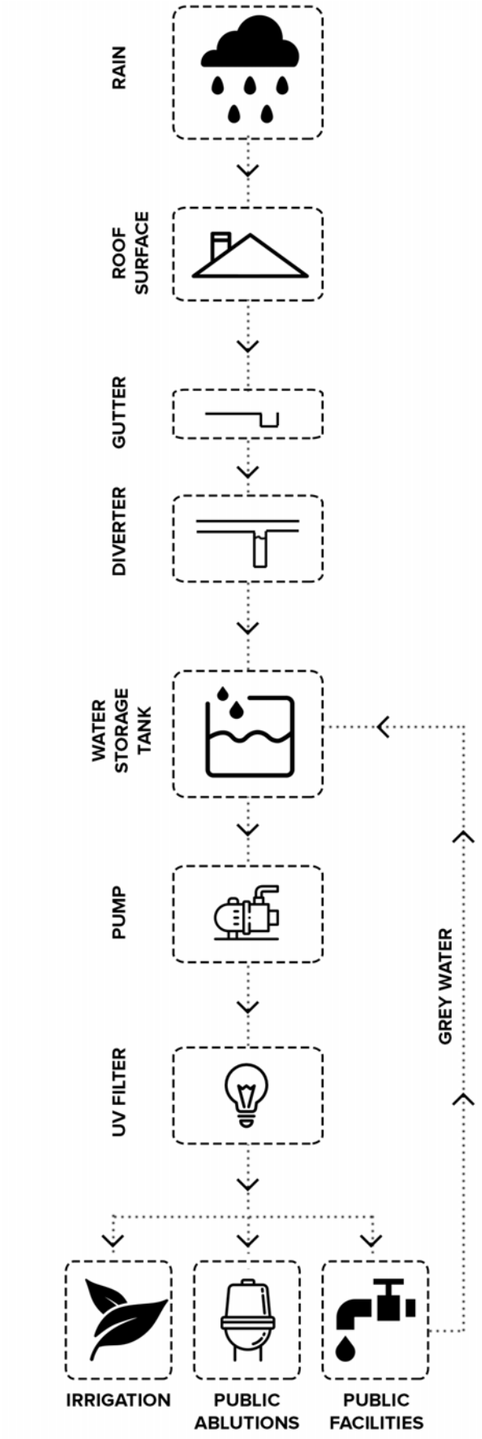


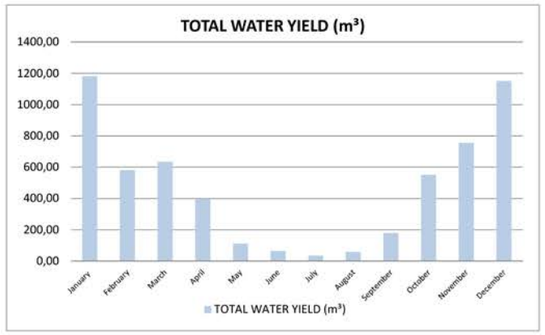
Fig. 2.5.3.3. Water system (Naidoo 2020)

WATER MANAGEMENT MODEL

WATER RESOURCE INFORMATION (YIELD, m^3)

RAIN WATER HARVESTING DATA

DESCRIPTION	AREA (m^2)	RUNOFF COEFF. (C)
Pitched roof	5834	0,9
Flat roof	3337	0,7
Paving	0	0,7
Lawn	0	0,1
Wetland	0	1
TOTAL AREA (A)	9171,00	
WEIGHTED C		0,83



TOTAL WATER YIELD

MONTH	AVE RAINFALL , P (m)	CATCHMENT YIELD (m^3) (Yield = PxAxC)	ALTERNATIVE WATER SOURCE (m^3)	TOTAL WATER YIELD (m^3)
January	0,15	1168,32	12,00	1180,32
February	0,08	568,99	12,00	580,99
March	0,08	622,09	12,00	634,09
April	0,05	386,91	12,00	398,91
May	0,01	98,62	12,00	110,62
June	0,01	53,11	12,00	65,11
July	0,00	22,76	12,00	34,76
August	0,01	45,52	12,00	57,52
September	0,02	166,90	12,00	178,90
October	0,07	538,64	12,00	550,64
November	0,10	743,48	12,00	755,48
December	0,15	1137,98	12,00	1149,98
ANNUAL AVE.	0,70	5553,32	144,00	5697,32

WATER DEMAND

LANDSCAPE IRRIGATION DEMAND (m^3)

DESCRIPTION:	LAWN (m^2):	0	AGRI (m^2):	3000	PLANTING (m^2):	0	
MONTH	WEEKLY IRR. (m)	MONTHLY DEMAND (m^3)	WEEKLY IRR. (m)	MONTHLY DEMAND (m^3)	WEEKLY IRR. (m)	MONTHLY DEMAND (m^3)	TOTAL MONTHLY IRR. DEMAND (m^3)
January	0,015	0	0,025	300	0,005	0	300
February	0,015	0	0,025	300	0,005	0	300
March	0,015	0	0,025	300	0,005	0	300
April	0,015	0	0,025	300	0,005	0	300
May	0,01	0	0,025	300	0,005	0	300
June	0,01	0	0,025	300	0	0	300
July	0,01	0	0,025	300	0	0	300
August	0,015	0	0,025	300	0	0	300
September	0,015	0	0,025	300	0,005	0	300
October	0,015	0	0,025	300	0,005	0	300
November	0,015	0	0,025	300	0,005	0	300
December	0,015	0	0,025	300	0,005	0	300
ANNUAL TOTAL		0		3600		0	3600

B2 DOMESTIC & WC DEMAND

MONTH	PERSONS/DAY	WATER/ CAPITA/ DAY (l)	DOMESTIC DEMAND (m^3/month)
January	200	10	62
February	800	10	224
March	800	10	248
April	800	10	240
May	800	10	248
June	200	10	60
July	200	10	62
August	800	10	248
September	800	10	240
October	800	10	248
November	200	10	60
December	200	10	62
ANNUAL TOTAL			2002

EVAPORATION LOSS (For 'open' reservoirs) 35mm - 45mm/week in summer

AREA OF RESERVOIR (m^2): 0

MONTH	EVAPORATION RATE (m/week)	EVAPORATION RATE (m/month)	TOTAL LOSS (m^3/month)
January	0,04	0,16	0
February	0,035	0,14	0
March	0,025	0,1	0
April	0,02	0,08	0
May	0,015	0,06	0
June	0,01	0,04	0
July	0,01	0,04	0
August	0,02	0,08	0
September	0,03	0,12	0
October	0,035	0,14	0
November	0,035	0,14	0
December	0,04	0,16	0
ANNUAL TOTAL	0,32	1,26	0,00

B4 TOTAL WATER LOSS & DEMAND

MONTH	TOTAL DEMAND (m^3/month)
January	362,00
February	524,00
March	548,00
April	540,00
May	548,00
June	360,00
July	362,00
August	548,00
September	540,00
October	548,00
November	360,00
December	362,00
ANNUAL TOTAL	5602

Fig. 2.5.3.4. Rainwater harvesting calculations (Naidoo 2020)

WATER BUDGET

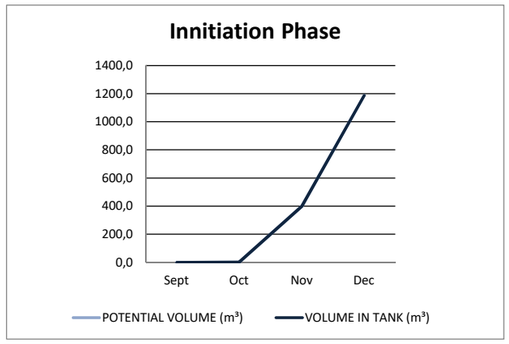
TANK CAPACITY (m^3): 5000
MIN VOLUME (m^3): 0

WATER BUDGET INNITIATION PHASE

MONTH	YIELD (m^3/month)	DEMAND (m^3/month)	MONTHLY BALANCE	POTENTIAL VOLUME (m^3)	VOLUME IN TANK (m^3)
Sept	178,9	540,0	-361,1	**0,0**	**0,0**
Oct	550,6	548,0	2,6	**2,6**	**2,6**
Nov	755,5	360,0	395,5	**398,1**	**398,1**
Dec	1150,0	362,0	788,0	**1186,1**	**1186,1**
	2635,0	**1810,0**	**825,0**		

WATER BUDGET YEAR 1

MONTH	YIELD (m^3/month)	DEMAND (m^3/month)	MONTHLY BALANCE	POTENTIAL VOLUME (m^3)	VOLUME IN TANK (m^3)
January	1180,3	362,0	818,3	**2004,4**	**2004,4**
February	581,0	524,0	57,0	**2061,4**	**2061,4**
March	634,1	548,0	86,1	**2147,5**	**2147,5**
April	398,9	540,0	-141,1	**2006,4**	**2006,4**
May	110,6	548,0	-437,4	**1569,0**	**1569,0**
June	65,1	360,0	-294,9	**1274,1**	**1274,1**
July	34,8	362,0	-327,2	**946,9**	**946,9**
August	57,5	548,0	-490,5	**456,4**	**456,4**
September	178,9	540,0	-361,1	**95,3**	**95,3**
October	550,6	548,0	2,6	**98,0**	**98,0**
November	755,5	360,0	395,5	**493,4**	**493,4**
December	1150,0	362,0	788,0	**1281,4**	**1281,4**
ANNUAL AVE.	**5697,3**	**5602,0**	**95,3**		



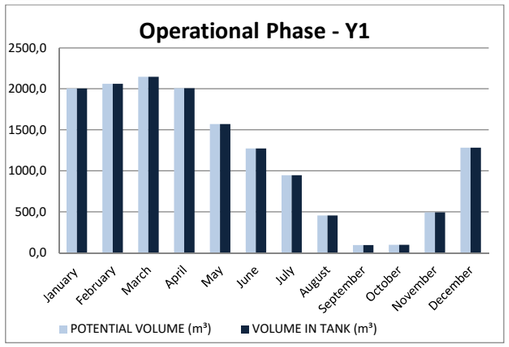


Fig. 2.5.3.5. Rainwater harvesting calculations (Naidoo 2020)

5.3.3 Ventilation Systems

Precedent:

Type: School
Architect: Diébédo Francis Kéré
Location: Gando, Burkino Faso
Year: 2012

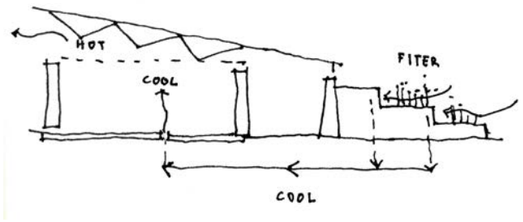


Fig. 2.5.3.8. School in Gando ventilation response(Naidoo 2020)

Fig. 2.5.3.6. School in Gando (Archdaily 2020)

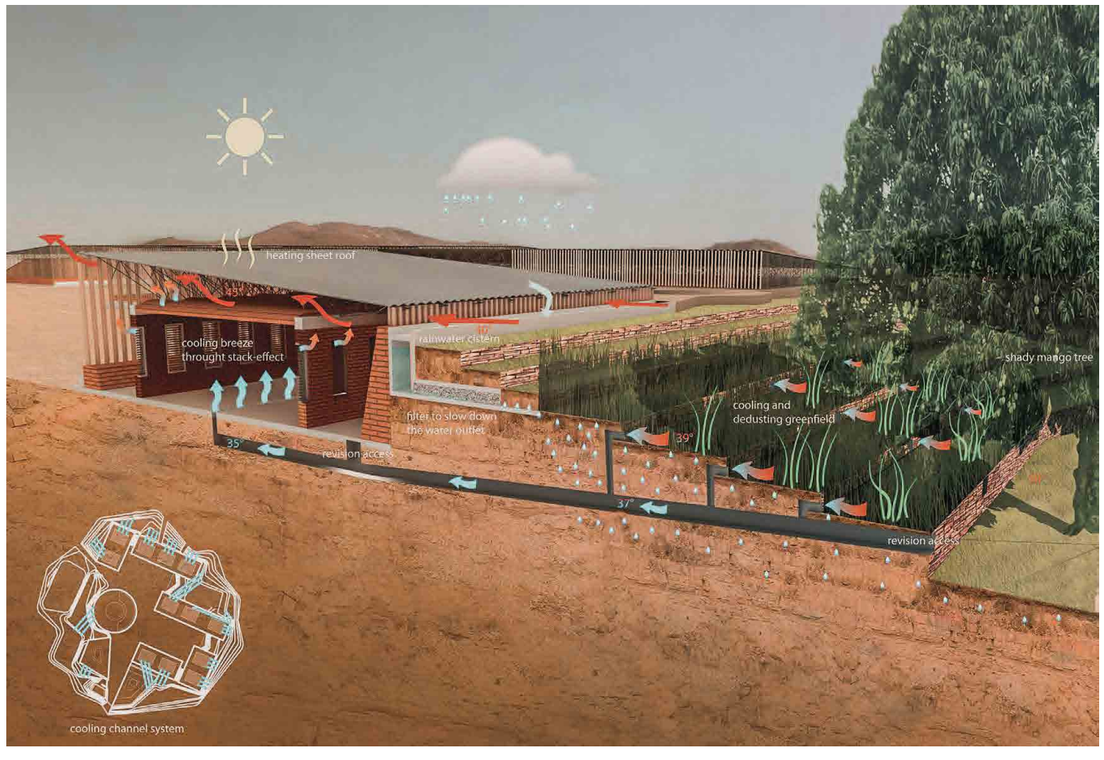


Fig. 2.5.3.7. School in Gando ventilation response(Archello 2020)

Ventilation system to be implemented at Tsako Thabo:

A passive system has been used to naturally ventilate the building. To accommodate a comfortable physical educational environment that does not hinder the learning process, large room volumes with window openings at different heights have been used. This to allow for ventilation of varying conditions (Barret et al 2015).

The building form articulated itself with circulation space serving a hierarchical role. Due to these high volume spaces throughout the building, it provided the opportunity to implement the stack effect. The difference in pressure created from hot air rising in the building, and being released through an outlet in the circulation 'tower', draws cool air into the building (Kang & Lutz-Carrillo 2009). Promoting air flow is crucial due to the public programme of the building.

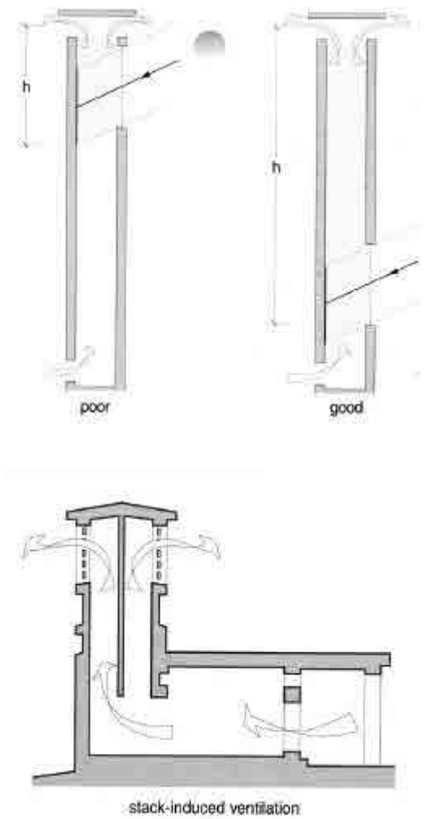


Fig. 2.5.3.9. Stacked induced ventilation system (Kang & Lutz-Carrillo 2009)

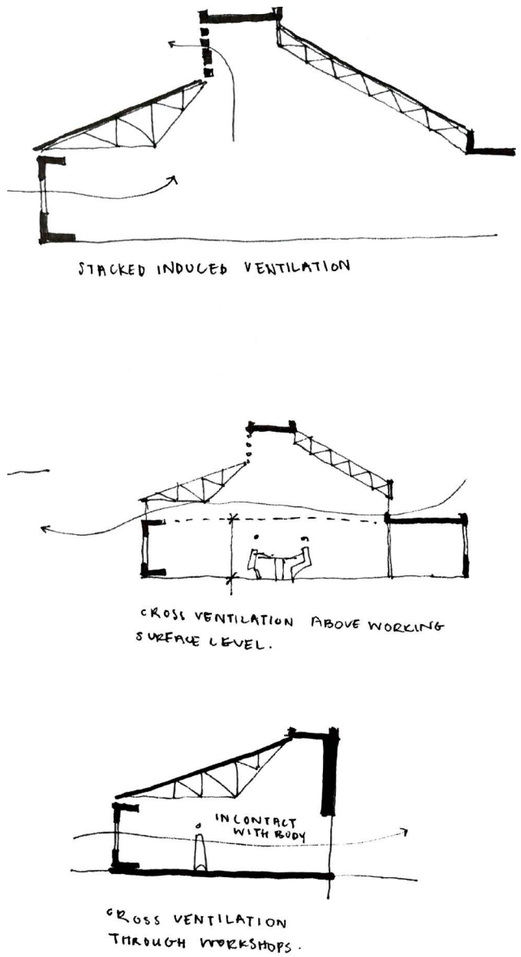


Fig. 2.5.3.10. Ventilation system (Naidoo 2020)

5.4 Building Performance

The physical educational environment directly impacts its learners (Hertzberger 2008) and is therefore an important aspect to the dissertation. Numerous studies have been conducted on the impact of internal environments on the health and performance of learners, with poor conditions relating to detrimental impacts on learning (Motsatsi 2015:48). Policy for public school infrastructure lacks guidelines relating to building performance (Department of Basic Education 2012). Section 14 and section 16, within these policy documents, make mention of lighting conditions and comfort levels, however the guidelines are limited (Department of Basic Education 2012:12). Lighting stipulations state the lux values that need to be achieved but not methods of doing so through the physical infrastructure. Comfort levels do not speak to the relevance of visual and thermal comfort in the learning process. This resembles the outdated approach of the Administration Boards (mentioned in 2.2.2), where school building performance in relation to the learning process was “not considered in any way whatsoever” (Candiotes 1997:20-21).

The following performance based design assessment has been conducted to a single classroom block at Tsako Thabo Secondary School, to understand the shortfalls within the current schooling typology that affect learning capabilities. The investigation has been conducted on a classroom block due to the fact that learners spend most of their time within this single space (Barret et al 2015, Motsatsi 2015), therefore the indoor environmental quality of these spaces becomes crucial. The particular classroom block has been selected as it represents the same makeup as the other blocks on site and can therefore serve as the base model to compare results against.

This assessment of the building engages with an iterative process to investigate the adaptations that impact the greatest improvement of the building’s performance. In doing so, the intention is to provide a guideline of the spatial adaptations that can be made to the current typology to improve the learning condition, according to incremental improvements that schools can afford at the time. Aligning with the dissertation intentions of responding to policy for public school infrastructure, this process needed to be conducted with rigour, therefore the building performance software tool, Integrated Environmental Solutions Virtual Environment (IESVE), was used to conduct simulations for the following building performance themes:

- Solar Intensity- Daylight capture/shading strategy
- Glare- Visual Comfort
- Thermal Comfort

Each parameter assessment is structured according to a base model test and analysis of the building performance of the current typology. This is followed by a series of iterations which are compared against the base model results. With each iterative test, a single variable to the physical quality of the building is changed. This is done to understand the level of improvement that the isolated variable induces. Results from the iterative process informed the final design and technical response of the dissertation.

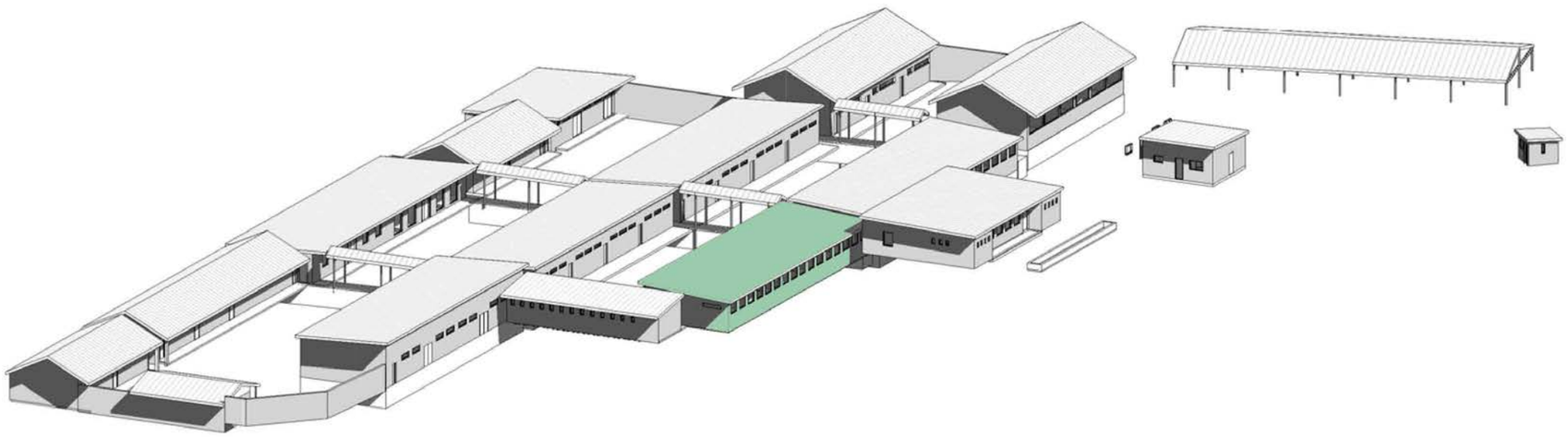


Fig. 2.5.4.1. Existing Tsako Thabo school with classroom block highlighted (Naidoo 2020)

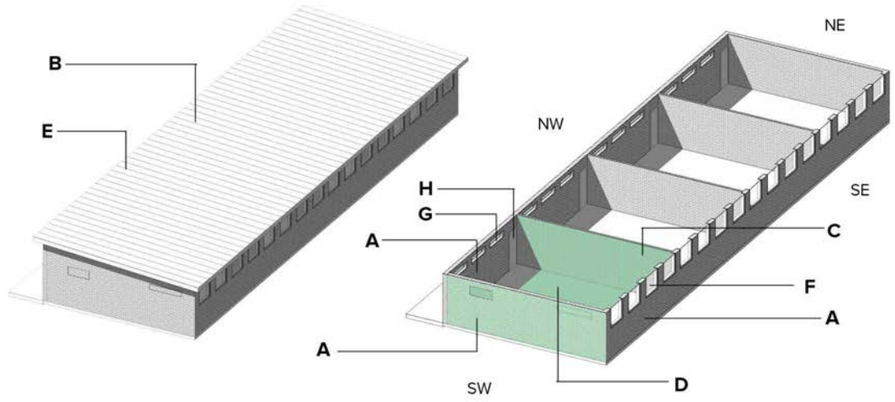


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

Current Classroom Block Exterior Conditions:

A: Walls- 230mm double skin brown and cream painted brick exterior walls
B: Roof- Standard timber truss with standard 2mm corrugated profile, steel roof sheeting and 400mm painted fascia board.

Current Classroom Block Interior Conditions:

C: Walls- Painted brick walls with 110mm single skin interior partitioning walls
D: Floor- Red Vinyl Tiles
E: Ceiling- Standard white painted 12mm gypsum ceiling board
F: Window- 1310x1490mm Maroon painted mild steel window frame with 6mm thick clear glazing
G: Window- 1490x390mm Maroon painted mild steel window frame with 6mm thick clear glazing
H: Doors- 1200x900mm Standard single leaf maroon painted door

Fig. 2.5.4.3. External conditions at Tsako Thabo (Naidoo 2019)

Fig. 2.5.4.4. Internal conditions at Tsako Thabo (Naidoo 2019)

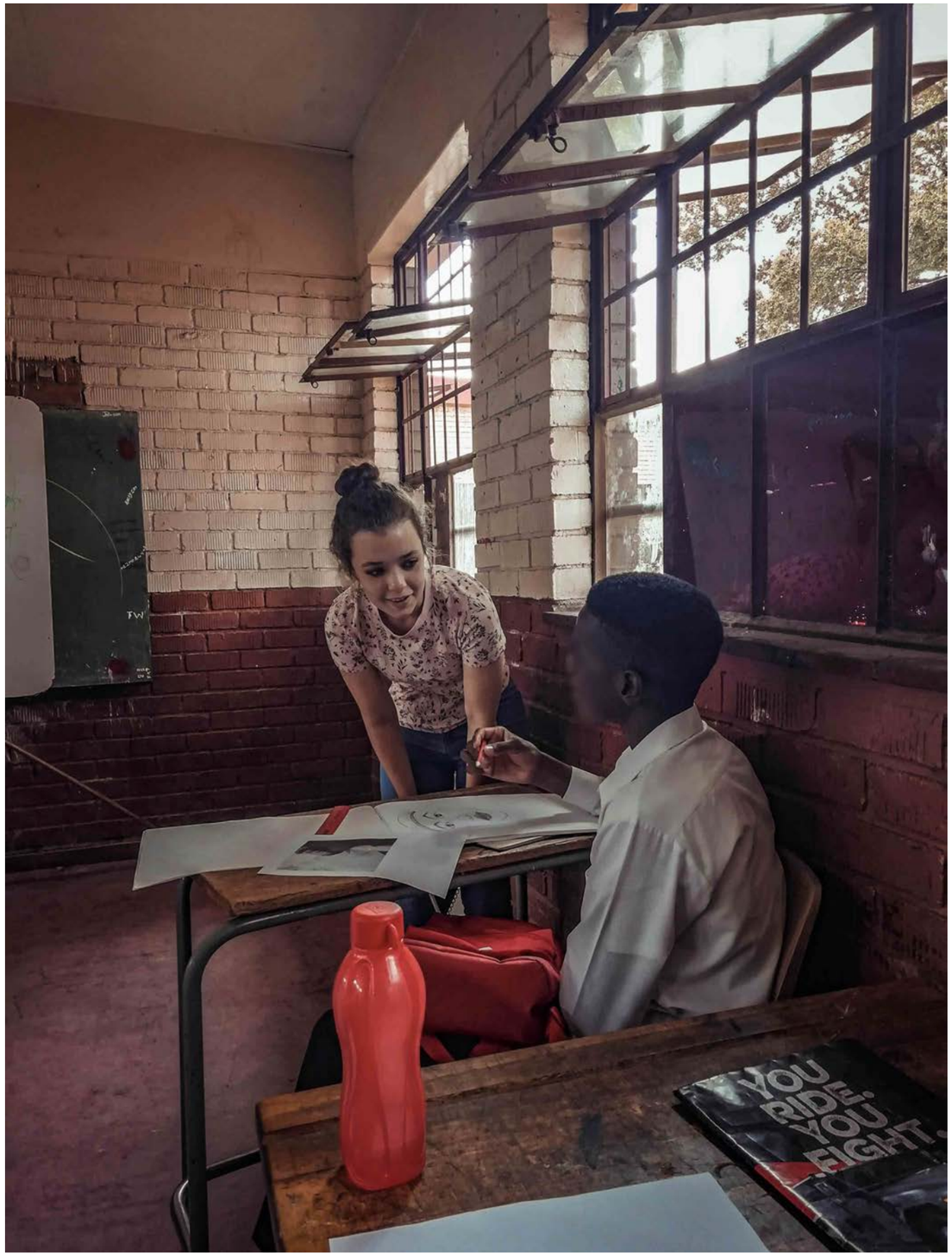


Fig. 2.5.4.5. Internal conditions at Tsako Thabo (Naidoo 2019)

5.4.1 Solar Intensity: Daylight Capture

“Poor quality of electrical lighting causes headaches and impairs visual performance” (Barret et al 2015), therefore it is important to consider reducing the dependency on artificial lighting within the learning environment to minimise the impact on learning potential. Natural light however has the potential to “significantly influence reading vocabulary” (Barret et al 2015).

The FlucsDL tool in IESVE was used to calculate the daylight levels and illuminance on the working surfaces within the classroom. For the following tests, the working surface was set to the height of a desk at 735mm, to determine the lighting condition during learning. Before the simulations could be conducted, a model of the existing classroom block was developed and surface finishes were allocated to determine their percentage of reflectance. This was important in gathering an accurate reading on the daylight capture within the classroom. Simulations were set to occur during a Standard Overcast Sky, to analyse the buildings daylight performance under the poorest conditions.

According to policy for public school infrastructure, section 14.1.1, the artificial lighting level for a classroom needs to have a reading of 200 lux, with specialised areas requiring 300 lux (Department of Basic Education 2012:12). Unfortunately, policy does not mention strategies for acquiring this lux level reading through natural light. For the analysis of the following results, the lux levels were read with cognizance of the amount of the work surface receiving a reading of 200 lux. This figure was used as a guide, so that adaptations to the existing would minimise the dependency on artificial lighting that could hinder learning performance. The German Sustainable Building Council (DGNB) provided a guideline for the analysis of daylight factor (DF) from the results (Velux 2020):

DF greater than 3% : very good
DF greater than 2% : medium
DF greater than 1% : slight
DF lesser than 1% :none

Base Variable Test

Variables

F: Window F Size: 1310x1490mm
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
D: Floor surface: Red Vinyl Tiles with 10% reflectance
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard with 80% reflectance

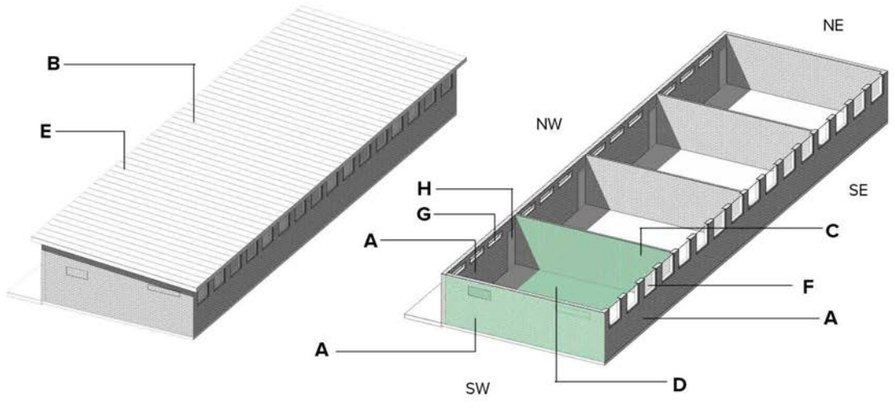


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

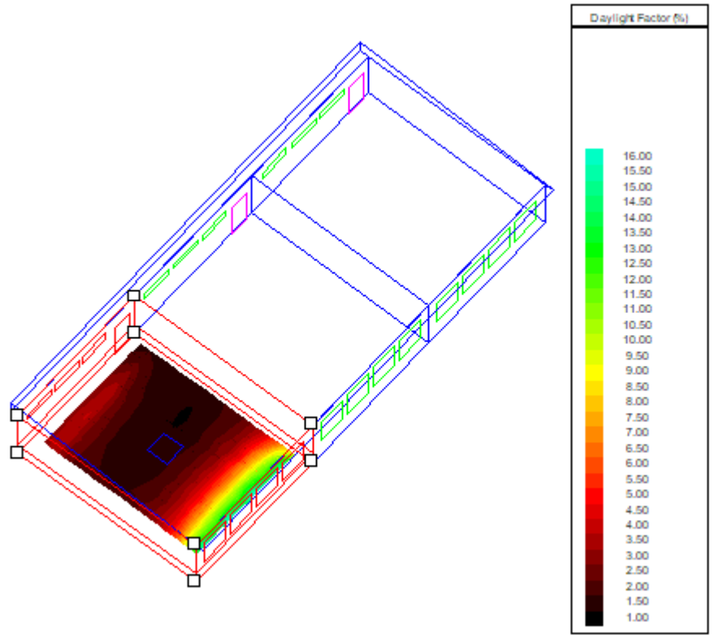


Fig. 2.5.4.6. Solar intensity base model results (IESVE 2020)

	Total
Daylight levels (lux)	492.733
Percentage area above threshold (%)	66.5

Fig. 2.5.4.7. Solar intensity base model results (IESVE 2020)

Findings and Discussion

The base model displayed an average lux reading of 492.73 which exceeds the minimum requirements of 200 lux set out by policy. Unfortunately when looking at the daylight factor reading across the work surface in the classroom, a major area reflects a lot daylight factor of 1% where learner desks would usually be concentrated. The periphery of the classroom, along the fenestration edges, receive a DF of 3% and above which is considered very good. Therefore, within the base model, learners seated within this area, have a visual advantage due to the daylight condition.

Iteration One Test

Variables

F: Window F Size: 1310x1490mm
G: Window Size: 1490x2390mm (Variable tested)
B: Overhang: 400mm roof overhang
D: Floor surface: Red Vinyl Tiles with 10% reflectance
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard with 80% reflectance

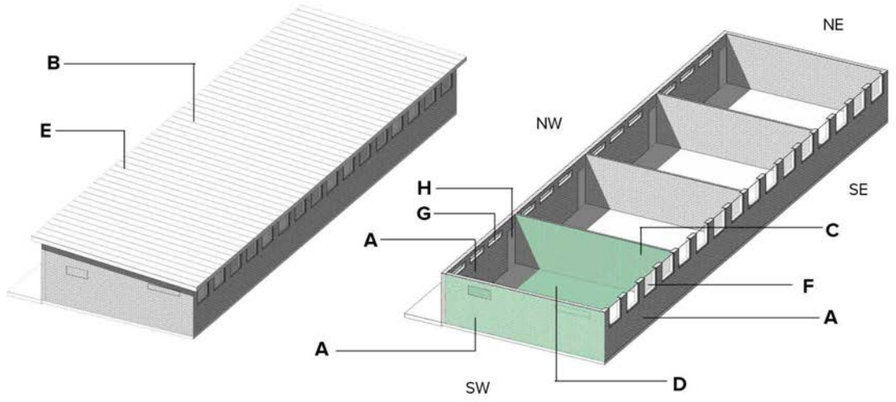


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

Findings and Discussion

Iteration one displayed superior lux levels to the base model, with an average reading of 678.02 lux. This is well above the minimum requirements dictated by policy. Within the work surface of the classroom, the previously disadvantaged central space from the base model improved with the reading shifting from a DF of 1% to a DF of 2%. 98.6% of the classroom work surface sits above this threshold of 2% DF, which is a superior performance to the base model.

	Total
Daylight levels (lux)	678.026
Percentage area above threshold (%)	98.6

Fig. 2.5.4.9. Solar intensity iteration one results (IESVE 2020)

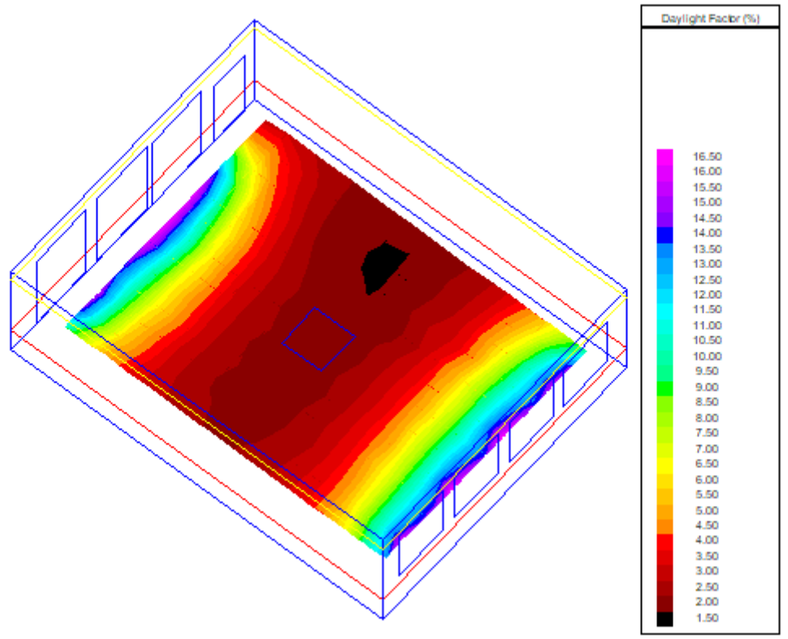


Fig. 2.5.4.8. Solar intensity iteration one results (IESVE 2020)

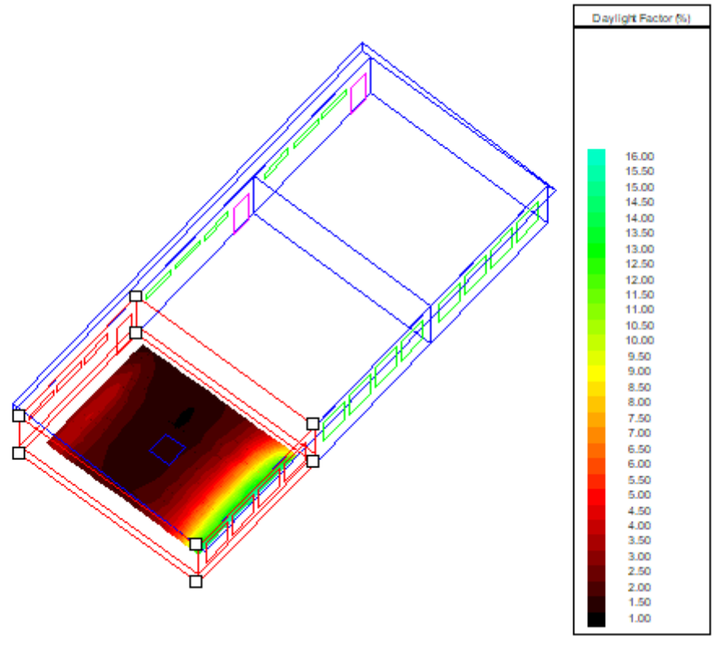


Fig. 2.5.4.6. Solar intensity base model results (IESVE 2020)

Iteration Two Test

Variables

F: Window Size: 1310x1490mm
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
Shading: 2000mm shading structure on NW elevation (Variable tested)
D: Floor surface: Red Vinyl Tiles with 10% reflectance
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard with 80% reflectance

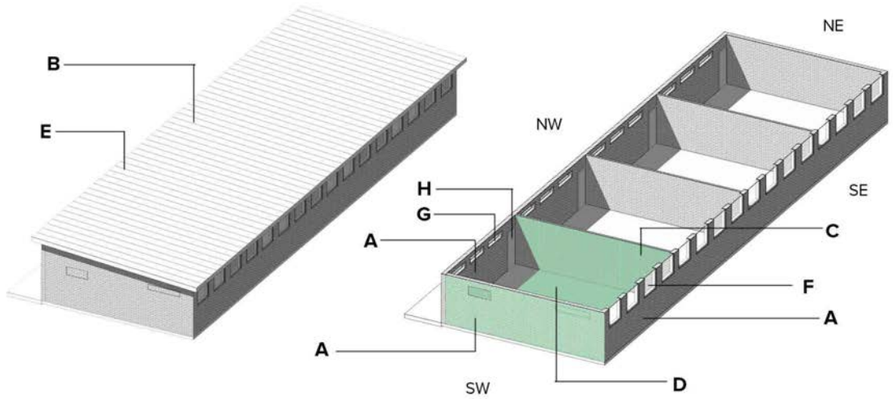


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

Findings and Discussion

The average lux levels within iteration two performed inferior to the base model. This is also reflected in the daylight factor readings across the working surface, where the minimum DF % is below 1. In this iteration half of the work surface in the classroom receives poor daylight whilst the other half of the classroom receives a DF & reading of 2 and up.

	Total
Daylight levels (lux)	436.224
Percentage area above threshold (%)	42.1

Fig. 2.5.4.11. Solar intensity iteration two results (IESVE 2020)

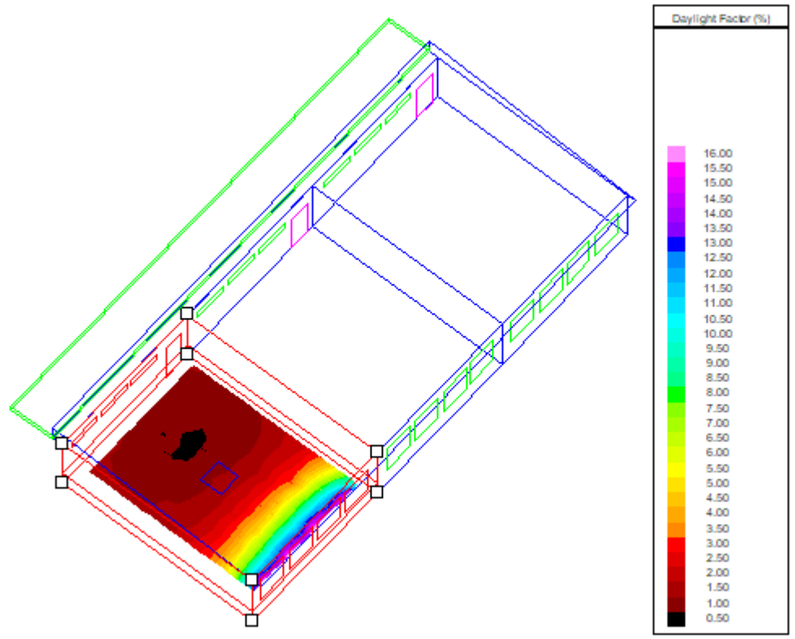


Fig. 2.5.4.10. Solar intensity iteration two results (IESVE 2020)

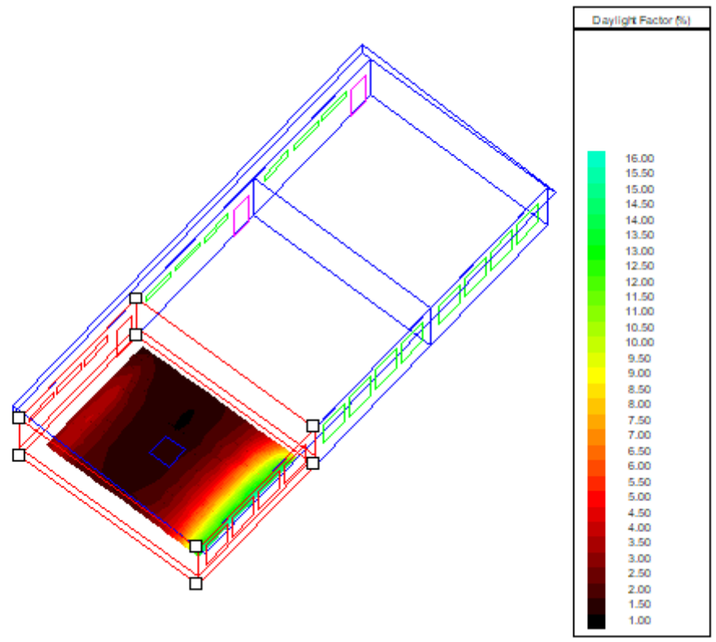


Fig. 2.5.4.6. Solar intensity base model results (IESVE 2020)

Iteration Three Test

Variables

F: Window Size: 2390x1490mm (Variable tested)
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
Shading: 2000mm shading structure on NW elevation (Variable tested)
D: Floor surface: Red Vinyl Tiles with 10% reflectance
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard with 80% reflectance

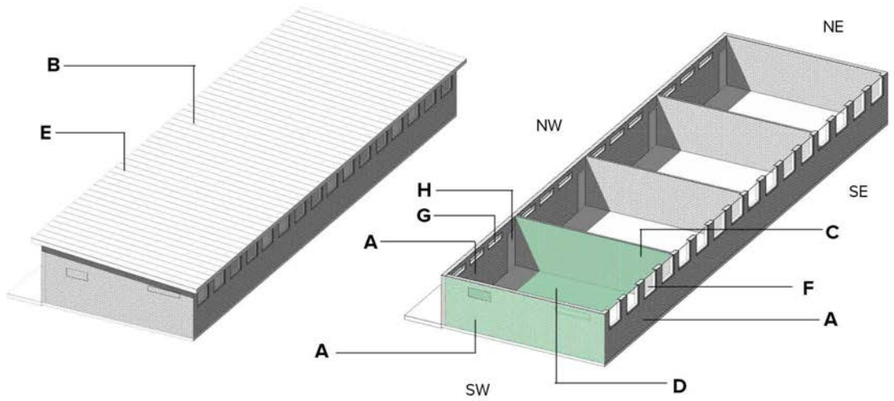


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

Findings and Discussion

For iteration three, the variable changes in iteration one and two were combined. Increasing the openings and providing covered circulation space is important to the design response of the building (see chapter 4), therefore this iteration was intended to see how both variable adaptations performed. In combination, the average lux levels exceeded the base model. The percentage of DF% above the threshold of DF 2%, also performed superior to the base model, with a reading of 85.1%. In combination, the positive effects on daylight by iteration one balanced out the negative effects of iteration two.

	Total
Daylight levels (lux)	532.831
Percentage area above threshold (%)	85.1

Fig. 2.5.4.13. Solar intensity iteration three results (IESVE 2020)

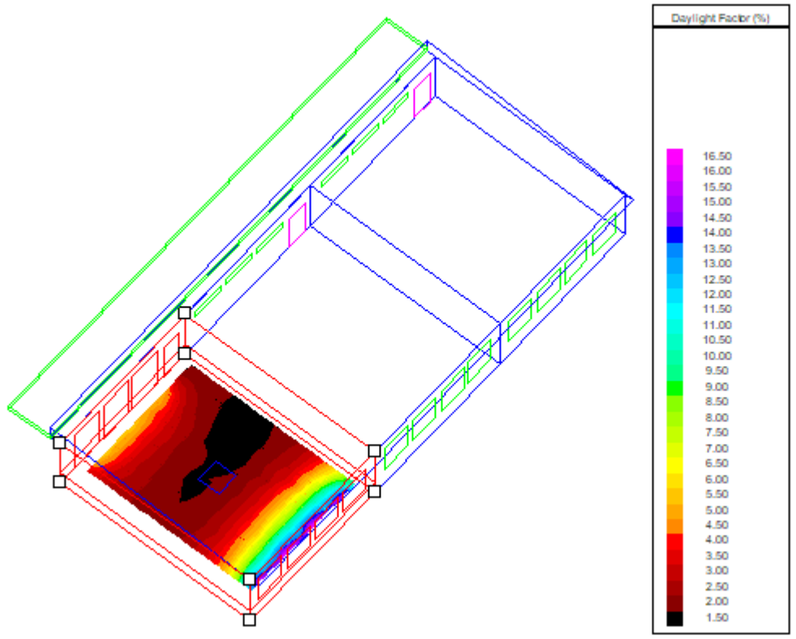


Fig. 2.5.4.12. Solar intensity iteration three results (IESVE 2020)

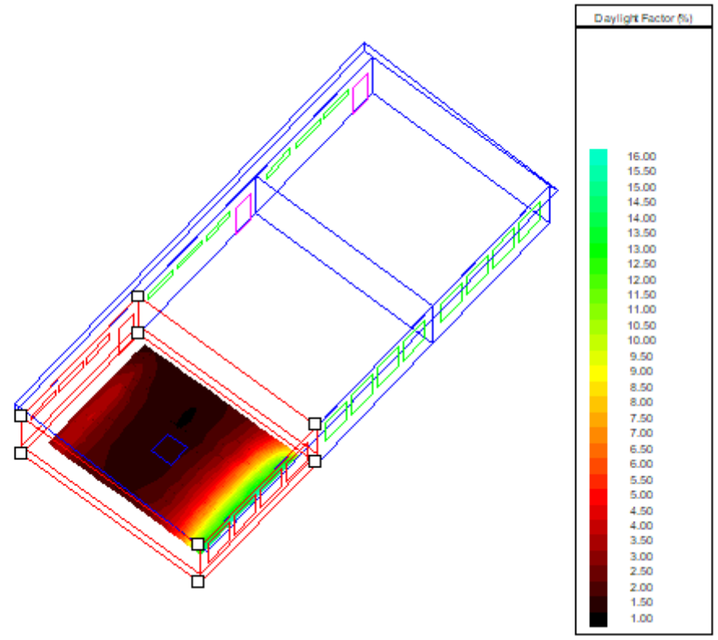


Fig. 2.5.4.6. Solar intensity base model results (IESVE 2020)

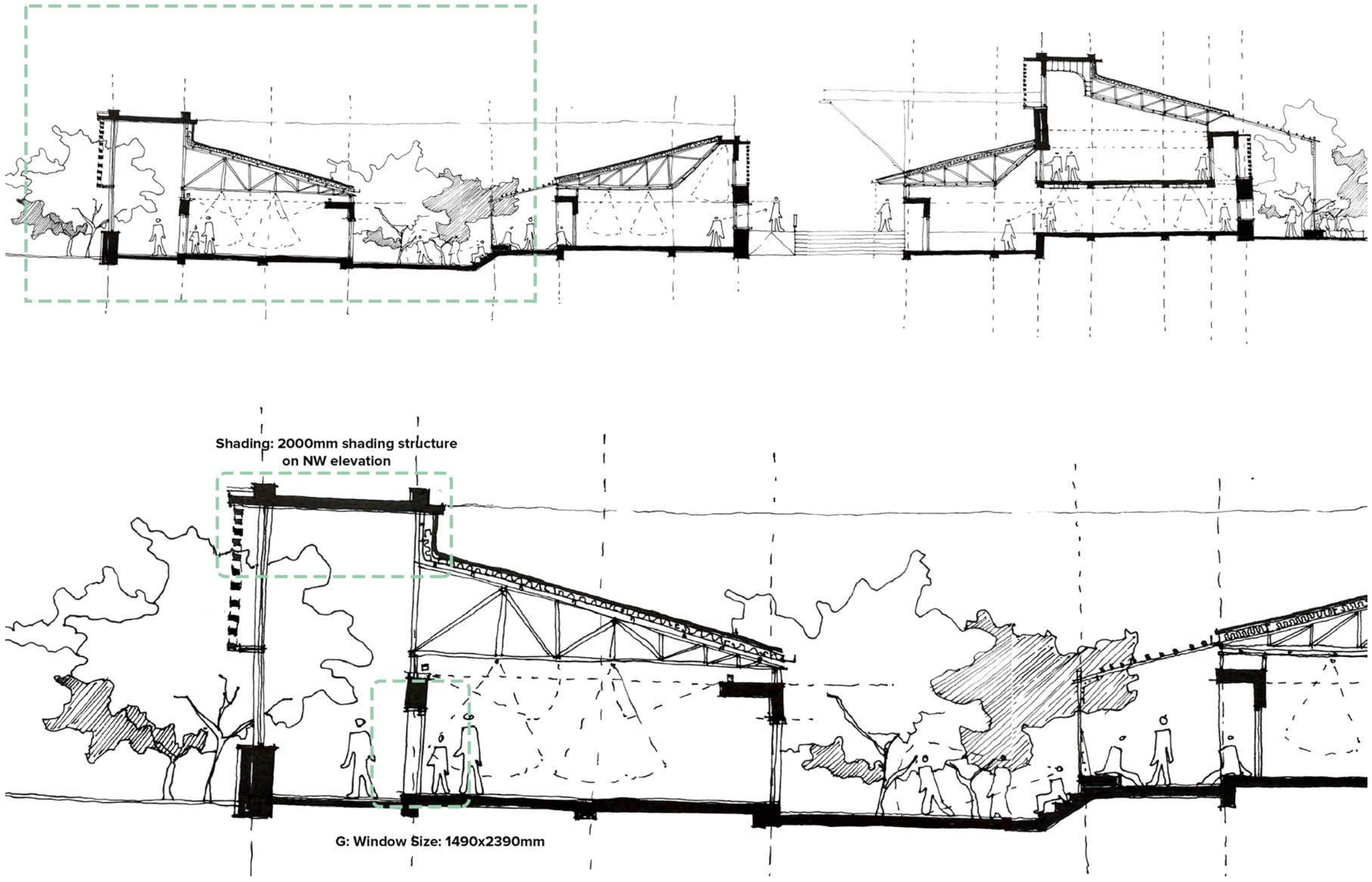


Fig. 2.5.4.14. Iterative development of section using solar intensity analysis results (Naidoo 2020)

Conclusion

Iteration one had the greatest impact of the daylighting levels within the classroom block, however iteration three with the combination of adaptations, was able to meet the design needs as well as improve the base models building performance. It is important to note however that this simulation did reflect uneven lighting conditions between the outer and inner working surfaces. Therefore, for further consideration, mechanisms for bringing in natural light to central spaces of the classroom is suggested.

5.4.2 Glare: Visual Comfort

Using the RadianceIES tool within IESVE, an illuminance analysis was conducted to understand the impact of visual comfort experienced by learners during learning. This was done through investigating the effect of glare.

Direction of view was an important factor to consider when analysing the effect of glare. For this reason, the direction of view was set according to the teaching method currently conducted at the school where learners face a focal point. It is important to note that even though the dissertation proposes the spatial configuration and play type to allow for multiple learning arrangements, it was important to establish a base analysis on the current learning in place. The direction of view was set at a height based on the eye level of a seated learner (1200mm), focussed on the height of a teacher standing (1.8m) (Motsatsi 2015:64).

The following results were analysed according to the difference in lux levels within the individual space, due to the fact that the visual discomfort from glare is experienced as a result of the difference in light and dark areas within a space. The greater the difference between the minimum and maximum lux levels results in increased difficulty for the eye to adjust, resulting in visual discomfort. Therefore the aim through each variable iteration, was to reduce this difference.

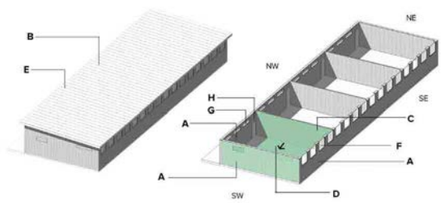


Fig. 2.5.4.15. Classroom block with directional arrow (Naidoo 2020)

Base Variable Test

Variables

F: Window Size: 1310x1490mm
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
D: Floor surface: Red Vinyl Tiles
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard

Results: 21 June (Winter Solstice)

Total Image:
Minimum = 1.70 Lux
Maximum = 2296.07 Lux
Average = 92.10 Lux
Difference = 2294.37

Results: 22 Dec (Summer Solstice)

Total Image:
Minimum = 4.59 Lux
Maximum = 3495.34 Lux
Average = 142.39 Lux
Difference = 3490.75

Findings and Discussion

The difference in lux values is greater during the summer period than it is for the winter. This results in learners experiencing an increase in visual discomfort during the summer time frame. As a result, learner performance could potentially be higher during the winter period than the summer.

Fig. 2.5.4.16. Visual comfort base model results June 21 (IESVE 2020)

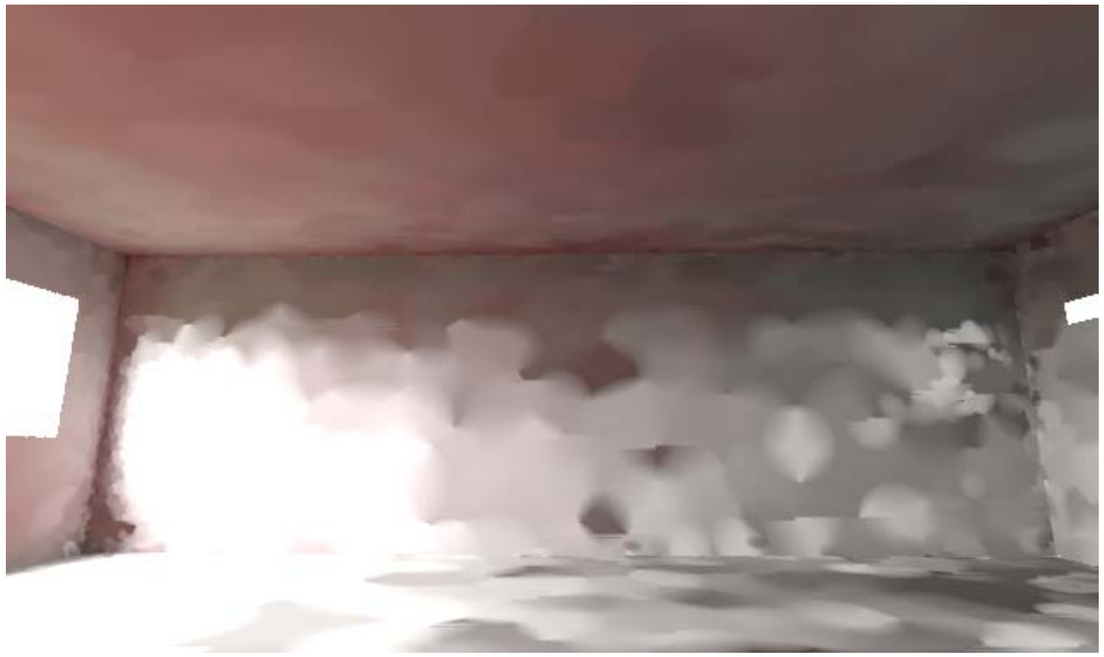


Fig. 2.5.4.17. Visual comfort base model results Dec 22 (IESVE 2020)

Iteration One Test

Variables

F: Window Size: 1310x1490mm
G: Window Size: 1490x2390mm (Variable tested)
B: Overhang: 400mm roof overhang
D: Floor surface: Red Vinyl Tiles
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard

Variation to window G, keeping the same lintel height whilst allowing the classroom space to open up towards the exterior.

Results: 21 June (Winter Solstice)

Total Image:
Minimum = 9.00 Lux
Maximum = 2428.87 Lux
Average = 200.43 Lux
Difference = 2419.87

Results: 22 Dec (Summer Solstice)

Total Image:
Minimum = 14.73 Lux
Maximum = 3640.12 Lux
Average = 299.25 Lux
Difference = 3625.39

Findings and Discussion

With the change of window size in iterative test one, both the summer and winter difference in lux values increased. Therefore, isolating this variable highlighted that this change negatively impacts the visual discomfort through the increase in glare within the classroom. Through this simulation, the base model with the existing classroom conditions performed better.

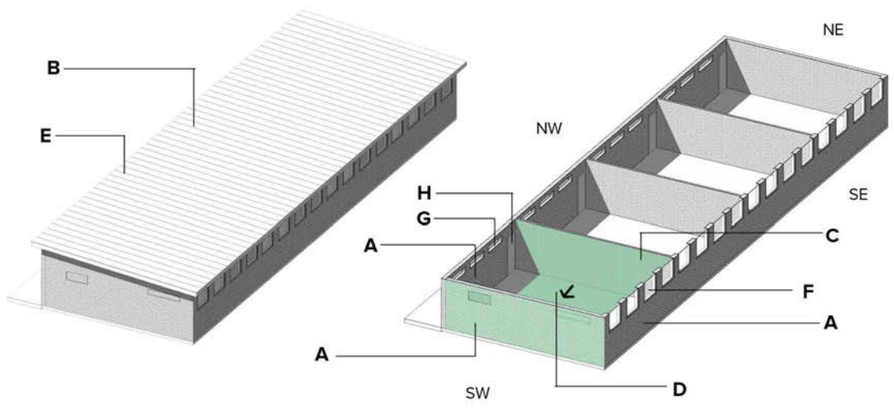


Fig. 2.5.4.15. Classroom block with directional arrow (Naidoo 2020)

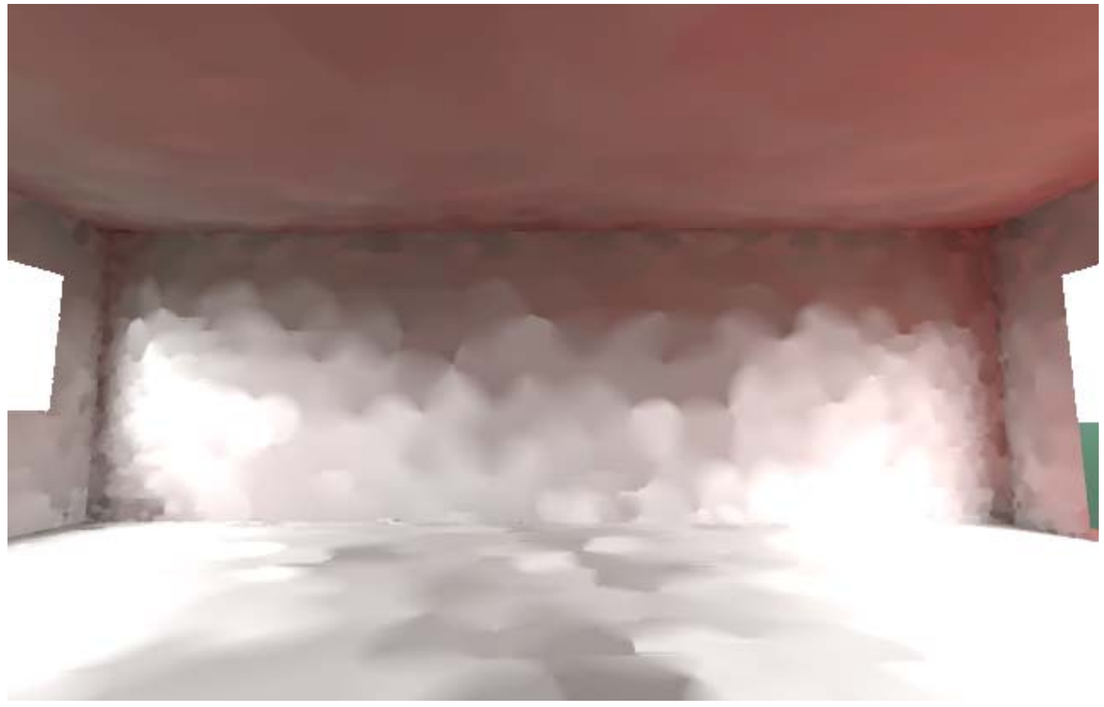


Fig. 2.5.4.18. Visual comfort iteration one results June 21 (IESVE 2020)

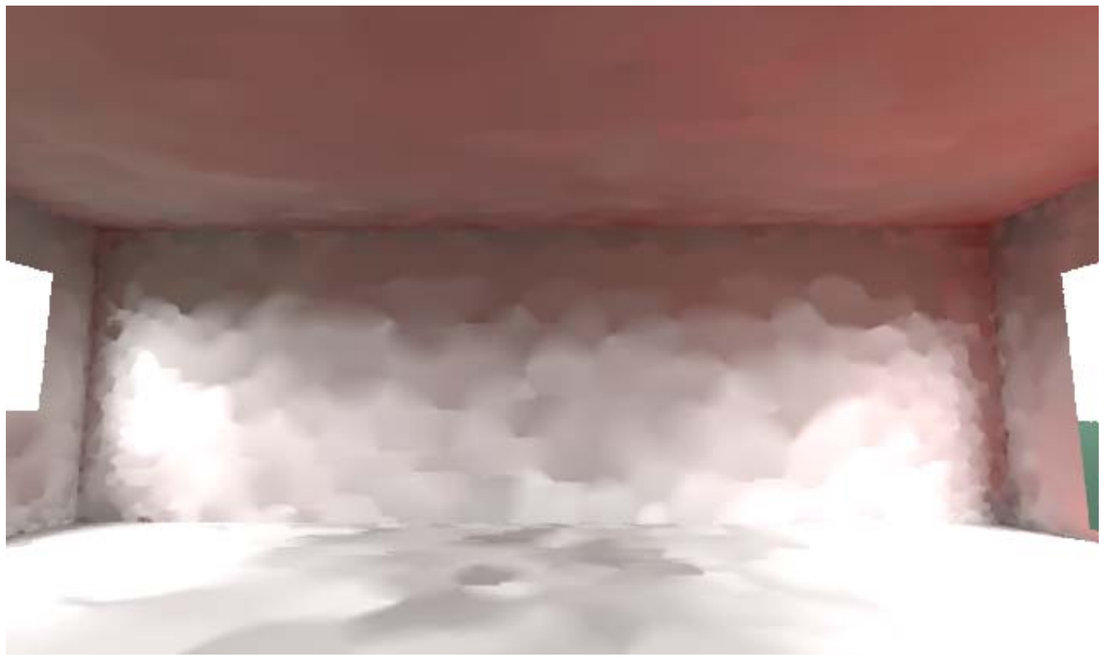


Fig. 2.5.4.19. Visual comfort iteration one results Dec 22 (IESVE 2020)

Iteration Two Test

Variables

F: Window Size: 1310x1490mm
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
2000mm roof overhang over window G (Variable tested)
D: Floor surface: Red Vinyl Tiles
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard

Results: 21 June (Winter Solstice)

Total Image:
Minimum = 2.43 Lux
Maximum = 2272.46 Lux
Average = 101.85 Lux
Difference = 2270.03

Results: 22 Dec (Summer Solstice)

Total Image:
Minimum = 4.55 Lux
Maximum = 3464.21 Lux
Average = 151.84 Lux
Difference = 3459.66

Findings and Discussion

Introducing an overhang positively impacted the visual comfort experienced in the classroom. The difference in lux levels for both the summer and winter period reduced in comparison to the base model. Therefore, the impact of glare on the learning experience was minimised within this iteration.

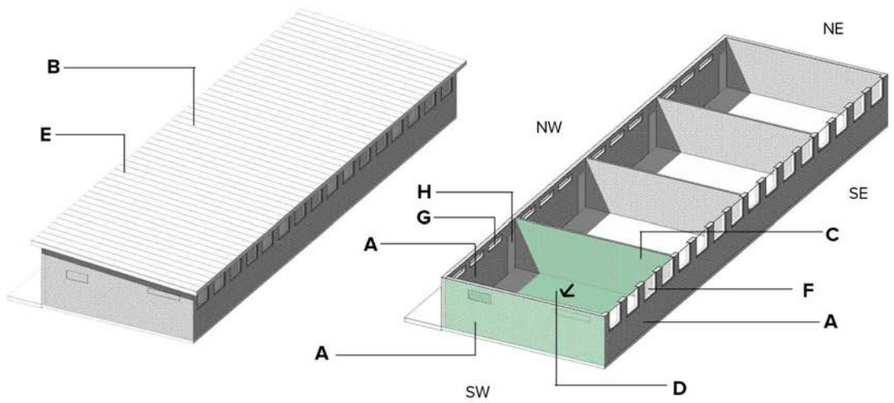


Fig. 2.5.4.15. Classroom block with directional arrow (Naidoo 2020)

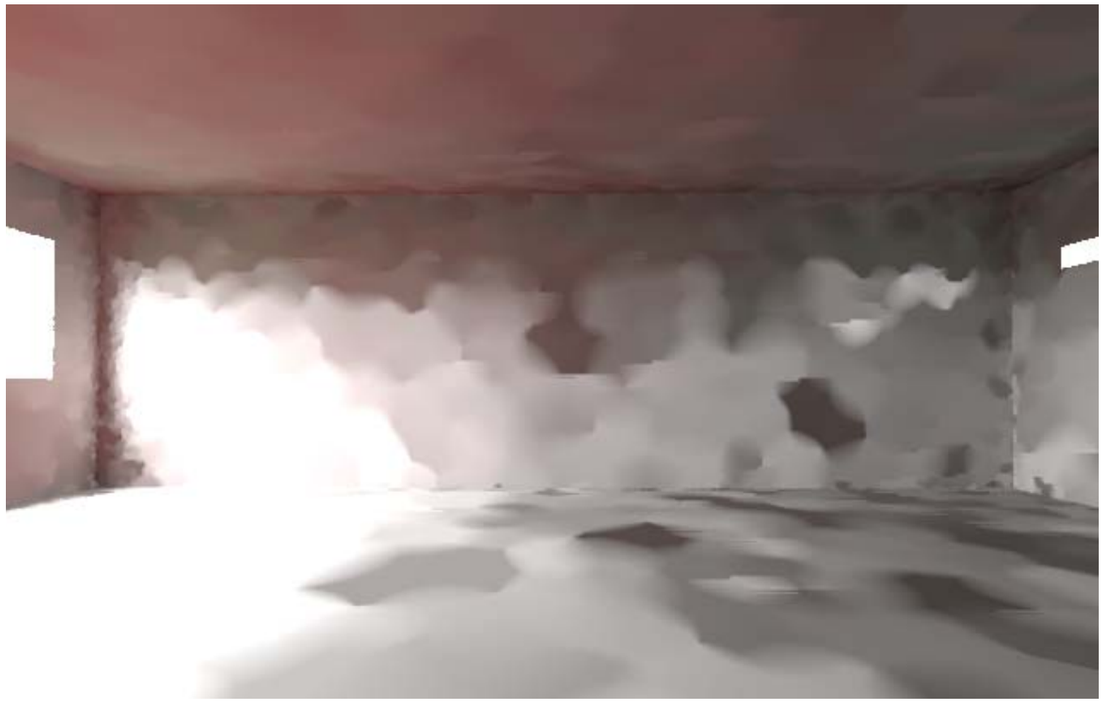


Fig. 2.5.4.20. Visual comfort iteration two results June 21 (IESVE 2020)

Fig. 2.5.4.21. Visual comfort iteration two results Dec 22 (IESVE 2020)

Iteration Three Test

Variables

F: Window Size: 1310x1490mm
G: Window Size: 1490x390mm
B: Overhang: 400mm roof overhang
Overhang: 1000mm overhang over window F @ 2500mm height (Variable tested)
D: Floor surface: Red Vinyl Tiles
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard

Results: 21 June (Winter Solstice)

Total Image:
Minimum = 1.58 Lux
Maximum = 2229.98 Lux
Average = 67.31 Lux
Difference = 2228.4

Results: 22 Dec (Summer Solstice)

Total Image:
Minimum = 2.79 Lux
Maximum = 3398.83 Lux
Average = 98.14 Lux
Difference=3396.04

Findings and Discussion

In this iteration, the introduction of a 1000mm overhang reduced the experience of glare, in comparison to the base model, during the winter and summer period. Therefore this change in variable to the current condition positively influenced the visual comfort experienced by learners within the classroom.

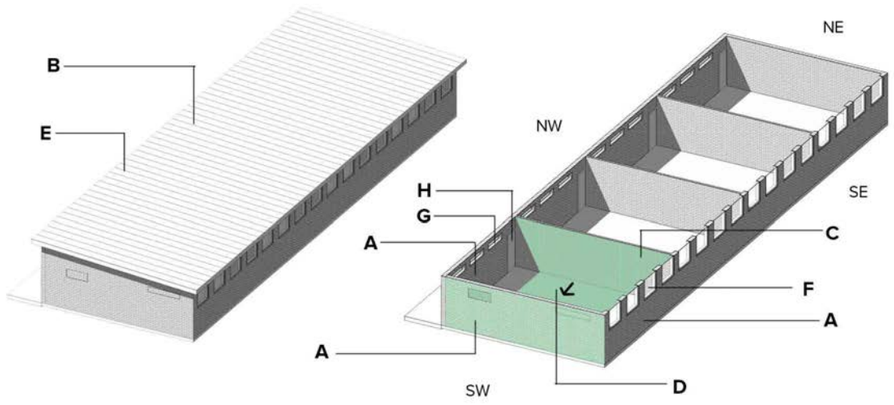


Fig. 2.5.4.15. Classroom block with directional arrow (Naidoo 2020)

Fig. 2.5.4.22. Visual comfort iteration three results June 21 (IESVE 2020)

Fig. 2.5.4.22. Visual comfort iteration three results June 21 (IESVE 2020)

Iteration Four Test

Variables

F: Window Size: 1490x1390mm
G: Window Size: 1490x2390mm (Variable tested)
B: Overhang: 400mm roof overhang
Overhang: 1000mm overhang over window F @ 2500mm height (Variable tested)
Overhang: 2000mm roof overhang over window G (Variable tested)
D: Floor surface: Red Vinyl Tiles
C: Interior wall surface: Cream painted brick
E: Ceiling: white painted gypsum plasterboard

Results: 21 June (Winter Solstice)

Total Image:
Minimum = 5.33 Lux
Maximum = 2233.49 Lux
Average = 143.27 Lux
Difference=2228.16

Results: 22 Dec (Summer Solstice)

Total Image:
Minimum = 5.31 Lux
Maximum = 3381.02 Lux
Average = 214.25 Lux
Difference=3375.71

Findings and Discussion

Isolating the variables during iterations 1-3, produced varied results, therefore within iteration 4, the changes in variables were combined to understand the visual comfort performance, should the school afford to implement all the suggested adaptations. The results of this simulation rendered lower values for the difference in lux levels for both the summer and winter solstice, in comparison to the base model.

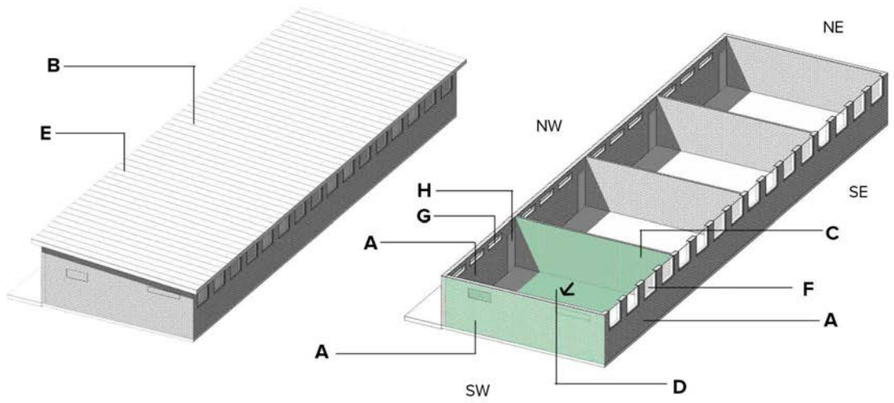


Fig. 2.5.4.15. Classroom block with directional arrow (Naidoo 2020)

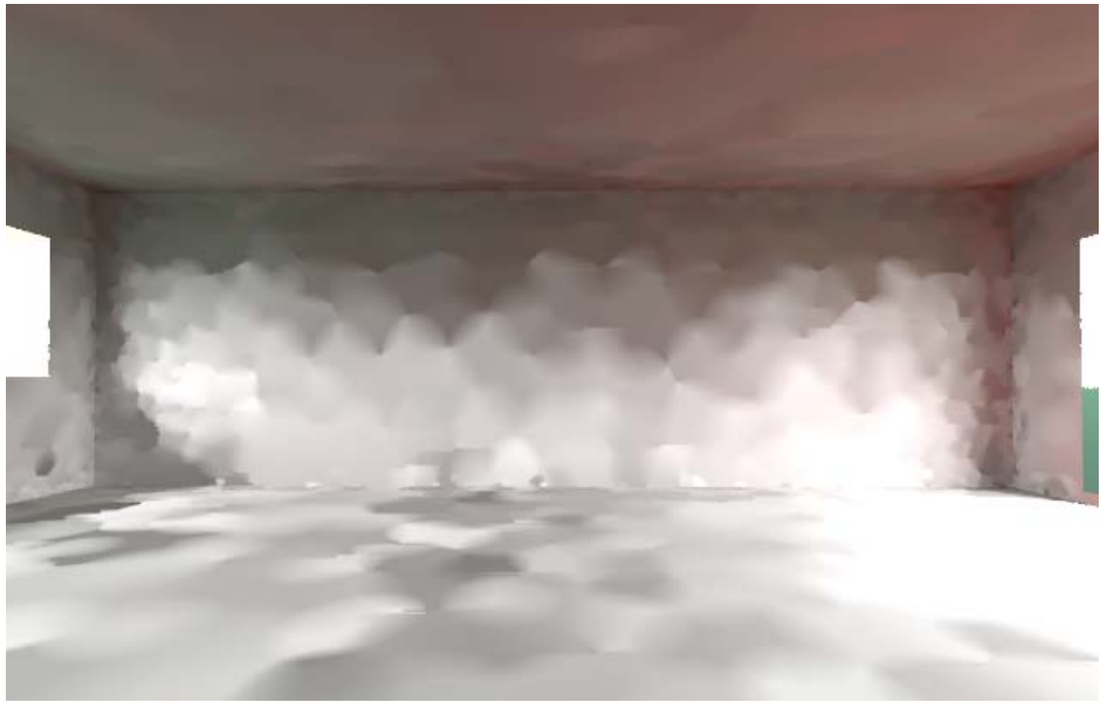


Fig. 2.5.4.24. Visual comfort iteration four results June 21 (IESVE 2020)

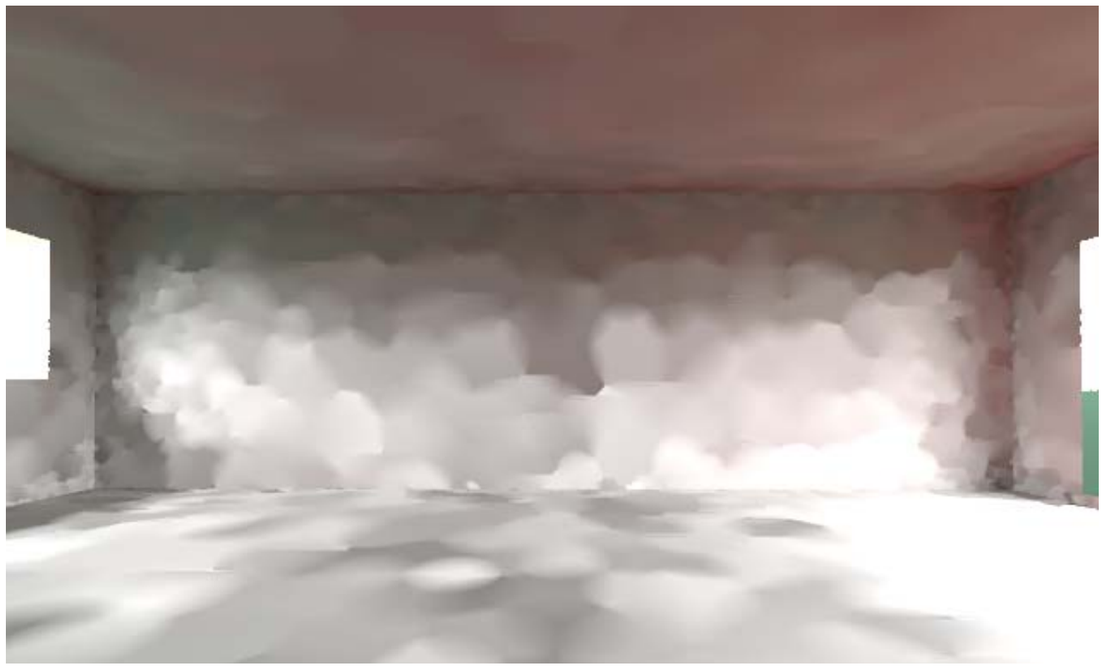


Fig. 2.5.4.25. Visual comfort iteration four results Dec 22 (IESVE 2020)

Conclusion

From each iterative test done above, iteration 4, with the combination of variable changes, resulted in the best performance for visual comfort with a reduction in the glare experienced. Iteration 1 produced disappointing results, in terms of the thematic focus for building performance, however this change is an important adaptation within the spatial configuration potential of the classroom to allow for multiple layouts (see 4.5). When the variable change was applied in combination with iterations 2 and 3, the performance improved.

As a result, it is suggested that should any of the above variable adaptations be made to the current typology, that iteration 1 be done in combination with iteration 2 and 3, and never in isolation. Iterations 2 and 3 both performed superior to the base model and can therefore be applied in isolation.
However, should the intention be to adapt a single variable in the physical condition to impact the greatest improvement, it is suggested that iteration 3 be applied.

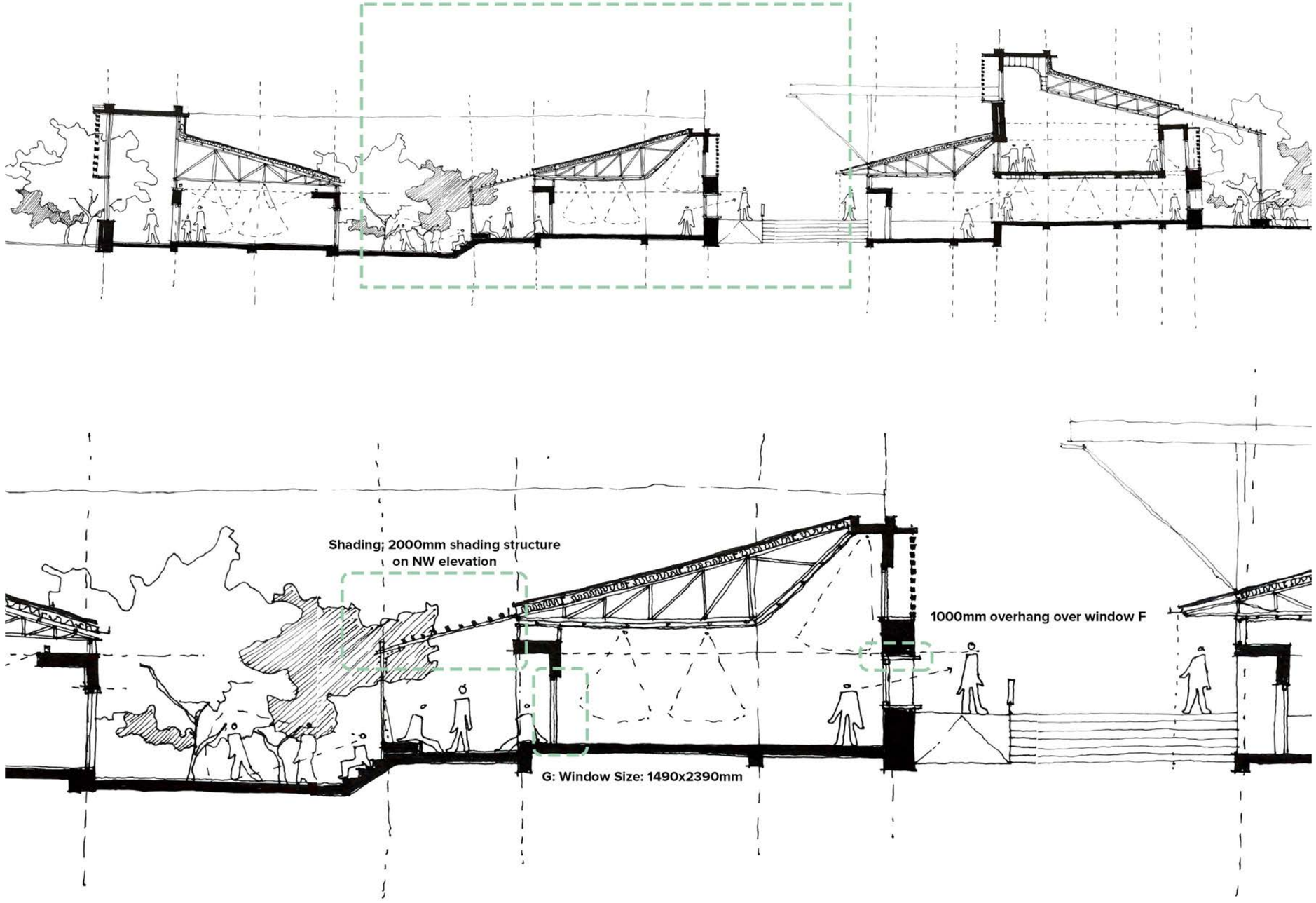


Fig. 2.5.4.26. Iterative development of section using visual comfort analysis results (Naidoo 2020)

5.4.3 Thermal Comfort

Using the VistaPro tool in IESVE, an analysis of the indoor/outdoor temperature and thermal comfort of the selected classroom block was conducted. This was done to gauge the thermal comfort experienced by learners during learning. Learners are more susceptible to high thermal conditions in comparison to adults (Motsatsi 2015:50). In an extensive study on the physical qualities of the learning environment, it was found that the thermal condition directly related to learning progress (Barret et al 2015:128). This factor also has the potential to hinder mental capacity and learner focus, in extreme conditions (Motsatsi 2015:49). Unfortunately within policy for public school infrastructure, section 16 on comfort levels, there is no guidance on dealing with thermal performance within these learning environments (Department of Basic Education 2012).

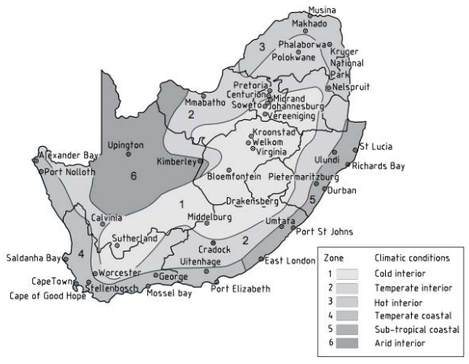


Fig. 2.5.4.27. Climatic zones within South Africa (SANS 10400 2017)

Before running the thermal comfort test, a few parameters within the project needed to be set. The classroom block was modelled with the location set to Pretoria for accurate readings on the building performance. Thereafter, the construction of the building elements was allocated according to the conditions currently present on site at Tsako Thabo. An important aspect to gathering an accurate reading was setting the building occupancy conditions. Indoor air temperature as well as the level of occupancy by users within a space is crucial for understanding thermal comfort (Nicol et al 2012:4). Therefore, this involved allocating the activity hours of

1: very cold, danger
2: cold, shivering
3: cool, unpleasant
4: cool, acceptable
5: slightly cool/acceptable
6: comfortable, pleasant/cool
7: comfortable, pleasant
8: comfortable, pleasant/warm
9: slightly warm/acceptable
10: warm, acceptable
11: warm, unpleasant
12: hot, very uncomfortable
13: very hot, danger
14: unoccupied
15: non-sedentary

Fig. 2.5.4.28. Thermal comfort index (Konstantinou et al 2019)

the building space in relation to the number of occupants at any given time. These hours were set to the average school day and the school year, with cognizance of the current inactive hours. The number of occupants within the classroom space was set in accordance to Candiotes (1997:34), which describes the standard classroom to allow for 36 learners and 1 teacher.

To analyse the data the following parameters were used:

Dry bulb temperature- External air temperature
Dry resultant temperature- The mean value of the indoor room air as well as the radiant temperature
Comfort index- An indication of the comfort experienced according to the comfort index scale
People dissatisfied- % of people from the total occupancy dissatisfied

To assess the results from the thermal comfort simulations, a comparison between the difference in dry bulb and dry resultant temperature was made. The intention, through each iteration, was to minimise the difference in temperature. This analysis was also done with awareness of the percentage of people dissatisfied and the reading on the comfort index scale. With each iteration, the aim was to incrementally improve the results of the base model through seeing how a single variable change performs.

Two time periods were used during the analysis. The month of March was selected out of the summer range (December - March), to understand the thermal performance during the hotter parts of the year, while the school has full occupancy. August was selected as the second period within the winter range (June-August), as the school would be on holiday during the June and July period therefore altering the people dissatisfied parameter. Temperatures during this time are analysed according to the City of Tshwane's summer and winter comfort zones (Motsatsi 2015:82):

Summer comfort zone: 20.5°C - 26°C
Winter comfort zone: 20.5°C - 24.5°C

Base Variable Test

Variables

E: Ceiling- 12mm gypsum ceiling board (R-value = 0.0595 m^2K/W)
H: Doors- 30mm plywood (R-value= 0.2308 m^2K/W)
F & G: Windows- Single glazing, 6mm clear float glass (R-value= 0.1700 m^2K/W)
D: Floor- 170mm concrete slab with 30mm cement screed finished with 3mm vinyl tile (R-value= 0.1060 m^2K/W)
C: Internal walls- 110mm brick (R-value= 0.1774 m^2K/W)
B: Roof- Standard 2mm corrugated profile, steel roof sheeting (R-value= 0.00 m^2K/W). 4 degree roof pitch with 400mm overhang.
A: External wall- 230mm masonry wall (R-value= 0.3284 m^2K/W)

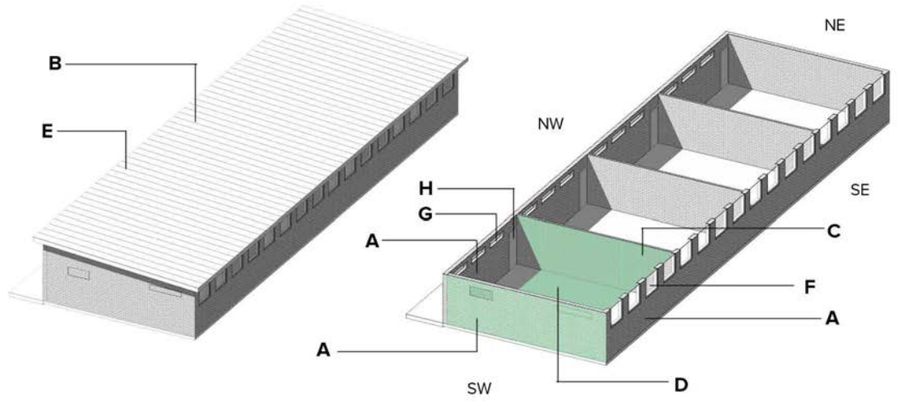


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

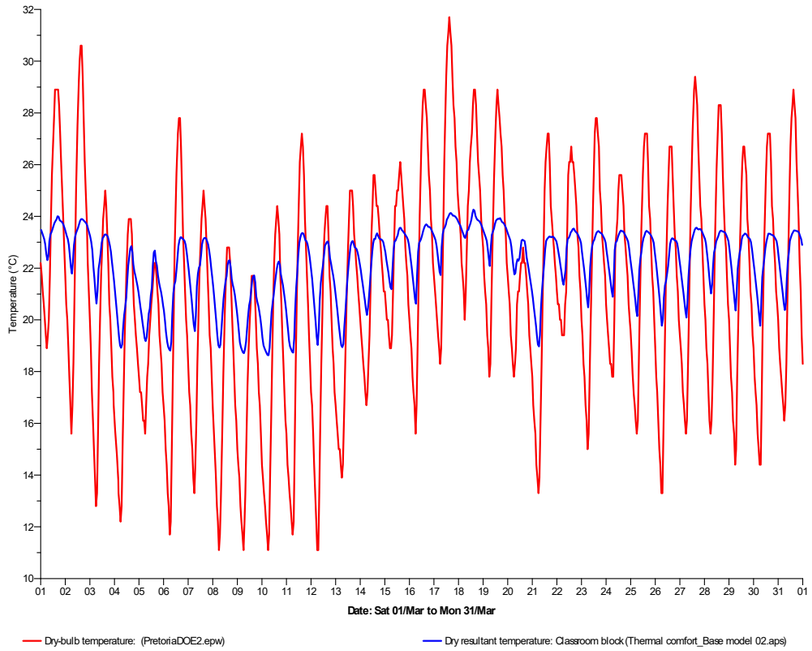


Fig. 2.5.4.29. Base model Indoor and outdoor temperature results for March (IESVE 2020)

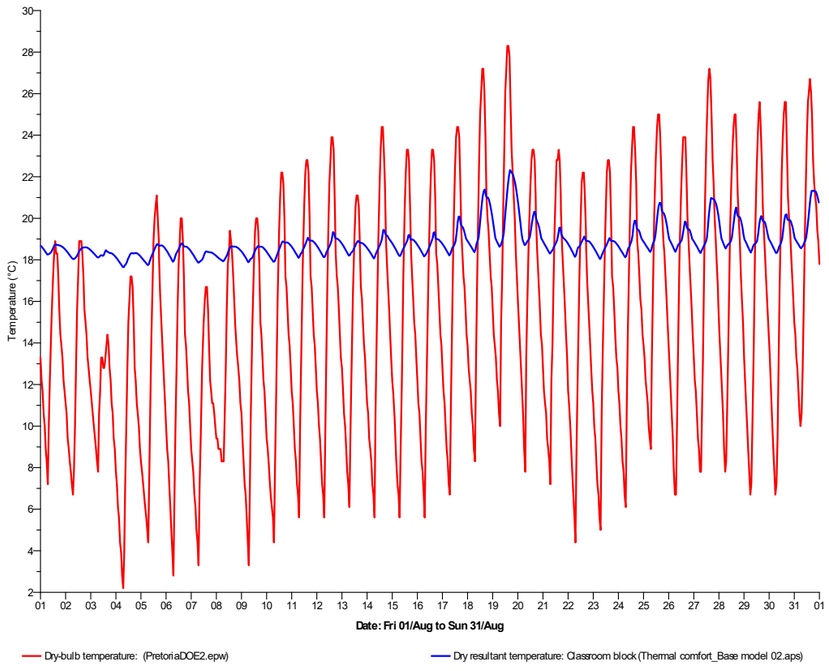


Fig. 2.5.4.30. Base model Indoor and outdoor temperature results for August (IESVE 2020)

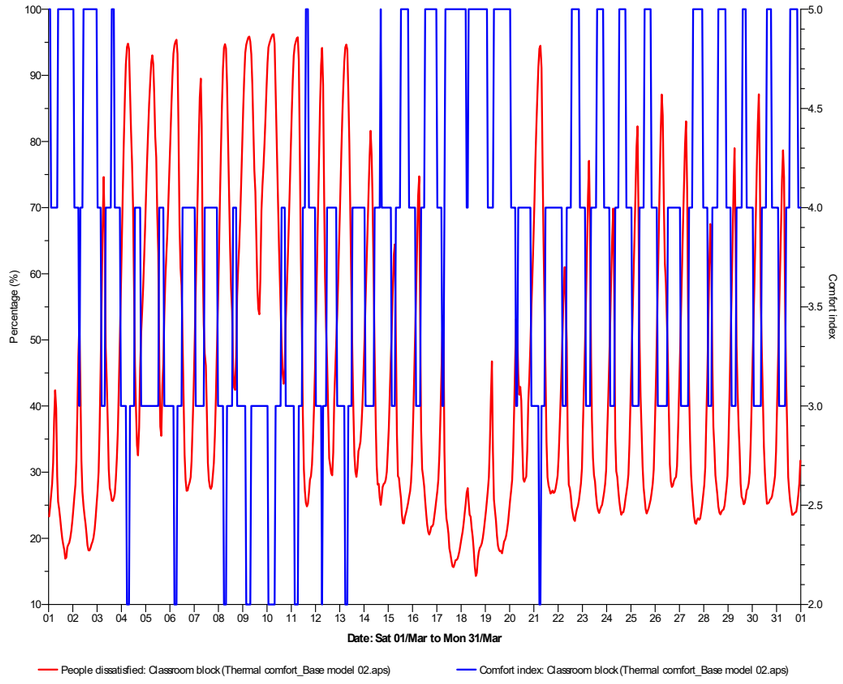


Fig. 2.5.4.31. Base model People dissatisfied and comfort index results for March (IESVE 2020)

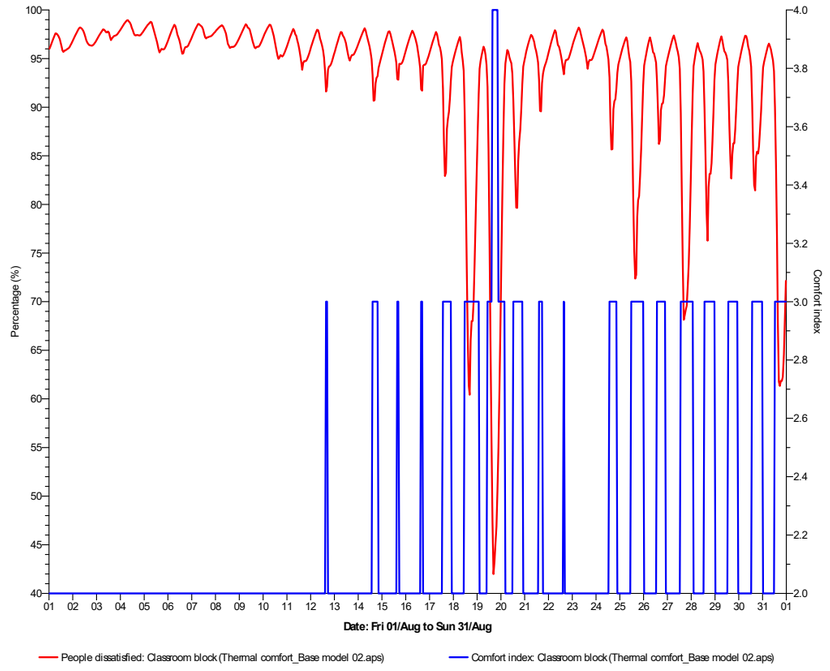


Fig. 2.5.4.32. Base model People dissatisfied and comfort index results for Aug (IESVE 2020

Base Model Results				
	March		August	
	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)
Maximum temperature	32	24.2	28	22
Minimum temperature	11	18.7	2	18
Difference in min and max temperature	21	5.5	26	4

Fig. 2.5.4.33. Thermal comfort base model results (Naidoo 2020)

Findings and Discussion

Temperature:

The maximum temperature for the summer period during March is 24.2°C and is within the summer comfort zone, however the minimum temperature falls to 18.7°C, which is below the comfort zone threshold. A similar condition occurs during the winter period, in August, where the maximum indoor temperature value is within the winter comfort zone range, however the minimum value falls below. Overall, the greatest issue lies with the difference in minimum indoor and outdoor temperatures during August, which has the highest difference in comparison to the others.

Thermal comfort:

The comfort index represents that the building experiences a greater deal of comfort in the summer month of March, in comparison to the winter month of August. This is also reflected in a higher percentage of people dissatisfied during August than in March. In the span of a single day, when building occupancy is at its peak, the percentage of people dissatisfied increased and the comfort index decreased. The comfort index increased during periods when the school closed in the afternoon. This indicates that during learning hours when the school is active, greater thermal discomfort is experienced. This is a potential hindering agent to the learning process as previously discussed.

Iteration Test One:

Variables

E: Ceiling- 12mm gypsum ceiling board (R-value = 0.0595 m^2K/W)
H: Doors- 30mm plywood (R-value= 0.2308 m^2K/W)
F & G: Windows- Single glazing, 6mm clear float glass (R-value= 0.1700 m^2K/W)
D: Floor- 170mm concrete slab with 30mm cement screed finished with 3mm vinyl tile (R-value= 0.1060 m^2K/W)
C: Internal walls- 110mm brick (R-value= 0.1774 m^2K/W)
B: Roof- **5mm** steel roof sheeting with **100mm insulation board (R-value= 2.3257 m^2K/W).** 4 degree roof pitch with 400mm overhang. **(Variable tested)**
A: External wall- 230mm masonry wall (R-value= 0.3284 m^2K/W)

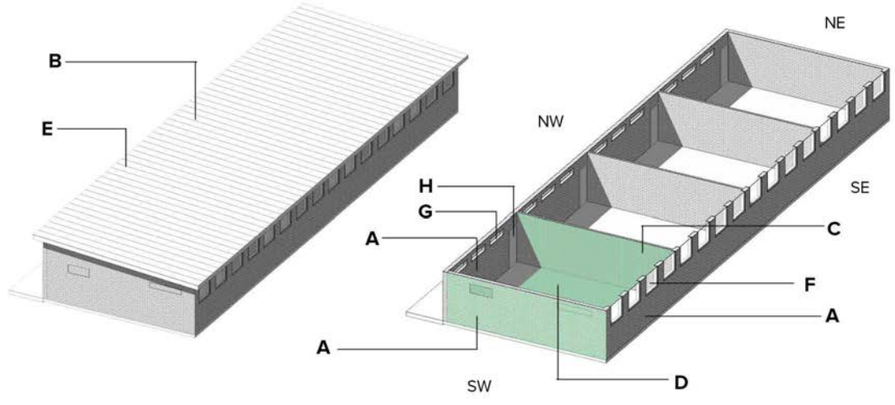


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

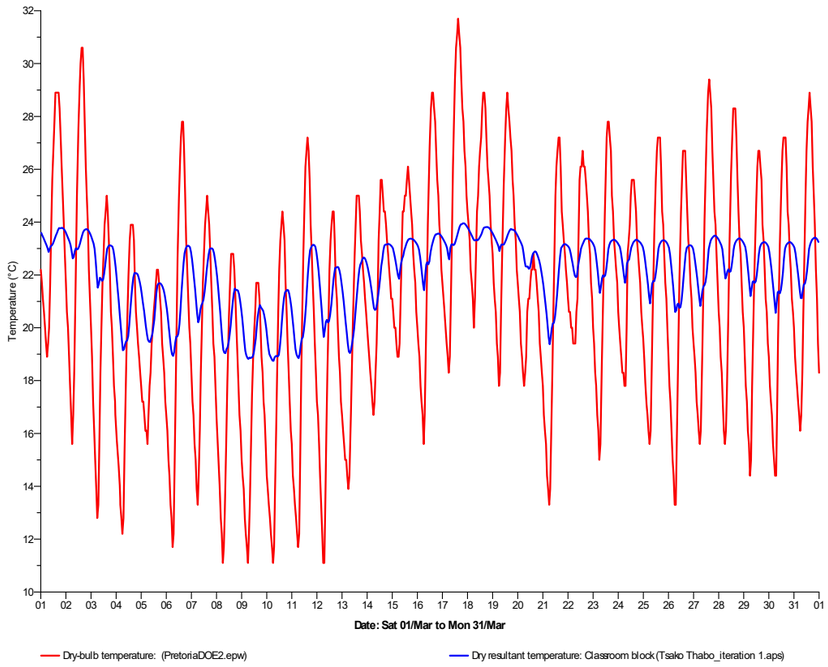


Fig. 2.5.4.34. Iteration one Indoor and outdoor temperature results for March (IESVE 2020)

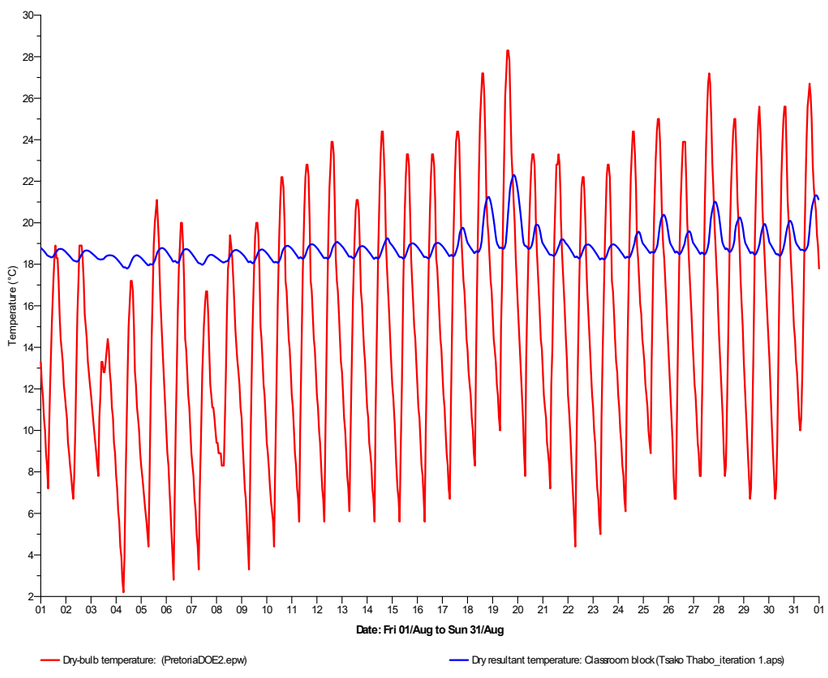


Fig. 2.5.4.35. Iteration one Indoor and outdoor temperature results for Aug (IESVE 2020)

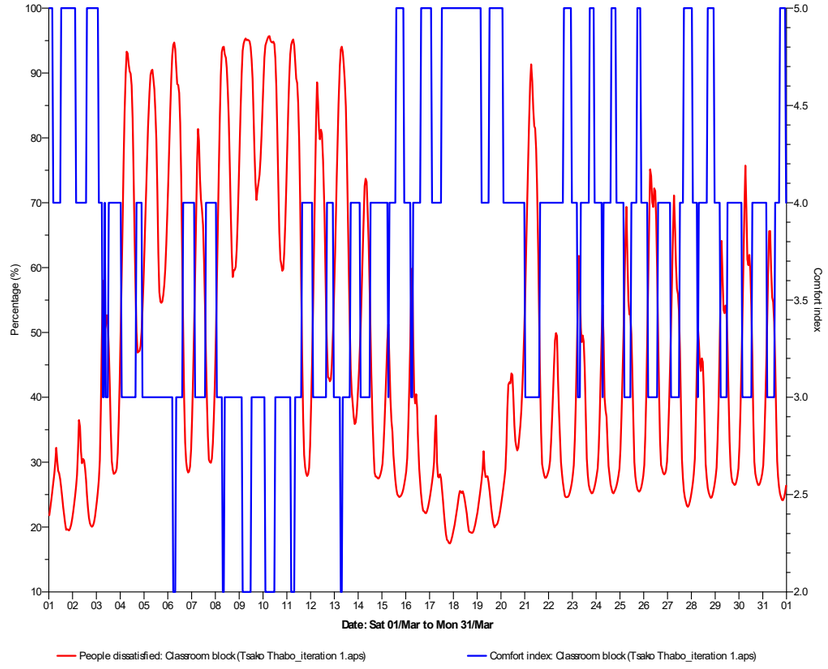


Fig. 2.5.4.36. Iteration one People dissatisfied & comfort index results for Mar (IESVE 2020

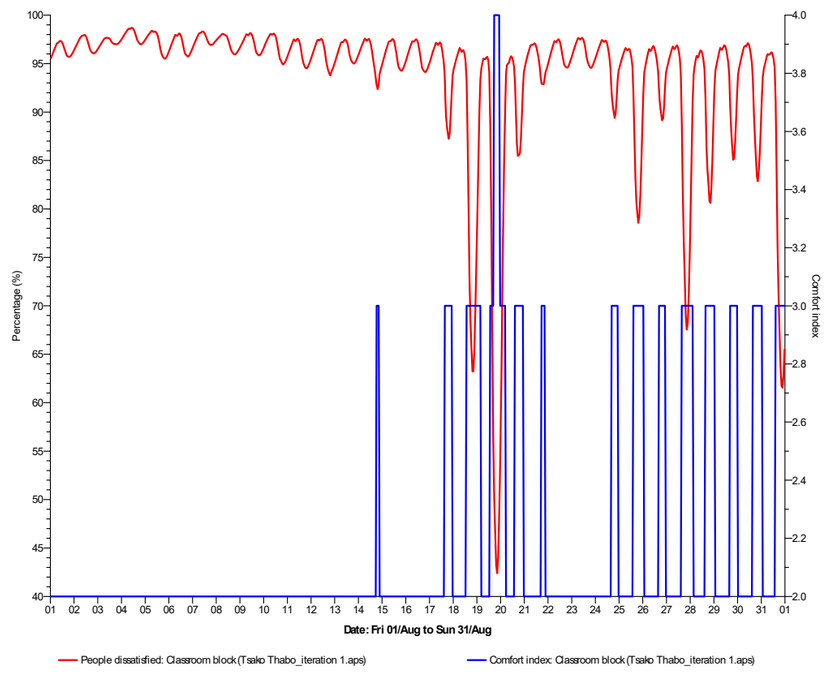


Fig. 2.5.4.37. Iteration one People dissatisfied and comfort index results for Aug (IESVE 2020

Iteration 1 Results				
	March		August	
	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)
Maximum temperature	32	23.7	28	22
Minimum temperature	11	18.5	2	17.8
Difference in min and max temperature	21	5.2	26	4.2

Fig. 2.5.4.38. Thermal comfort iteration one results (Naidoo 2020)

Findings and Discussion

Temperature:

The maximum temperatures for both March and August fall within their respective comfort zones for the summer and winter season. However, in both months, the minimum temperatures still sit below the comfort zone. The difference in minimum and maximum temperature for interaction 1, is lower than the base model results. Therefore within the summer period, iteration one performs superior to the existing condition on site. In the winter period of August, this difference in temperature increases, therefore the base model presents better conditions during winter. Greater thermal comfort is experienced during March than in August, therefore learning progress potentially improves during summer.

Thermal comfort:

The comfort index, during March, sits within the same range as the Base model. However, few days within the month experience a lower reading within this comfort index scale. Within the summer period, the percentage of people dissatisfied decreases as the month progresses. Therefore in comparison with the base model, iteration one performs better during the summer period. During August, the percentage of people dissatisfied drops lower in the base model than it does in iteration one. This condition reflects the data above and is likely related to the increase in temperature difference, as well as the lower temperatures falling out of the comfort zone.

Iteration Test Two:

Variables

E: Ceiling- 12mm gypsum ceiling board (R-value = 0.0595 m^2K/W)
H: Doors- 30mm plywood (R-value= 0.2308 m^2K/W)
F & G: Windows- Single glazing, 6mm clear float glass (R-value= 0.1700 m^2K/W)
D: Floor- 170mm concrete slab with 30mm cement screed finished with 3mm vinyl tile (R-value= 0.1060 m^2K/W)
C: Internal walls- 110mm brick (R-value= 0.1774 m^2K/W)
B: Roof- Standard 2mm corrugated profile, steel roof sheeting (R-value= 0.00 m^2K/W). 4 degree roof pitch with 400mm overhang.
A: External wall- 230mm masonry internal wall with 10mm plaster, 240mm cavity and 230mm external masonry wall (R-value= 0.8103 m^2K/W) (Variable tested)

Findings and Discussion

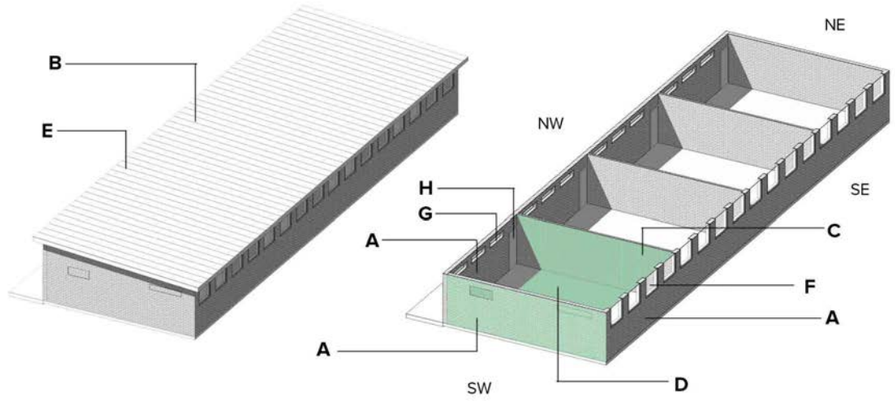


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

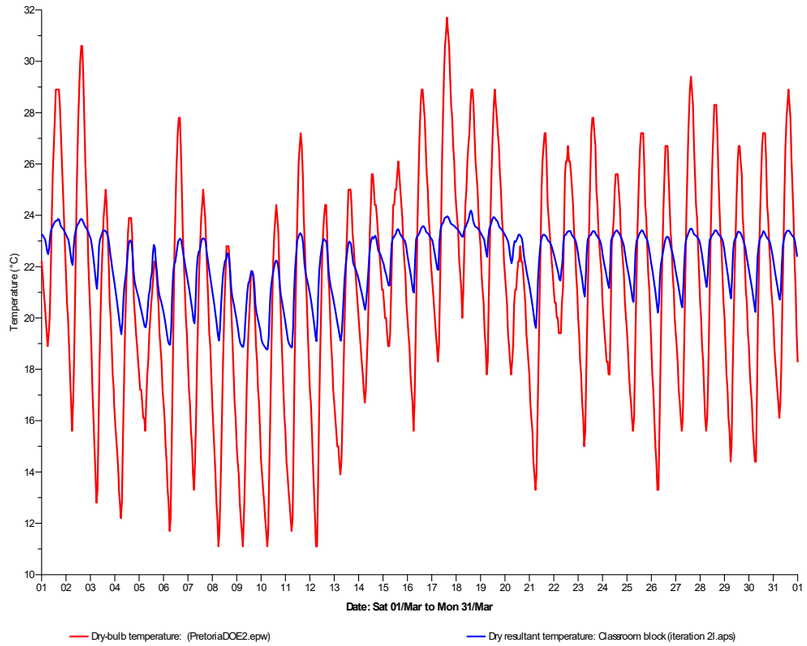


Fig. 2.5.4.39. Iteration two Indoor and outdoor temperature results for Mar (IESVE 2020)

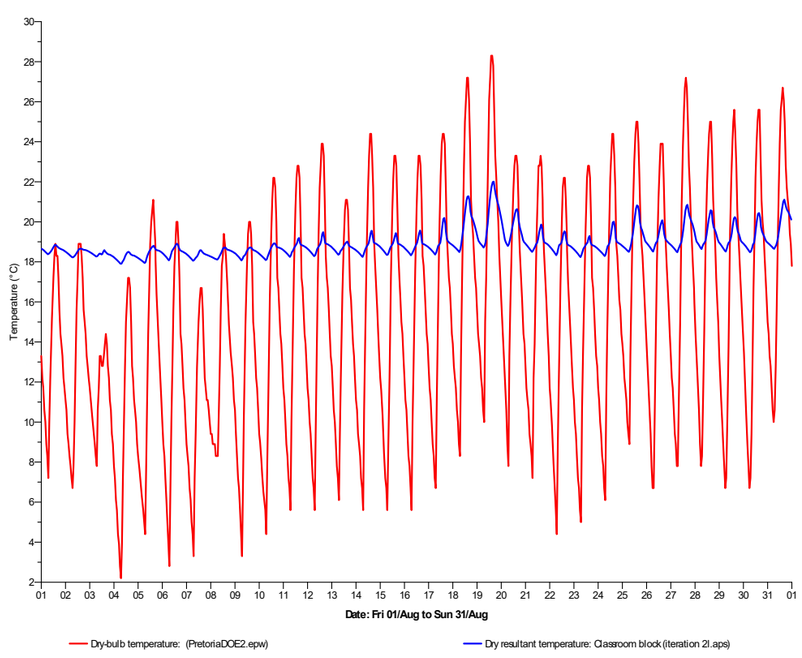


Fig. 2.5.4.40. Iteration two Indoor and outdoor temperature results for Aug (IESVE 2020)

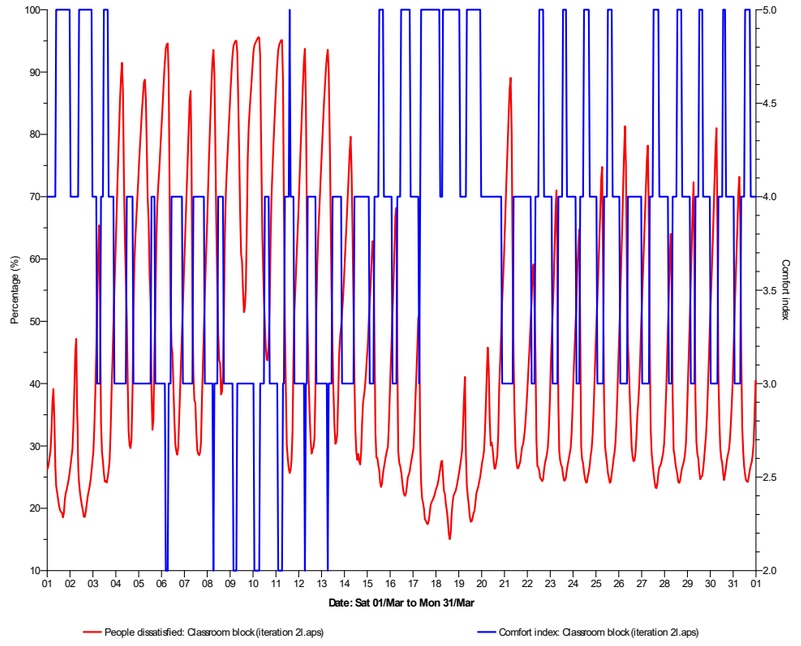


Fig. 2.5.4.41. Iteration two People dissatisfied & comfort index results for Mar (IESVE 2020)

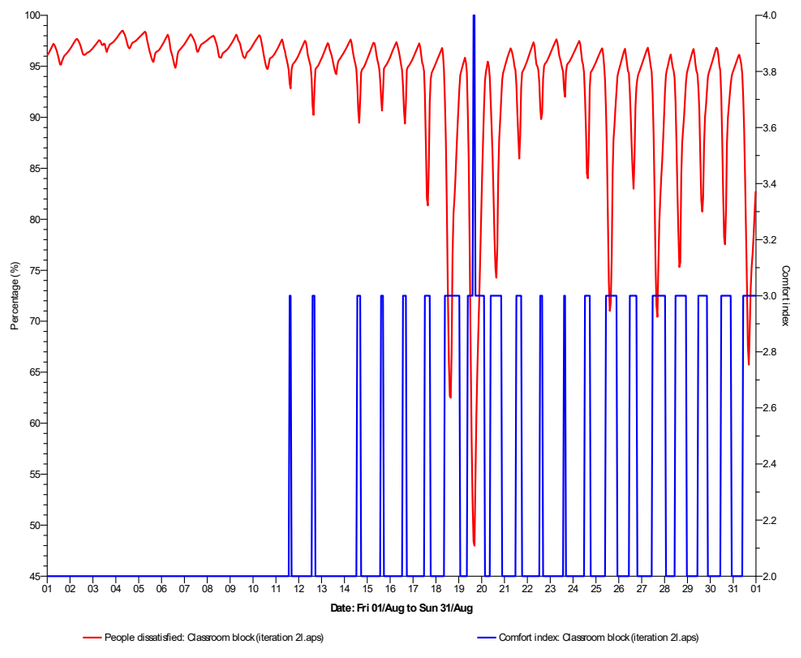


Fig. 2.5.4.42. Iteration two People dissatisfied & comfort index results for Aug (IESVE 2020)

Iteration 2 Results				
	March		August	
	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)
Maximum temperature	32	24	28	22
Minimum temperature	11	18.6	2	18
Difference in min and max temperature	21	5.4	26	4

Fig. 2.5.4.43. Thermal comfort iteration two results (Naidoo 2020)

Temperature:

The difference in temperature for August remained the same for the base model and iteration two. Therefore, the variable change had little impact on the winter conditions at the school. However, during the summer period in March, the difference in temperature was lower than the base model. With this iteration, the variable change induces greater thermal comfort during the summer period than it did in the winter period.

Thermal comfort:

The comfort index dropped to a lower value fewer times in March, than it did in the base model. This correlates with the percentage of people dissatisfied reducing in the later days of the month. As with the temperature analysis, the comfort index and percentage of people dissatisfied represent similar results.

Iteration Test Three:

Variables

E: Ceiling- 12mm gypsum ceiling board (R-value = 0.0595 m^2K/W)
H: Doors- 30mm plywood (R-value= 0.2308 m^2K/W)
F & G: Windows- Single glazing, 6mm clear float glass (R-value= 0.1700 m^2K/W)
D: Floor- 170mm concrete slab with 30mm cement screed finished with 3mm vinyl tile (R-value= 0.1060 m^2K/W)
C: Internal walls- 110mm brick (R-value= 0.1774 m^2K/W)
B: Roof- Standard 2mm corrugated profile, steel roof sheeting (R-value= 0.00 m^2K/W). 4 degree roof pitch with 400mm overhang.
Shading-2000mm shading device on NW elevation (Variable tested)
A: External wall- 230mm masonry wall (R-value= 0.3284 m^2K/W)

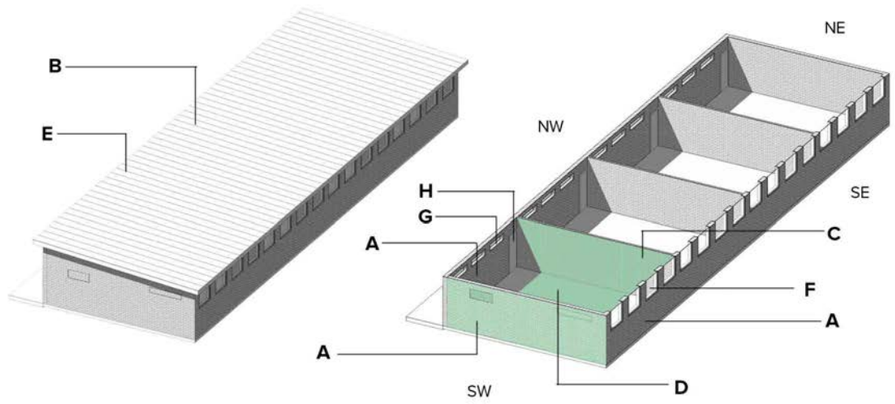


Fig. 2.5.4.2 Classroom block (Naidoo 2020)

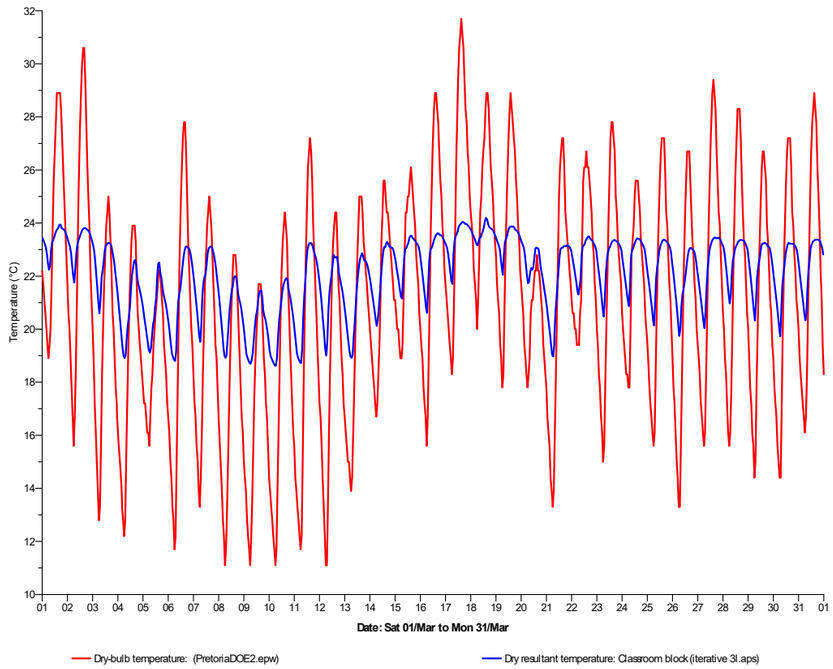


Fig. 2.5.4.44. Iteration three Indoor and outdoor temperature results for Mar (IESVE 2020)

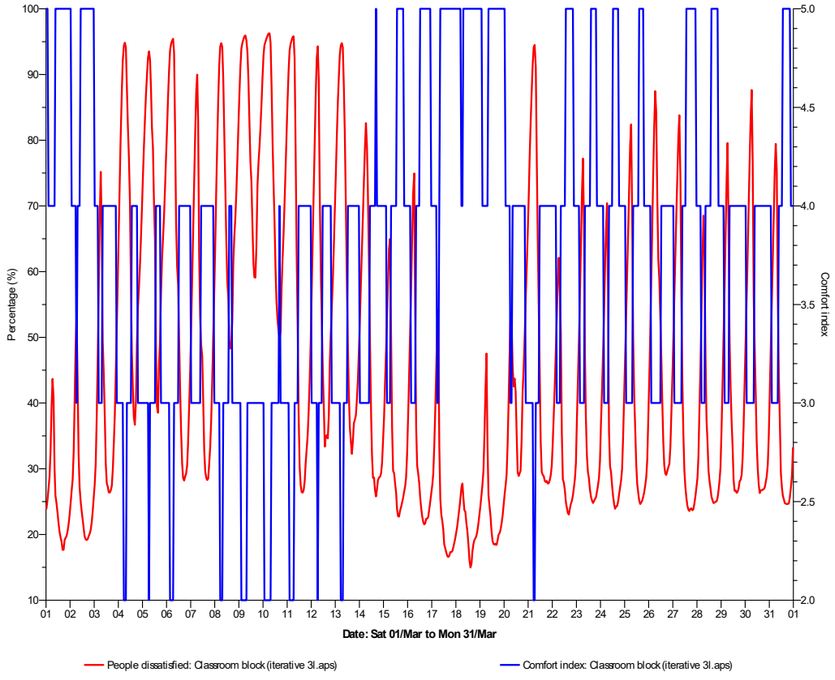


Fig. 2.5.4.45. Iteration three Indoor and outdoor temperature results for Aug (IESVE 2020)

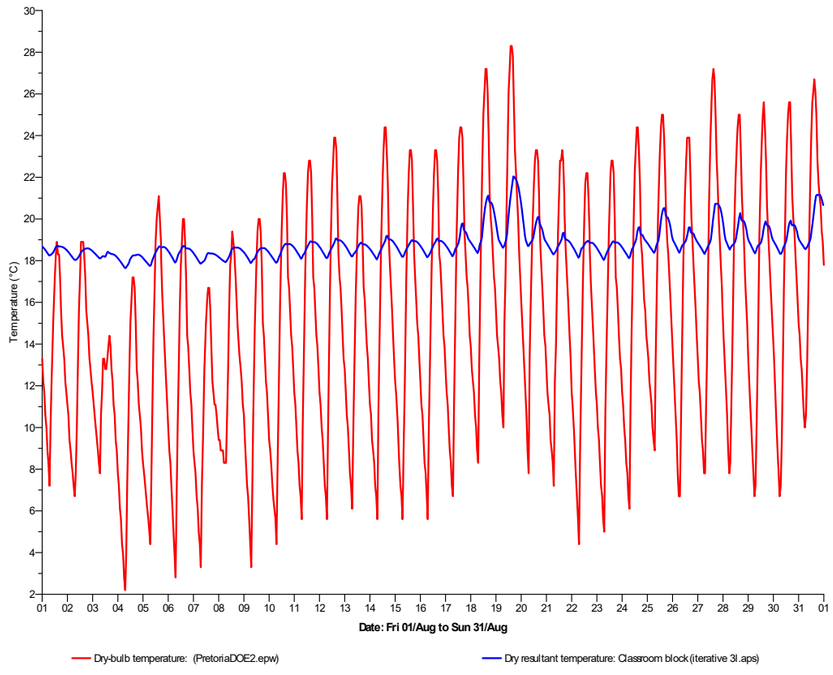


Fig. 2.5.4.46. Iteration three People dissatisfied & comfort index results for Mar (IESVE 2020)

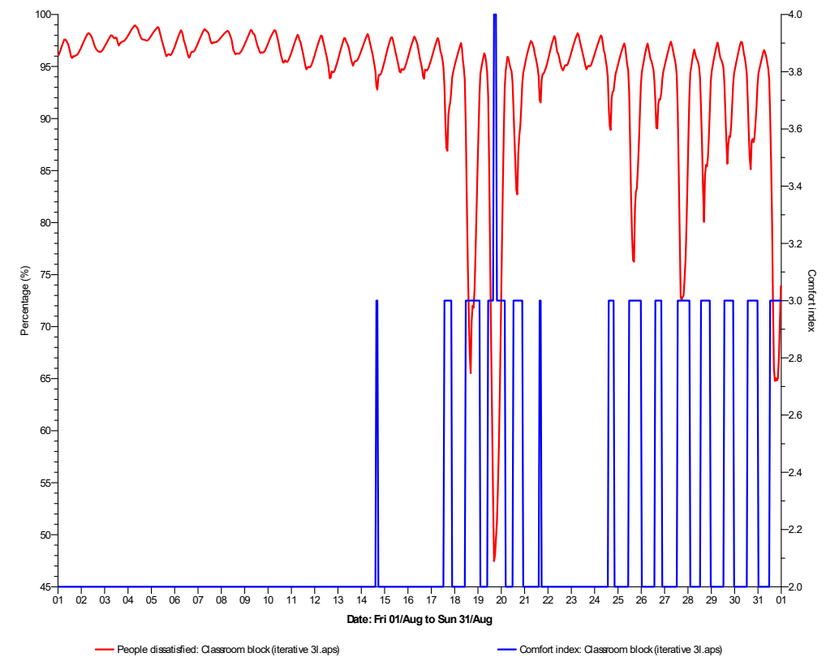


Fig. 2.5.4.47. Iteration three People dissatisfied & comfort index results for Aug (IESVE 2020)

Iteration 3 Results				
	March		August	
	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)	Outdoor (Dry bulb temperature)	Indoor (Dry resultant)
Maximum temperature	32	24	28	22
Minimum temperature	11	18.5	2	17.8
Difference in min and max temperature	21	5.5	26	4.2

Fig. 2.5.4.48. Thermal comfort iteration three results (Naidoo 2020)

Findings and Discussion

Temperature:

Although the minimum and maximum temperatures for March differ from the base model results, their differences in value equate. The maximum temperature during March falls within the summer comfort zone and in comparison to the base model, is slightly cooler. However, the minimum value falls out of the summer comfort zone range. The maximum value during August sits within the winter comfort range, however the minimum value does not. The difference in temperature during this period is inferior to the base model. Therefore, iteration three performs better in summer than it does in winter in comparison to the base model, when looking at the temperature.

Thermal comfort:

The comfort index and the percentage of people dissatisfied during March and August displays similar values in comparison to the base model. This could be as a result of the similar difference in minimum and maximum temperature. Due to this, iteration three does not have a significant impact on the thermal comfort experienced.

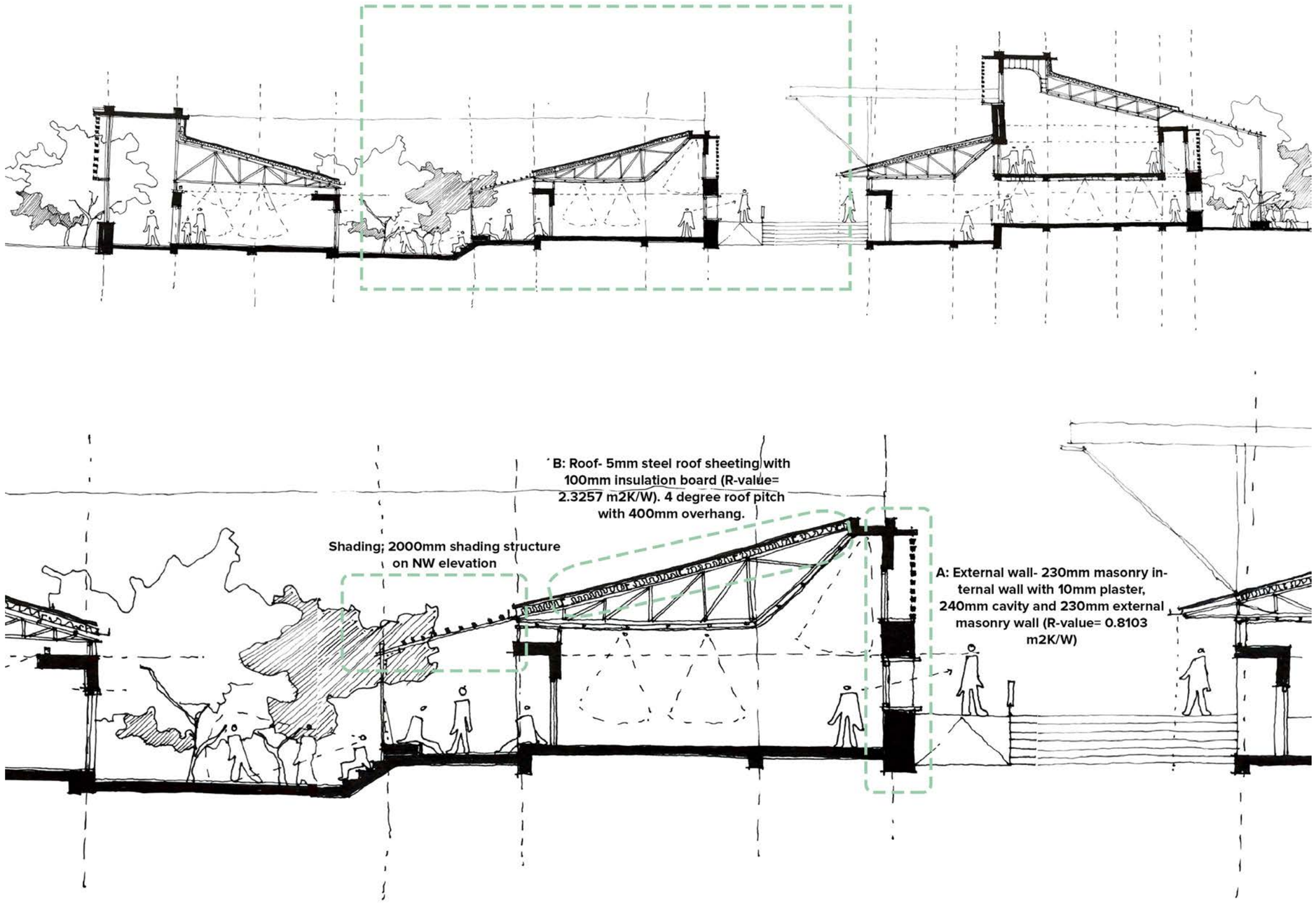


Fig. 2.5.4.49. Iterative development of section using thermal comfort analysis results (Naidoo 2020)

Conclusion

From the iterations conducted, iteration one, displayed the greatest improvement on thermal comfort during the summer period however not in the winter period. Iteration two however, presented the best performance for both the winter and summer period. Overall it was found that the thermal comfort during winter was difficult to improve and in each case the variable change insignificantly altered the resulting values in comparison to the base model. None of the iterations conducted drastically impacted thermal comfort. Therefore it is suggested that further investigation be conducted in this regard.

5.5 Sustainability

5.5.1 Ventilation

The building relies on natural ventilation systems as depicted in 5.3.3. Therefore, reliance on mechanical ventilation is prevented. The explored systems employ the wind's natural force to actively ventilate the building using passive methods (Kubba 2012:349).

5.5.2 Light

Due to the amount of time spent in the classroom, the quality of natural light becomes an important factor that affects learning and well-being (Michaelidou 2012).

Capturing natural daylight into the building was an environment strategy adopted by the project. Through an iterative process (see 5.4), alterations to the current built learning environment was adapted to improve the natural lighting conditions. As a result, reliance on artificial lighting was reduced.

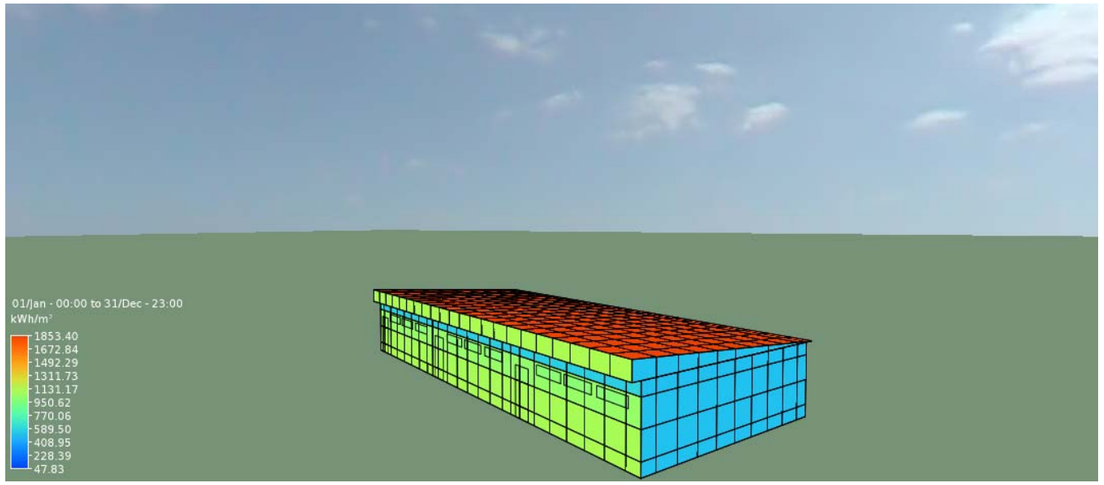


Fig. 2.5.5.1. Tsako Thabo Solar exposure test results (IESVE 2020)

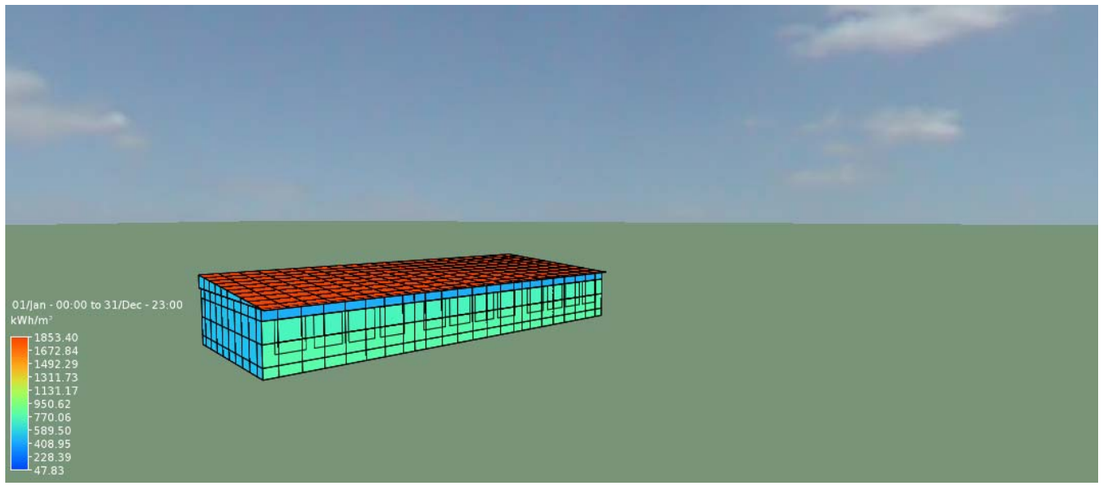


Fig. 2.5.5.2. Tsako Thabo Solar exposure test results (IESVE 2020)

With the building relying on natural daylight, each iteration test was cognizant of the resulting effects of light within the learning space. Controlling the effects of glare and achieving an optimum daylight factor for learning, was therefore crucial.

5.5.3 Energy

A solar exposure study was conducted using the building performance software tool, Integrated Environmental Solutions Virtual Environment (IESVE). This test was conducted on the basic classroom block at Tsako Thabo Secondary School. As a result of the test, an indication of surface sunlight exposure over the period of a year was achieved. This provides useful information for the placement of photo-voltaic panels. The results also provided an indication on the solar exposure of facades which guided the shading considerations to avoid dependency on mechanical cooling.

5.5.4 Materiality

Within the dissertation, the typological makeup of public schools in Mamelodi is challenged. However, even though the typology is outdated (see 2.2), the materials of the building have potential. Consideration for efficient material use is essential in understanding sustainability in building (Sayigh 2014). Material reuse positively contributes to reducing a building's environment strain (Kubba 2012:298).

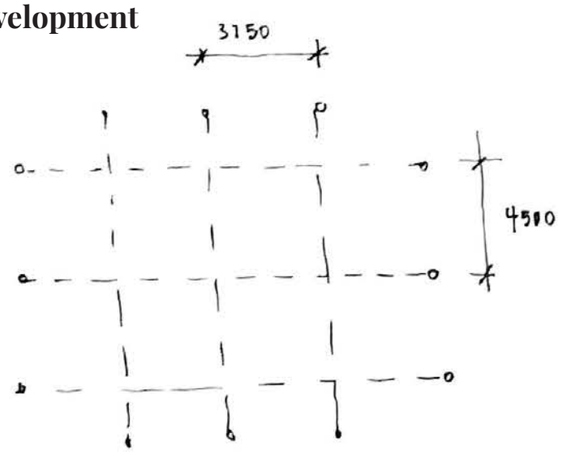
If it is being questioned how the built environment efficiently spends allocated funds, then we need to consider the reuse of materials. When adaptations to the existing are suggested, the reuse of material for additions is advised. Therefore the building adopts a 'design for deconstruction approach' (Sayigh 2014) to facilitate this approach.

5.5.5 Sustainability

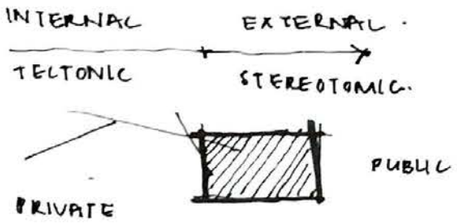
The iterative tests conducted in 5.4 Building Performance were directed towards improving the current condition of the physical built environment of the classrooms, to enhance learning performance. These tests also provided an understanding of the sustainability of the building.

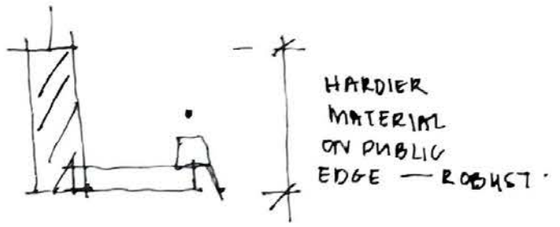
Through the tests, lighting and thermal comfort were taken into consideration. The quality and intensity of natural light, as well as thermal comfort, was optimised to improve the building performance. In each case, adaptations to the existing building were directed towards optimizing the natural environment and reducing dependency on artificial energy sources. In doing so, the internal condition of the classrooms were altered to improve learning capabilities.

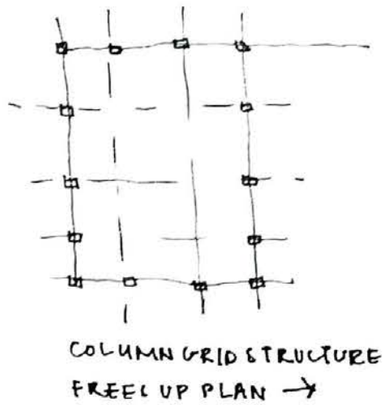
5.6 Technical development

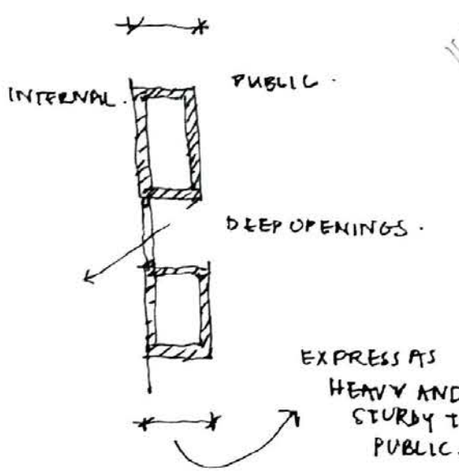


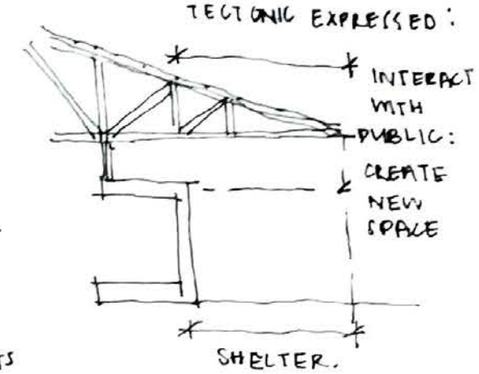
STRUCTURAL GRID: BASED OFF EXISTING CLASSROOM GRID / MODULE.

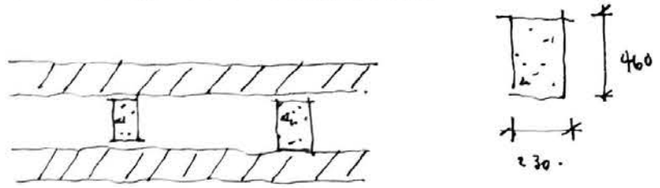






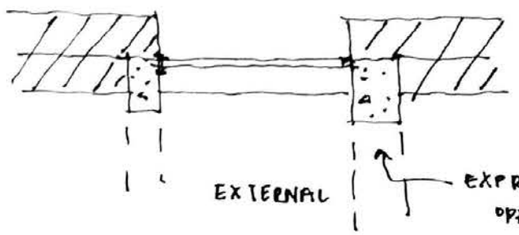


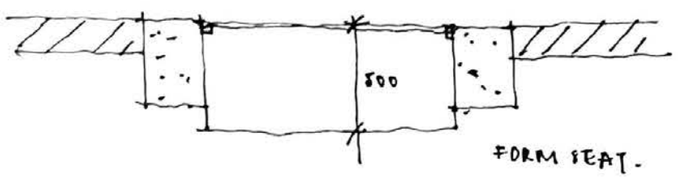


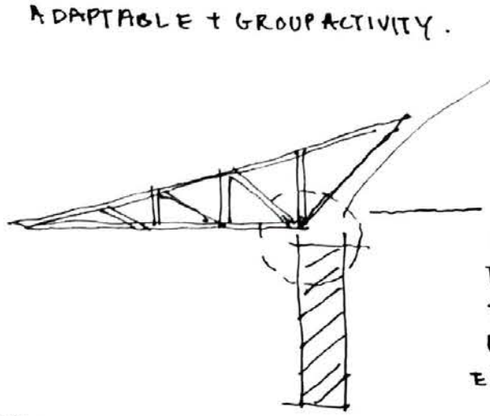


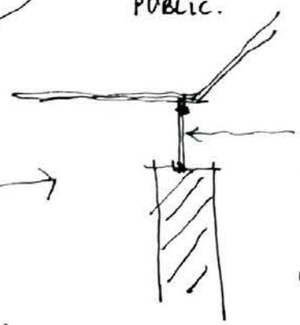
TECTONIC VS STEREOTOMIC

INTERNAL.









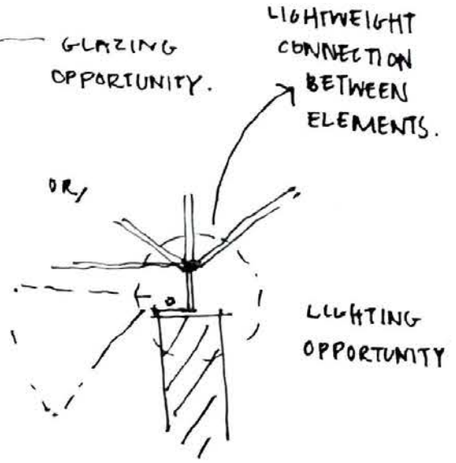


Fig. 2.5.6.1. Structure and material considerations (Naidoo 2020)

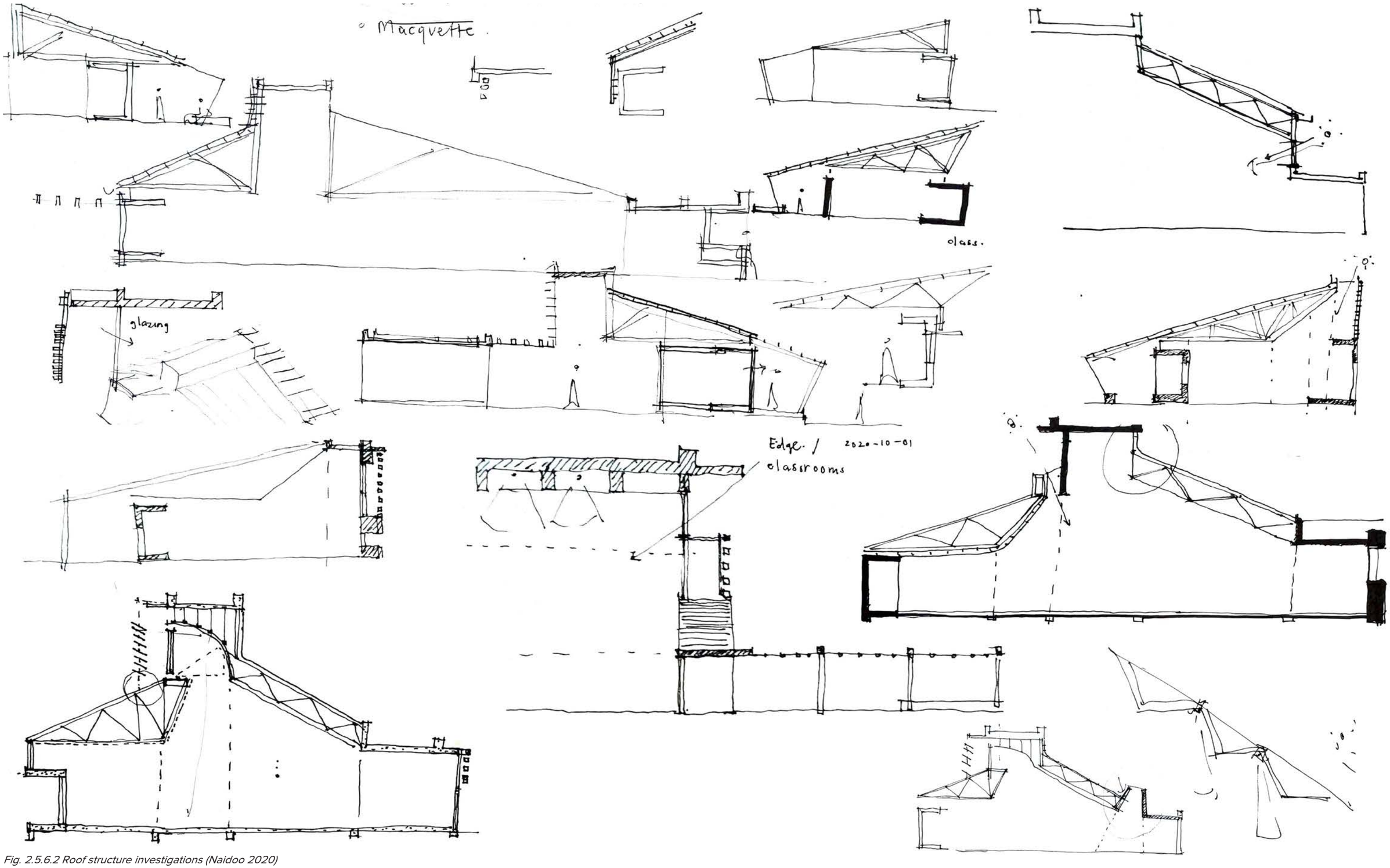
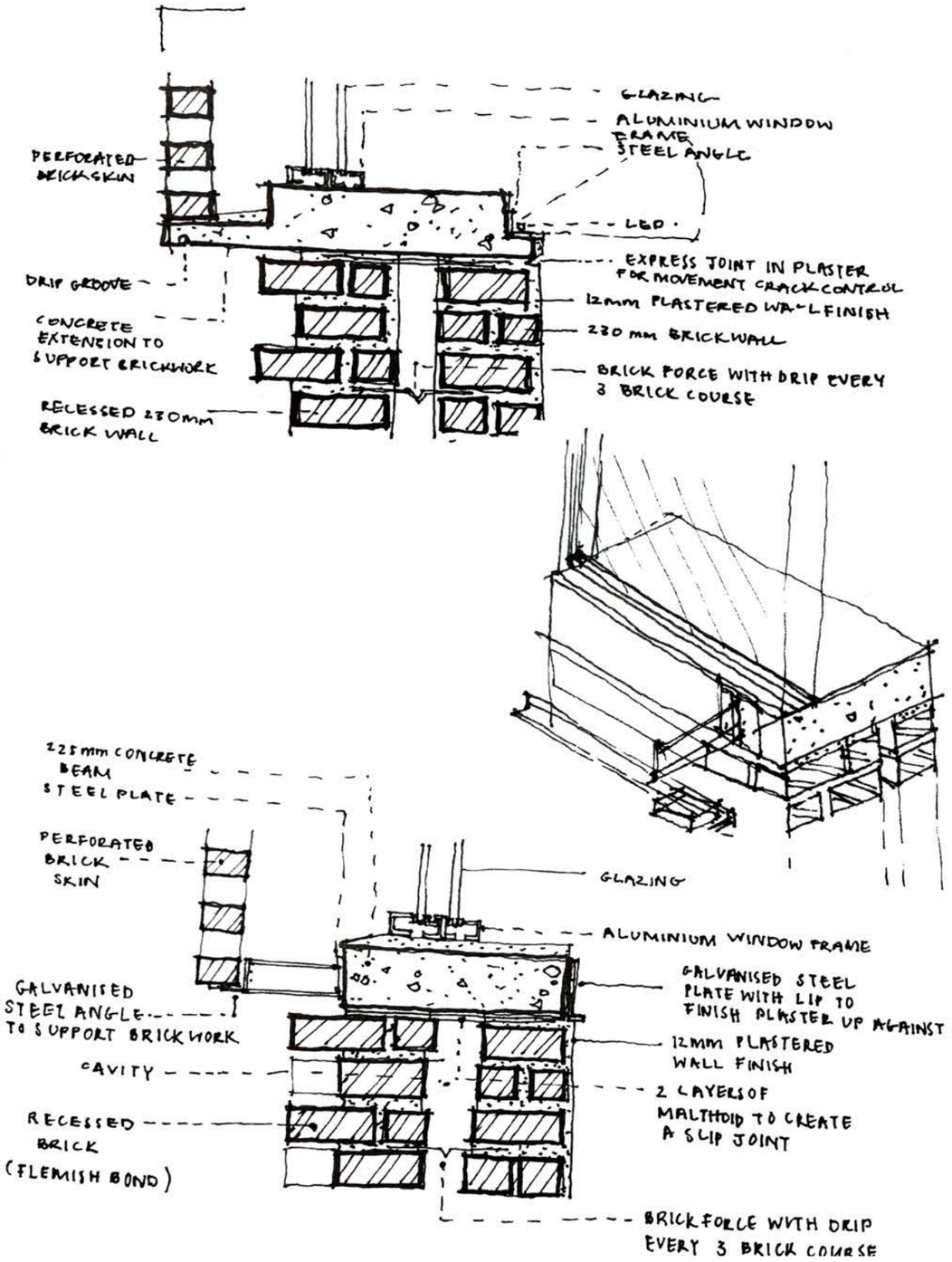


Fig. 2.5.6.2 Roof structure investigations (Naidoo 2020)



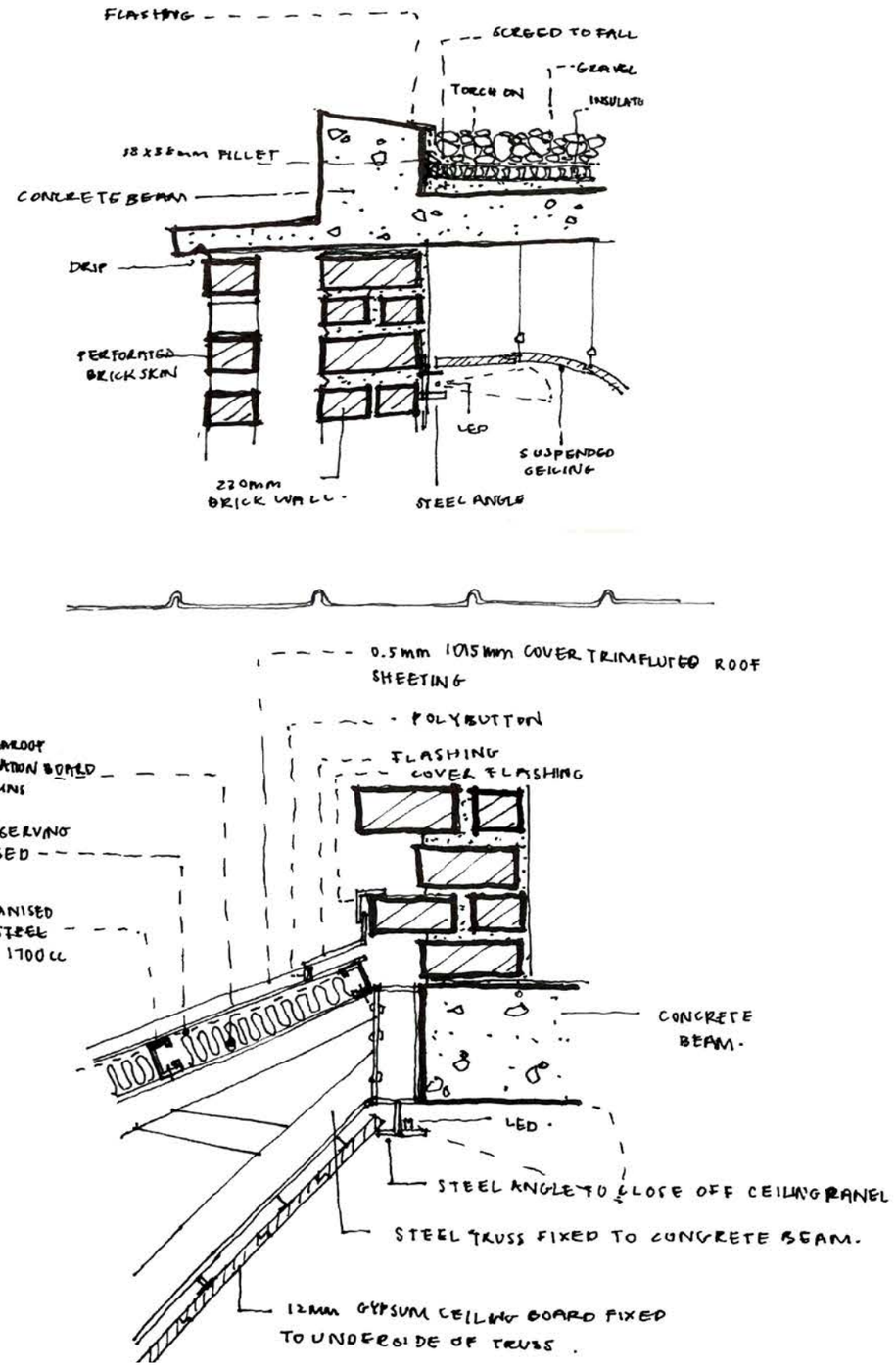


Fig. 2.5.6.3. Detail investigation (Naidoo 2020)

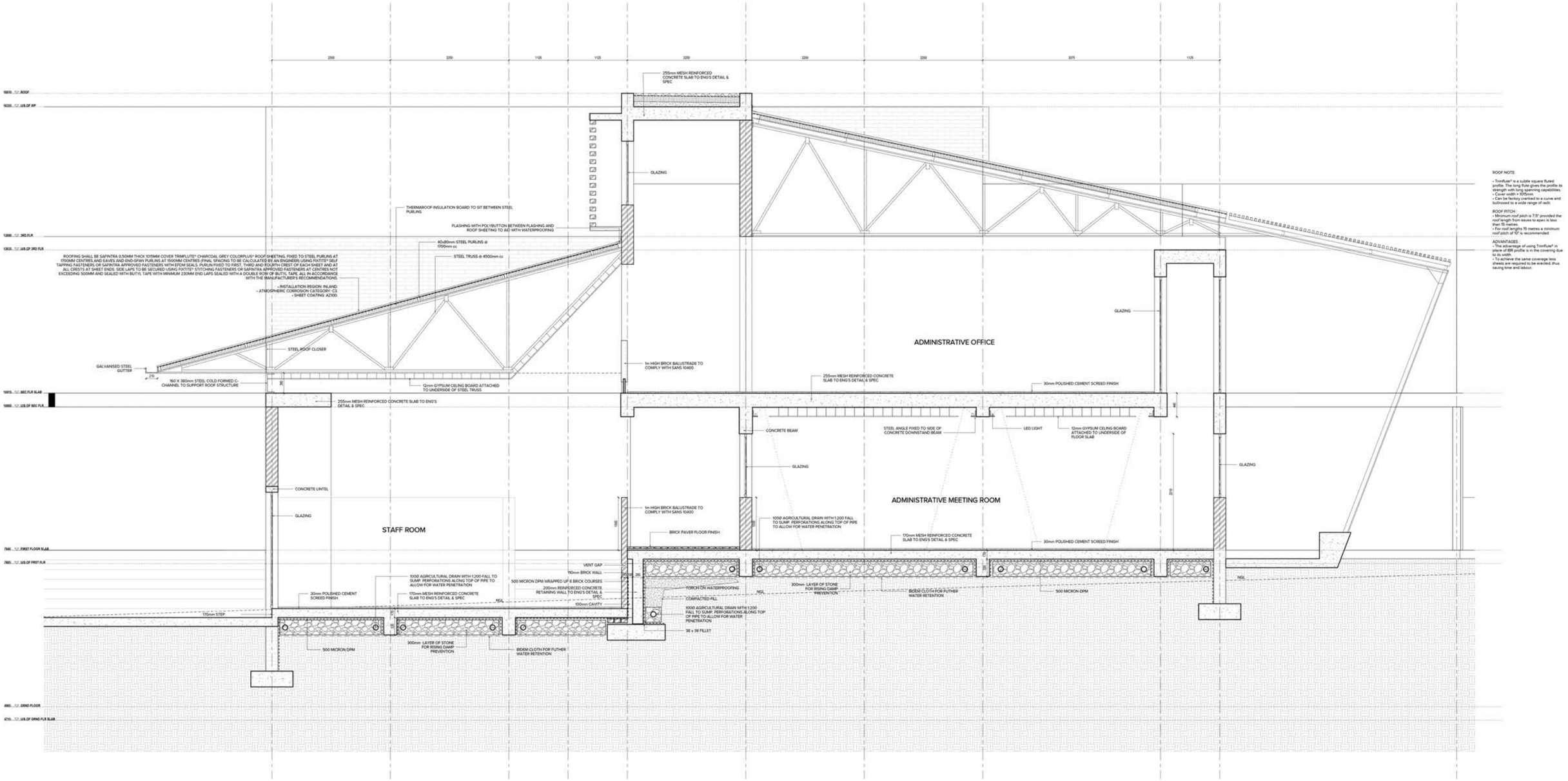
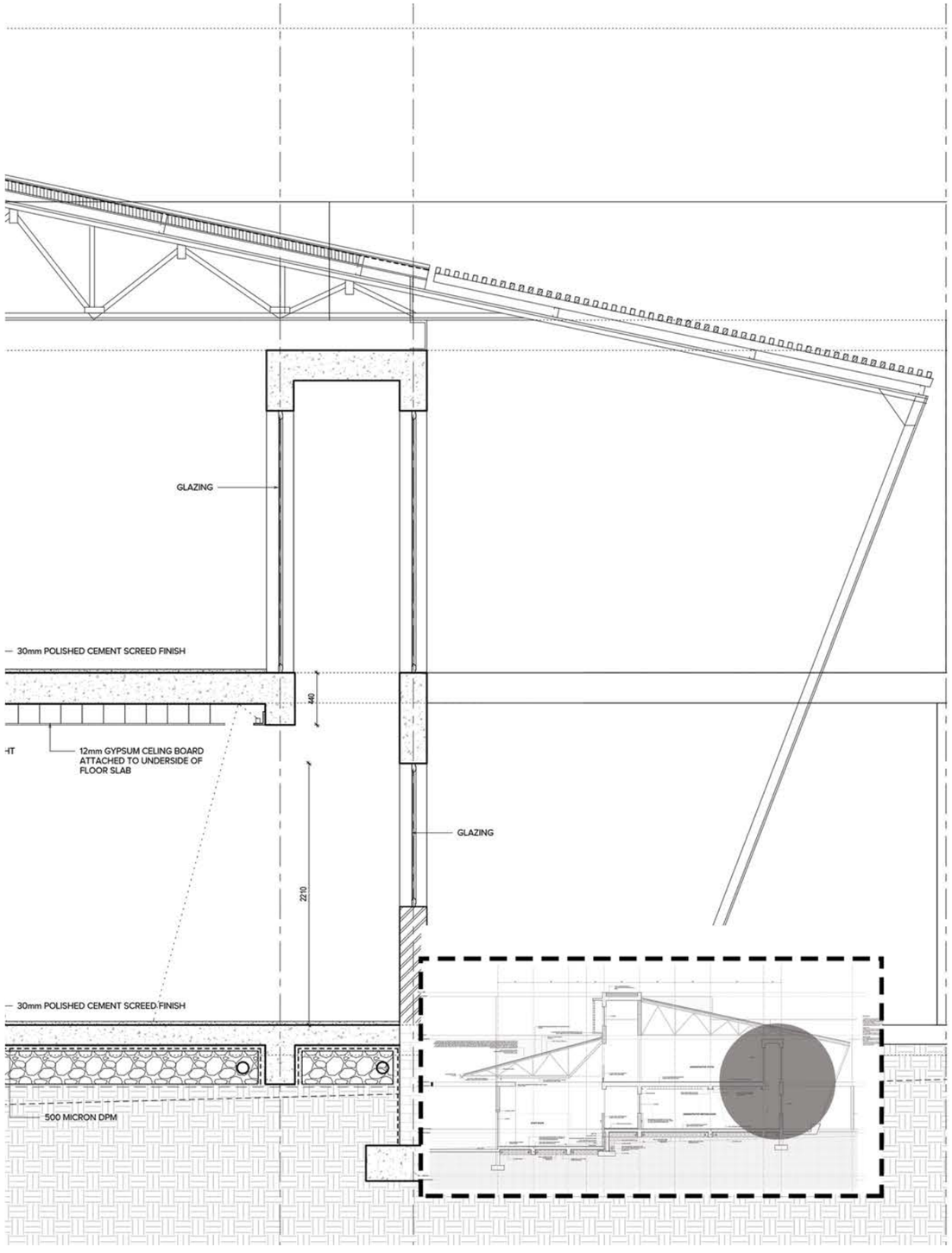


Fig. 2.5.6.4. Technical investigation (Naidoo 2020)



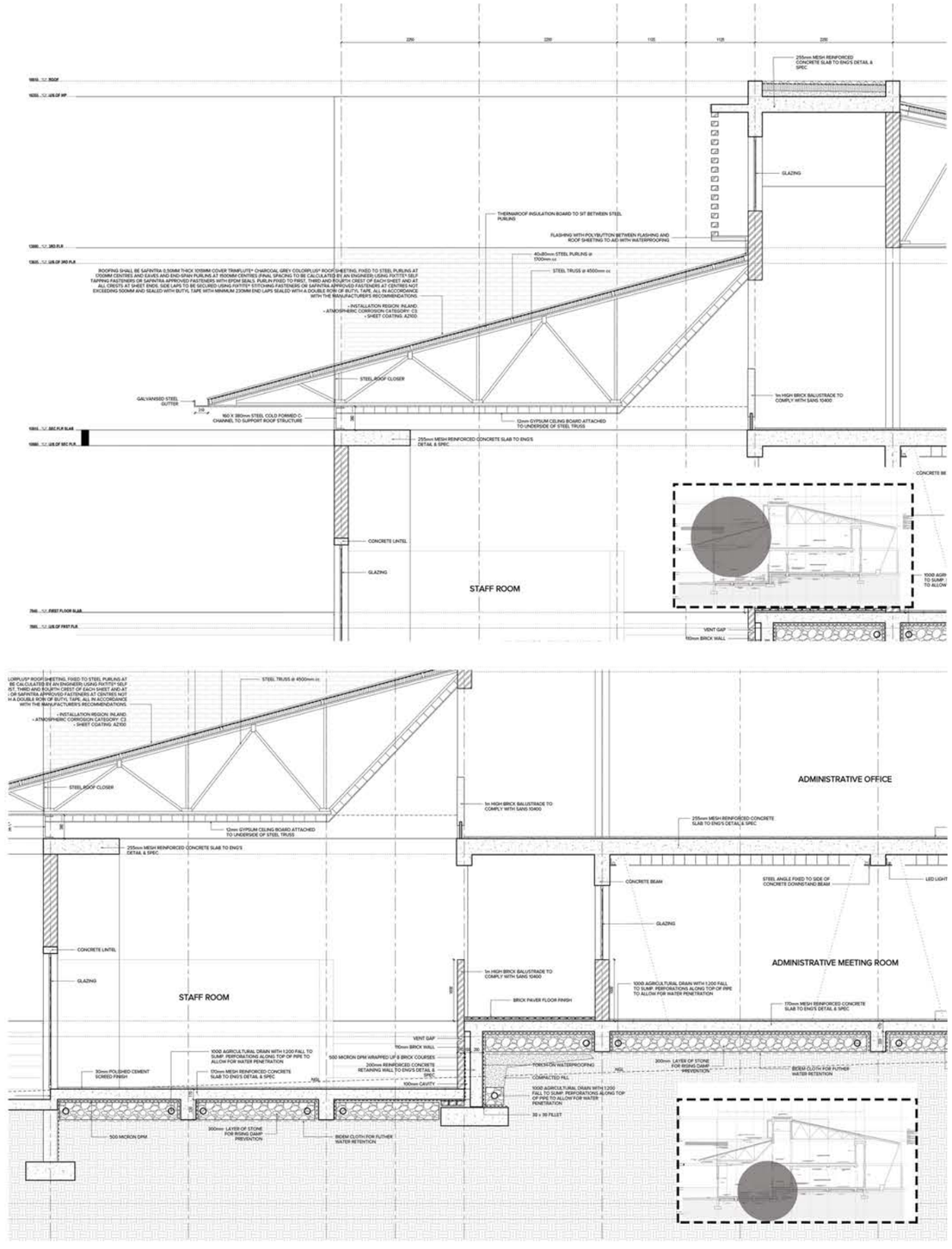


Fig. 2.5.6.5. Technical investigation (Naidoo 2020)

Chapter Six

REFLECTION

06

CHAPTER
Reflection

06
REFLECTION

6.1 Spatial Matrix Contribution to Policy

To align with the dissertation intentions of providing spatial definition to educational policy, the following spatial matrix was developed. This is done through developing spatial principles that respond to the two themes within the dissertation:

- Building as Public Threshold
- Building as Pedagogy

These themes have been investigated in detail in Volume 2, Chapter 4 of this dissertation. The matrix is a synthesized overview of the investigation into; the theoretical background, analysis of the existing conditions, precedent studies and PAR and co-design game informants of each theme.

The first theme of Building as Public Threshold is structured according to Boettger (2014) threshold principles:

- Spatial Delimitation
- Spatial Sequence
- Spatial Geometry
- Spatial Topography
- Spatial Materiality

Spatial delimitation is further analysed to respond to varying conditions (Moise 2014) of interaction between the community and the school:

- Strong Boundary- reflects a distinction between individual spaces and controls the communication between them
- Diffuse Boundary- allows for individual spaces to overlap and blur into each other to create a connection
- Spatialised Boundary- creation of a hybrid space where individual spaces have common ground with shared characteristics

The architectural language presented within this theme is directed towards responding to the design concept of publicly redefining the schooling environment. It aims to show how threshold conditions can mediate the relationship between a school and its community and influence the experience of that context.
The second theme deals with Building for Pedagogy to understand the typological characteristics of the physical learning environment. This is explored through:

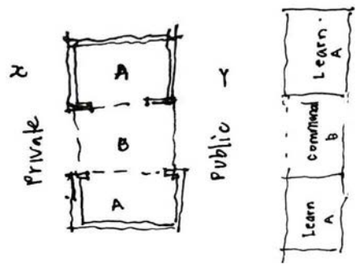
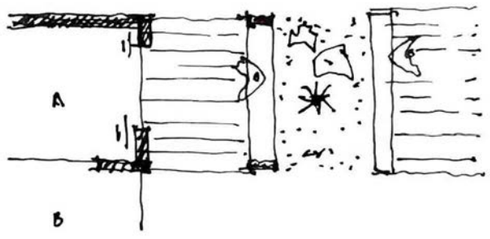
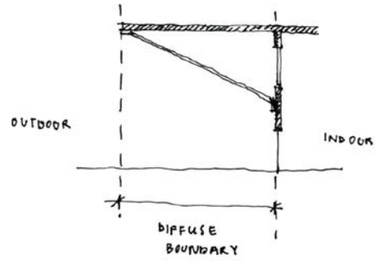
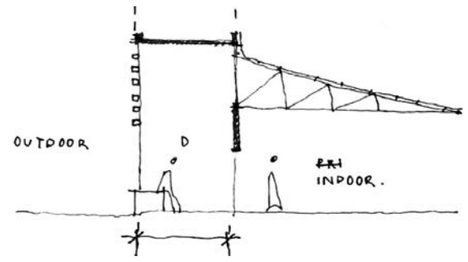
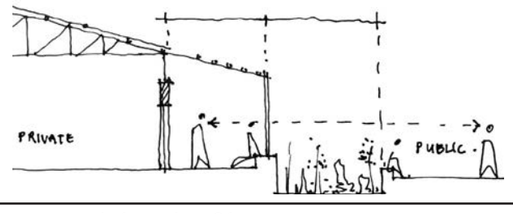
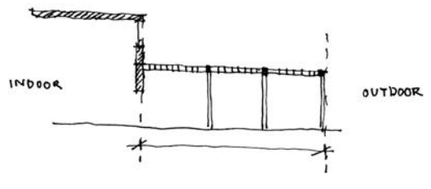
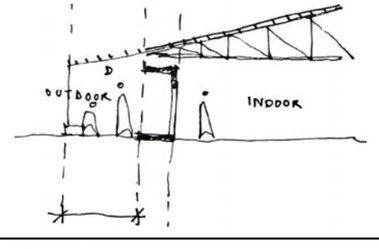
- Plan Type
- Spatial Configuration
- Circulation

As discussed in 4.5.1, the architectural language of this theme is directed towards challenging the conventional educational environment. This is done through providing opportunities to acquire life skills (Dudek 2015) and social learning through interaction (Kuhn 2012). The matrix intends to provide an architectural language to Policy for Public School Infrastructure in South Africa.

1. SPATIAL MATRIX

Building as Public Threshold

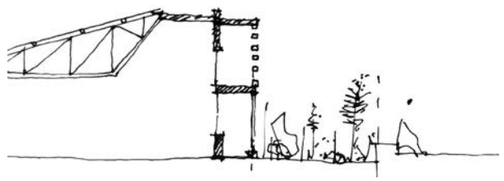
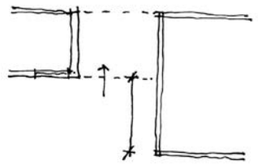
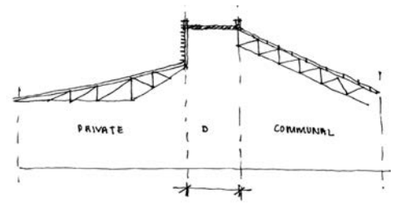
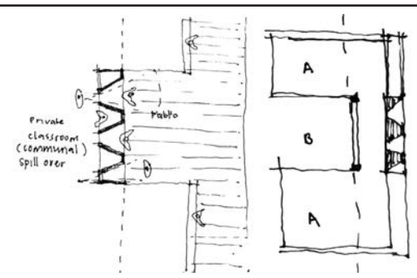
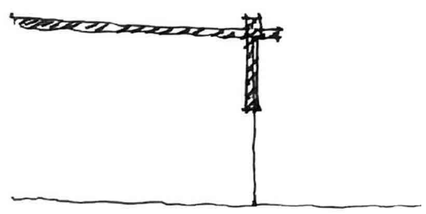
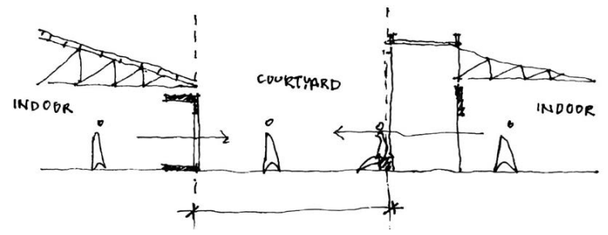
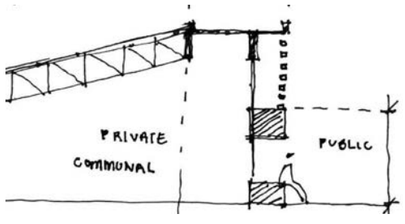
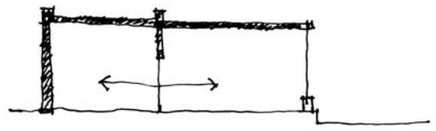
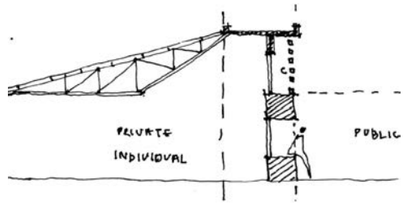
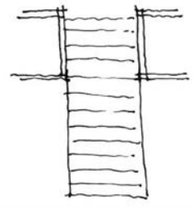
Spatial Delimitation

		Strong Boundary	Diffused Boundary	Spatialised Boundary
	Reference Plan	 • The strong boundary approaches presented below have been structured according to the following diagram where space A represents private learning programme and space B represents communal activity		
01	Space A Approach			
		• Limit close interaction between public and private learning space: no provided shade/seating • Acoustic threshold applied due to quieter learning occurring within space • Maintains visual connection	• Overhang distinguishes threshold zone • Support of overhang to not touch ground to reinforce blurring of the threshold space • Overhang protrudes to invite interaction	• External circulation element • Dual shared space between indoors and outdoors
02				
		• Section approach 1 to plan 01	• Exterior pergola shading structure as transition zone	• External circulation element • Dual shared space between indoors and outdoors

1. SPATIAL MATRIX

Building as Public Threshold

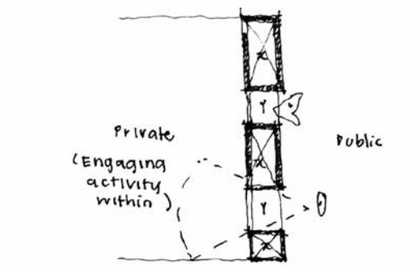
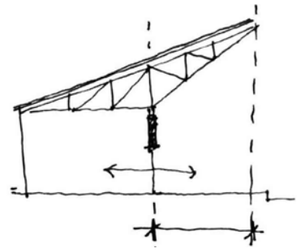
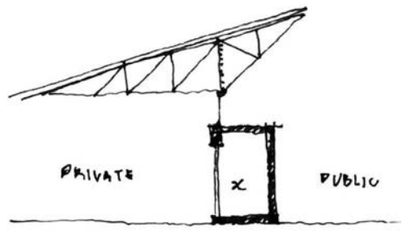
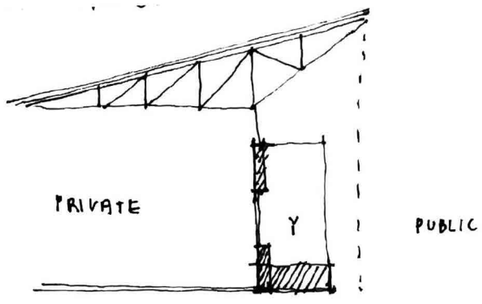
Spatial Delimitation

		Strong Boundary	Diffused Boundary	Spatialised Boundary
03	Space A Approach			
		• Section approach 2 to plan 01	• Protruding elements frame entrance/permeable threshold	• Internal circulation element • Connection and buffer between private and communal programme
04				
		• Maintain privacy for classrooms that sit on the public edge • Controlled visual connection through articulation of openings	• Maintain the same level between respective spaces apart from the required 170mm step between indoor and outdoor	• Courtyard as spatialised threshold • Maintains connection with adjacent spaces
05	Space B Approach			
		• Section approach 1 to plan 04	• Bleeding of programme into external space	
06				
		• Section approach 2 to plan 04	• Protrusion of floor finish through space to create continuity	

1. SPATIAL MATRIX

Building as Public Threshold

Spatial Delimitation

		Strong Boundary	Diffused Boundary	Spatialised Boundary
07	Space B Approach			
		• Approach used when activity within the private space stimulates learning • Articulation of openings allows for visual connection • No buffer between public and private- allow public to closely interact with the architecture • Boundary is maintained through strong edge • Thickened edge occupied with programme/supporting space	• Overhang to create transitional zone to blur boundary between internal and external space	
08				
		• Section approach to plan 07 through occupied thickened edge		
09				
		• Section approach to plan 07 through public seating of edge		

1. SPATIAL MATRIX

Building as Public Threshold

Spatial Delimitation

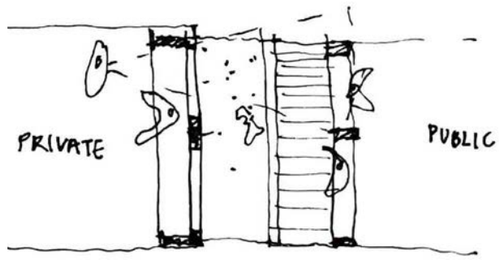
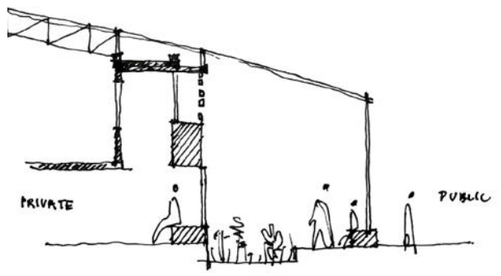
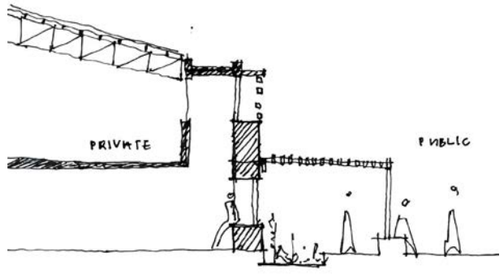
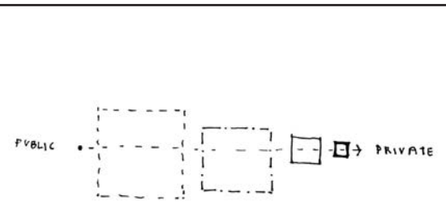
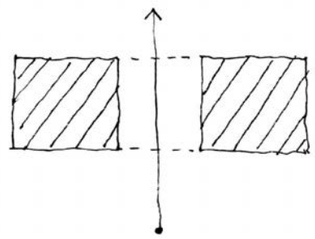
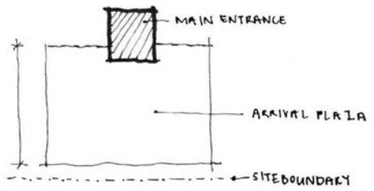
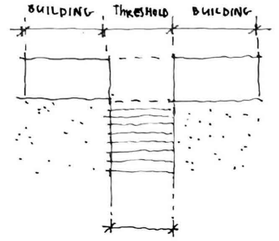
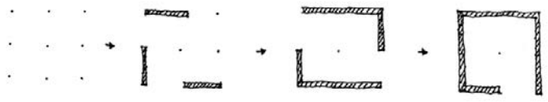
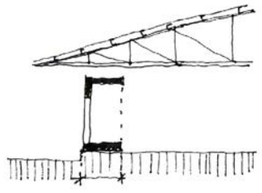
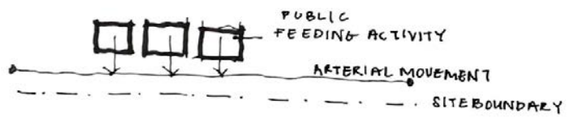
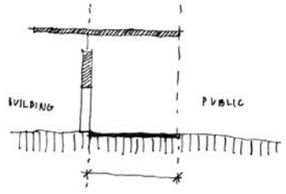
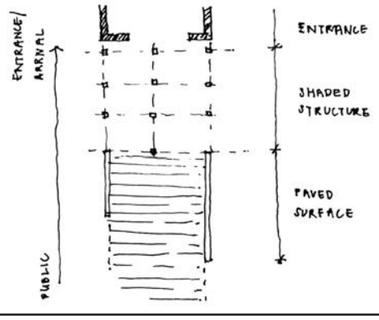
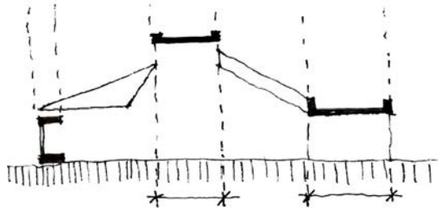
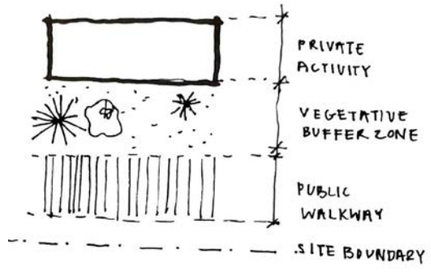
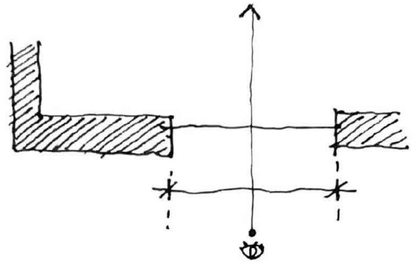
		Strong Boundary	Diffused Boundary	Spatialised Boundary
10	Space A Approach			
		• Boundary aimed at preventing movement and maintaining privacy • Visual connection maintained to allow for surveillance • Acoustic threshold to accommodate private activity		
11				
		• Section approach 1 to plan 10		
12				
		• Section approach 2 to plan 10		

Fig. 2.6.1. Building as public threshold spatial matrix (Naidoo 2020)

2. SPATIAL MATRIX

Building as Public Threshold

	Spatial Sequence	Spatial Geometry	Spatial Topography	Spatial Materiality
01				
	• Size of space reduces as you transition into private space of the building • Permeability of those spaces decreases as you transition in. This is reflected through controlling access and differentiation in openings	• Threshold distinguished by break in massing	• Main entrance set back from boundary to create arrival landing • Contributes to public presence of the site • Emphasizes the point of arrival	• Variation in floor surface finish • Surface material to encourage movement towards threshold • Hard surface finish
02				
	• Visual/physical access decreases as you transition from public to private	• Edge condition is defined through geometry • Geometry holds edge to establish threshold	• Placement of public programme along arterial movement routes to feed activity onto site periphery	• Floor surface finish within roof overhang over threshold space
03				
	• Guiding elements used towards the main threshold into a space • Change in floor surface as you transition towards your arrival point	• Flat roof elements distinguish threshold space	• Layering of buffer zones between public and private programme • Design of public frontage to a private programme is intended to stimulate movement and prevent pausing	• Permeable material at the threshold to allow for visual permeability as first level of threshold into the site

2. SPATIAL MATRIX

Building as Public Threshold

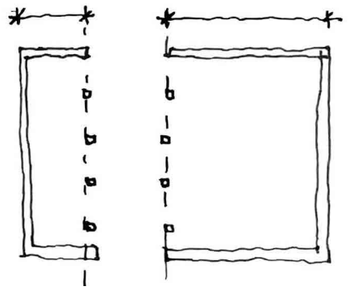
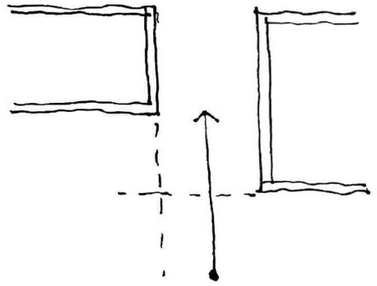
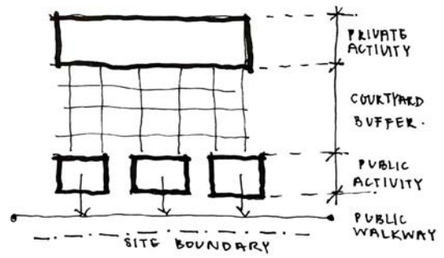
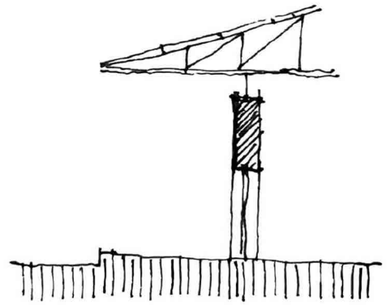
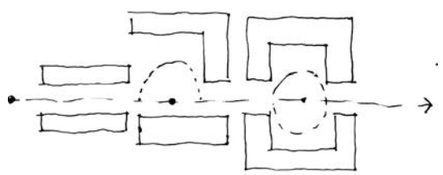
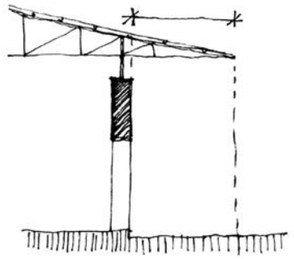
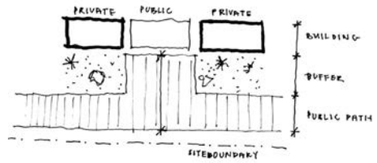
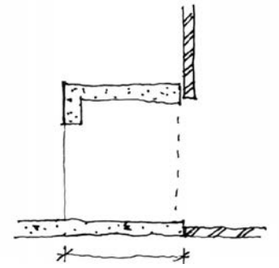
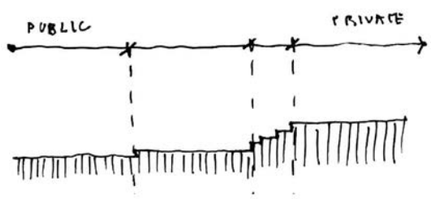
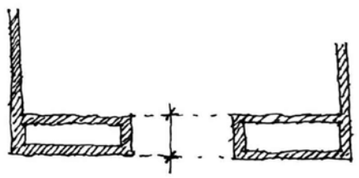
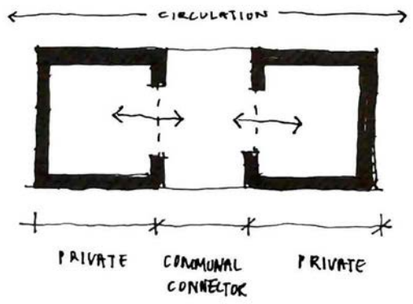
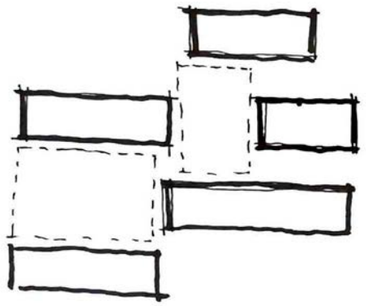
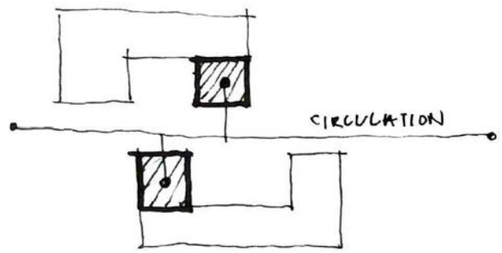
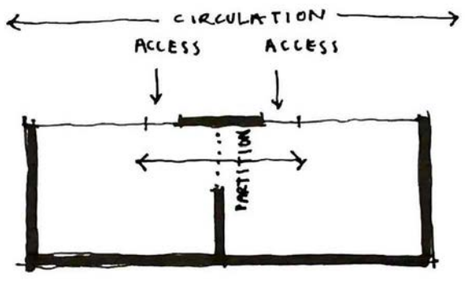
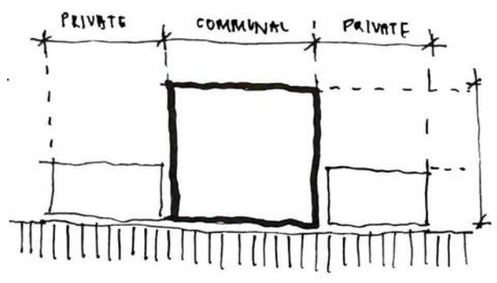
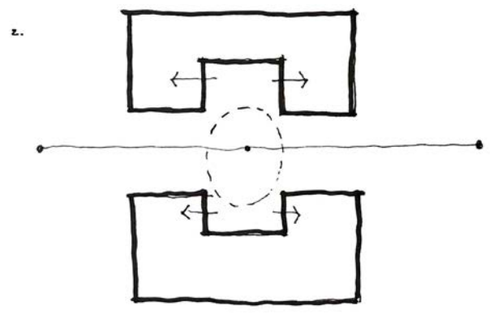
	Spatial Sequence	Spatial Geometry	Spatial Topography	Spatial Materiality
04				
	• Structural elements used as a mechanism to guide movement through building • These elements demarcate space	• Staggered massing frames threshold space	• Layering of public programme as buffer between private and public • Intended to activate site boundary	• Exposure of material and structure at the threshold and points where public interacts with the architecture
05				
	• Along a transition/movement route, adjacent buildings narrow the pathway to encourage movement and widen to allow for moments of pause	• Roof overhang used to highlight the threshold	• Widening of public pathways where the architecture allows for interaction with the public programme of the building	• Exposure of material differentiation at the threshold
06				
	• Level change used to demarcate space an control movement			• Thickening of material allows for deeper openings to articulate and emphasize the threshold

Fig. 2.6.2. Building as public threshold spatial matrix (Naidoo 2020)

3. SPATIAL MATRIX

Building for Pedagogy

	Plan Type	Spatial Configuration	Circulation
Intention	• Varied articulation of learning spaces allows for a range of individual to group activities (Hertzberger 2008). • Barret et al (2015) acknowledges this allowance for individualisation through flexibility as a key variable of the physical educational environment that enhances the learning experience. • Plan type should accommodate differentiations in learning style through variations in room size, classroom articulation and flexibility of plan.	• The learning environment is suggested to represent that of a micro city with multiple opportunities for learning (Hertzberger 2008:69) and encourages interaction • Easy access to attached breakout spaces, well defined learning zones and wider corridors are some of the main physical elements that affect the learning experience (Barret et al 2015). • Emphasis is placed on social space to draw a parallel to the public space of the city (Hertzberger 2008). • Kuhn (2012) speaks to the spatial configuration of the learning environment and suggests the relevance of hierarchy by allowing for an intermediate learning space between the 'classroom' and school.	• Approach to educational circulation as the 'learning street' (Dovey & Fisher 2014:43, Hertzberger 2008) . • Informal and formal learning environments are starting to be recognised as integral in the holistic learning development of a child. • The 'learning street' redefines corridors for interaction and provides multiple opportunities to learn in a variety of ways. • Circulation sits as the primary artery where the main elements are concentrated, allowing for passive surveillance of the school and learners to feel included (Hertzberger 2008).
01			
	• Adjacent private learning spaces with an internal communal connecting space	• Staggering of buildings to frame courtyard spaces • Provides opportunity for external learning in a new environment	• Circulation absorbs arm of built form to create a landing space which serves as shared space for learning
02			
	• Partition between adjacent learning spaces to allow for opportunity multiple learning arrangements	• Communal space serves a hierarchical role within the spatial configuration • The volume encourages group learning activities and accommodates the communal activity	• Circulation widens at the entrance into a space to form a new internal zone

3. SPATIAL MATRIX

Building for Pedagogy

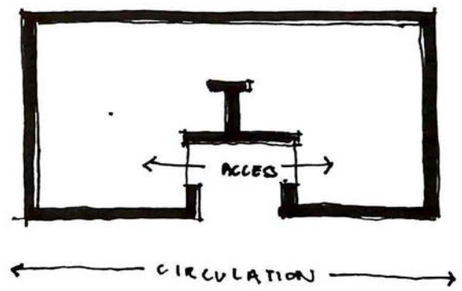
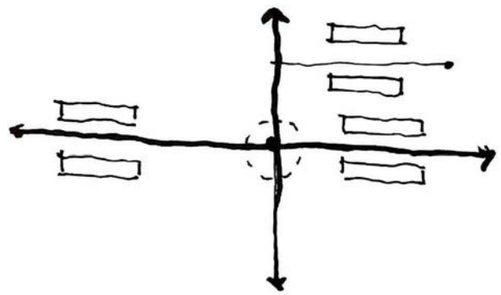
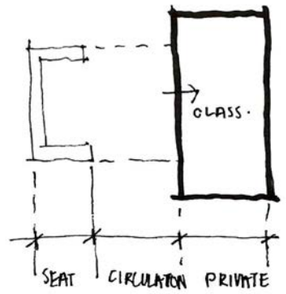
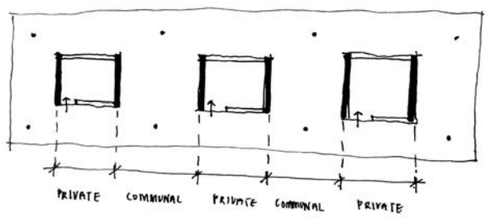
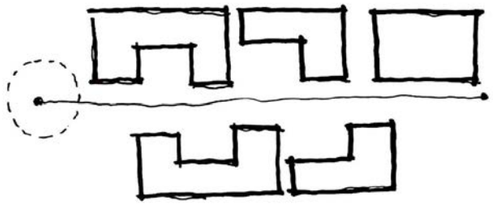
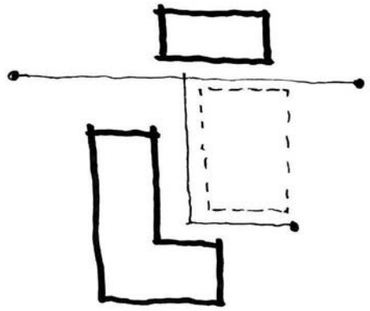
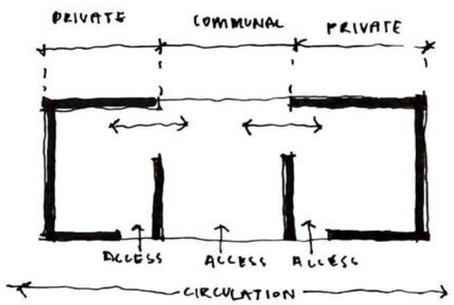
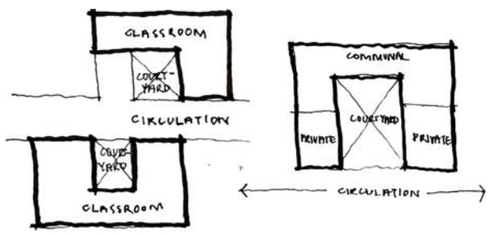
	Plan Type	Spatial Configuration	Circulation
03			
		• Main axis used to guide placement of building	• Circulation widens to form external seating at the entrance into class-room • Opportunity for learners to socially engage
04			
	• Private learning spaces buffered by communal learning zones	• Central axis that is held at either end • Building units along the axis fame internal courtyard space • Buildings absorb courtyards to create a series of semi private zones	• Circulation widens to form a landing creating the opportunity for an external social zone
05			

Fig. 2.6.3. Building for pedagogy spatial matrix (Naidoo 2020)

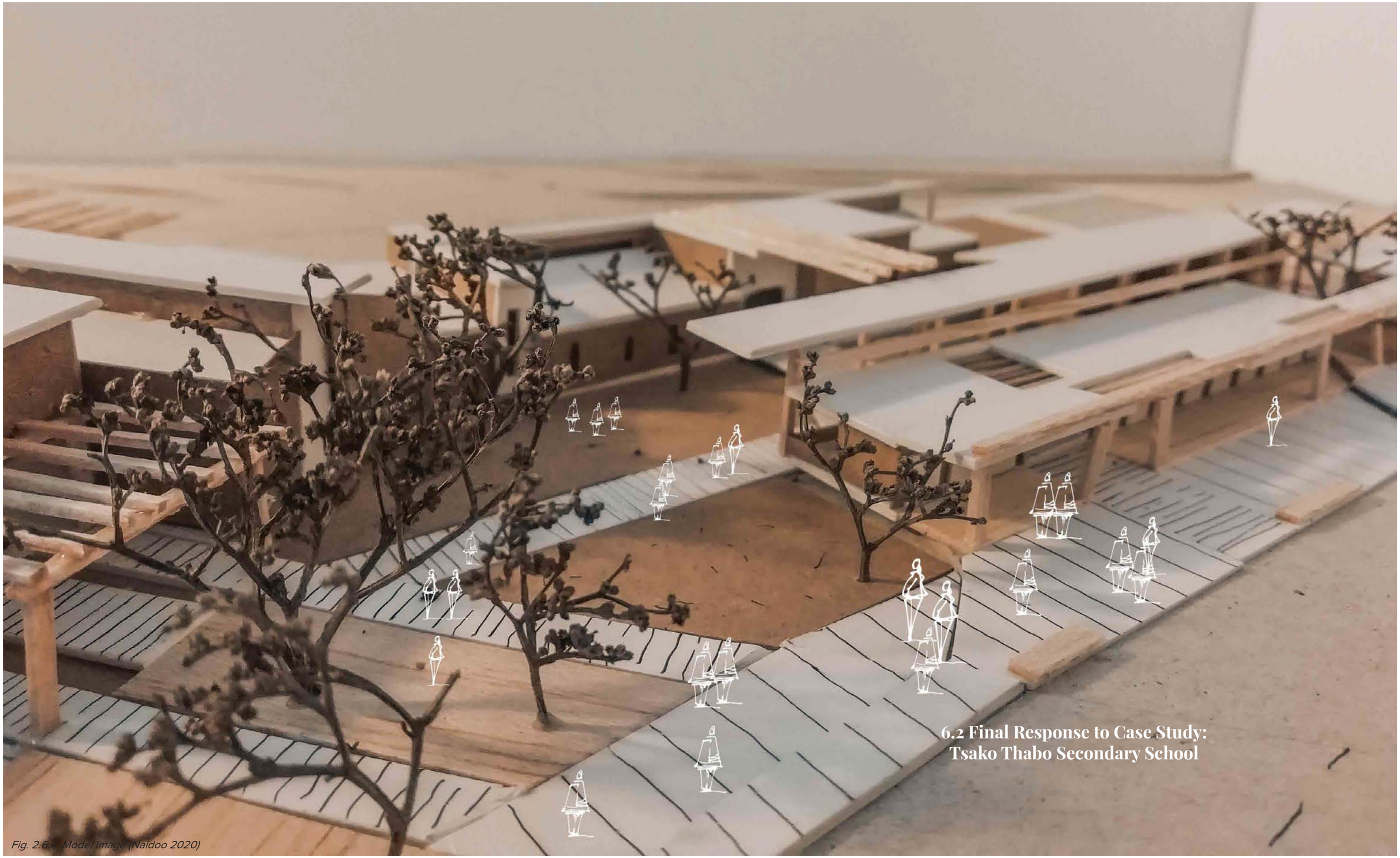


Fig. 2.6.4: Model image (Naidoo 2020)

6.2 Final Response to Case Study: Tsako Thabo Secondary School

Fig. 2.6.5. Site plan. NTS. Original scale 1:100 (Naidoo 2020)

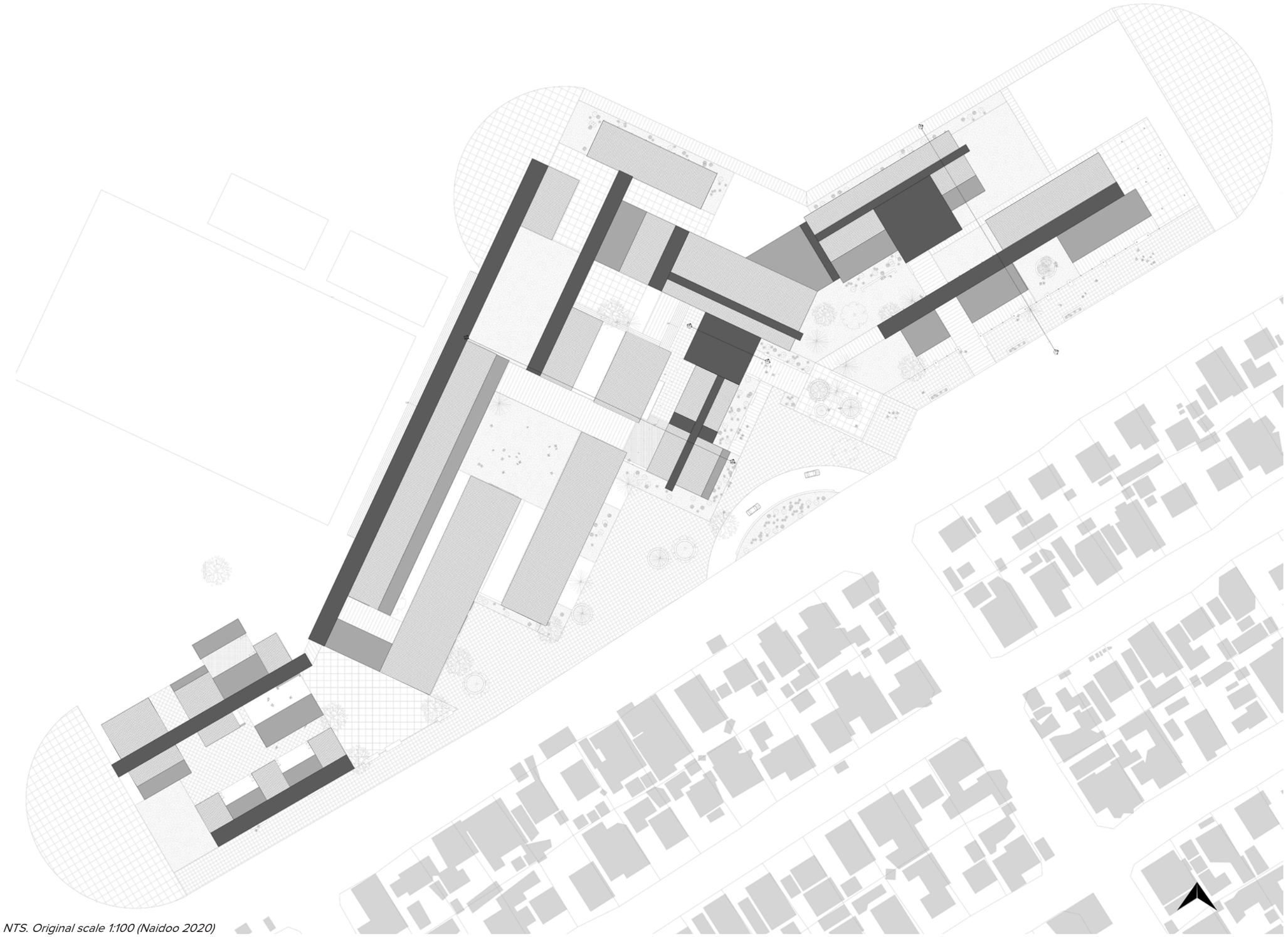


Fig. 2.6.6. Roof plan. NTS. Original scale 1:100 (Naidoo 2020)

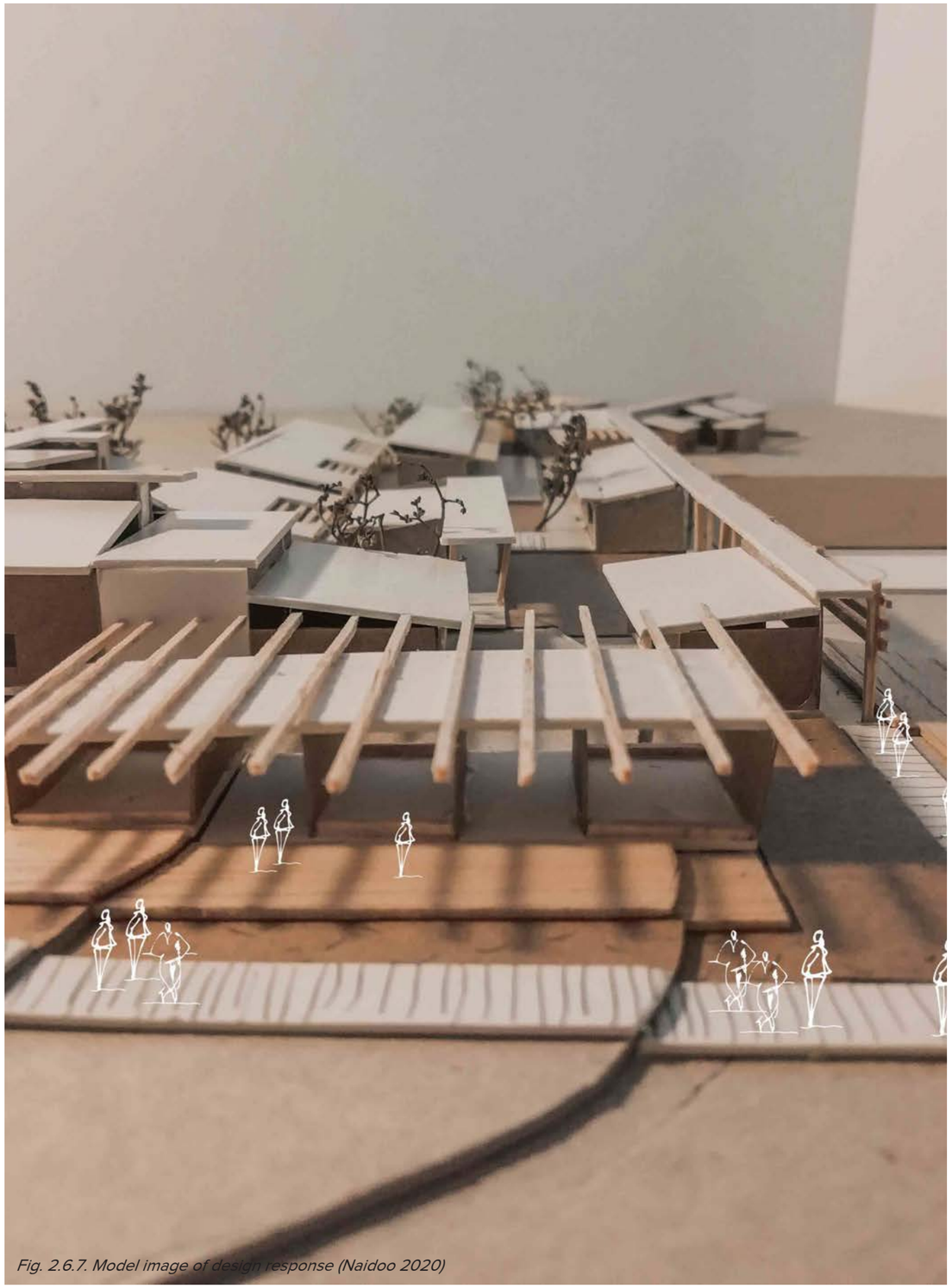


Fig. 2.6.7. Model image of design response (Naidoo 2020)

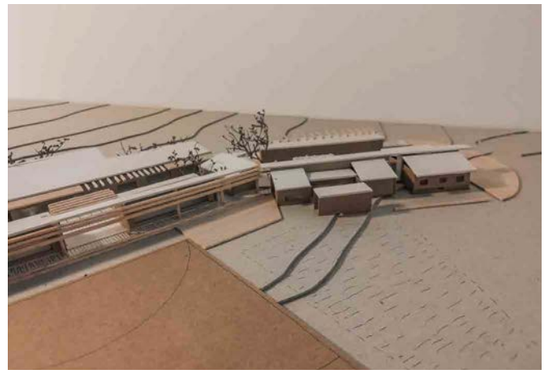


Fig. 2.6.8. Model images of design response (Naidoo 2020)

Fig. 2.6.9. Ground floor plan with footprint of existing highlighted. NTS. Original scale 1:100 (Naidoo 2020)

Fig. 2.6.10. Model image from the north western perspective (Naidoo 2020)

Fig. 2.6.11. Ground floor plan focusing on the main library intervention. NTS. Original scale 1:100 (Naidoo 2020)

Fig. 2.6.12. Model images focusing on the main library intervention (Naidoo 2020)

Fig. 2.6.13. Model image focusing on the main entrance on the south eastern boundary (Naidoo 2020)

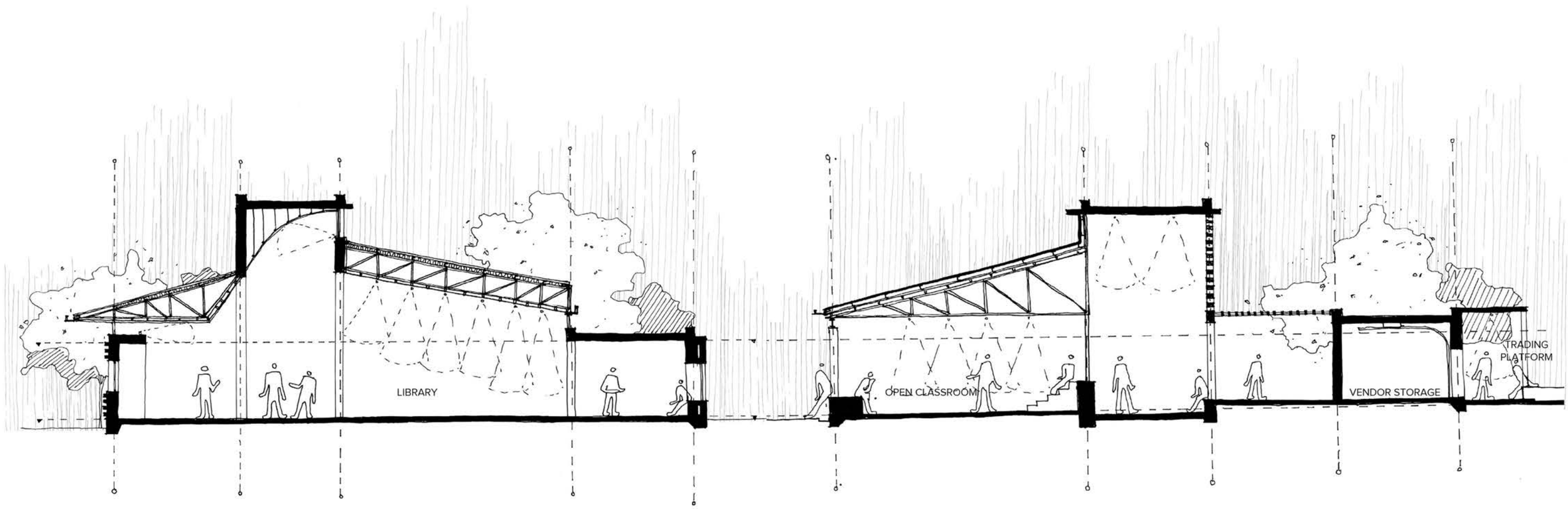


Fig. 2.6.14. Section A cutting through the library and economic edge. NTS. Original scale 1:100 (Naidoo 2020)

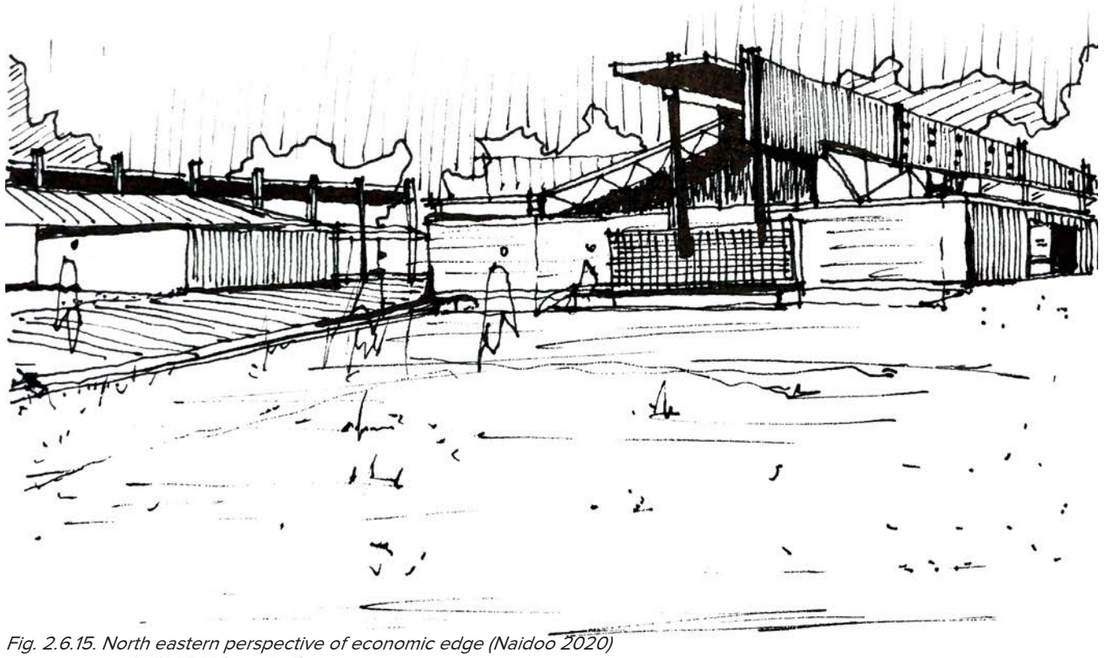


Fig. 2.6.15. North eastern perspective of economic edge (Naidoo 2020)

Fig. 2.6.16. South eastern elevation of the library intervention. Image style adopted from Macfarlane (2020) (Naidoo 2020)

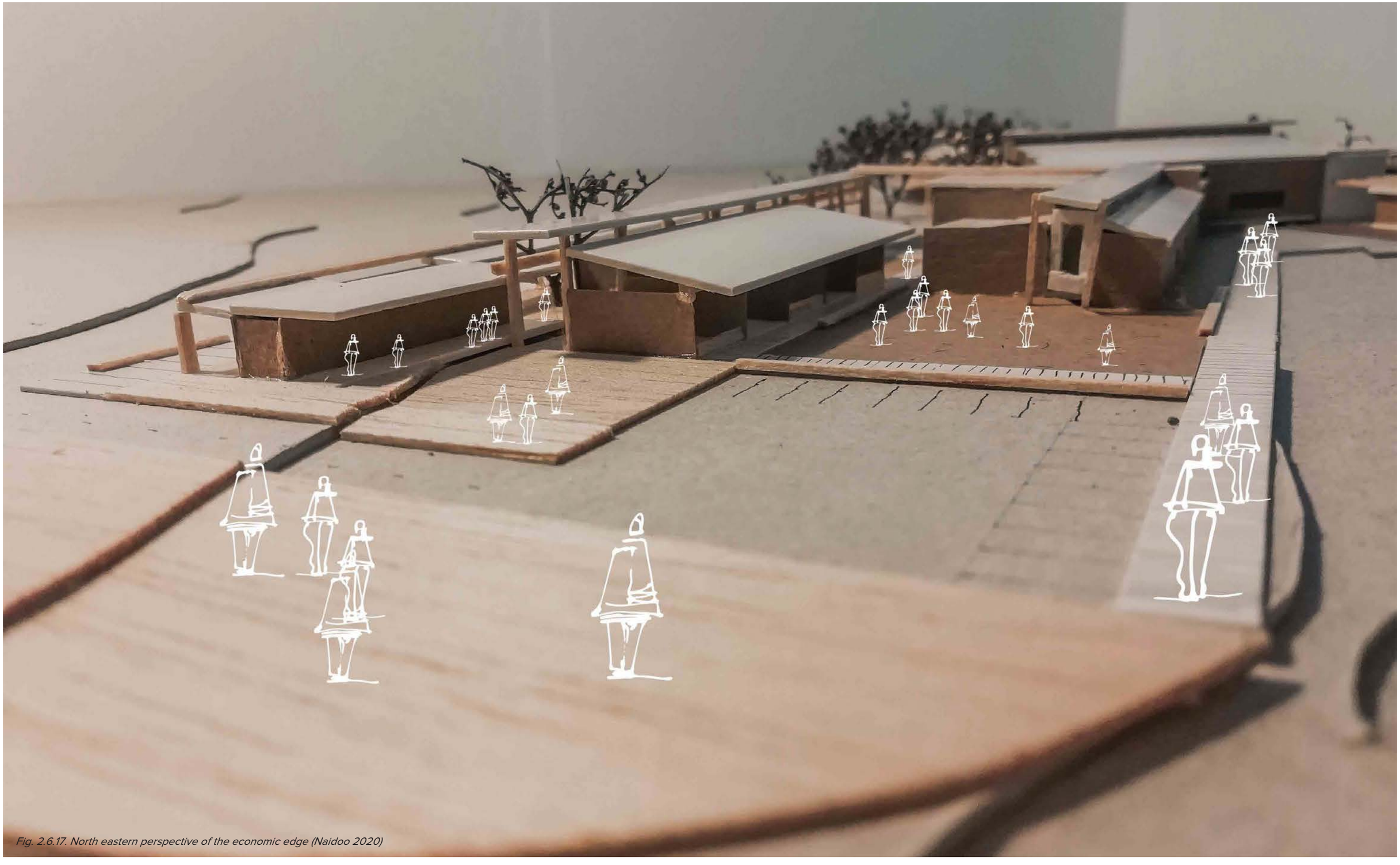


Fig. 2.6.17. North eastern perspective of the economic edge (Naidoo 2020)

Fig. 2.6.18. South eastern perspective of the economic edge (Naidoo 2020)

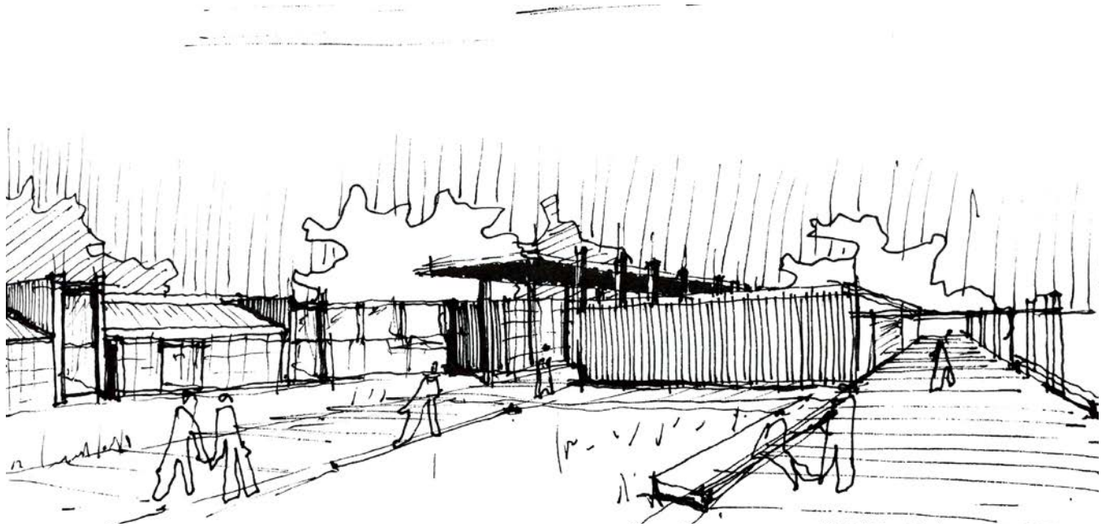


Fig. 2.6.19. South western perspective of the economic edge (Naidoo 2020)

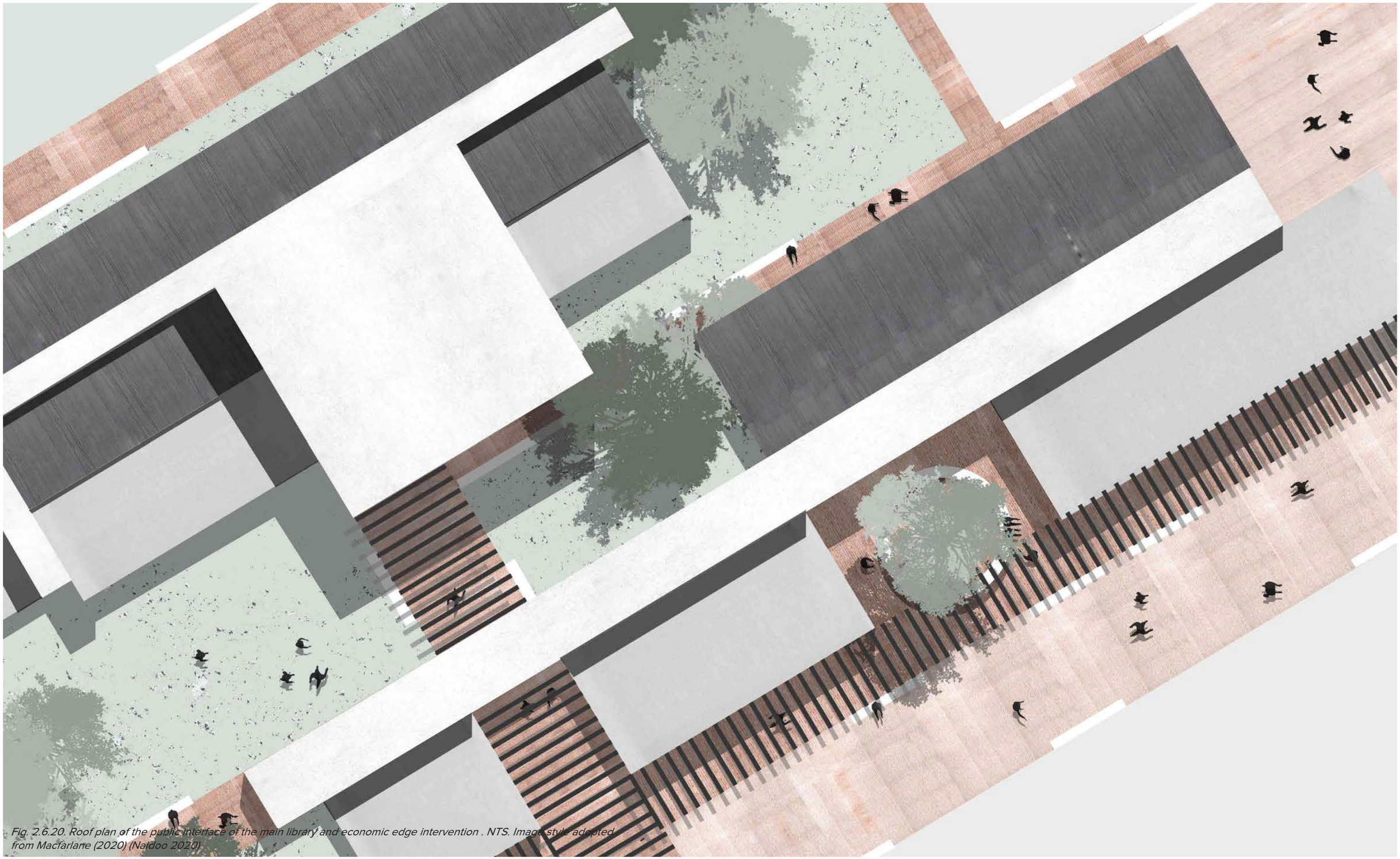


Fig. 2.6.20. Roof plan of the public interface of the main library and economic edge intervention . NTS. Image style adopted from Macfarlane (2020) (Naidoo 2020).

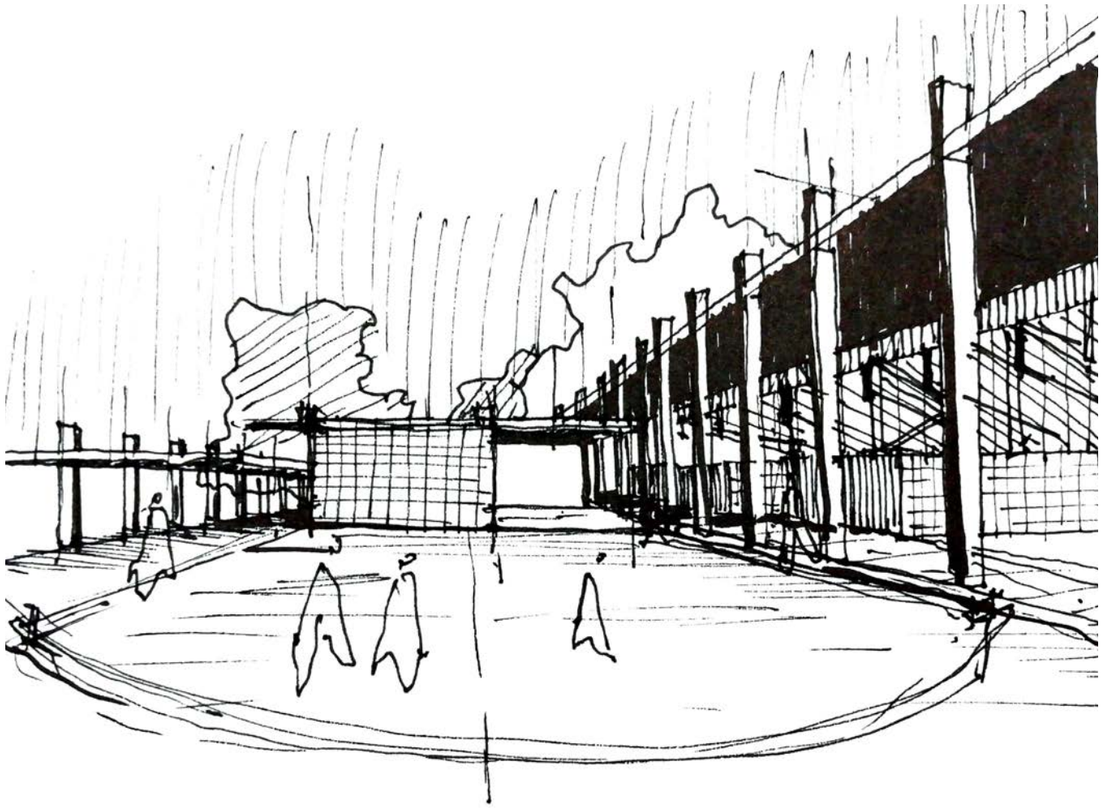


Fig. 2.6.21. South Western perspective of the economic edge (Naidoo 2020)

Fig. 2.6.22. South eastern perspective of the library and economic edge (Naidoo 2020)

Fig. 2.6.23. Ground floor plan focusing on the administration and hall. NTS. Original scale 1:100 (Naidoo 2020)

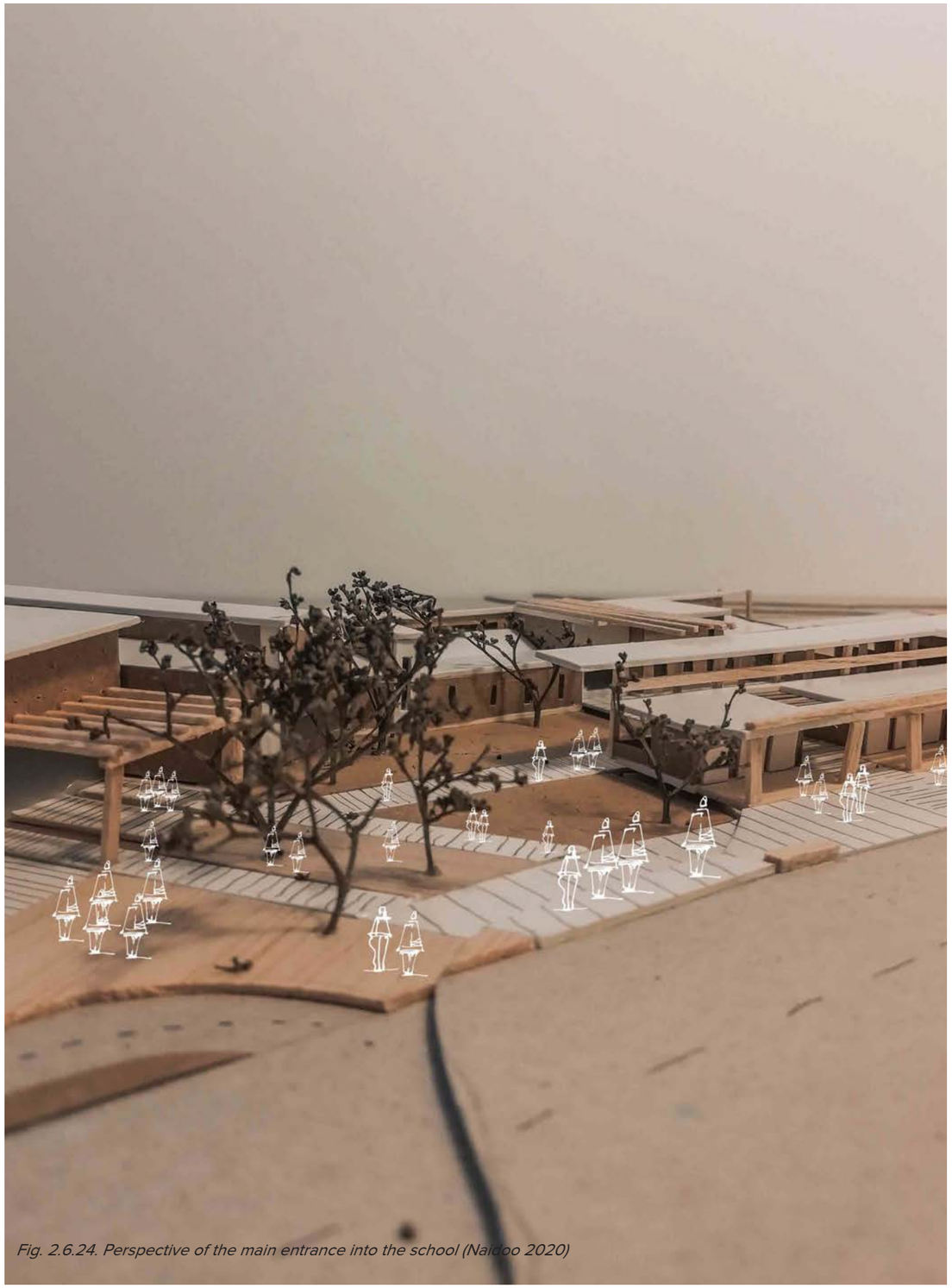


Fig. 2.6.24. Perspective of the main entrance into the school (Naidoo 2020)

Fig. 2.6.25. Administrative block perspectives (Naidoo 2020)

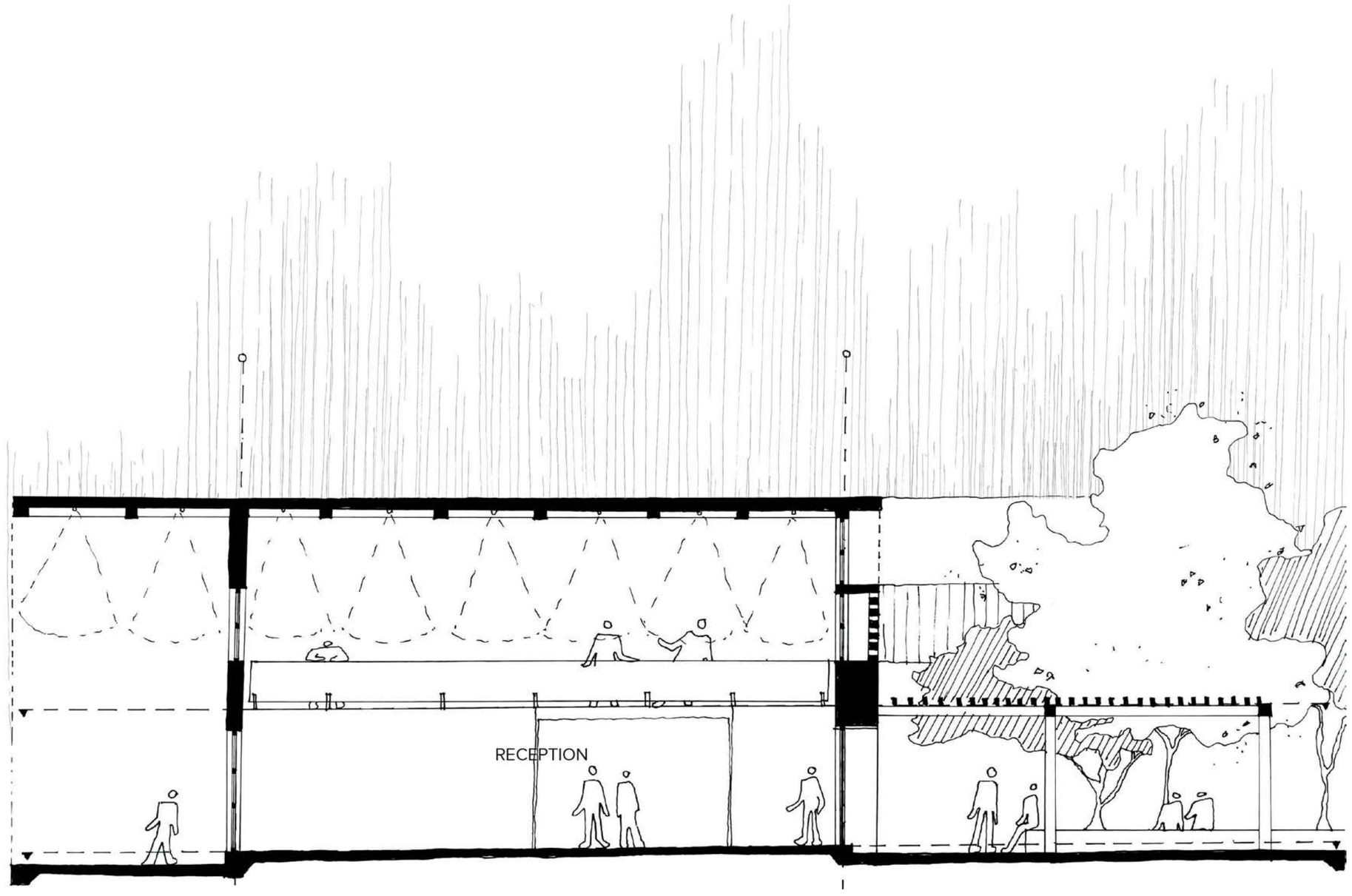


Fig. 2.6.26. Section B cutting through the reception. NTS. Original scale 1:100 (Naidoo 2020)

Fig. 2.6.27. Model image (Naidoo 2020)

Fig. 2.6.28. Ground floor plan focusing on alterations to the existing. NTS. Original scale 1:100 (Naidoo 2020)

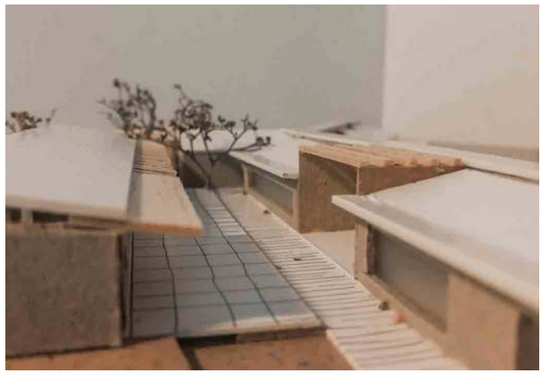


Fig. 2.6.29. Model images of the classroom blocks (Naidoo 2020)

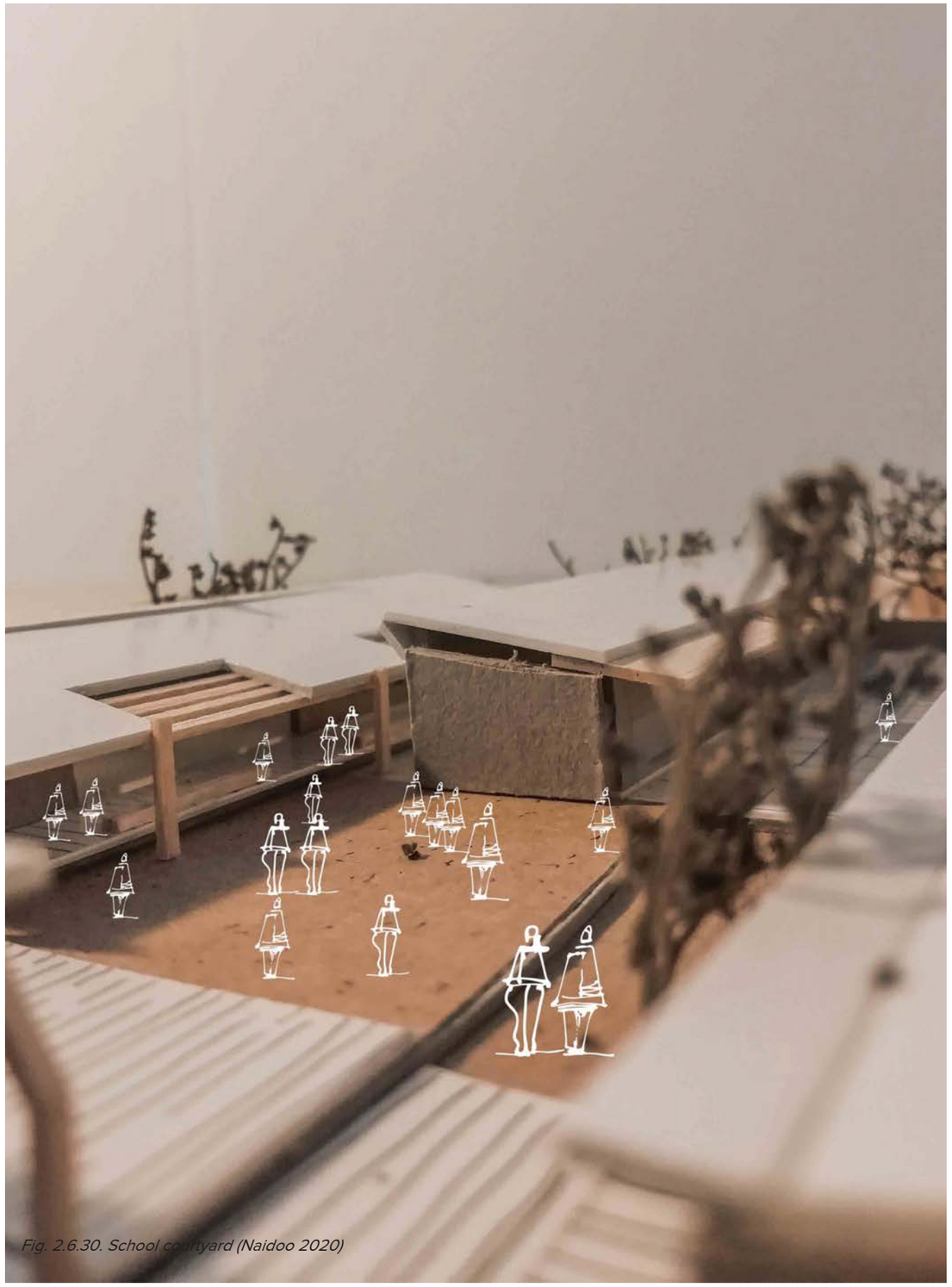


Fig. 2.6.30. School courtyard (Naidoo 2020)

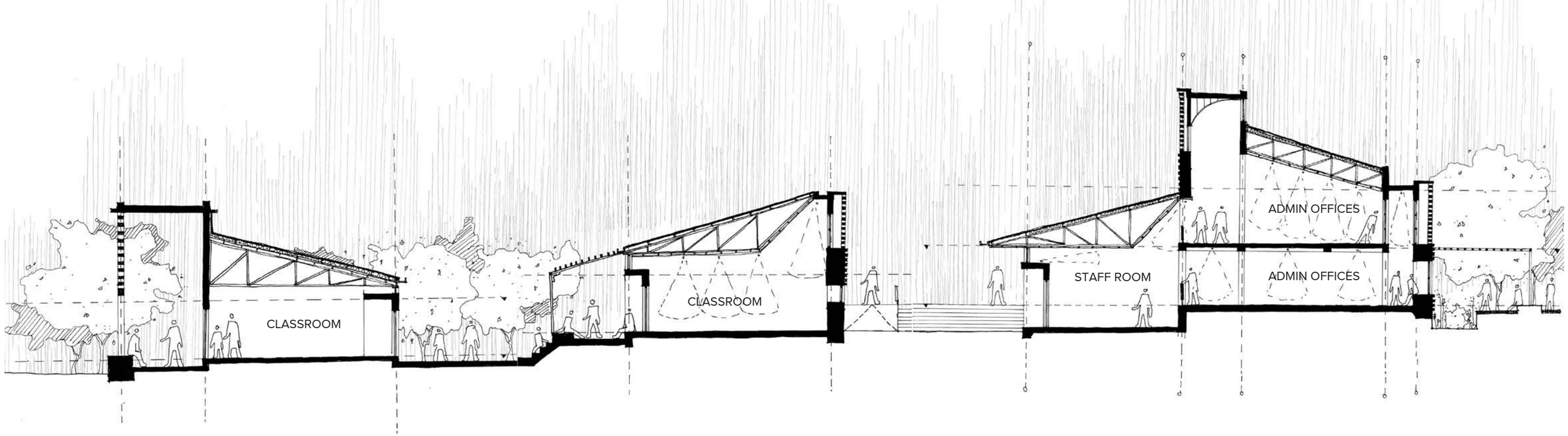


Fig. 2.6.31. Section C cutting through classrooms and administration. NTS. Original scale 1:100 (Naidoo 2020)

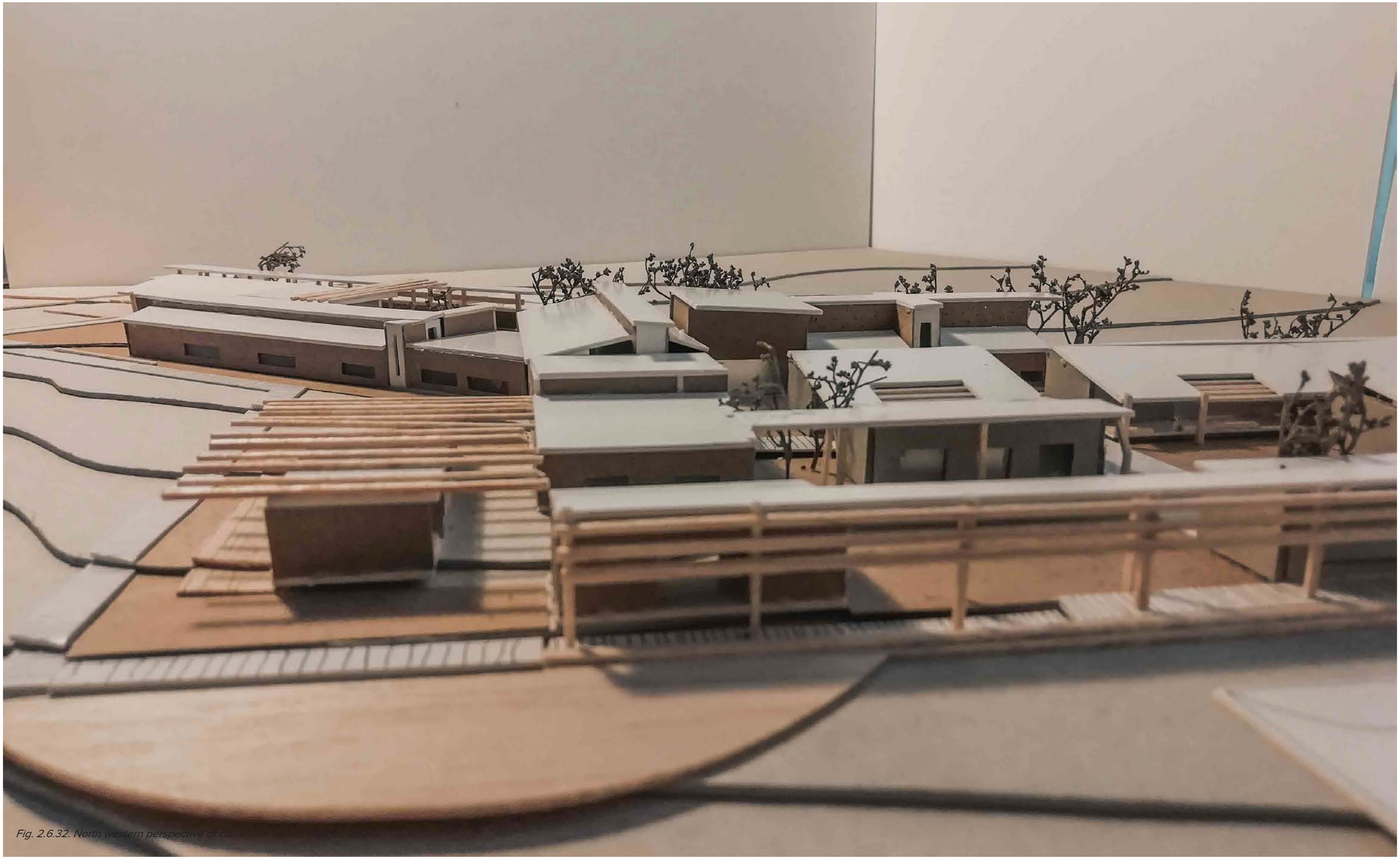


Fig. 2.6.32. North western perspective of classroom blocks (Nasbo 2020)

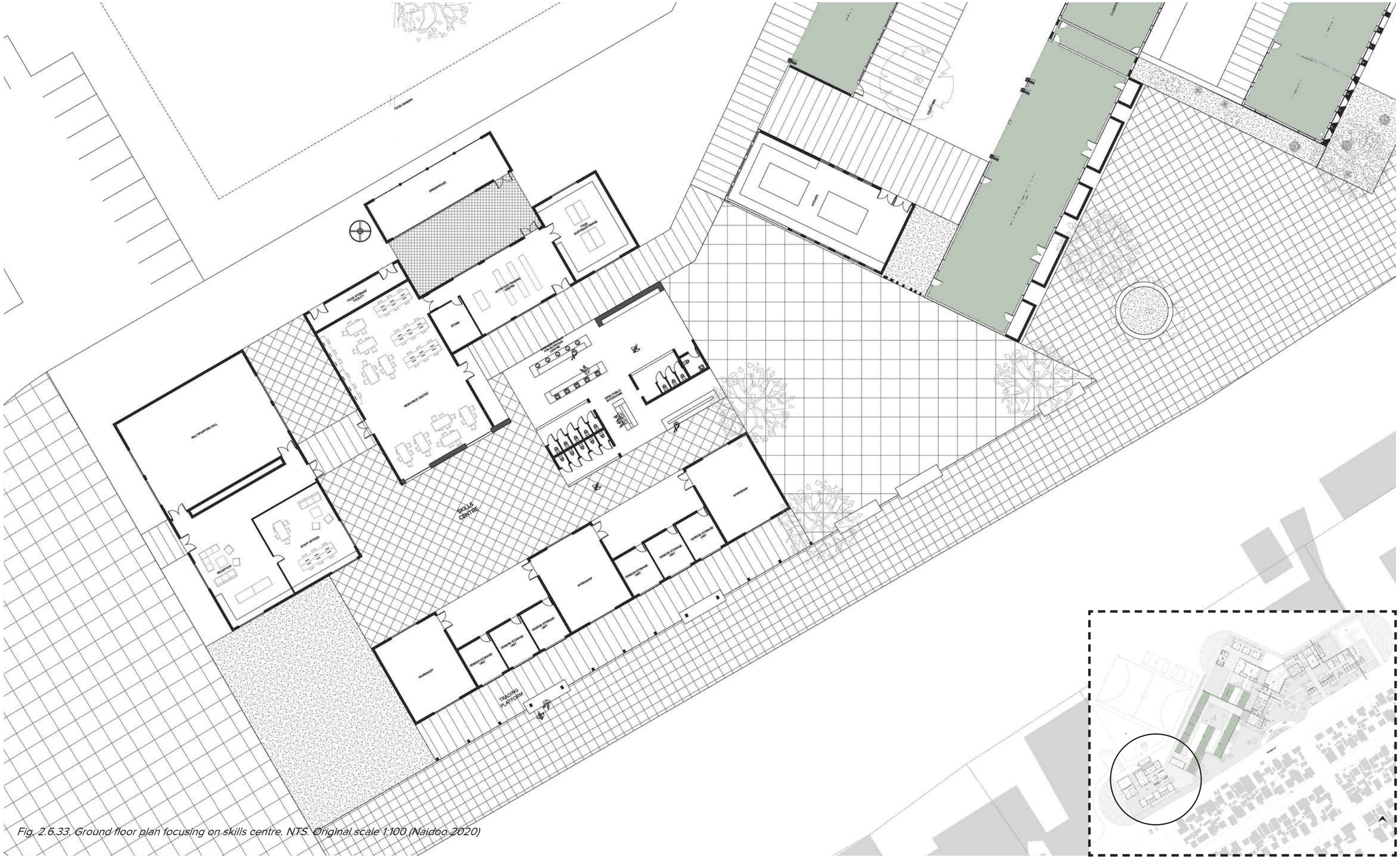


Fig. 2.6.33. Ground floor plan focusing on skills centre. NTS. Original scale 1:100 (Naidoo 2020)

Fig. 2.6.34. Model image of the skills centre (Naidoo 2020)

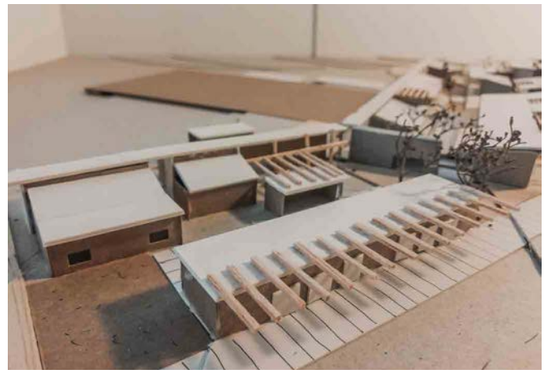


Fig. 2.6.35. Model images of the skills centre (Naidoo 2020)

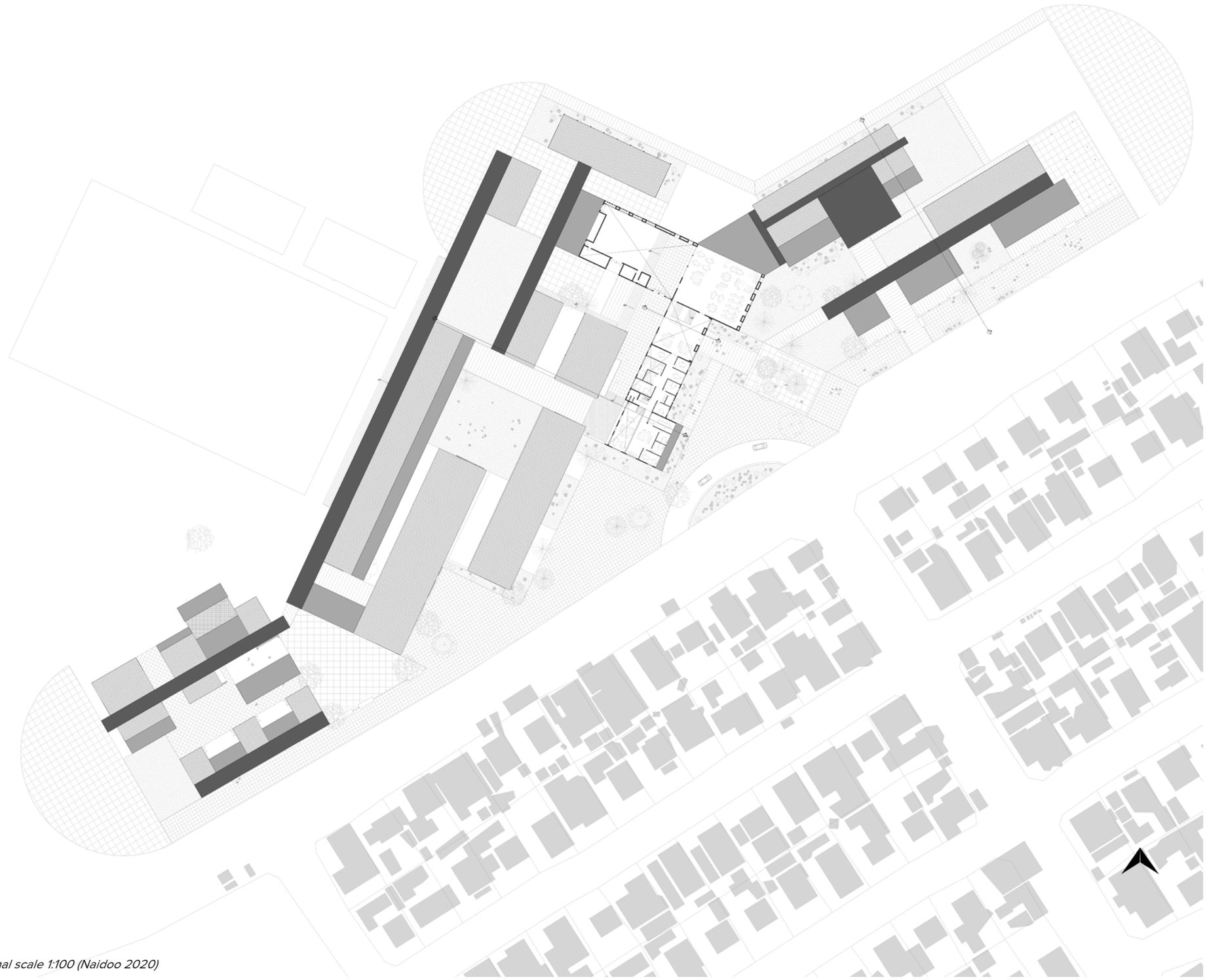


Fig. 2.6.36. First floor plan. NTS. Original scale 1:100 (Naidoo 2020)

Fig. 2.6.37. 1:100 sectional model through the library to illustrate structure and internal quality (Naidoo 2020)

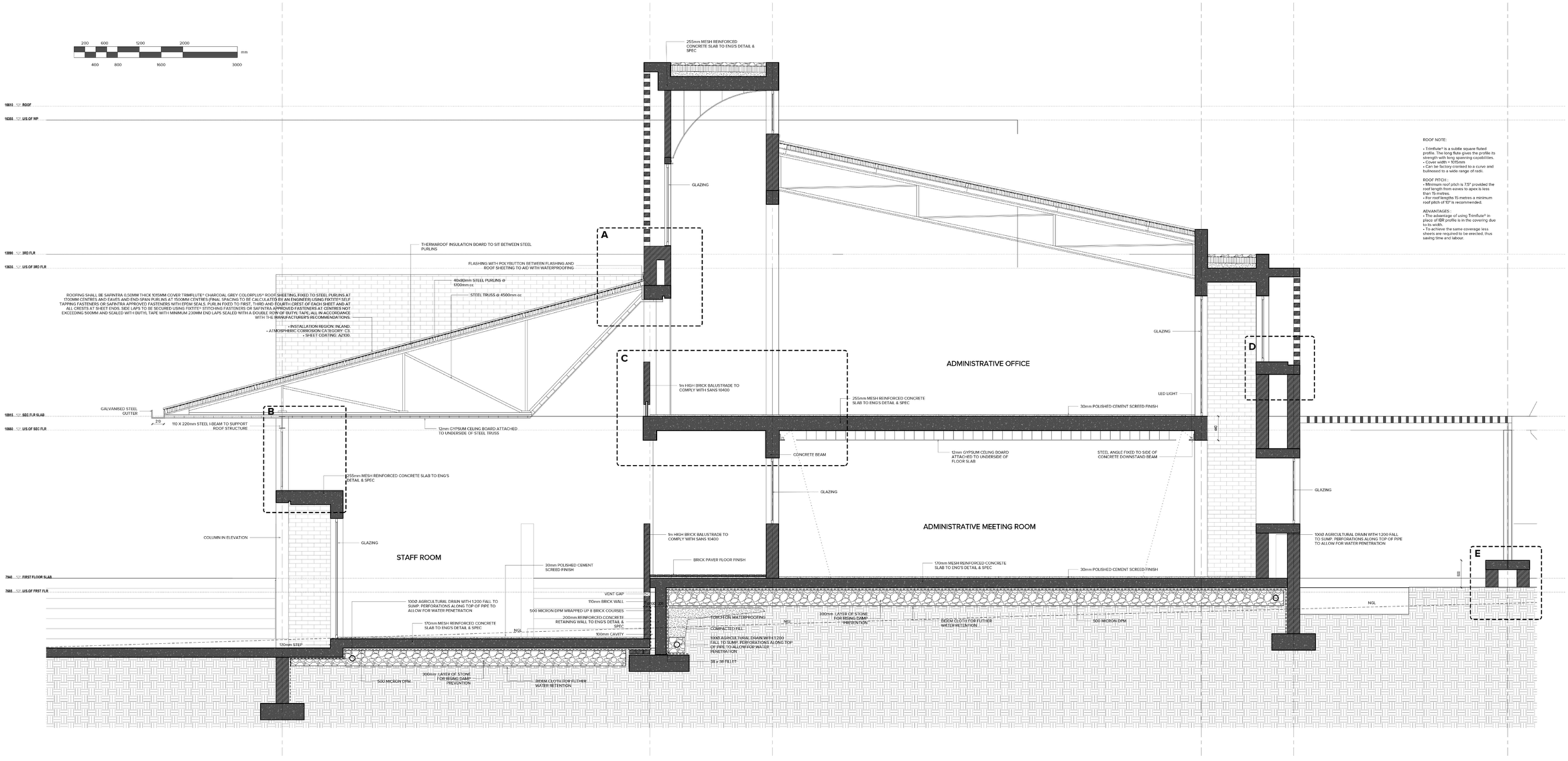


Fig. 2.6.38. Technical section C. NTS. Original scale 1:20 (Naidoo 2020)

Fig. 2.6.39. 1:100 sectional model through the library to illustrate structure and internal quality (Naidoo 2020)

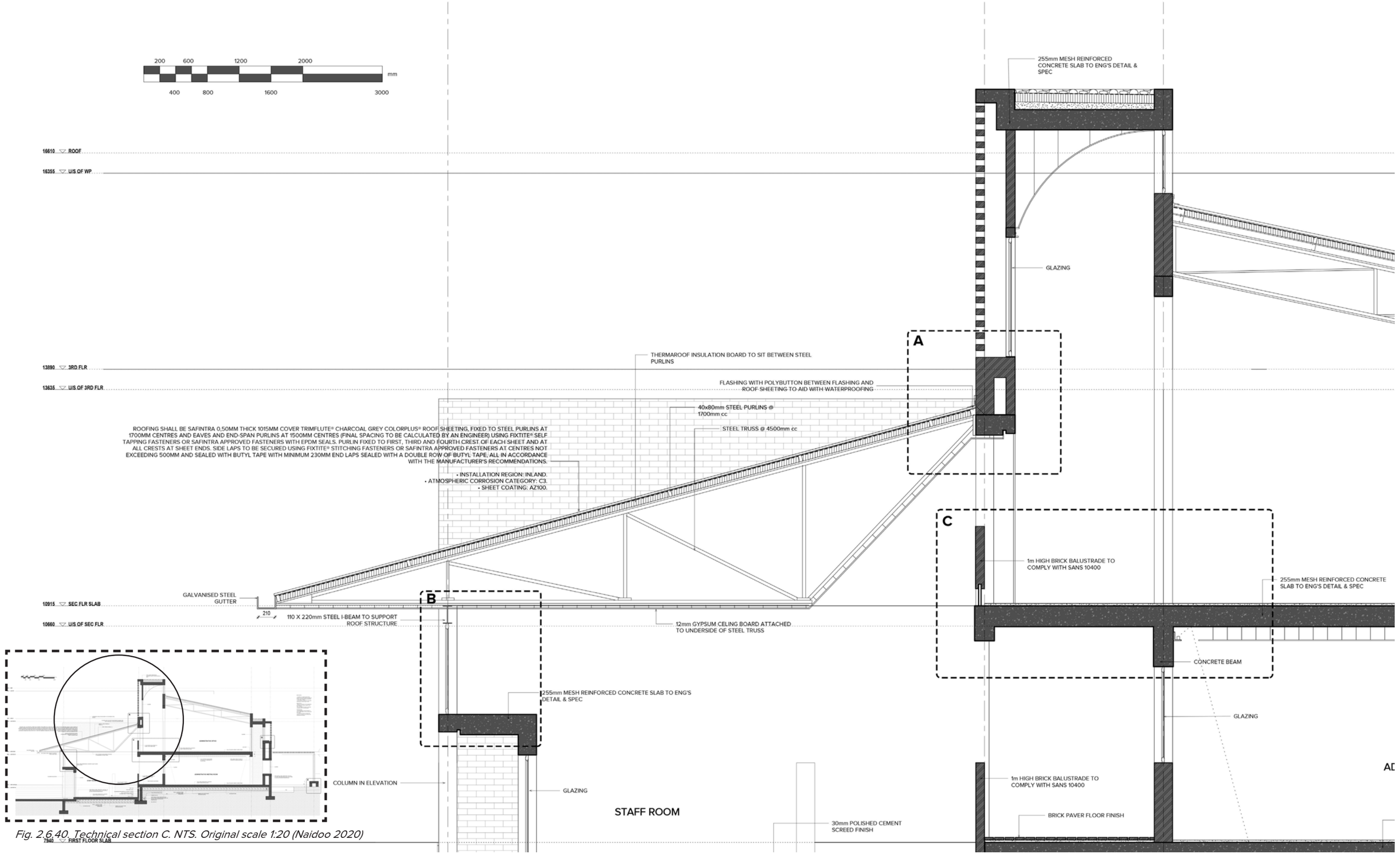


Fig. 2.6.40. Technical section C. NTS. Original scale 1:20 (Naidoo 2020)

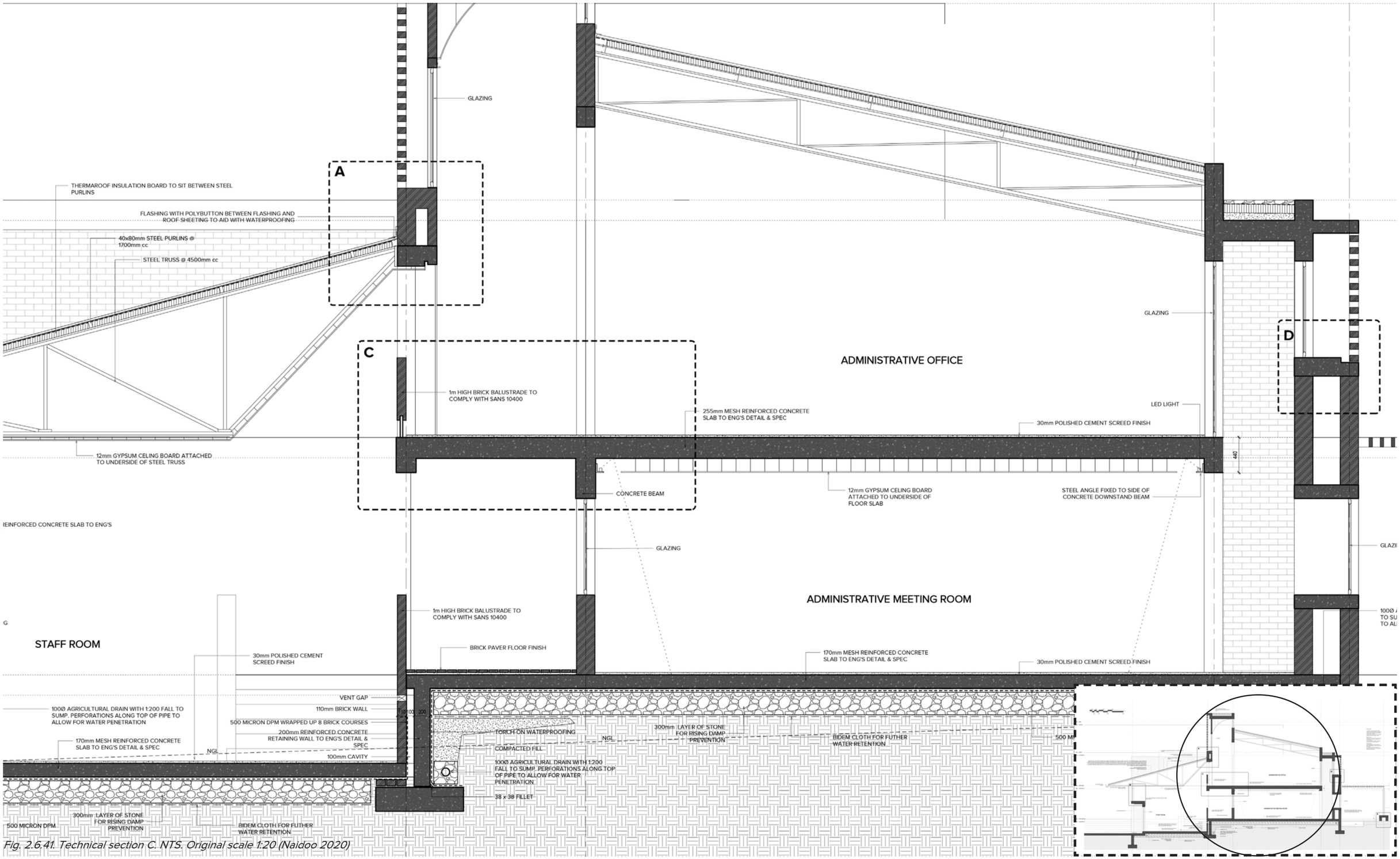


Fig. 2.6.41. Technical section C. NTS. Original scale 1:20 (Naidoo 2020)

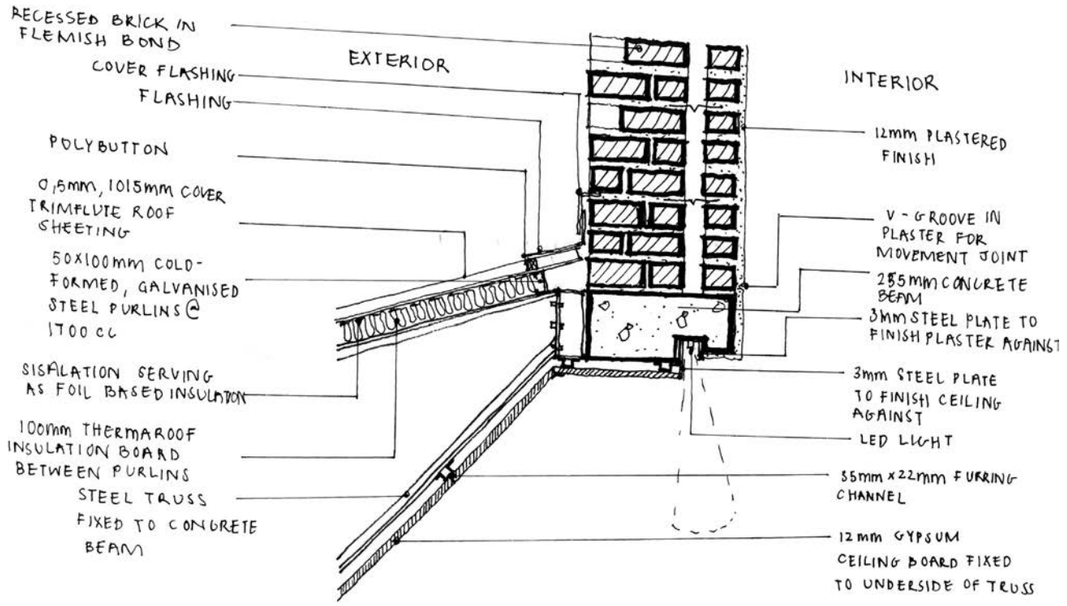


Fig. 2.6.42. Detail A. NTS. Original scale 1:10 (Naidoo 2020)

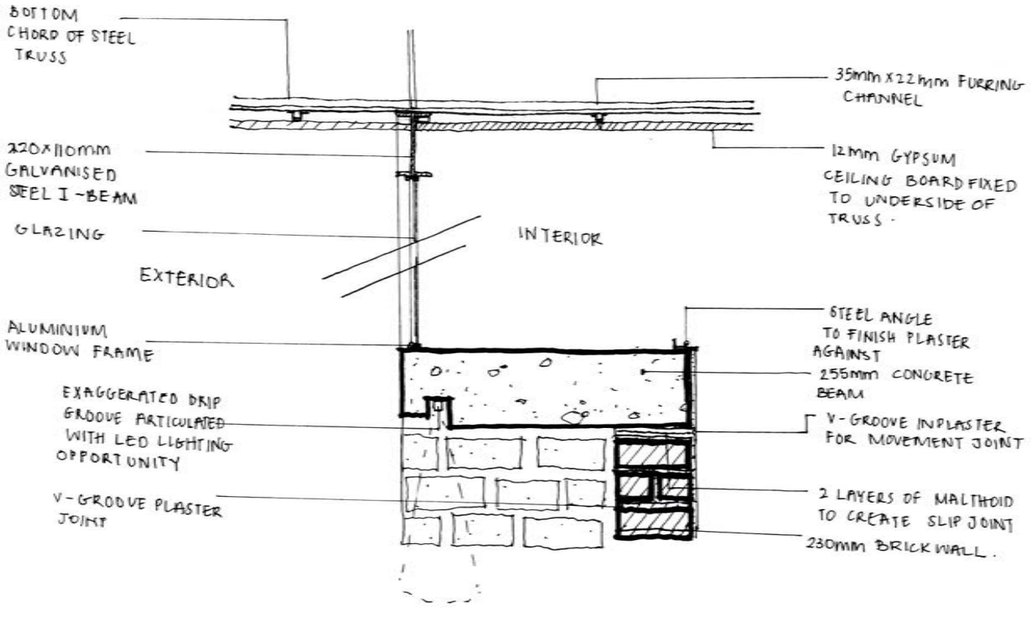


Fig. 2.6.43. Detail B. NTS. Original scale 1:10 (Naidoo 2020)

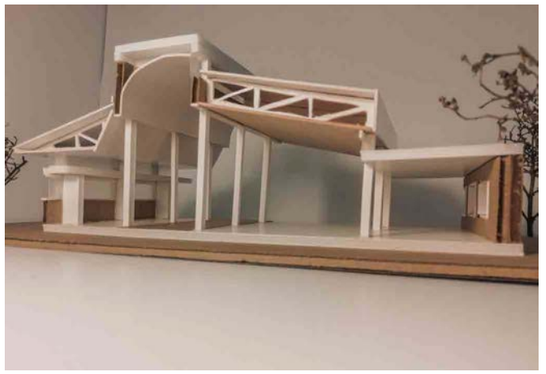


Fig. 2.6.44. 1:100 sectional model through the library to illustrate structure and internal quality (Naidoo 2020)

Fig. 2.6.45. 1:100 sectional model through the library to illustrate structure and internal quality (Naidoo 2020)

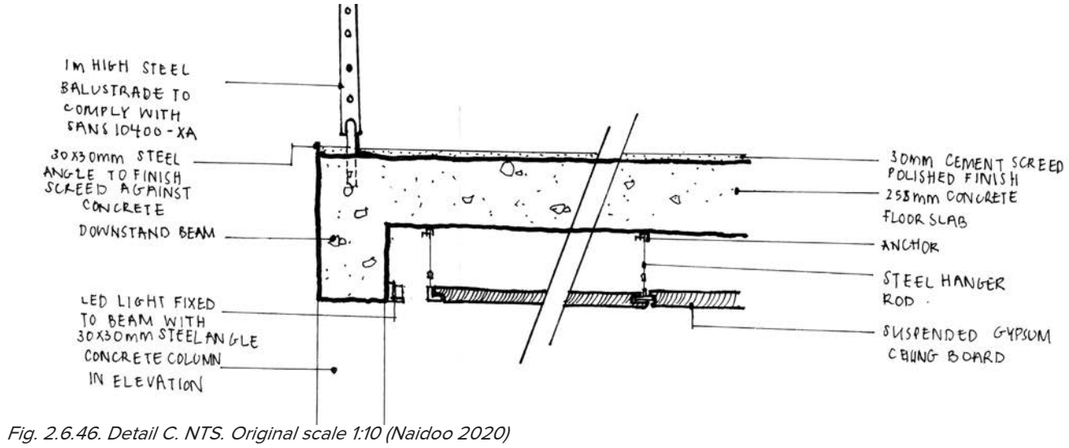


Fig. 2.6.46. Detail C. NTS. Original scale 1:10 (Naidoo 2020)

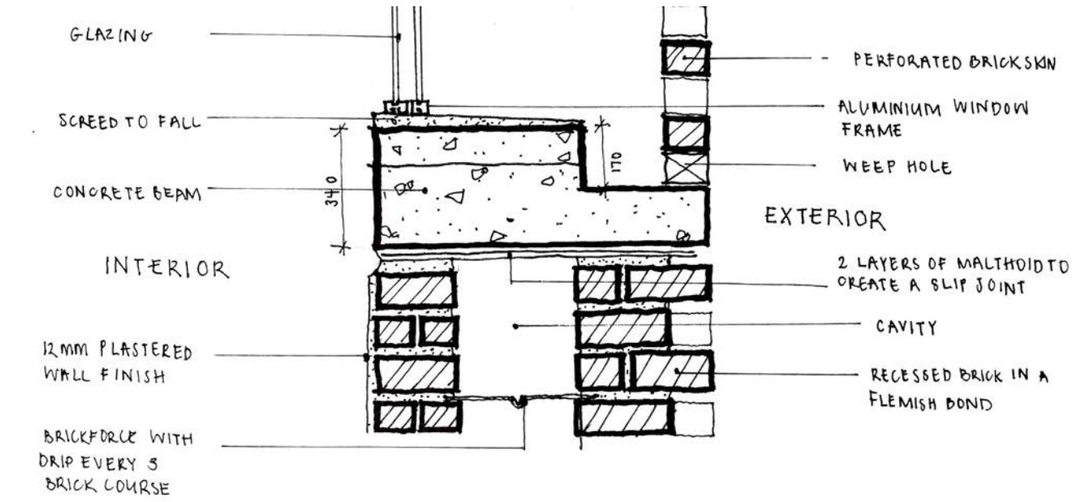


Fig. 2.6.47. Detail D. NTS. Original scale 1:10 (Naidoo 2020)

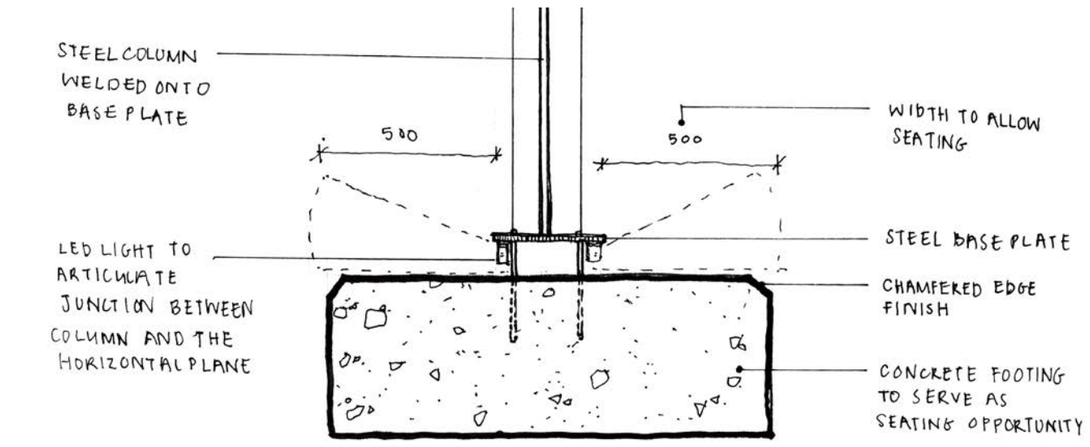


Fig. 2.6.48. Detail E. NTS. Original scale 1:10 (Naidoo 2020)

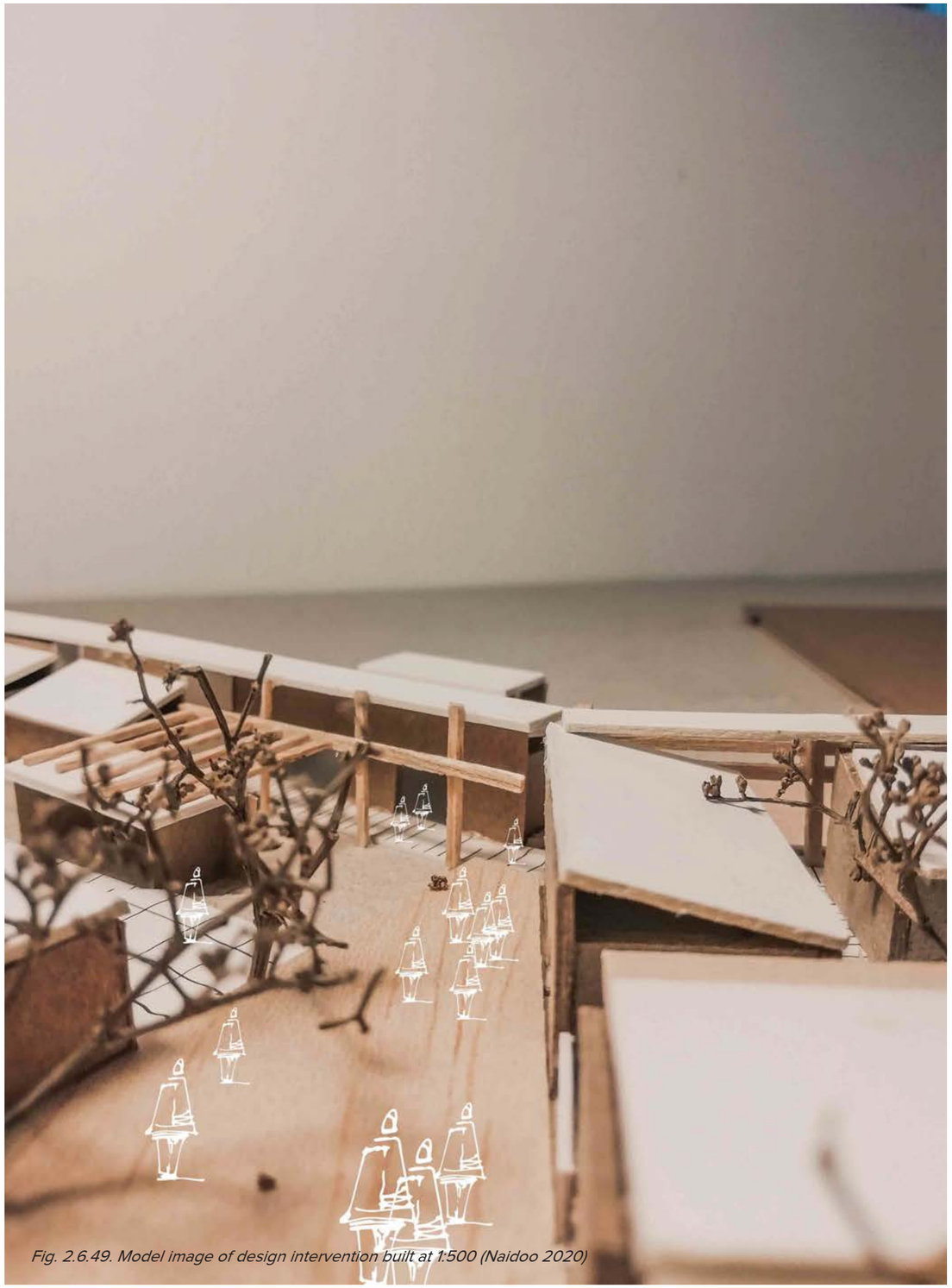


Fig. 2.6.49. Model image of design intervention built at 1:500 (Naidoo 2020)

Fig. 2.6.50. Model image of design intervention built at 1:500 (Naidoo 2020)

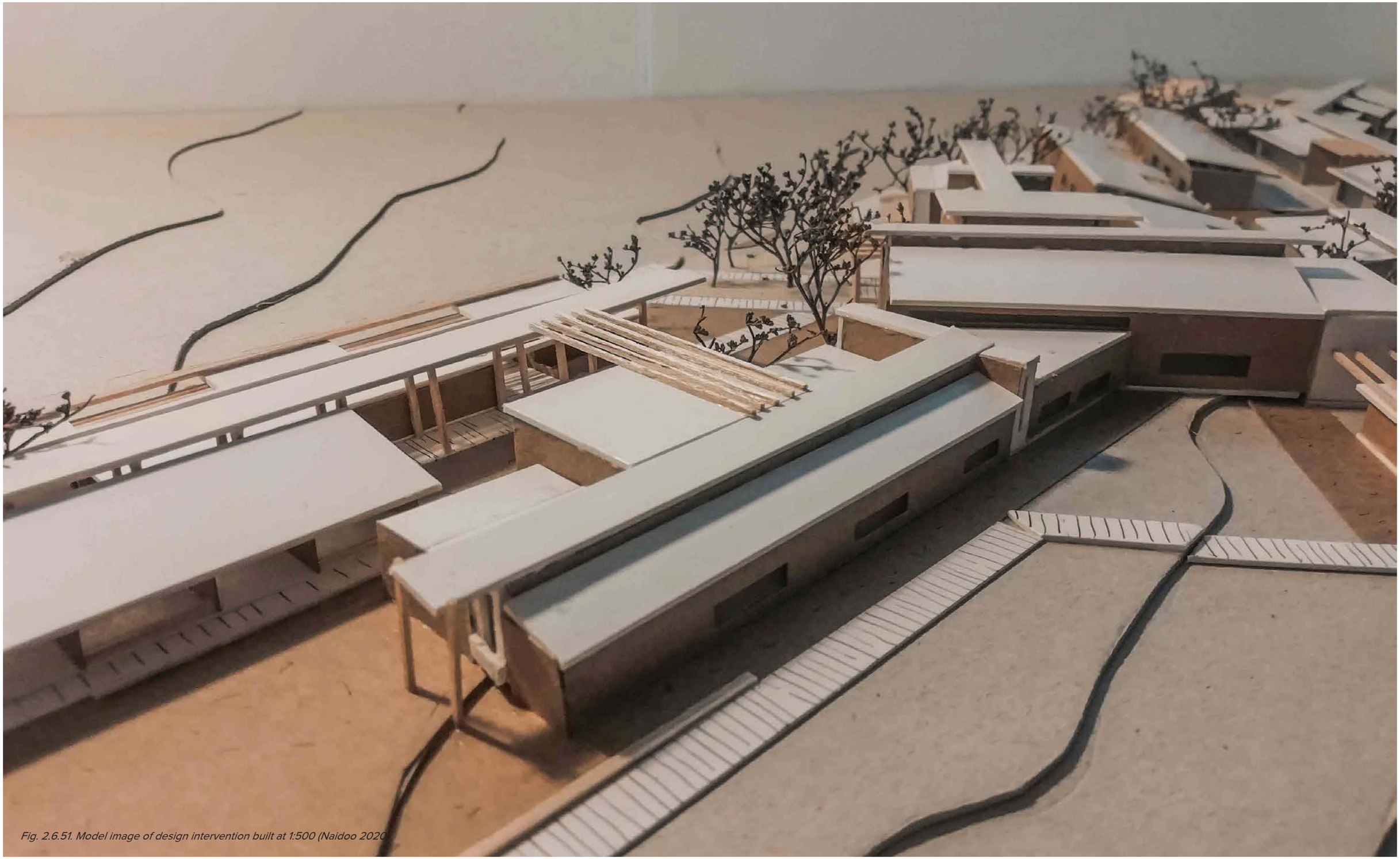
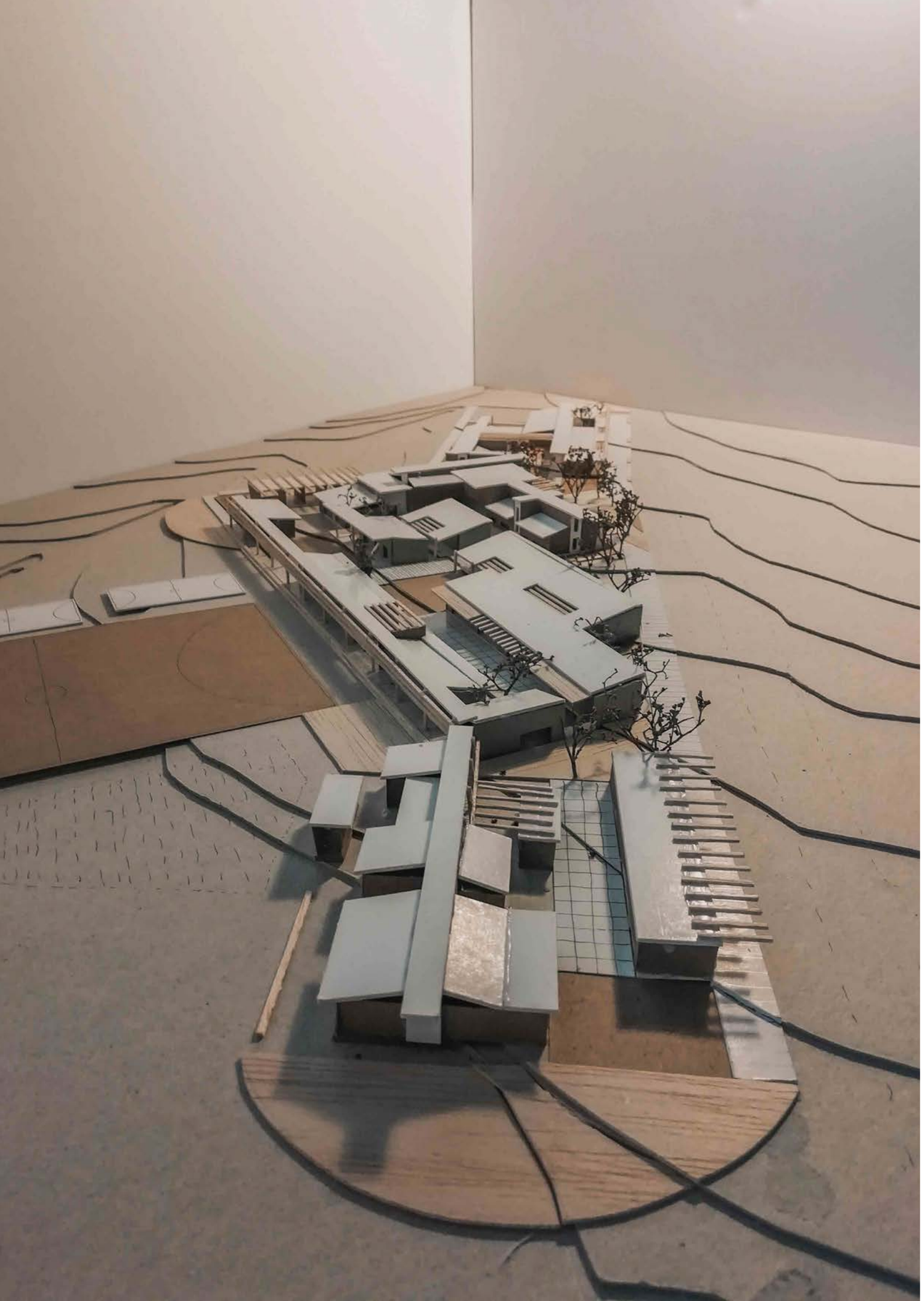


Fig. 2.6.51. Model image of design intervention built at 1:500 (Naidoo 2020



Chapter Seven

CONCLUSION

07

CHAPTER
Conclusion

07

CONCLUSION

7.1 Conclusion

With an increased awareness of the physical educational environment, it is crucial for the architectural discipline to establish a spatial standard. This input should be in response to the dynamic growth within education towards lifelong learning. The lack of spatial development of public schooling typologies in South Africa has been problematic in this regard.

Establishing a community-school relationship is integral to the holistic development of a learner. Participatory Action Research (PAR) findings support the notion for an integrated community school relationship. However, as a result of policy stipulations, such as the boundary guidelines, the built educational environment is doing little to stimulate this relationship. Therefore, it can be concluded that there is a causal impact of policy on the typology of schools and thus the relationship between community and school. The lack of relationship has a detrimental impact on encouraging lifelong learning and is a crucial aspect addressed in the dissertation.

This dissertation intimately investigated the spatial consequences of architecture on the educational ecosystem. This was achieved through a typological investigation into the methods of building as public threshold and building for pedagogy, in the context of Mamelodi East. The dissertation set out to develop a spatial matrix to address the redefinition of typology, in relation to the above mentioned themes, to achieve lifelong learning. This was achieved through:

- Establishing a set of criteria from a literature overview to understand how typology is addressed within each theme
- Analysing the existing built educational environment through the established criteria
- Studying precedents for methods of approaching the criteria
- Distilling informants from PAR and co-design game application
- Testing the application of surfaced mechanisms on the case study school, Tsako Thabo Secondary School, through an exploratory process
- Synthesizing the surfaced mechanisms into design principles categorized according to the established criteria

This process resulted in a table (spatial matrix) which highlighted a distilled set of design principles to respond to varied conditions on site. Design principles from the matrix were applied to Tsako Thabo Secondary School, as a case study, to illustrate how the matrix serves as a guide. Through developing spatial mechanisms for building as a public threshold and building for pedagogy, the dissertation objective was achieved.

The developed architectural language of the matrix was further elaborated through the technical concept of the dissertation. Interaction between building elements took on a symbolic nature to depict the relationship between the architecture and the intimacies of its construction. The technical and design approaches reflected each other by consisting of a series of elements articulated through their varied configurations, according to the presented conditions.

Ultimately lifelong learning is achieved by stimulating interaction between a community and its school through the tangible (spatial) built environment. The spatial principles presented are directed towards encouraging this intangible (non-spatial) relationship by providing various mechanisms to encourage and mediate interaction between a school and its context. In doing so, it responds to the concept of publicly redefining a school within its context. Through developing the design principles according to typological criteria, the outcome of the study was not isolated to a particular school and could inform similar typological schools.

Two major contributions from the dissertation have been the spatial matrix and research into digital and analogue design games in the co-design process. The investigation and varied medium approach to design games is a contributing factor to co-design discourse. This is particularly relevant in the changing dynamic of researcher-participant interaction in light of the COVID-19 pandemic.

The spatial matrix is an important contribution to South African educational policy for public school infrastructure. It provides the necessary spatial definition to achieve the government's intention for lifelong learning. It also has the potential to stimulate the learning environment and position public schools as collective urban entities.

Fig. 2.7.1. Model image of design intervention built at 1:500 (Naidoo 2020)

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01

VOLUME

APPENDICES

KONSTANTINOU, NAIDOO & SMITH 2020

APPENDIX A

A

UKUDOBA

Timeline

Lauren Konstantinou

Purll Naidoo

Kelsey Smith

THE UNIT FOR URBAN CITIZENSHIP STUDIO_MAMELODI
GROUP INTRODUCTION

Involvement in NRF Research Project "Stitching the City"

Lauren Konstantinou, Purll Naidoo and Kelsey Smith are personally involved in an ongoing NRF Research Project, titled 'Stitching the City"

The research project involves a collaboration between the architecture departments of Chalmers University of Technology, in Sweden, and University of Pretoria, in South Africa.

The intention of the project is to develop a data collection methodology that results in efficient storage of collected information in an online data warehouse. This data warehouse allows for layers of information to be accumulated each year and easily accessed.

As part of our dissertation outcome, we have contributed to the creation of the ukuDoba Method, which we have applied to our individual dissertations as a research methodology

UKUDOBA
Timeline

A COLLABORATIVE RESEARCH PROJECT (STITCHING THE CITY) BETWEEN CHALMERS UNIVERSITY OF TECHNOLOGY, SWEDEN, AND THE UNIVERSITY OF PRETORIA, SOUTH AFRICA

NT METHODS OF DATA COLLECTION
ORK
GUE MAPPING
PPING (DESKTOP &
CT SITE WALKS
UCTION TO EPICOLLECT
L DATA CAPTURING)

PPING & CAP
ty Action Planning)

CO-DESIGN
E ANALYSIS
ORKSHOPS
AME DESIGN
TERACTIVE PARTICIPATION
CIAL INCLUSION

EPICOLLECT

METHODOLOGY

PROBLEMS WITH ANALOGUE DATA:
- Re-done every year (No collaboration)
- Data sits stagnant on an a shelf or gets thrown away
- Emphasis on recapturing data rather than comparing and compiling data
- Not tangible
- Inaccessible data for interdisciplinary work
- Limited tools available and training required for epicollect

POSSIBLE SOLUTION

NRF – STINT PROJECT "STITCHING THE CITY"

1 *Project aim : To establish a transdisciplinary collaboration between the Chalmers University of Technology in Gothenburg, Sweden and the University of Pretoria, South Africa.*

2 *To develop a methodological framework and digital platform for the collection & sharing of non-traditional types of spatial economic data at a street- and precinct level.*

To be developed and adapted to local Global South and Global North conditions.

3 *To create home-grown strategies for economic survival, based on co-operative networks that over years have disparate and unsynchronised research processes.*

4 *In hope that this collaboration will serve to capture types of micro-data in order to share it among researchers from different disciplines to inform responsive economic transformation policies.*

5 **NRF – STINT APPLICATION PROCESS**

3 CHOSEN CANDIDATES

UP ◘ Chalmers University

2019

WHAT
COLLABORATIVE PROJECT TO TEST THE EFFECTIVENESS OF DIGITAL TOOLS TO CAPTURE LIVED CIRCUMSTANCES OF USERS FROM A HANDS-ON AND REAL-WORLD PERSPECTIVE

21 SEP

EXCHANGE TO GOTHENBURG
CHALMERS UNIVERSITY OF TECHNOLOGY AND UNIVERSITY OF PRETORIA

GOTHENBURG, SWEDEN

WHY SWEDEN?
- HAMMARKULLEN, GOTHENBURG
- MAMELODI, PRETORIA
- IMMIGRANTS, ECONOMIC CLASS
- RACIAL & ECONOMIC DIVIDE
- SOCIAL INCLUSION STUDIO
- UNIT FOR URBAN CITIZENSHIP

WHY US?
- INTEREST IN **PARTICIPATORY DESIGN**
- **EXPOSURE** IN HONOURS 2019
- **CONTINUATION** IN MASTERS 2020

NOW — LATER

TESTING EXISTING METHODOLOGIES

ANALOGUE DATA COLLECTION
- HANDS-ON
- REAL WORLD PERSPECTIVE
- LIVED EXPERIENCES FROM USERS OF SPACE
- INFORMATION THAT MATTERS

DIGITAL DATA COLLECTION
- REMOVED POINT OF VIEW
- EASILY OUTDATED IN THESE SOCIAL CONTEXTS
- SHAREABLE & COMPARABLE

CAN IT BE DONE?
CAN DIGITAL COLLECTION METHODS BE USED EFFECTIVELY TO CAPTURE ANALOGUE DATA IN ORDER FOR A REAL-WORLD PERSPECTIVE TO BE ACHIEVED?

29 SEP

THE TRIP'S OUTCOME
- MULTIPLE DISCIPLINES = HOLISTIC CONTEXTUAL UNDERSTANDING
- DATA WAREHOUSE = EASY ACCESS & BUILDING ON INFO EACH YEAR
- **GEONODE**
- DATA COLLECTION BY ANYONE - ESPECIALLY COMMUNITY MEMBERS

2020

HOW
HOW DO WE GO ABOUT COLLECTING DATA USING DIGITAL TOOLS TO BE ABLE TO STORE THE INFORMATION IN AN ONLINE DATABASE

27 JAN

EXCHANGE IN SOUTH AFRICA
CHALMERS UNIVERSITY OF TECHNOLOGY AND UNIVERSITY OF PRETORIA

CONTINUATION OF THE RESEARCH PROJECT

RESEARCHERS
3 X STUDENTS FROM EACH UNIVERSITY

DEVELOPMENT OF THE FRAMEWORK
OUTLINING THE PROCESS
- COLLECT DATA
- CONVERT DATA
- STORE DATA

DATA COLLECTION PLATFORM
TESTING MULTIPLE DIGITAL DATA COLLECTION PLATFORMS

KEY CATEGORIES
- USABILITY
- ACCESSIBILITY

CAN THE ONLINE PLATFORM PERFORM THE SAME TASK AS ANALOGUE METHODS

KOBO TOOLBOX
TESTING EACH TOOL OF THE CHOSEN DATA COLLECTION PLATFORM ON SITE

REFLECTING ON USE OF EACH TOOL THROUGH DISCUSSION

UKUDOBA FRAMEWORK DRAFT 1.0

STEP-BY-STEP CHAPTERS
1. COLLECT DATA **KOBO TOOLBOX**
2. CONVERT DATA **QGIS**
3. STORE DATA **GEONODE**

08 FEB

UKUDOBA WORKSHOPS
PRESENTING THE FRAMEWORK TO UNIVERSITY OF PRETORIA HONOURS AND MASTERS STUDENTS

ONGOING DEVELOPMENT OF FRAMEWORK BASED ON THEIR FEEDBACK

APPLICATION OF FRAMEWORK TO PROJECTS
USE OF THE FRAMEWORK WITHIN 3X MASTERS STUDENTS PROJECTS AT THE UNIVERSITY OF PRETORIA

KELSEY SMITH, LAUREN KONSTANTINOU, PURLL NAIDOO

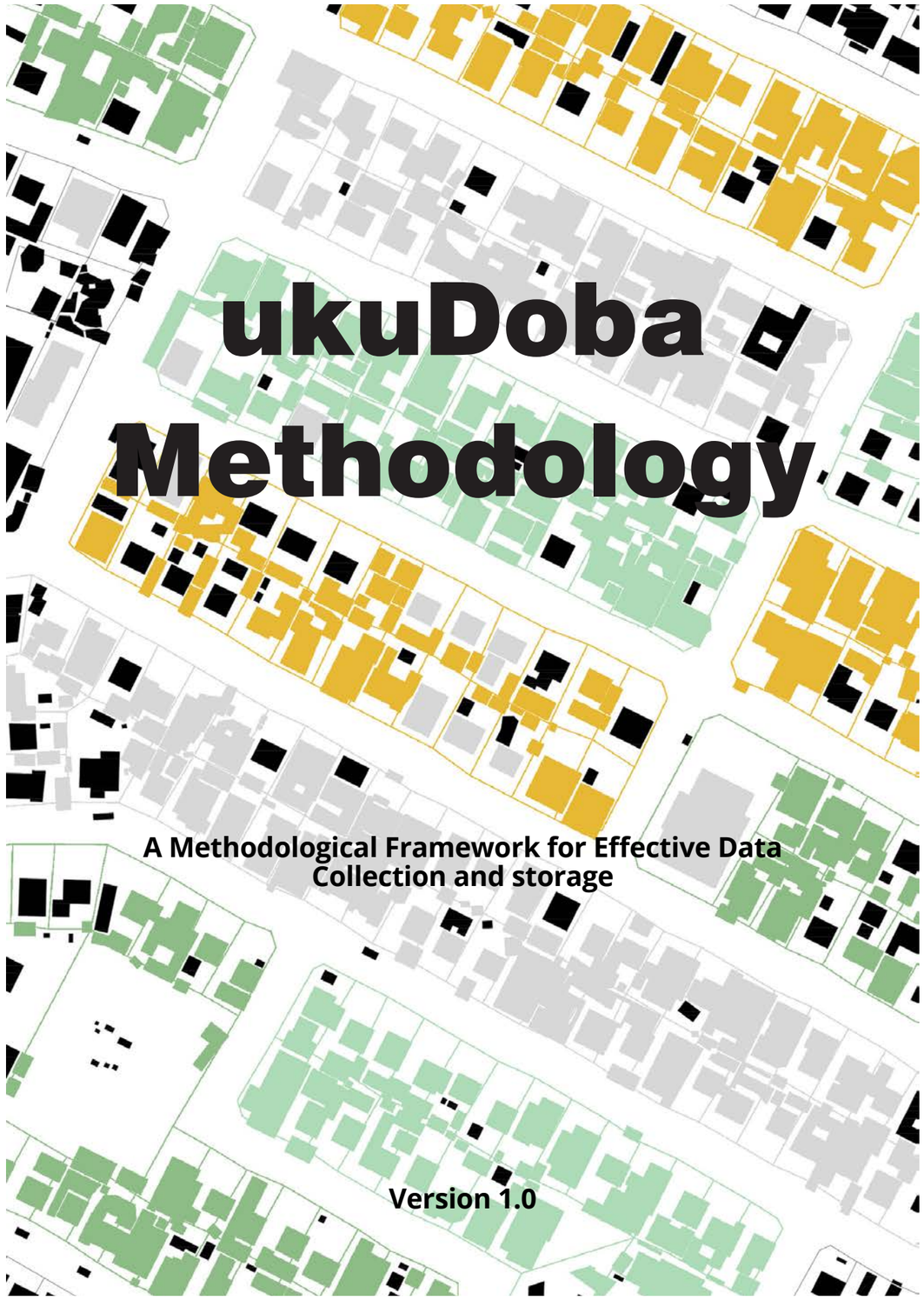
APPENDIX B

B

UKUDOBA

A Methodological Framework

VERSION 1.0 & 2.0


ukuDoba
Methodology
A Methodological Framework for Effective Data Collection and storage
Version 1.0

Preface

The ukuDoba handbook is the outcome of the Swedish-South African project “Stitching the City” that integrates education and research. The project aims at developing a method and digital library of geolocated data for knowledge facilitation to support data re-use in architectural courses. It also aims at establishing a collaboration between the University of Pretoria, South Africa, and the Chalmers University of Technology in Gothenburg, Sweden.

“Stitching the City” has been hosted by the course Planning and Design for Social Inclusion in Gothenburg (2019 and 2020) and the Urban Citizen studio in Pretoria (2020). Many thanks Emilio and Carin!

ukuDoba has been tested in field studies by students in two areas: Mamelodi-East in the City of Tshwane and Hammarkullen in Gothenburg and the handbook has been developed by the six master students in an iterative process. Thank you, Robin, Lauren, Purll, Mumtaheena, Kelsey and Markus for your invaluable work! Without you, no handbook.

A special thank you goes also to Cameron and Victoria for development of the GeoNode structure to store and share our data. Finally, thank you Marco, Monica, Serena for your support and constructive input.

Liane & Chrisna
October 2020

Preface

Swedish team - Chalmers University
of Technology:
Liane Thuvander, project leader
Marco Adelfio
Emilio Brandao
Monica Billger
Department of Architecture and Civil Engineering

South African team - University of Pretoria:
Chrisna du Plessis, project leader
Carin Combrink
Department of Architecture
Serena Coetzee
Victoria Rautenbach
Cameron Green
Department of Geography, Geoinformatics and Meteorology

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STINT
Stiftelsen för internationalisering av högre utbildning och forskning
The Swedish Foundation for International Cooperation in Research and Higher Education

NRF National Research Foundation

Authors

Robin Eskilsson
(Sweden)
robin.eskilsson2@gmail.com

Lauren Konstantinou
(South Africa)

Purll Naidoo
(South Africa)

Mumtaheena Rifat
(Bangladesh)
rifatm@student.chalmers.se

Kelsey Smith
(South Africa)

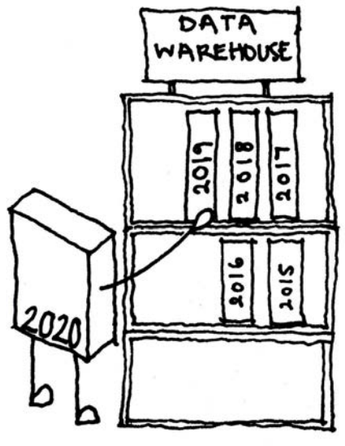
Markus Zorn
(Austria)
markuszorn5@outlook.com

The ukuDoba methodology was created from a collaboration between three Master of Architecture students from Chalmers University of Technology, Sweden and three Master of Architecture students from the University of Pretoria, South Africa. All authors are actively involved in the 'Stitching the City" research project and have a background in participatory design, social inclusion and urban citizenship within architecture. This background influenced their interest in the creation of the ukuDoba Method.

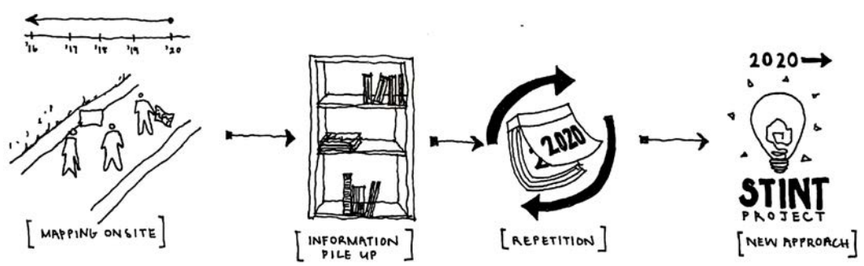
Contents

ukuDoba

Over time, physical maps and folders are being stacked in bookshelves. This format of data collection is difficult to access and build upon. Year, after year, these research processes are repeated, by both universities, leaving layers of rich data disjointed.



ukuDoba - the methodological framework, has been developed for the collection and sharing of non-traditional types of spatial economic data at a street and precinct level in an online platform. These cross-disciplinary micro-data can be layered and easily accessed by researchers from different disciplines as well as students and community members.

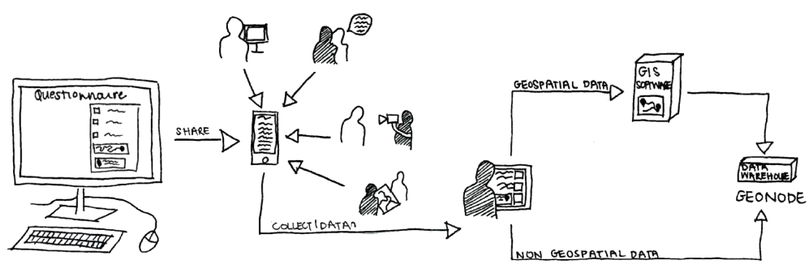


ukuDoba

The methodological framework, ukuDoba, and online platform, Geonode, are currently being tested in two study areas: Mamelodi East in Tshwane, South Africa and Hammarkullen in Gothenburg, Sweden.

Here, we present a step by step guide to follow the ukuDoba methodology of how to effectively digitally collect, convert and store data in an online platform, GeoNode.

In Zulu the word ukuDoba means ‘fishing’. With this booklet, we hope to help users ‘fish’ for the data they need for their project.



The ukuDoba Methodology

KoBo Toolbox

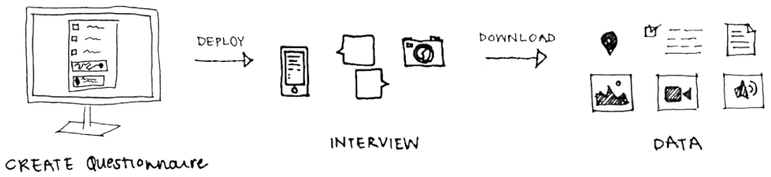
QGIS

Geonode

1 Data Collection

Data Collection

KoBo Toolbox



What?

- Kobo Toolbox is an open access Digital data collection tool that allows you to create a questionnaire that can be downloaded to your mobile device, filled in on the ground, offline, and geo-referenced on site. You can take photographs, record video and voice clips, or write text.
- After fieldwork, you can then upload the data to the internet over WiFi and access the data via your computer. This data can then be shared with others and they can then use it or edit it.
- Other tools used for similar data collection are: Maptionnaire, FieldPapers, EpiCollect5 etc.

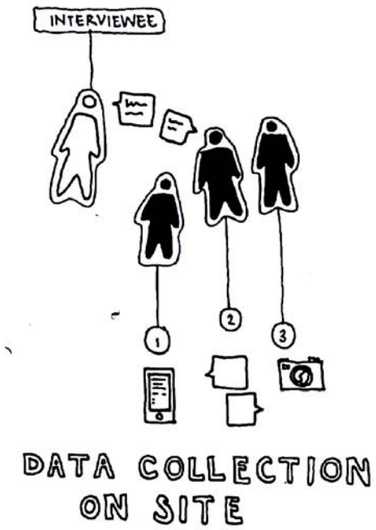
Why?

- Communities to share their knowledge.
- To digitally store data in a Digital platform (easier to access and use).
- To geolocate collected data

Data Collection

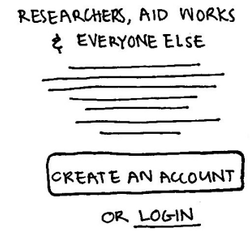
How?

- Always collect data in groups of three people.
- The first person is in charge of taking notes and should focus on gathering data using the data collections tool.
- The second person is in charge of leading the interview and can have the questions open on their phone as a guide.
- The third person is in charge of documentation of the process and takes pictures, video and audio records.



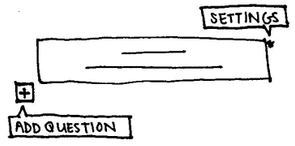
Getting started

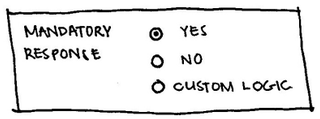
1. Use your computer to start. You will only use your phone when filling out the form on site.
2. https://www.kobotoolbox.org/ > Scroll down > **Researchers, Aid Workers and Everyone Else** > Create an Account > Verify in email



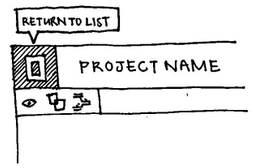
Creating a questionnaire

1. Open KoBo Toolbox on your computer browser > **New** > Build from Scratch > Fill in
2. Project Name > Use a set format (e.g. **2020_ Location_Project Name**) > **Create Project**
3. "**+**" > types of questions (see glossary for types of questions)
    - Question 1: select **Acknowledge** question (digital consent for interview). See example below:
    - Question 2: select **Point** question (current location of interview).
    - Question **Settings** > Mandatory Response > **Yes** (Question 1 and Question 2)





4. Layout and Settings > Select Start Time and End Time
5. Save & Preview
6. Return to List (top left corner)



I hereby voluntarily grant permission for participation in this project, as explained to me by the researcher. I am aware that the results of the investigation may be used for the purposes of publication. I will remain anonymous: my comments may be used without giving any geographic or personal references (name, address, ID, occupation, age, income etc) that may accidentally imply my identity.

Glossary: question types & examples

Point: tracks your current location*

Acknowledge: gives consent to the interview*

Text: add in between questions for additional notes

Quantitative Tools examples:

How many children do you have?
Which ones are applicable to you?

Qualitative Tools examples:

How would you rate this park?
When did the music festival happen?

Media: captures images, sounds and videos

Line and Area: highlights a route or area

* Make these questions mandatory to fill in.

Note: Some tools present challenges in application due to internet access and device compatibility.

Calculate tool example:

"How many girls?" > Settings > Data column name > "girls"

"How many boys?" > Settings > Data column name > "boys"

${girls} + ${boys} > Settings > Data column name > "total_ children"

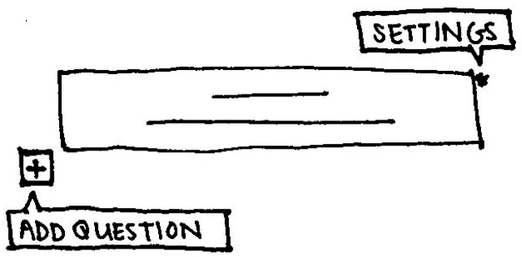
"There are ${total_children} in this room."

Carry-on question example

“Which colour is your favourite?”

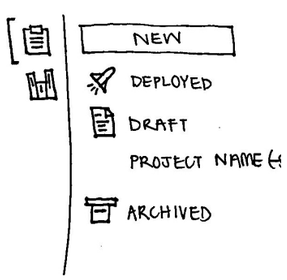
- Blue
- Red
- Yellow
- Other

“If other, explain.”



Settings of question > **Skip Logic** > **Add a Condition** > **Select a Question** > “Which colour is your favourite?” > “Other”
Now the text box question will only pop up if “other” is selected.

To use your questionnaire

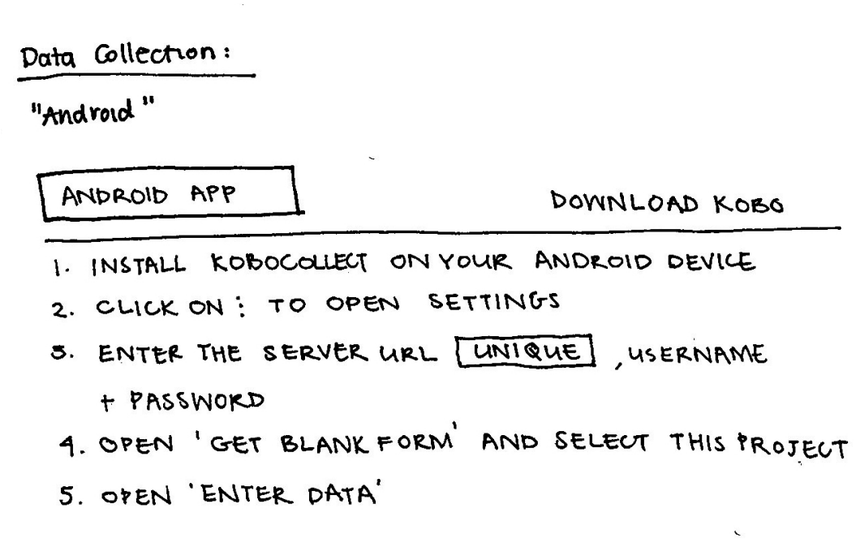


1. Menu > **Draft** > Your Project > **Deploy**
2. To share with others: Hover over project name > ***share icon*** (right hand side)

Data collection

There are two ways to collect data. Follow the relevant steps:
Collect Data > dropdown options

Android Users: “Android Application”
Download KoboCollect > Follow instructions on KoBo Toolbox to open form (enter given unique URL) > To fill in form on your phone: **Fill in blank form**



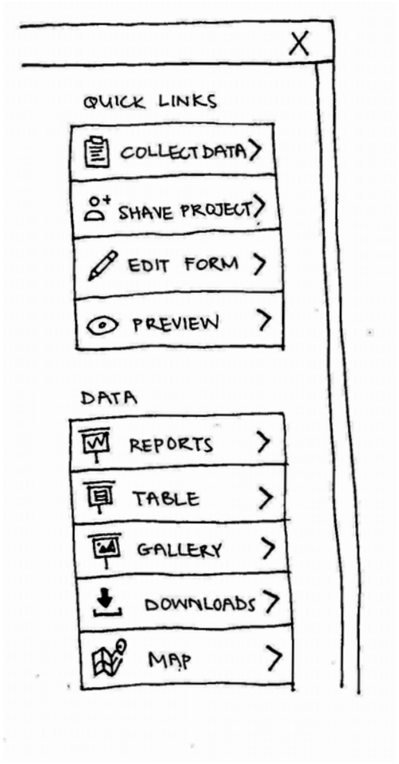
iOS Users: “Online-Offline (multiple submission)”
Click **Open** > copy **URL of form** > Open https://www.the-qrcode-generator.com new tab > select URL > paste URL of form > Save > scan QR Code on phone to c form

1. Internet access needed to open form on phone
2. No internet access needed when using form in field

After collection

1. Edit data **before** uploading forms.
2. **Android Users:**
   To Edit = **Edit Saved Form**
   To Upload = **Send Finalized Form** > Select All > Send Selected

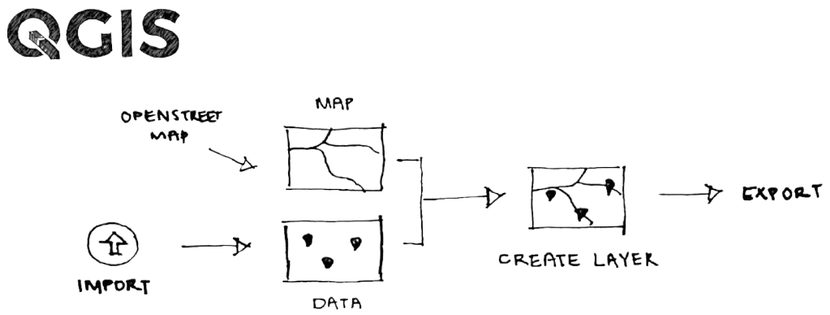
   iOS Users:
   To Edit = Save form as **draft** > Select form in side menu > edit it
   To Upload = Open side menu > Select Forms > **Upload** (iPhone will automatically upload forms when connected to internet if not saved as draft)
3. Desktop PC > Kobo website > Deployed > Your Project
4. Summary of data collected > Data > **Reports**
5. Downloads > Export Type > **CSV (Legacy)** > New Export > Pending > **Click to Refresh** > click the file link to download



Step 1 Complete

2 Data Conversion

Data Conversion



What?

A geographic information system (GIS) is a framework which provides a platform for users to engage with spatial data, through analysis and editing. There are alternative platforms that can perform this function, however we will use QGIS as it is a free service, making it more accessible to a wider range of people.

Why?

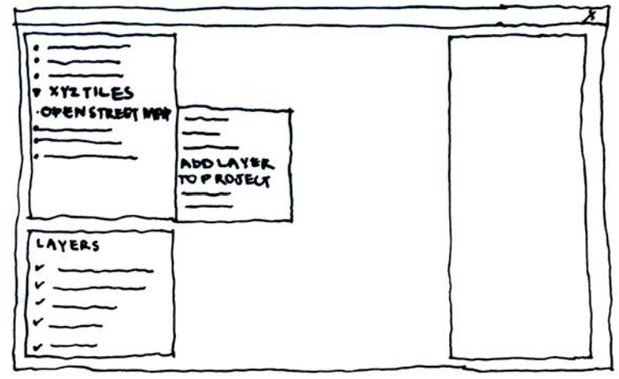
For the purpose of this framework, QGIS will be used to convert the data into a usable file type that can be imported and stored in the data warehouse GEONODE.

Getting started

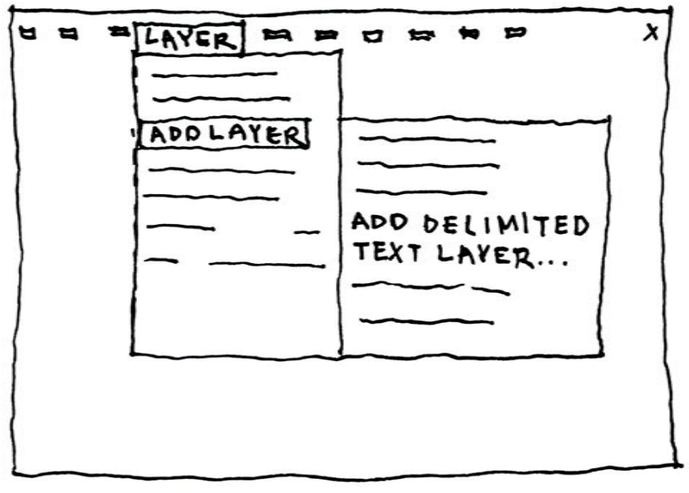
Download QGIS Standalone Installer Version 3.10 (64 bit) > Install QGIS > Run QGIS

Importing CSV Legacy files

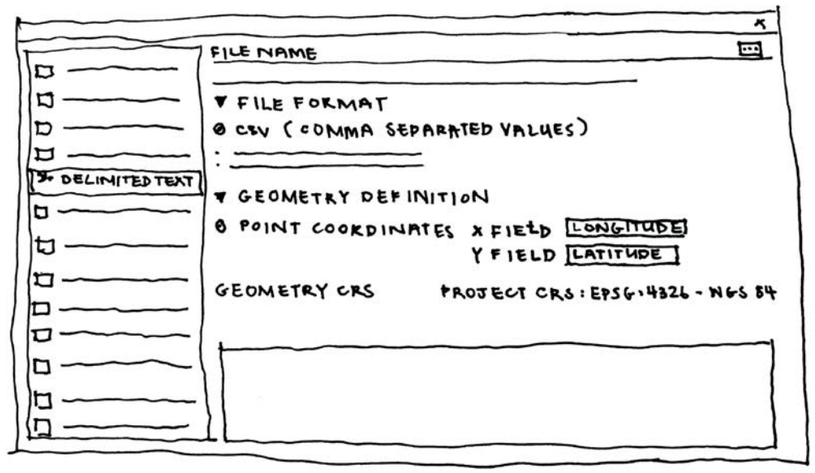
1. Open QGIS application on your computer > Project tab > New
2. Side Browser Menu > Drop down tab **XYZ Tiles** > Right click on **Openstreetmap** > **Add Layer to project**



3. Main menu > **Layer tab** > **Add Layer** > **Add Delimited Text layer**



4. File name > Click (...) to browse > Select your **CSV (Legacy) File** > **Ope**n

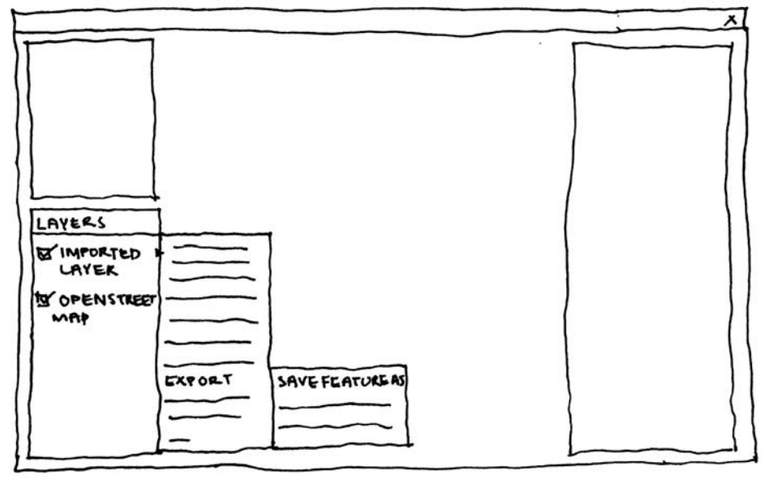


5. Drop down tab > **File Format** > select **CSV (comma separated values)**
6. Drop Down tab > **Geometry definition** > Select **Geometry CRS = Project CRS: EPSG:4326-WGS 84** > Select **X field = Longitude** and **Y field = Latitude** > **Add** > Close window

Note:
Once editing the X and Y fields, if the points appear on a blue screen then delete your imported CSV (legacy) layer, re-import it and let X field= Latitude and Y field = Longitude.
If you do not use a CSV legacy file, you will not have the option to select the x and y fields.

Exporting ESRI shape files

1. Layers Menu > Insure Openstreetmap layer is below your Layer
2. Right click on your layer > **Export** > **Save feature as**
3. Create a new folder on your computer with your project name to export your shapefiles to
4. Drop down tab **Format** > Select **ESRI Shapefile** > **File Name** > Click (...) to browse > Write your file name > Drop down tab **CRS** > Select **Project CRS: EPSG:4326 - WGS 84** > **Ok**
   (There should be 6 shapefiles exported)



Notes

There is no need to save QGIS files as the only files that are required are the ESRI Shapefiles that you export.

Tips

To learn more check the Youtube tutorial:
https://www.youtube.com/watch?v=sQ2z-D8TN2E

Step 2 Complete

3 Data Warehouse

Data Warehouse

What?

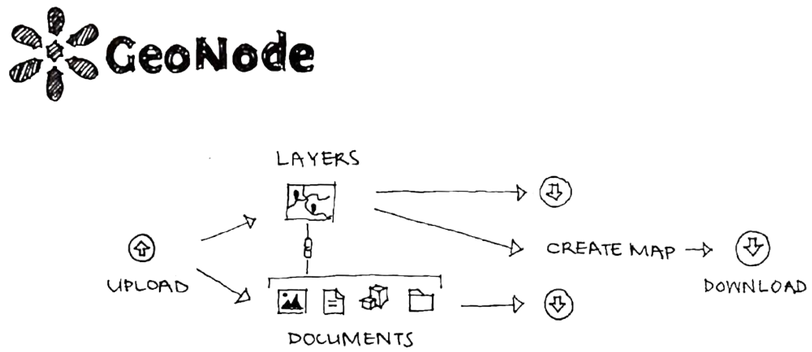
GeoNode is a web-based application and platform that facilitates the creation, sharing and collaborative use of geospatial and non-geospatial data.

The Geospatial data can be stored as Layers, formats that GeoNode supports:
Shapefiles & its associated files (.cpg, .dbf, .prj, .qpj, .shp, .shx)
GeoTiffs (.tiff, .tif)
American Standard Code for Information Interchange (ASCII)
The Non-geospatial data can be stored as Documents, formats that GeoNode supports:
Microsoft Word (.doc & .docx), Powerpoint (.ppt & .pptx), Excel (.xls & .xlsx)
Image Formats (.gif, .jpg, .jpeg, .png, .tiff, .tif)
OpenDocument File Formats (.ods, .odt,. odp)
Portable Document Format (.pdf)
Compressed Files (.rar, .zip, .gz)
Markup Languages (.sld, .xml, .qml)
Text documents (.txt)

Both of these could be linked with each other. Also documents that are non-spatial in nature can still be uploaded to GeoNode and then linked to a spatial file afterwards.

You are able to take all other files that are not individually supported and create a .zip file in order to upload them.
(Cheat file : .zip file)

Data Warehouse



Why?

To store and share the data we collectected with geolocation in an open source platform.
To manage and catalogue geospatial data and keep track of metadata. Each dataset in the system can be shared publicly or restricted to allow access to only specific users.
To manage and share data if the project is occurring over several years such as a longitudinal study so that the data can be used for numerous years after the date of collection as long as it is labelled and managed correctly.

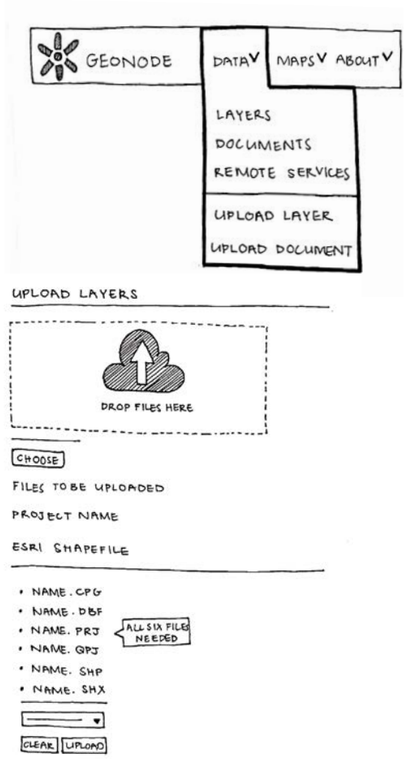
Getting started

Please refer to **The Stitching the City GeoNode** link and not the GeoNode demo when the document refers to geonode.

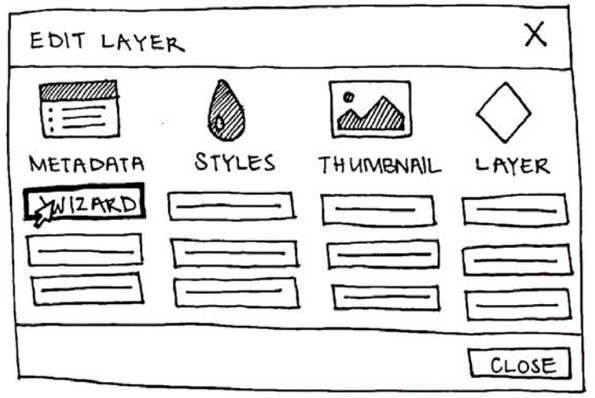
Open **GeoNode** (https://geocatalogue.co.za/)
Register > Wait for approval > **Sign In**
Main Menu > **About** > **People** > Find other users and yourself
(Edit your profile to include your contact information)

(Stitching the City QR Code)

Uploading layers



1. Main Menu > **Data** > **Upload Layer**
2. Drag the shapefiles and its associated files in **Drop files here**.
   (Exported from previous tool, eg: QGIS/Kobo, make sure all six file types are there - .cpg, .dbf, .prj, qpj, shp, shx. and avoid duplicates.)
3. Permission > Select **Users** and **Groups** in all tabs > **Upload Files**
   (To control who you want to share the collected data with.)
4. **Inspect Data** > **Next**
   (Recheck the list of data uploaded and edit if needed. Leave **Advanced tabs** on default.)
5. Layer uploaded.
   (Find the preview window, **Infos, Attributes**. You can **Share, Rate, Comment or make it Favourite**)
6. Editing tools > **Styles** > **Edit** > Edit if needed



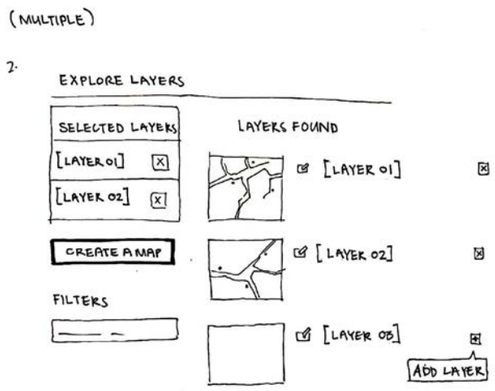
7. Editing tool > **Metadata** > **Wizard**
8. Edit > Fill in **Basic Metadata** > Fill in **Location and Licences** > Fill in **Optional Metadata** > Fill in **Dataset attributes**
   (Make sure you go through all the mandatory boxes as everything you input here is important for documentation accuracy and for other users who will be looking for data.)
9. Preview > Check.
10. Settings > Edit if needed, or leave it default.
11. Update > **Return to Layer**

Uploading documents

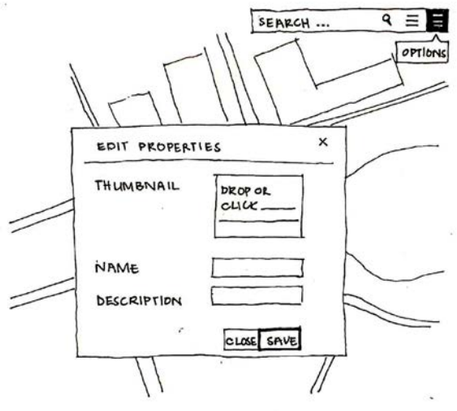
1. Main menu > **Data** > **Upload Document.**
2. Create a **Title** > Browse the File > Add **URL**, if needed.
3. Permission > Select **Users** and **Groups** in all tabs
   (To control who you want to share the collected data with.)
4. Link to > Choose Layer/ Map > **Upload**.
5. Edit **Metadata** (Follow the same steps as **Layer**.)
6. Document uploaded.
   (Find the **Infos**. You can **Share, Rate, Comment** or make it **Favourite**)

Creating map

1. (Single layer) Go to your **Layer** > **Create a Map**
   Or, (Multiple layers) Main menu > **Data** > **Layers** > Click **(+)** and select the Layers > **Create a Map**

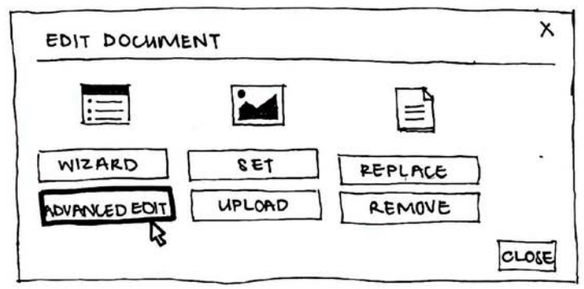


2. Layers > Edit if needed
3. Options > **Save as** > **Edit Properties** > Fill in > **Save**
4. Map added



Linking documents to layer/map

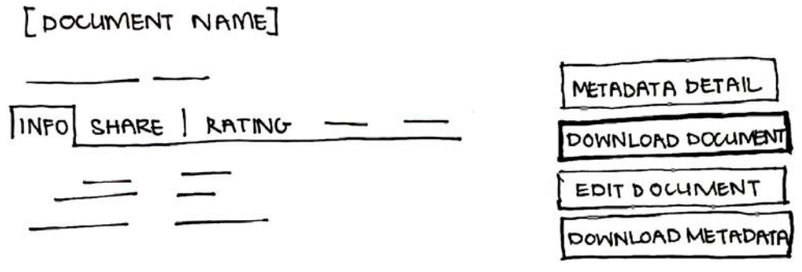
1. Go to your **Document** > **Edit Document** > **Metadata** > **Advanced Edit** (You can use the **Wizard**)



2. Link to > Choose Layer/ Map > **Update**
3. Document Linked.
   (Check in your Layer page if the document is there)

Downloading layer/ documents

1. (Layer) Go to your **Layer** > **Download Layer** > Select File type/ format.
2. Or, (Document) Go to your **Document** > **Download Document.**



Tips

- Select appropriate file names when renaming Layers, Maps and Documents to ensure that data is kept clean.
- Fill out the metadata as best as you can, be as descriptive as possible as that will help identify files later. If you are unsure of anything you can fix it later.
- Set permissions for each layer, this is important for data security. The default is set to ‘Anyone’, meaning that anyone who can log in can edit the data.
- Use all the tagging and legend options to make the data filter process convenient for users.
- For linking multiple files as Documents to one Layer or Map, upload them as a zip folder rather than uploading separate files.

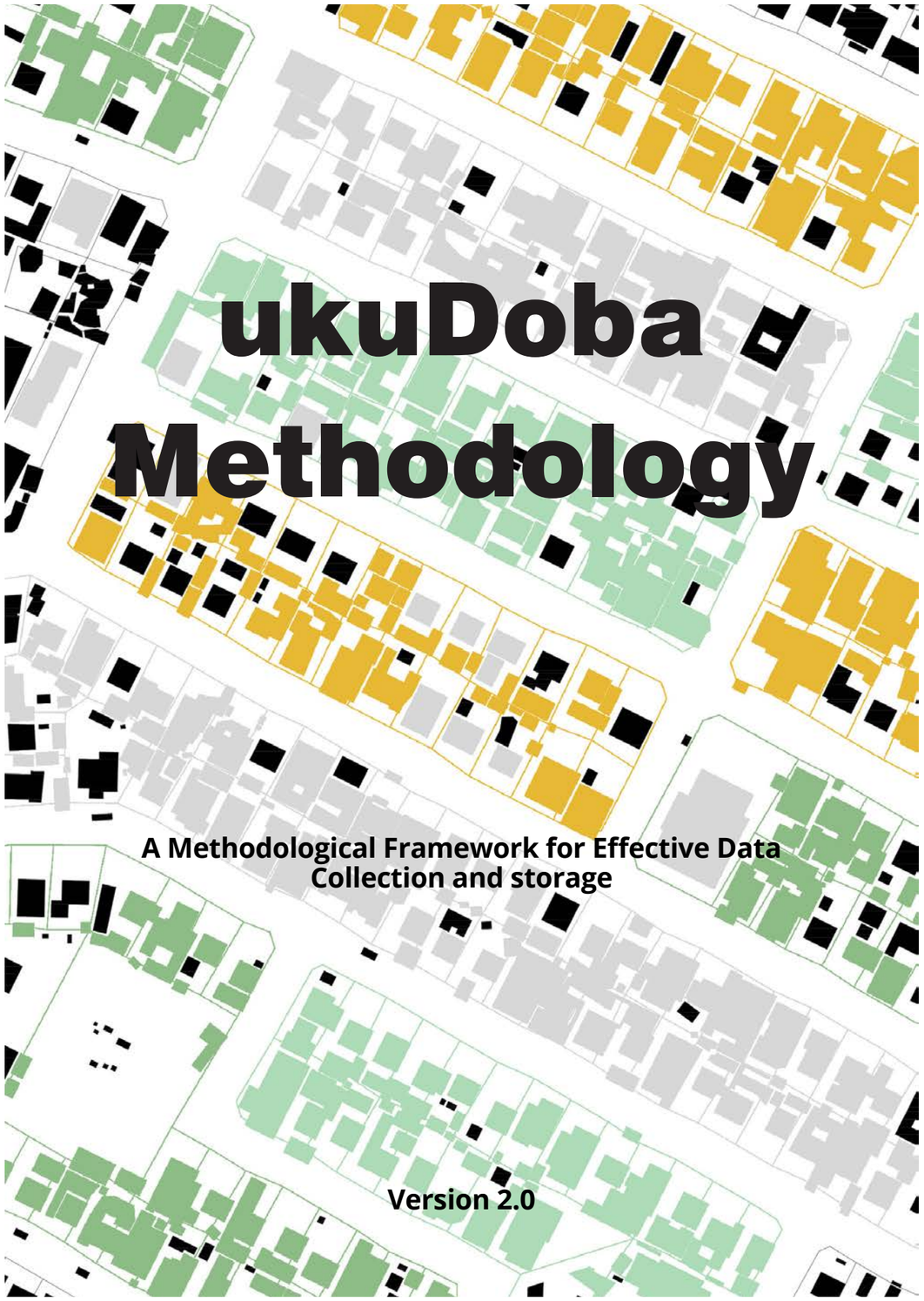
To learn more visit the ‘CDL wiki’ page.
(https://github.com/CamGreen/NRF-STINT_Wiki/blob/master/README.md)

Step 3 Complete

Authors

Robin Eskilsson
Lauren Konstantinou
Mumtaheena Rifat
Kelsey Smith
Markus Zorn
Purll Naidoo

September 2020



Preface

The ukuDoba handbook is the outcome of the Swedish-South African project “Stitching the City” that integrates education and research. The project aims at developing a method and digital library of geolocated data for knowledge facilitation to support data re-use in architectural courses. It also aims at establishing a collaboration between the University of Pretoria, South Africa, and the Chalmers University of Technology in Gothenburg, Sweden.

“Stitching the City” has been hosted by the course Planning and Design for Social Inclusion in Gothenburg (2019 and 2020) and the Urban Citizen studio in Pretoria (2020). Many thanks Emilio and Carin!

ukuDoba has been tested in field studies by students in two areas: Mamelodi-East in the City of Tshwane and Hammarkullen in Gothenburg and the handbook has been developed by the six master students in an iterative process. Thank you, Robin, Lauren, Purll, Mumtaheena, Kelsey and Markus for your invaluable work! Without you, no handbook.

A special thank you goes also to Cameron and Victoria for development of the GeoNode structure to store and share our data. Finally, thank you Marco, Monica, Serena for your support and constructive input.

Liane & Chrisna
October 2020

Preface

Swedish team - Chalmers University
of Technology:
Liane Thuvander, project leader
Marco Adelfio
Emilio Brandao
Monica Billger
Department of Architecture and Civil Engineering

South African team - University of Pretoria:
Chrisna du Plessis, project leader
Carin Combrink
Department of Architecture
Serena Coetzee
Victoria Rautenbach
Cameron Green
Department of Geography, Geoinformatics and Meteorology

The research has been financed by The Swedish Foundation for International Cooperation in Research and Higher Education (STINT) and South Africa's National Research Foundation (NRF).

Authors

Robin Eskilsson
(Sweden)
robin.eskilsson2@gmail.com

Lauren Konstantinou
(South Africa)

Purll Naidoo
(South Africa)

Mumtaheena Rifat
(Bangladesh)
rifatm@student.chalmers.se

Kelsey Smith
(South Africa)

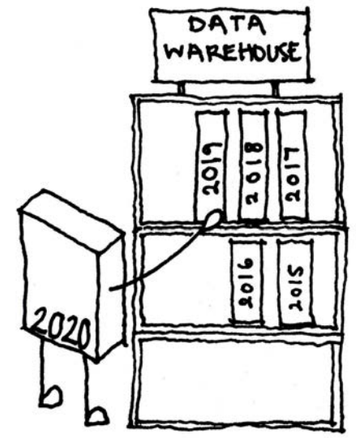
Markus Zorn
(Austria)
markuszorn5@outlook.com

The ukuDoba methodology was created from a collaboration between three Master of Architecture students from Chalmers University of Technology, Sweden and three Master of Architecture students from the University of Pretoria, South Africa. All authors are actively involved in the 'Stitching the City" research project and have a background in participatory design, social inclusion and urban citizenship within architecture. This background influenced their interest in the creation of the ukuDoba Method.

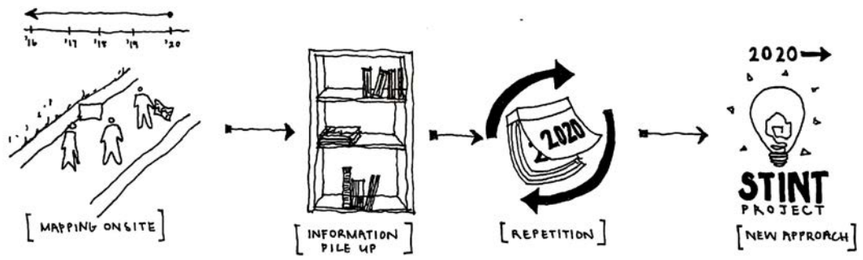
Contents

ukuDoba

Over time, physical maps and folders are being stacked in bookshelves. This format of data collection is difficult to access and build upon. Year, after year, these research processes are repeated, by both universities, leaving layers of rich data disjointed.



ukuDoba - the methodological framework, has been developed for the collection and sharing of non-traditional types of spatial economic data at a street and precinct level in an online platform. These cross-disciplinary micro-data can be layered and easily accessed by researchers from different disciplines as well as students and community members.

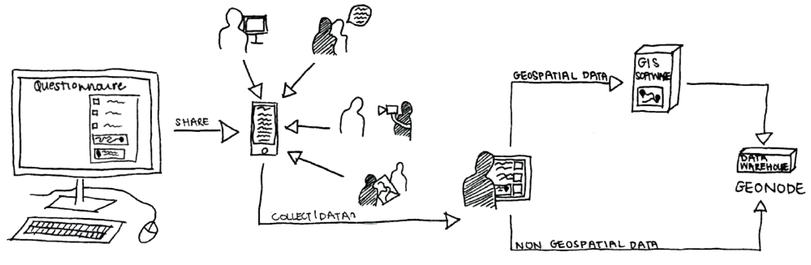


ukuDoba

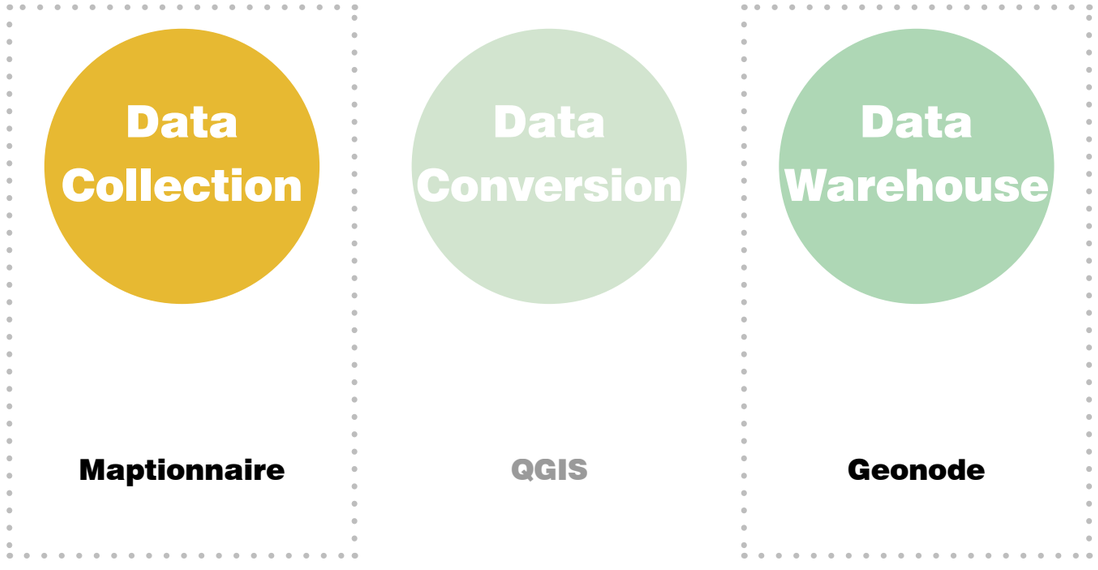
The methodological framework, ukuDoba, and online platform, Geonode, are currently being tested in two study areas: Mamelodi East in Tshwane, South Africa and Hammarkullen in Gothenburg, Sweden.

Here, we present a step by step guide to follow the ukuDoba methodology of how to effectively digitally collect, convert and store data in an online platform, GeoNode.

In Zulu the word ukuDoba means ‘fishing’. With this booklet, we hope to help users ‘fish’ for the data they need for their project.



The ukuDoba Methodology



1

Data Collection

Data Collection

maptionnaire

What?

- Maptionnaire is a paid subscription based service that allows you to create questionnaires that can be sent out to participants or be filled in out on the field by yourselves. It is georeferenced and supports multiple types of media.
- After fieldwork, you can access the data via your computer. This data can then be shared with others and they can use it or edit it.
- Other tools used for similar data collection are: Kobo Toolbox, FieldPapers, EpiCollect5 etc.

Why?

- Let communities to share their knowledge
- To digitally store data in a Digital platform (easier to access and use)
- To geolocate collected data

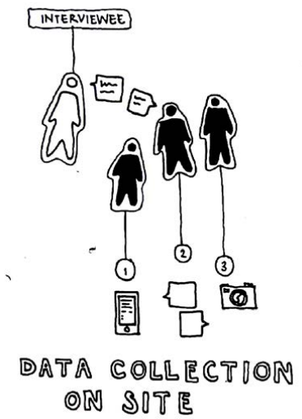
10

Data Collection

How?

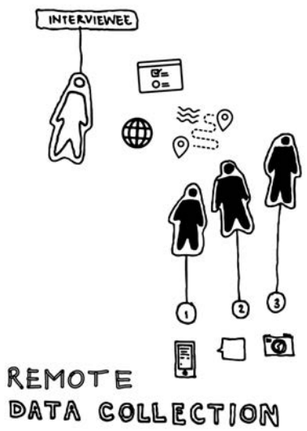
On-site collection

- Always collect data in groups of three people.
- The first person is in charge of taking notes and should focus on gathering data using the data collections tool.
- The second person is in charge of leading the interview and can have the questions open on their phone as a guide.
- The third person is in charge of documentation of the process and takes pictures, video and audio recordings.



Remote collection

- It is important to have a dialogue between the interviewer and interviewee.
- This could be ensured by sending the questionnaire link online for people to fill up and discussing / having dialogue over the phone or internet with audio calls.
- Filling up the questionnaire together and discussing / having dialogue with video calls, sharing screens options can help.
- If multiple participants need to fill out the same form in the same browser, they have to use incognito mode



Getting started

- Use your computer to start. You can only use your smartphone or tablet for collecting data
- Visit the link below to log in **https://app.maptionnaire.com/en/login/**

Creating a questionnaire

1. **Questionnaire** > **Create new**
2. **Edit** > Fill in **Name and Description**
   (This is the first page people would see, so introduction, background and purpose should be included in the description)
3. **Pages** > **(+)** > Create at least 3 pages
4. Write **Page name**s for all pages
   (Suggested as 'Consent', 'Name of Survey', 'Thanks for Participating')
5. First page > **(+)** > **Multiple choice question** > **Question** > **Choose one** > Type in your consensual agreement in the question box and create two options "**Yes**" and "**No**"
6. Next page > **(+)** > Select the types of questions (see glossary for types of questions) > Click the **Question** to edit
7. Last page > **(+)** > **Paragraph of Text** > Type in a note of thanks with the contact info of your team for further inquiries > **Page settings** > Check **"This is an exit page** (Additional questions could be added such as, asking for reasons if answered no to the consent)

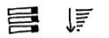
Carry-on
Creating a questionnaire

8. **Branching rules** at the top > **Triggering question** > Select your triggering question > **Triggering answers** > Choose **Yes** > **Choose target page** > Choose *"Name of survey"* > **Save** > Go back to **Edit** (Using branching rules are not recommended to use with individual questions, only pages)
9. **Location at the beginning** under the pages> Set your site area (This is the default background of your questionnaire pages, could be changed for each page in the settings tab)
10. **Maps** > Select the type of map
11. **General Settings** > Edit as per your preferences > Find the link for the questionnaire > Set a **Questionnaire Password** if you want limited access > Go back to **Edit**
12. **Data and Privacy settings** > Edit as per your preferences
13. **Style settings** > Edit the style of your questionnaire
14. **Language settings** > Select the additional language, if needed> Click **Translate** to add all the questions in selected language > **Save**
15. **View** > Check the questionnaire

Note:
Make sure to keep your form clean of unnecessary datapoints before deploying the questionnaire. This will ensure effective collection of data, save you time during analysis, and keep the participants engaged.

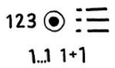
Glossary: question types & examples

Drawbutton: mark out points, highlight a route or area, upload a media file



Multiple choice: choose one, choose many, dropdown, priority assessment

Open question: big answer field, small answer field



Number questions: integer numbers, string of digits, decimal numbers, range of numbers

Video & document: link a video from youtube or upload your own to show inbetween questions

Paragraph or text: add in between questions for additional information to participants

Setting up background maps for forms

1. **Location at the beginning** > zoom in to set the viewport > **save**
2. Under **Maps** you tick the boxes you want your participants to be able to toggle between

- If you wish to set a different map for only one of your pages:
  Click the page > Click **settings** > follow the steps above

I hereby voluntarily grant permission for participation in this project, as explained to me by the researcher. I am aware that the results of the investigation may be used for the purposes of publication. I will remain anonymous: my comments may be used without giving any geographic or personal references (name, address, ID, occupation, age, income etc) that may accidentally imply my identity.

Branching questions

Using skip logic in your survey is a great way of controlling the navigation in the form depending on what the answers are.

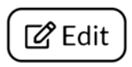
The most important thing to consider is that the target answer is a page and that it is only compatible with multiple choice questions. Be careful with using the branching as it can lead to undesireable outcomes in the collected data.

To use your questionnaire

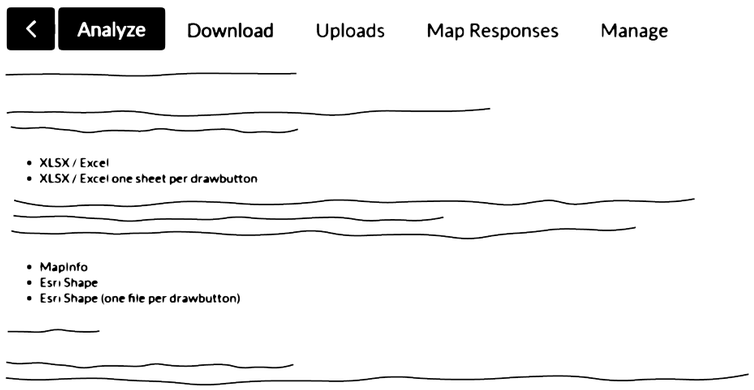
Simply distribute the link to the web-based questionnaire to allow participants to fill it in and start collecting your data!

After collection

1. Find your questionnaire > **Response Data** > **Analyze** > Check and edit if needed



2. Find your questionnaire > **Response Data** > **Download** > Download ESRI Shape file



Step 1 Complete

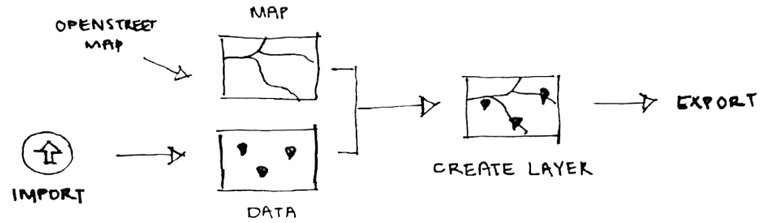
2

Data Conversion

If your chosen data collection tool does not provide a shapefile or if you for some other reason have a csv file that needs to be geolocated, follow this portion of the handbook. Maptionnaire provides shapefiles in the file-format .shp

Data Conversion

QGIS



What?

A geographic information system (GIS) is a framework which provides a platform for users to engage with spatial data, through analysis and editing. There are alternative platforms that can perform this function, however we will use QGIS as it is a free service, making it more accessible to a wider range of people.

Why?

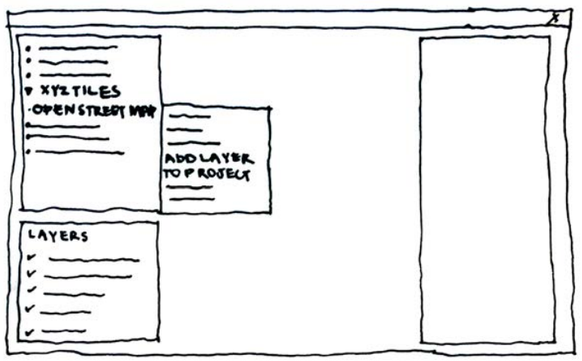
For the purpose of this framework, QGIS will be used to convert the data into a usable file type that can be imported and stored in the data warehouse GEONODE.

Getting started

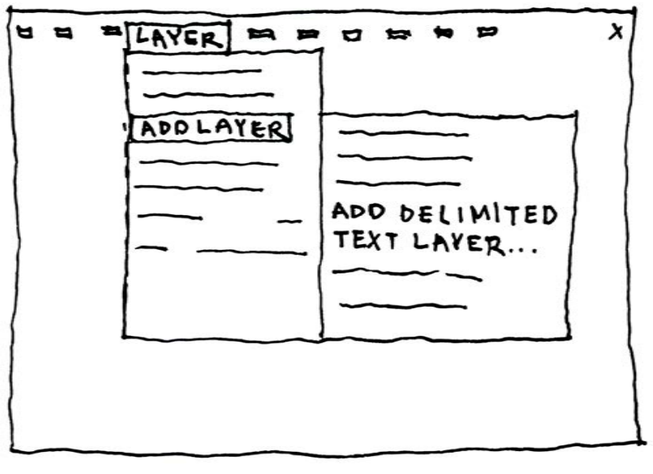
Download QGIS Standalone Installer Version 3.10 (64 bit) > Install QGIS > Run QGIS

Importing CSV Legacy files

1. Open QGIS application on your computer > Project tab > New
2. Side Browser Menu > Drop down tab **XYZ Tiles** > Right click on **Openstreetmap** > **Add Layer to project**

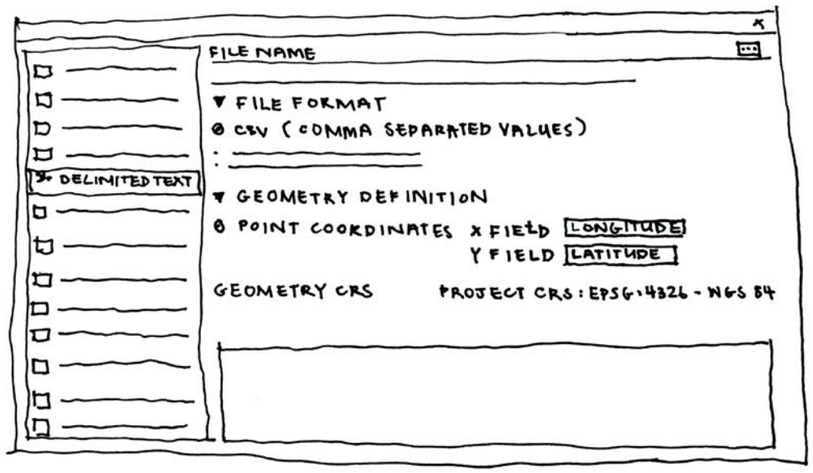


3. Main menu > **Layer tab** > **Add Layer** > **Add Delimited Text layer**



QGIS

4. File name > Click (...) to browse > Select your **CSV (Legacy) File** > **Ope**n

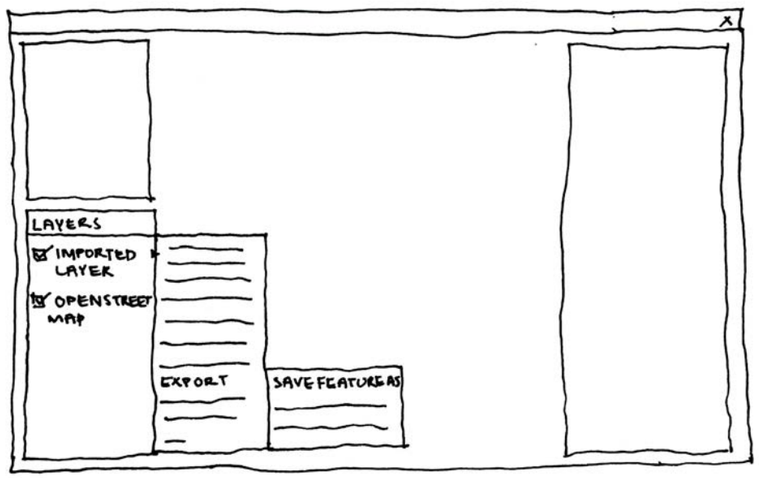


5. Drop down tab > **File Format** > select **CSV (comma separated values)**
6. Drop Down tab > **Geometry definition** > Select **Geometry CRS = Project CRS: EPSG:4326-WGS 84** > Select **X field = Longitude** and **Y field = Latitude** > **Add** > Close window

Note:
Once editing the X and Y fields, if the points appear on a blue screen then delete your imported CSV (legacy) layer, re-import it and let X field= Latitude and Y field = Longitude.
If you do not use a CSV legacy file, you will not have the option to select the x and y fields.

Exporting ESRI shape files

1. Layers Menu > Insure Openstreetmap layer is below your Layer
2. Right click on your layer > **Export** > **Save feature as**
3. Create a new folder on your computer with your project name to export your shapefiles to
4. Drop down tab **Format** > Select **ESRI Shapefile** > **File Name** > Click (...) to browse > Write your file name > Drop down tab **CRS** > Select **Project CRS: EPSG:4326 - WGS 84** > **Ok**
   (There should be 6 shapefiles exported)



Notes

There is no need to save QGIS files as the only files that are required are the ESRI Shapefiles that you export.

Tips

To learn more check the Youtube tutorial:
https://www.youtube.com/watch?v=sQ2z-D8TN2E

Step 2 Complete

3 Data Warehouse

Data Warehouse

What?

GeoNode is a web-based application and platform that facilitates the creation, sharing and collaborative use of geospatial and non-geospatial data.

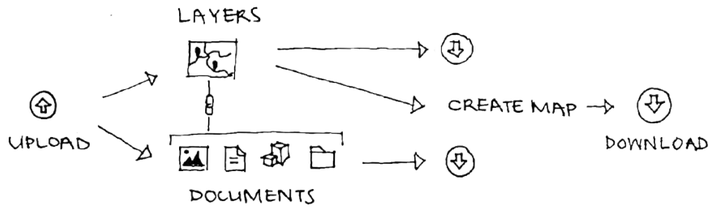
The Geospatial data can be stored as Layers, formats that GeoNode supports:
Shapefiles & its associated files (.cpg, .dbf, .prj, .qpj, .shp, .shx)
GeoTiffs (.tiff, .tif)
American Standard Code for Information Interchange (ASCII)
The Non-geospatial data can be stored as Documents, formats that GeoNode supports:
Microsoft Word (.doc & .docx), Powerpoint (.ppt & .pptx), Excel (.xls & .xlsx)
Image Formats (.gif, .jpg, .jpeg, .png, .tiff, .tif)
OpenDocument File Formats (.ods, .odt,. odp)
Portable Document Format (.pdf)
Compressed Files (.rar, .zip, .gz)
Markup Languages (.sld, .xml, .qml)
Text documents (.txt)

Both of these could be linked with each other. Also documents that are non-spatial in nature can still be uploaded to GeoNode and then linked to a spatial file afterwards.

You are able to take all other files that are not individually supported and create a .zip file in order to upload them.
(Cheat file : .zip file)

Data Warehouse

GeoNode



Why?

To store and share the data we collectected with geolocation in an open source platform.
To manage and catalogue geospatial data and keep track of metadata. Each dataset in the system can be shared publicly or restricted to allow access to only specific users.
To manage and share data if the project is occurring over several years such as a longitudinal study so that the data can be used for numerous years after the date of collection as long as it is labelled and managed correctly.

Getting started

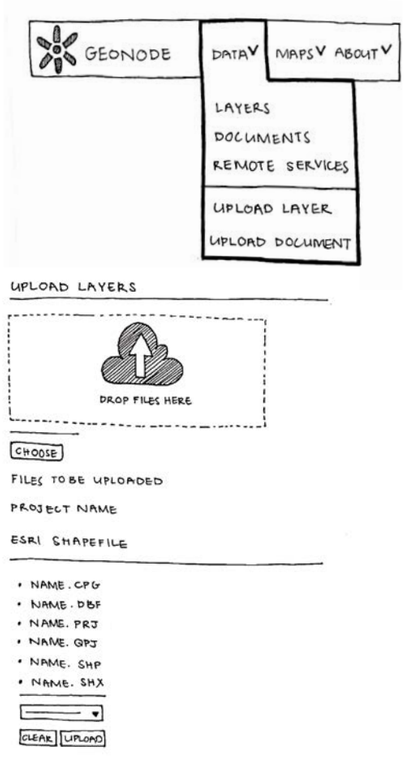
Please refer to **The Stitching the City GeoNode** link and not the GeoNode demo when the document refers to geonode.

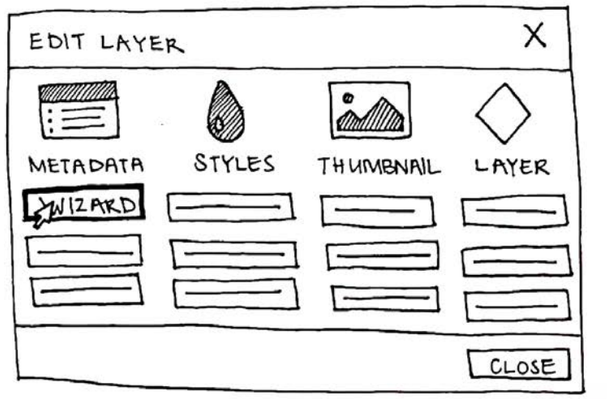
Open **GeoNode** (https://geocatalogue.co.za/)
Register > Wait for approval > **Sign In**
Main Menu > **About** > **People** > Find other users and yourself
(Edit your profile to include your contact information)

(Stitching the City QR Code)

Uploading layers

1. Main Menu > **Data** > **Upload Layer**
2. Drag the shapefiles and its associated files in **Drop files here**.
   (Exported from previous tool, eg: QGIS/Kobo/ Maptionnaire, .cpg, .dbf, .prj, qpj, shp, shx. and avoid duplicates.)
3. Permission > Select **Users** and **Groups** in all tabs > **Upload Files**
   (To control who you want to share the collected data with.)
4. **Inspect Data** > **Next**
   (Recheck the list of data uploaded and edit if needed. Leave **Advanced tabs** on default.)
5. Layer uploaded.
   (Find the preview window, **Infos, Attributes**. You can **Share, Rate, Comment or make it Favourite**)
6. Editing tools > **Styles** > **Edit** > Edit if needed





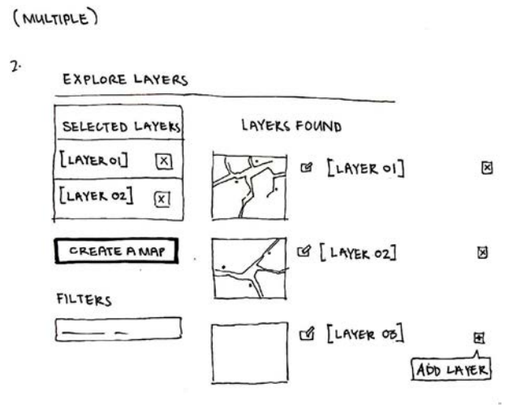
7. Editing tool > **Metadata** > **Wizard**
8. Edit > Fill in **Basic Metadata** > Fill in **Location and Licences** > Fill in **Optional Metadata** > Fill in **Dataset attributes**
   (Make sure you go through all the mandatory boxes as everything you input here is important for documentation accuracy and for other users who will be looking for data.)
9. Preview > Check.
10. Settings > Edit if needed, or leave it default.
11. Update > **Return to Layer**

Uploading documents

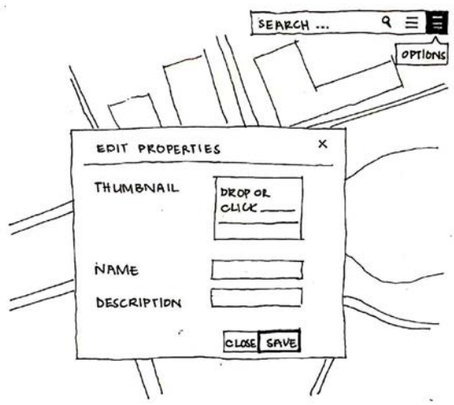
1. Main menu > **Data** > **Upload Document.**
2. Create a **Title** > Browse the File > Add **URL**, if needed.
3. Permission > Select **Users** and **Groups** in all tabs
   (To control who you want to share the collected data with.)
4. Link to > Choose Layer/ Map > **Upload**.
5. Edit **Metadata** (Follow the same steps as **Layer**.)
6. Document uploaded.
   (Find the **Infos**. You can **Share, Rate, Comment** or make it **Favourite**)

Creating map

1. (Single layer) Go to your **Layer** > **Create a Map**
   Or, (Multiple layers) Main menu > **Data** > **Layers** > Click **(+)** and select the Layers > **Create a Map**

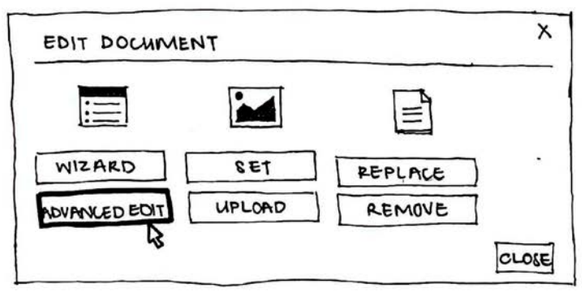


2. Layers > Edit if needed
3. Options > **Save as** > **Edit Properties** > Fill in > **Save**
4. Map added



Linking documents to layer/map

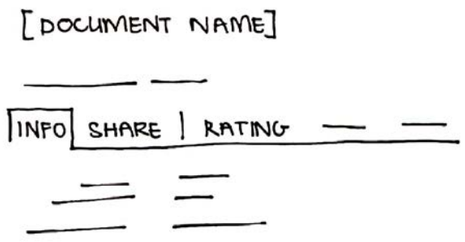
1. Go to your **Document** > **Edit Document** > **Metadata** > **Advanced Edit** (You can use the **Wizard**)

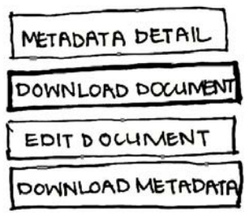


2. Link to > Choose Layer/ Map > **Update**
3. Document Linked.
   (Check in your Layer page if the document is there)

Downloading layer/ documents

1. (Layer) Go to your **Layer** > **Download Layer** > Select File type/ format.
2. Or, (Document) Go to your **Document** > **Download Document.**





Tips

- Select appropriate file names when renaming Layers, Maps and Documents to ensure that data is kept clean.
- Fill out the metadata as best as you can, be as descriptive as possible as that will help identify files later. If you are unsure of anything you can fix it later.
- Set permissions for each layer, this is important for data security. The default is set to ‘Anyone’, meaning that anyone who can log in can edit the data.
- Use all the tagging and legend options to make the data filter process convenient for users.
- For linking multiple files as Documents to one Layer or Map, upload them as a zip folder rather than uploading separate files.

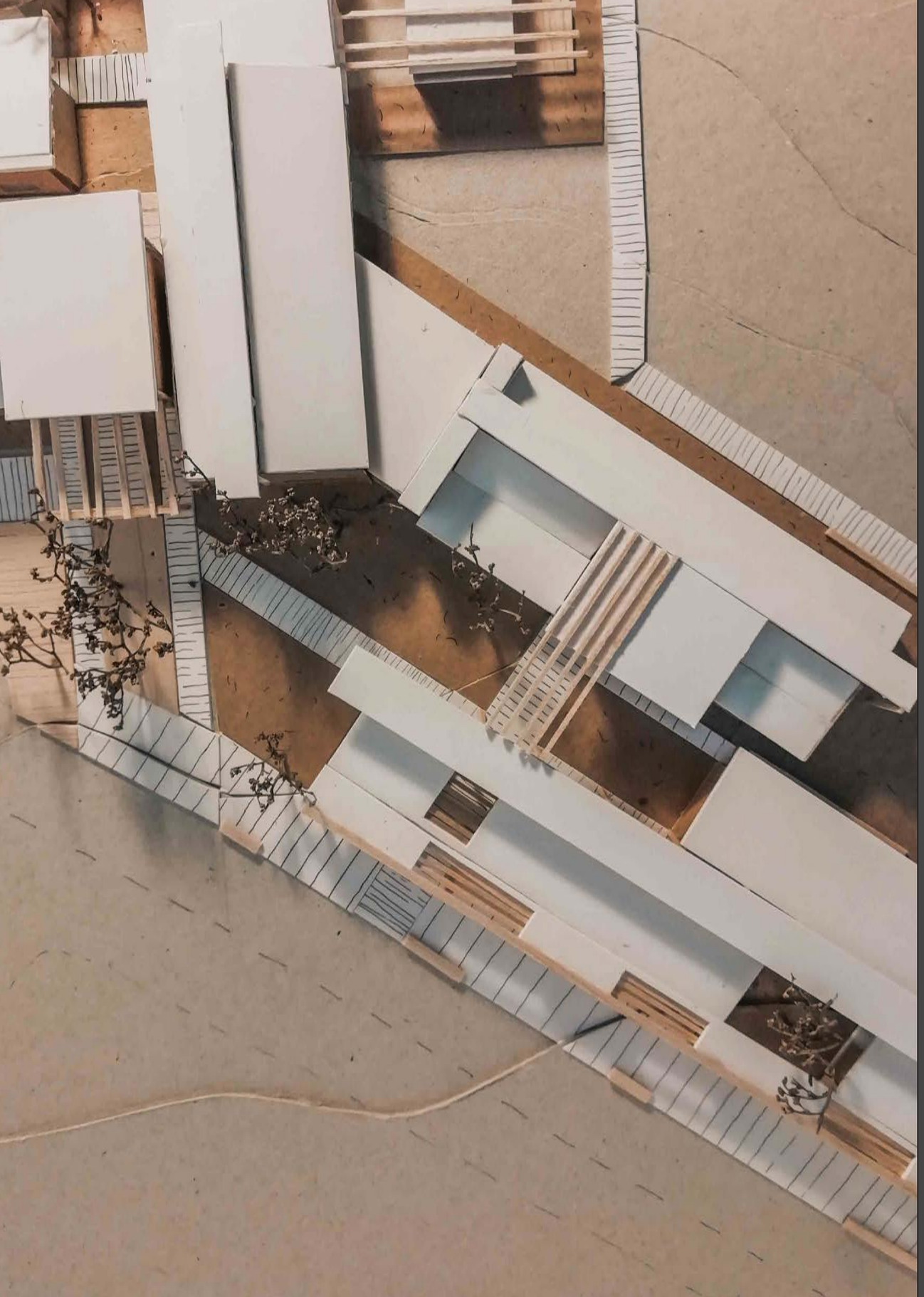
To learn more visit the ‘CDL wiki’ page.
(https://github.com/CamGreen/NRF-STINT_Wiki/blob/master/README.md)

Step 3 Complete

Authors

Robin Eskilsson
Lauren Konstantinou
Mumtaheena Rifat
Kelsey Smith
Markus Zorn
Purll Naidoo

September 2020



02

VOLUME

APPENDICES

NAIDOO 2020

APPENDIX 2.A

2.A

TOUR GUIDE

Analogue Design Game

Analogue Design Game: Tour Guide	
Creation of Design Game	
Format: Digital or Analogue Game	Analogue
Intention: Which part of the design process do I need assistance with through co-design	Understanding experience of school through user perspective
Precedent	Mission from Mars (Hagen et al 2012), Within this design game the researcher role-plays as an alien and participants are inhabitants of the planet, who have to guide the researcher through the planet to familiarise them with the context. The game is aimed at empowering the participant during the process of game play and allows the researcher to understand how participants perceive their environment.
Adaptation of precedent for research focus	For the dissertation application, the researcher role played as a new student transferring to the school and learners had to show the new student around and point out what the new student should know about the school and its functions
Challenges	The game did not require a lot of preparation beforehand and therefore did not create any challenges during the creation process.

Fig. 1. Tour Guide design game path taken through school (Naidoo 2020)

Fig. 2. Tour Guide design game application on site at Tsako Thabo (Naidoo 2019)

Design Game Rule Book	
Design Game Title	Tour Guide
Design Game Objective/Overview	To understand the spatial points of impact of a learner's school environment and to gain further insight into the elements of their environment that they consider important to share
Platform/Site for Game Play	On site at Tsako Thabo Secondary School, Mamelodi East, South Africa (Entire school used as a platform for game play)
Game Pieces	• Map of school so learners can locate themselves • Video recording equipment to record journey tour through the school (capture participant body language, dialogue and the feel of space)
Number of players	4-6 Participants
Duration of play	15 Minutes
Game Play	• Inform your participants that you are role playing as a new student and their duty is to introduce you to the school • Allow the participants (learners) to take ownership of the activity by guiding the researcher/s through the school from their perspective, highlighting important elements that the researcher/s should be aware of as 'new students' to the school • Start recording the tour and allow participants to guide the researcher/s • During the tour, researcher/s ask questions to gain further insight into the choices made participants (ie. Why are we not walking through this part of the school?) • Game play ends when participants have concluded the tour they wish to take researcher/s on
Researchers role during game play	• Observe users in field • Take photographs • Inferior to the participant

Application of Design Game	
Participants	6 Learners (ages 16-20) from Tsako Thabo Secondary School, Mamelodi East, South Africa
Participation	The ease of game play made it a simple game to partake in. Throughout game play, it stimulated curiosity within other learners in the school. Participants were able to equally engage with the researcher and other participants during game play to collectively decide on the tour path for the researcher to take.
Challenges	Having to record the session and focus on the participants at the same time posed a challenge during game application. It would be useful to partner with another researcher for this game to ensure that the process is well documented. The other researcher can therefore scribe dialogue from participants onto the printed map according to their space associations.
Opportunities	Game play is quite flexible and can therefore be easily adapted on site depending on different paths participants want to take. Data obtained during game application documentation is also not limited to the partipant group, as video recording captures the wider activity occuring during the school at that time.
Documentation of game play	The use of video has been acknowledged as a useful medium in capturing the richness usually lost in other media forms (Brandt, Messeter & Binder 2008:54). Video recorded during game play on site captured dialogue and path taken within school
Outcomes	The participants took ownership of the game and were excited to guide the researcher/s through the school. They were able to easily locate themselves on the map of the school. It was interesting that they guided the researcher/s to the 'dangerous' spaces of the school first, where it was briefly observed from a distance. Thereafter continued the tour to their preferred spaces of the school.
Contribution to the design process	Understand the points of tension within the school as well as the preferred spaces of the school. Attained a deeper spatial understanding of the educational environment within the school.

Fig. 3. Design informants from game application (Naidoo 2019)

Fig. 4. Design informants from game application (Naidoo 2019)

TOUR GUIDE

Role of landscape environments in assisting the learning process

The benefits of plants, water and the outdoor environment in assisting the balance of a learner's mental and psychological state. Exposure to these elements minimises the emotional pressure experienced by learners, therefore positively effecting the learning process (Ali, Rostam & Awang 2014).

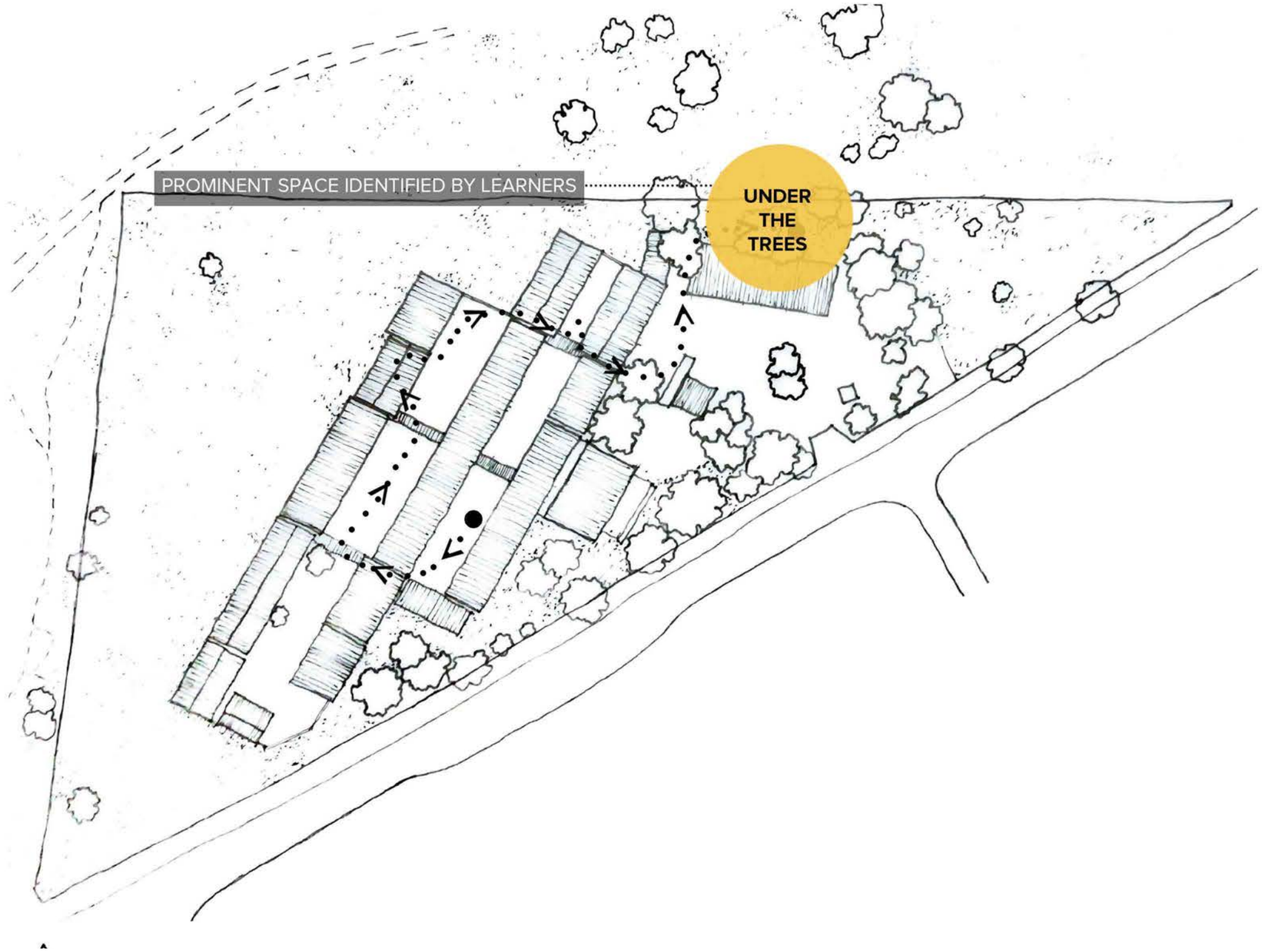


Fig. 5. Design informants from game application (Naidoo 2019)

APPENDIX 2.B

2.B

DOTS

Analogue Design Game

DOTS
Analogue Design Game

Analogue Design Game: Dots	
Creation of Design Game	
Format: Digital or Analogue Game	Analogue
Intention: Which part of the design process do I need assistance with through co-design	To understand learners spatial association within the school
Precedent	-
Adaptation of precedent for research focus	-
Challenges	The challenging element to the design game creation was deciding on the questions to ask the participants (learners) beforehand. Having not based the game off a precedent, it was difficult to assess how much could be achieved during the duration of game play. Therefore, at this stage, there was minimal control over aligning the game creation with the game outcome. The variable of time was particularly challenging in this case as researcher interaction with participants was limited to the 30 minute duration of the school lunch break. The creation of the design game had to therefore consider what the most effective method of game play would be appropriate to render maximum output.

Application of Design Game	
Participants	5 Learners (ages 16-20) from Tsako Thabo Secondary School, Mamelodi East, South Africa
Participation	During the process of game play, players were easily able to engage with each others choices. It was evident that game play with peers influenced players decisions during game play. In a few cases, some players altered their initial placement of their token to align with their peers decisions.
Challenges	The main challenge was being able to facilitate game play as well as document it. It would be beneficial to partner with another researcher who focuses on documenting the design game outcomes while the main researcher facilitates game play. It was also challenging to work on site under the trees with a table taken from a classroom, to remove from the nise of the learners during their break time. The natural environment and wind made it difficult to deal with the game pieces effectively.
Opportunities	The order of game play was fluid enough to adapt to the condition on site. In some cases, post discussion, alternative questions were raised which were easily incorporated into game play
Documentation of game play	Recorded during game play which documented dialogue as well as question raised and resulting placement of player token
Outcomes	Reflection post game play was able to highlight whether the learners answers to the questions were related to the space itself or the people/activity occupying the space
Contribution to the design process	Able to gain deeper understanding of the spatial connotations students place on the school environment. Overlaying the choices of students highlighted key spaces within the school that had positive connotations to the learners.

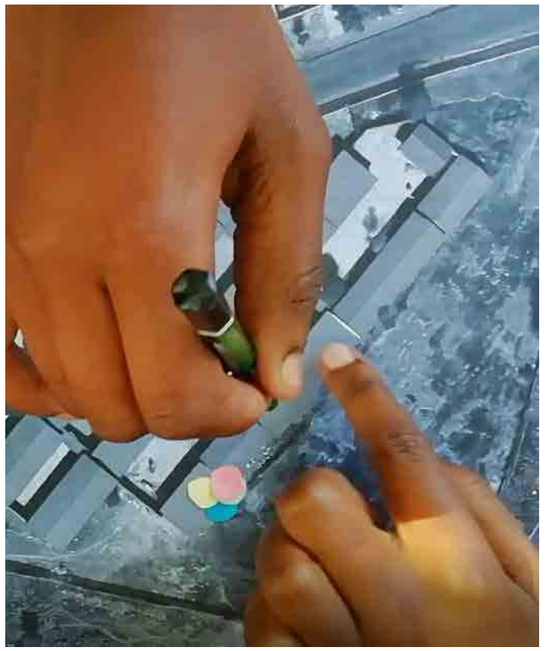


Fig. 1. Dots design game application on site at Tsako Thabo (Naidoo 2019)

Fig. 2. Dots design game application on site at Tsako Thabo (Naidoo 2019)

Design Game Rule Book	
Design Game Title	Dots
Design Game Objective/Overview	Players are posed a question and allocate a space on site to the question
Platform/Site for Game Play	On site at Tsako Thabo Secondary School, Mamelodi East, South Africa (Quiet space/room with a table)
Game Pieces	• Map or model of the school • Small coloured tokens to allocate a different colour per player • List of questions to ask players • Recording device
Number of players	5-6 Players
Duration of play	15-20 minutes
Game Play	• Each player gets a coloured token • The researcher poses a question to the group: *Introvert- Where would you go to in the school for a quiet moment alone before, during and after school?* *Safety- Where in the school do you feel safe?* *Respect- If there were people vanalising the school, but you had the power to stop them, which part of the school would you protect?* *Respected- Where in the school do you feel heard and untroubled?* *Importance- If the school was being demolished but you could save one part, which would it be?* • Players place their coloured token on the map to where they spatially associate their answer to the question • Engage in discussion to understand reasoning behind player decisions • Continue in this sequence until all questions are asked
Researchers role during game play	Facilitator: Poses the questions, stimulates dialogue and documents process of game play

APPENDIX 2.C

2C

STACKED
Analogue Design Game

STACKED
Analogue Design Game

Analogue Design Game: Stacked	
Creation of Design Game	
Format: Digital or Analogue Game	Analogue
Intention: Which part of the design process do I need assistance with through co-design	To engage participants in the spatial construction of the educational built environment and to harness the potential of the existing site
Precedent	-
Adaptation of precedent for research focus	-
Challenges	The challenging element to the design game creation was being able to predict the kind of tools that would be needed on site.

Design Game Rule Book	
Design Game Title	Stacked
Design Game Objective/Overview	To start envisioning an educational environment, through the use of model building, with considerations for the existing
Platform/Site for Game Play	On site at Tsako Thabo Secondary School, Mamelodi East, South Africa (Quiet space/room with a table)
Game Pieces	• Massing model of the site as movable elements • Box cardboard • Coloured paper • Cutting tools • Pens, pencils and ruler • Prestik • Recording device/ camera
Number of players	5-6 Players
Duration of play	25 minutes
Game Play	1. Define • Participants define an envisioned learning environment 2. Massing • Using the cardboard, participants allocate a massing block to a site in the school to spatially develop their vision • Participants allocate a quality to their massing block (ie. enclosed, covered or open) • Participants work amongst themselves to continue developing their envisioned site within the school boundary • Engage in discussion as to the quality of space and experience of the envisioned site 3. External Quality • Coloured paper is used to allocate external surface quality of the site 4. Hierarchy • Participants allocate hierarchy to site by stacking cardboard to massing elements to highlight importance from participants perspective 5. Discussion • Participants engage in a relective session to discuss their decisions throughout game play and the final achieved vision
Researchers role during game play	Facilitator: Poses the questions, stimulates dialogue, documents process of game play but allows the participant to guide decision making during game play

Application of Design Game	
Participants	6 Learners (ages 16-20) from Tsako Thabo Secondary School, Mamelodi East, South Africa
Participation	Participation from the group was incredibly fruitful with participants stimulating and interacting with each other through the decision making process. An accumulation of simultaneous action of cutting building blocks, allocating space and decision making made for successful participation.
Challenges	The design game heavily focussed on a spatial outcome and was therefore initially challenging to get participants to understand the intention of the game. Therefore game play was slow to start, however with stimulation from the researcher, participants were able to engage and become comfortable with decision making. Another challenge was being able to mediate game play with the distraction of other learners on their lunch break and unsuitable location to carry out game play on site (a single desk outside under the trees)
Opportunities	The game pieces allowed for flexible interpretation because participants were not limited to prescribed shapes/building blocks to construct their vision. The fluidity of the game rendered creativity. If spatial depiction was limited, then the dialogue surrounding spatial quality contributed to decision making and the design game outcome
Documentation of game play	Video recorded during game play on site which captures dialogue and design decisions made by participant group
Outcomes	Participants were able to spatially define their envisioned educational built environment on site.
Contribution to the design process	From the process of game play, the researcher was able to gather information on the quality of space that was aspired for by learners but lacking within the current context of the school. It was also evident of the potential within existing sites of the school that was not harnessed within the existing use

Fig. 1. Application of analogue design game on site at Tsako Thabo (Achi 2019)

Fig. 2. Stacked design game application (Naidoo 2019)

Fig. 3. Stacked design game application (Naidoo 2019)

APPENDIX 2.D

AUTOCORRECT

THE (TYPO)LOGY GAME

Digital Design Game

AUTOCORRECT
THE (TYPO)LOGY GAME

Digital Design Game

Digital Design Game: AutoCorrect	
Creation of Design Game	
Format: Digital or Analogue Game	Digital
Intention: Which part of the design process do I need assistance with through co-design	AutoCorrect was intended to assist in the early stages of the co-design process to assist participants in the conceptual understanding of the role that different levels of influence have on how school typologies are constructed
Precedent	-
Adaptation of precedent for research focus	-
Challenges	Initially finding a digital medium to host the board game was a challenge, however once TabletopiaTM was identified, creation through the site was user friendly. Creating the game online was a time consuming task as all the game pieces needed to be developed beforehand and loaded onto the platform.

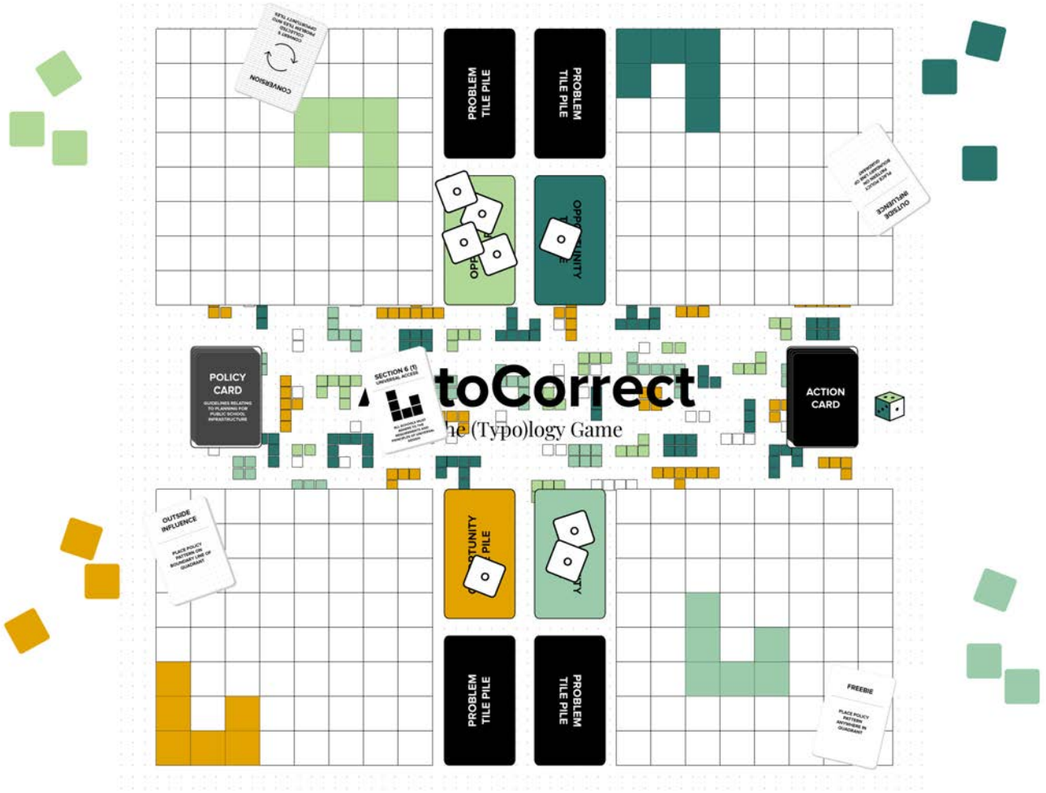


Fig.1. Autocorrect Game (Naidoo 2020)

Design Game Rule Book	
Design Game Title	AutoCorrect
Design Game Objective/Overview	AutoCorrect is an architectural game where participants construct a school typology using building blocks according to the restrictions provided by Government and the community in the context. Government policy for public school infrastructure provide you with the building patterns for your school typology and external factors guide your actions on how you construct those building patterns together.
Platform for Game Play	TabletopiaTM for Digital Play and Google MeetsTM for communication during play
Game Pieces	• 1x Game Board - Each player constructs their school typology within their quadrant. Each quadrant represents a different context • 1x Die - Coloured side to represent player colours during game play • 12x Policy Cards - Dictate the number of rounds in the game. The Policy Cards represent the different guidelines within government policy for public school infrastructure • 48x Action Cards - There are 3 types of Actions Cards in the game. The Action Cards play an individual role in each player's construction of their typology. This card represents the external factors from a school context that affect the educational environment. • 4 sets of 54x Building Blocks - Each player uses an individual colour set of building blocks to construct their school typology. You have different layers of influence that affect the spatial and non-spatial environment of a school. Building blocks represent these spatial elements • 48x Problem/Opportunity Tile - Collected at different points during the game. These tiles affect a player' s score. You have different layers of influence that affect the spatial and non-spatial environment of a school. Problem / Opportunity Tiles represent these non- spatial elements.
Number of players	4 Players
Duration of play	40-60 Minutes
Game Play	• The game begins with each player selecting quadrant of the game board to construct their school typology • Shuffle each card pile and place them face down on the game board • To start the round, Player 1 draws a Policy Card and places it face up on the game board • Each player draws a single Action Card • Using Building Blocks for your colour quadrant, each player must construct the pattern of the Policy Card according to their individual Action Card • Each player who successfully constructs their pattern collects 1 Opportunity Tile and places it in their Opportunity Pile on the game board • Each player who is unsuccessful, rolls the die to determine the number of Problems Tiles to collect and place in their Problem Pile on the game board • End of round 1 • Round 2-12 repeats the steps of round 1 but rotates clockwise between the players to determine the order of drawing Policy and Action Cards • End of Round 12 • Each player places their collected Opportunity Tiles from their Opportunity Pile in the open spaces on their quadrant • Thereafter if any players have excess Opportunity tiles, they must roll the die to land on a colour of another player, to donate their Opportunity Tiles. • Calculate the scores (The player with the lowest score wins! Each player calculates their score based on: Blank spaces on the game board quadrant = 1 Point each Collected Problem Tile = 2 Points each)
Researchers role during game play	• Observe player decisions • Facilitate conversation post game play on the conceptual understanding of the design game

Application of Design Game	
Participation	TabletopiaTM allowed for live game play by all participants on a single platform, therefore interaction was encouraged between players. The process of game play using the site was stimulating. Assisting this process with the use of google meets allowed for open dialogue amongst participants during game play
Challenges	Participants needed a reliable internet connection for game play to flow smoothly and to engage in conversation throughout
Opportunities	Hosting the game using TabletopiaTM, allows for wide range of participants internationally and locally. It provides the opportunity to easily send a link to participants at any given time and immediately engage in game play without the worry of putting together game pieces
Documentation of game play	Using Google MeetsTM as a communication medium allows the opportunity to record the session through the screen sharing option. This way the entire video footage of game play, accompanied by dialogue, is documented and immediately uploaded to the researchers linked Google DriveTM
Outcomes from participants	Game play with participants highlighted how the game also allows for interpretation. Participants were able to become aware of the policy that guides public school infrastructure and also challenged the limitations present within the game mechanics
Contribution to the design process	AutoCorrect allowed the researcher to grasp the conceptual understanding of the dissertation topic in order to communicate with participants clearly. It assisted the process by providing participants with background knowledge regarding the context that following co-design sessions would be dealing with

Fig. 2. Autocorrect (Naidoo 2020)

Fig. 3. Screenshot from AutoCorrect Game Play using Tabletopia™ (Naidoo 2020)

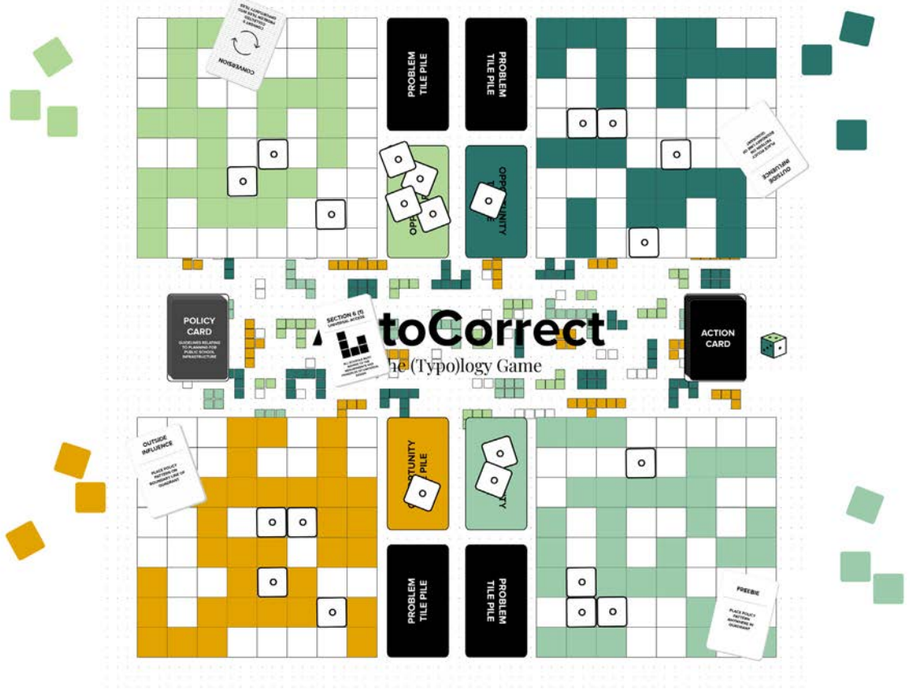


Fig. 4. AutoCorrect game board (Naidoo 2020)

Architectural Game Design

by Purll Naidoo

Fig. 5. AutoCorrect Design Game Rulebook (Naidoo 2020)

AUTOCORRECT
THE (TYPO)LOGY GAME

Digital Design Game

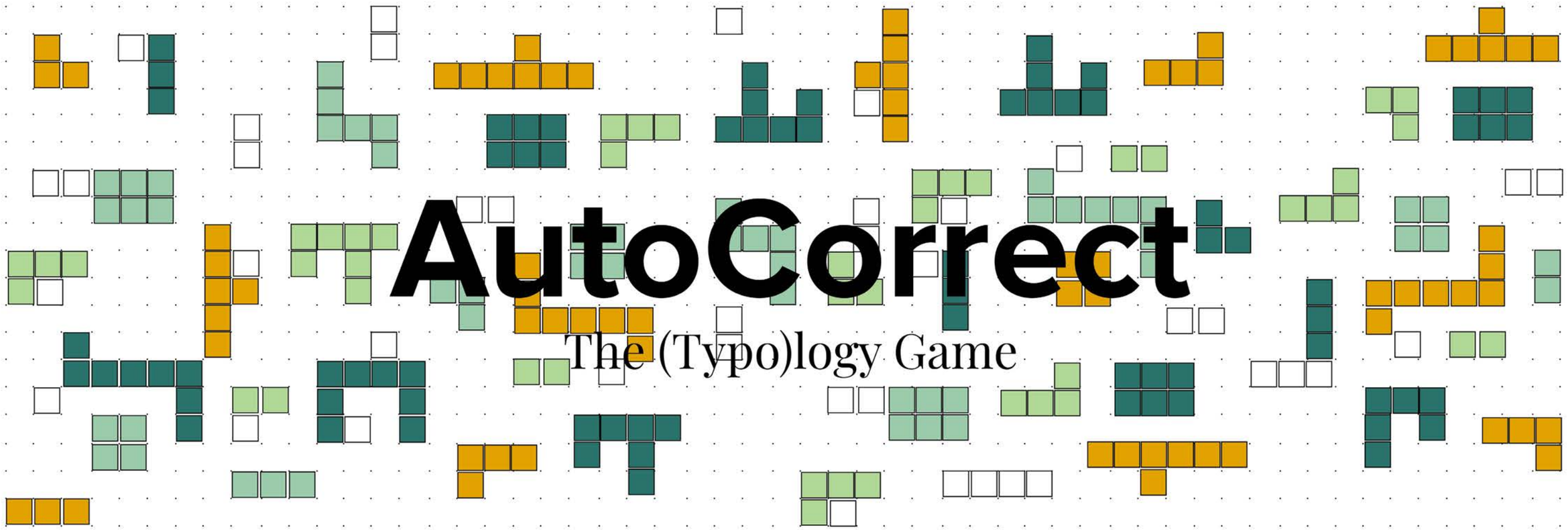


Fig. 6. AutoCorrect Design Game Rulebook (Naidoo 2020)

AUTOCORRECT
THE (TYPO)LOGY GAME

Digital Design Game

01

THEME

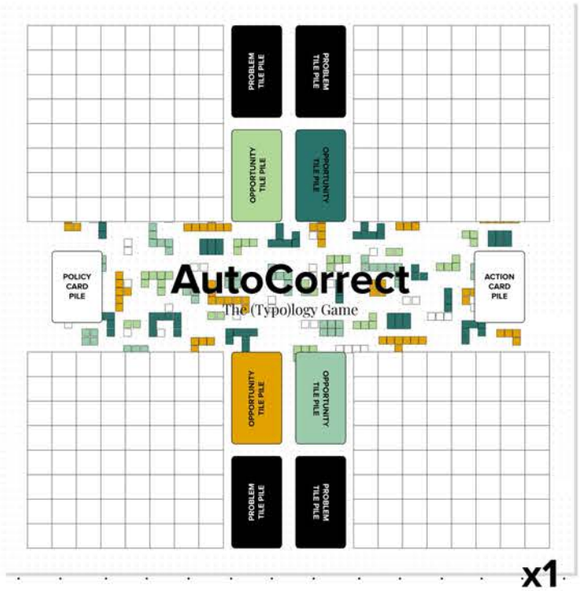
What is the game about?.

AutoCorrect is an architectural game based on the conceptual understanding of the role that different levels of influence have on how school typologies are constructed.

Government policy for public school infrastructure provide you with the building patterns for your school typology and external factors guide your actions on how you construct those building patterns together.

Fig. 7. AutoCorrect Design Game Rulebook (Naidoo 2020)

TOOLKIT

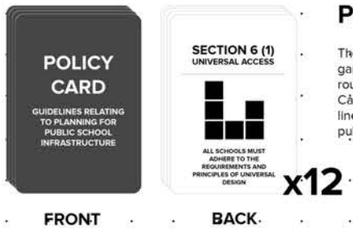


x1

GAME BOARD

Each player constructs their school typology within their quadrant. Each quadrant represents a different context.

x30 x12 x6



x12

FRONT BACK

POLICY CARD

There are 12 Policy Cards in the game that dictate the number of rounds in the game. The Policy Cards represent the different guidelines within government policy for public school infrastructure

ACTION CARD

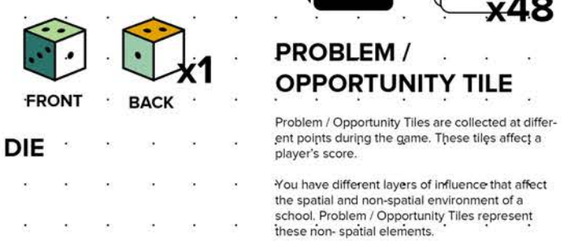
There are 3 types of Actions Cards in the game.
The Action Cards play an individual role in each player's construction of their typology. This card represents the external factors from a school context that affect the educational environment.

x54 x54 x54 x54

BUILDING BLOCKS

Each player uses an individual colour set of building blocks to construct their school typology.

You have different layers of influence that affect the spatial and non-spatial environment of a school. Building blocks represent these spatial elements.



x1

DIE

x48

PROBLEM / OPPORTUNITY TILE

Problem / Opportunity Tiles are collected at different points during the game. These tiles affect a player's score.

You have different layers of influence that affect the spatial and non-spatial environment of a school. Problem / Opportunity Tiles represent these non- spatial elements.

02

OVERVIEW

What happens during the game

- During the game, players of 2-4, will all be constructing their school typology on their quadrant of the game board.
- All players will be placing the same building pattern each round, but in different positions according to their individual Action Card drawn.
- Each player will individually be trying to fill each open space on their quadrant with a Building Block or Opportunity Tile.
- When a player can not complete an action, they accumulate a Problem Tile which negatively affects their score at the end.
- The aim, at the end of the game, is for each player to fill as many open spaces on their quadrant and accumulate the least Problem Tiles.

Fig. 8. AutoCorrect Design Game Rulebook (Naidoo 2020)

AUTOCORRECT
THE (TYPO)LOGY GAME

Digital Design Game

03

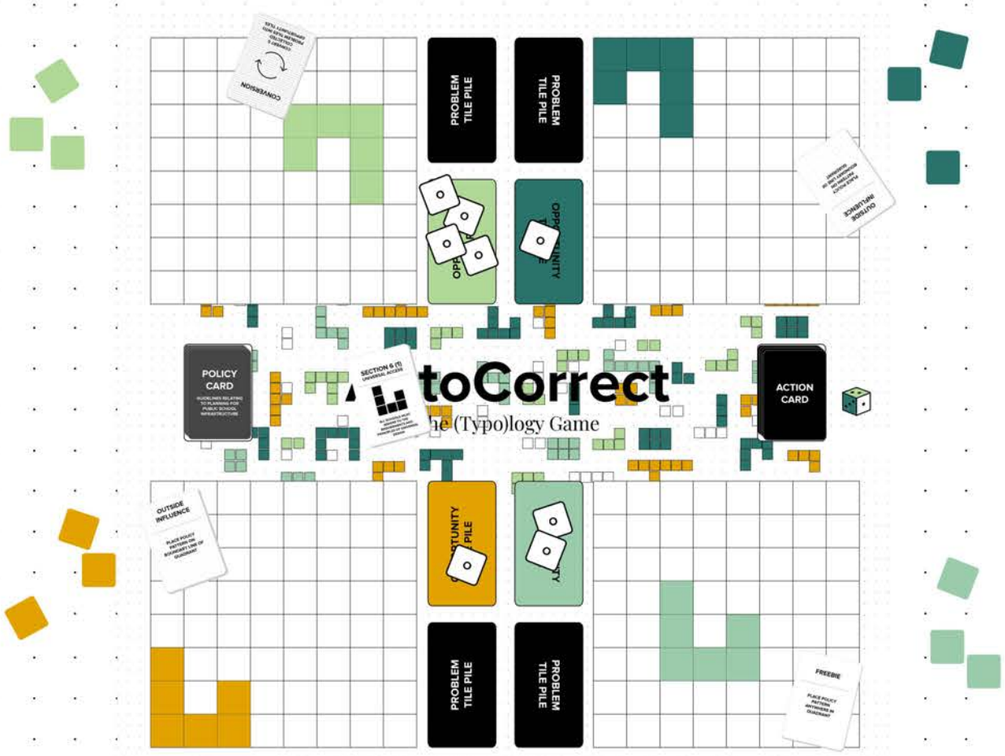
STRUCTURE
Overview of the Game

• The game is constructed of 12 rounds dictated by the number of Policy Cards
• All players apply an individual Action Card in each round
• Each round begins with drawing a Policy Card to see the pattern that each player needs to construct on their quadrant of the board
• Each player constructs the pattern according to the action card they draw, using the coloured Building Blocks for their quadrant on the game board.
• After each round, if the player successfully constructs their pattern on the game board, according to their Action Card, they must collect an Opportunity Tile.
• If a player can not construct their pattern, they must roll the die to determine how many Problem Tiles to collect
• At the end of the 12th round, players can place their collected Opportunity Tiles on the open spaces within their quadrant
• Thereafter if any players have excess Opportunity tiles, they must roll the die to land on a colour of another player, to donate their Opportunity Tiles.
• To determine the winning player, calculate the scores.

04

SCORING
Detereming the winner

The player with the lowest score wins!
Each player calculates their score based on:
Blank spaces on the game board quadrant = 1 Point each
Collected Problem Tile = 2 Points each

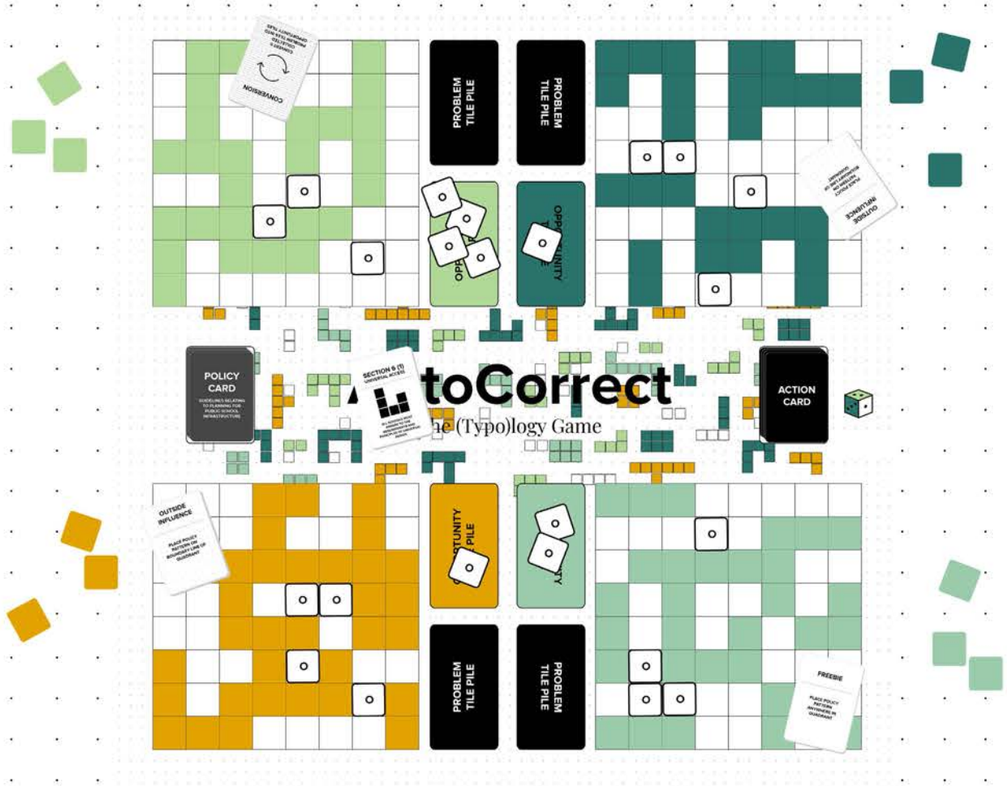


05

ACTIONS
How to Play

• The game begins with each player selecting quadrant of the game board to construct their school typology
• Shuffle each card pile and place them face down on the game board
• To start the round, Player 1 draws a Policy Card and places it face up on the game board
• Each player draws a single Action Card
• Using Building Blocks for your colour quadrant, each player must construct the pattern of the Policy Card according to their individual Action Card
• Each player who successfully constructs their pattern collects 1 Opportunity Tile and places it in their Opportunity Pile on the game board
• Each player who is unsuccessful, rolls the die to determine the number of Problems Tiles to collect and place in their Problem Pile on the game board
• End of round 1
• Round 2-12 repeats the steps of round 1 but rotates clockwise between the players to determine the order of drawing Policy and Action Cards
• End of Round 12
• Each player places their collected Opportunity Tiles from their Opportunity Pile in the open spaces on their quadrant
• Thereafter if any players have excess Opportunity tiles, they must roll the die to land on a colour of another player, to donate their Opportunity Tiles.
• Calculate the scores

Fig. 9. AutoCorrect Design Game Rulebook (Naidoo 2020)



06

CONCEPTUAL BACKGROUND

The thought process behind the game

If you follow the Government's Policy in a vacuum, with no external influence from an Action Card, each pattern can be constructed to result in all spaces on the quadrant being filled by a Building Block. However, in this scenario, you still collect Opportunity Tiles at the end of each successful round, but due to how you constructed the school typology, there is no space in your quadrant to place those opportunities. Therefore , opportunities are detached from your constructed school typology.

The outcome of having multiple players constructing the same policy pattern according to different actions results in different typologies. This outlines how vague and spatially undefined policy for public school infrastructure is.

Policy states that all schools should be made up from the same basic infrastructure, but the game highlights that each school is affected by external factors that either hinder or promote that educational environment.

The ability to convert Problem Tiles into Opportunity Tiles, highlights the potential of these school environments to enhance their situation to contribute to the holistic development of their school.

Fig. 10. AutoCorrect Design Game Rulebook (Naidoo 2020)

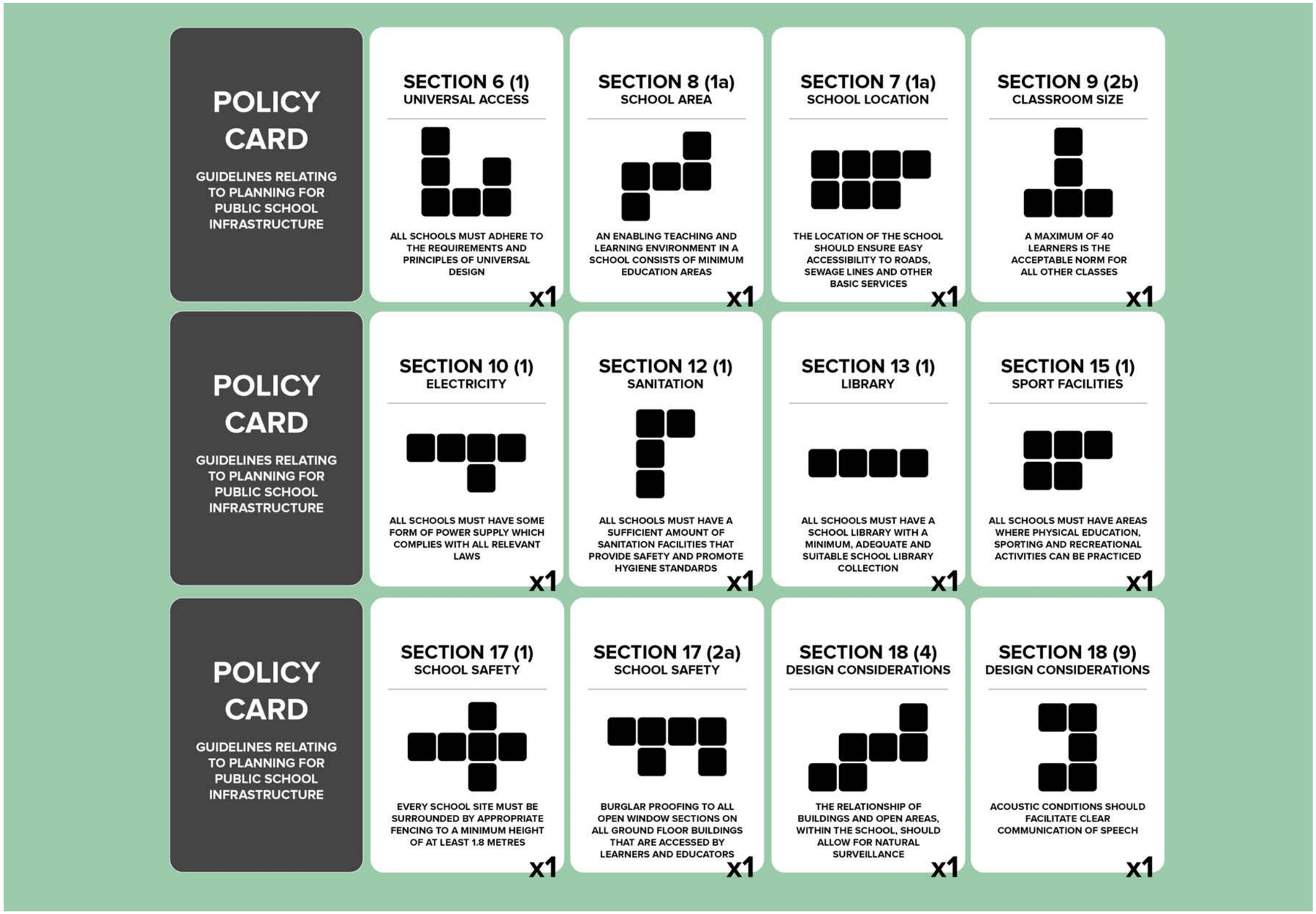


Fig. 11. AutoCorrect Design Game Policy Cards (Naidoo 2020)

AUTOCORRECT
THE (TYPO)LOGY GAME

Digital Design Game

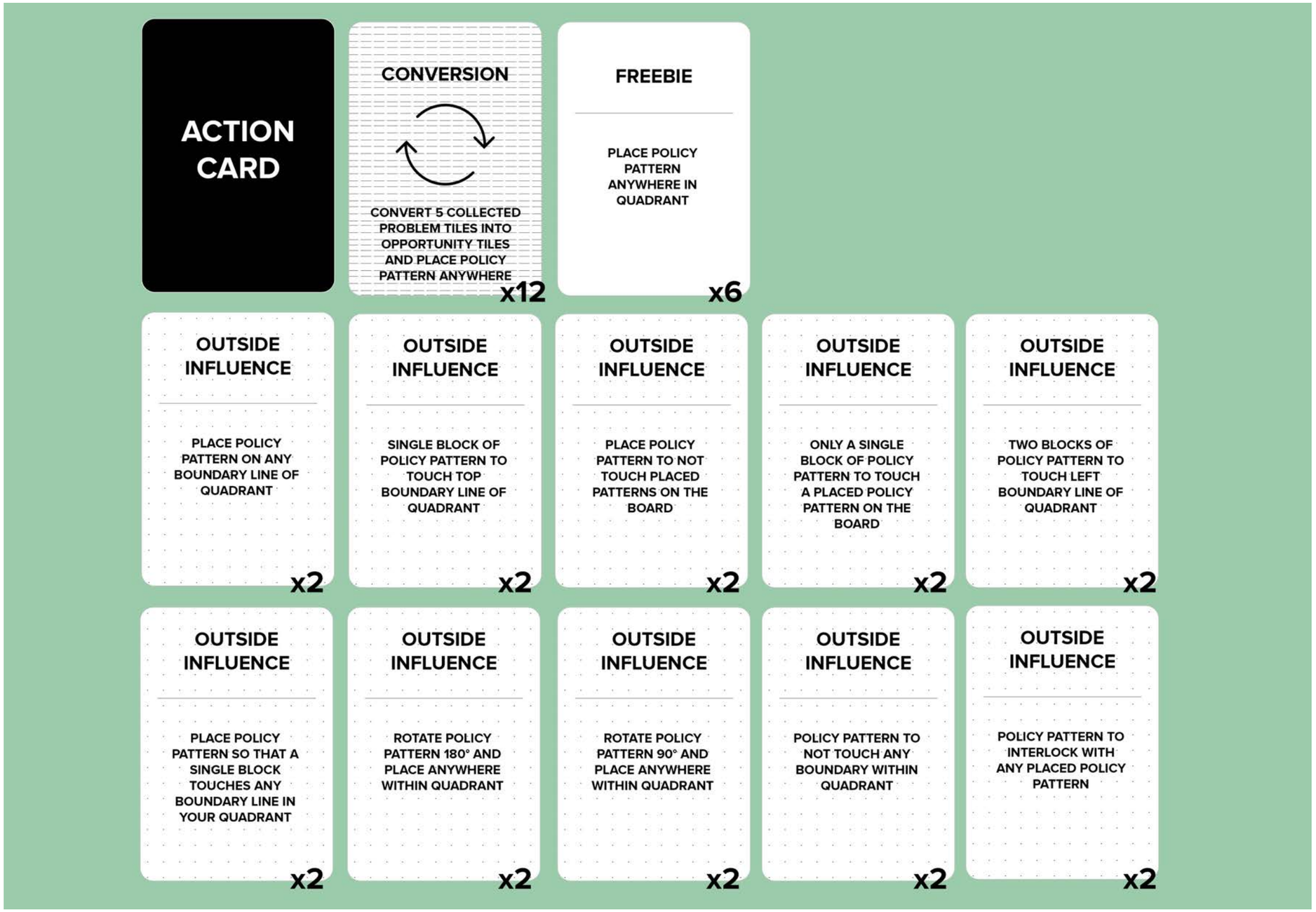


Fig. 12. AutoCorrect Design Game Action Cards (Naidoo 2020)

APPENDIX 2.E

2.D

PERSONA
Digital Design Game

PERSONA
Digital Design Game

Digital Design Game: Persona	
Creation of Design Game	
Format: Digital or Analogue Game	Digital
Intention: Which part of the design process do I need assistance with through co-design	The inability to actively engage with learners from Tsako Thabo has reduced the qualitative concerns of the dissertation. User experience and the social and psychological quality of the programme has lacked consideration within the dissertation. The intention of the design game is to contribute to understanding the user experience in relation to the programmatic considerations. Failure to successfully get in contact with learners from Tsako Thabo, has resulted in the consideration of role play. Roleplay is a useful method to engage in participation. It can provide a voice for those who are not generally heard or considered in the design process (Hamdi 2010:74). Selected participants for design game play have been chosen from a group of students who have previously engaged with the site and users and are therefore familiar with the context.
Precedent	-
Adaptation for research focus	User personas were created from collating collected primary data from interviews on site.
Challenges	The creation of the design game did not present any major challenges and was easily created in digital format using Google SlidesTM without an excessive amount of time taken

Design Game Rule Book	
Design Game Title	Persona
Design Game Objective/Overview	Understand the implications of programme on user experience of the site through role play
Platform for Game Play	Google SlidesTM- for visual and physical interaction with game elements Google MeetTM- for voice communication during game play
Game Pieces	•User profile cards •Developed programme layout diagrams on a site plan (imported as a jpeg. into Google SlidesTM) •User scenario questions for each round: *Where would you be most active on site during school hours?* *Where would you be most active on site out of school hours?* *Where would you be most active on site during the evening?* *Where would you feel the safest on site?* •Coloured tokens to track user decisions (shape tool using Google SlidesTM)
Number of players	4-6 Participants
Duration of play	45 minutes
Game Play	• Researcher introduces game objective and overview to participants • Each participant selects a user profile card to roleplay as that character during the game • A colour token is allocated to the corresponding user profile to track decisions made during game play • The facilitator runs through the programme diagram to orientate the participants • The game is played in rounds. Each round a scenario is presented to the user/participant • The user/participant then places their coloured token on the programme site plan • Discussion amongst participants and facilitator after each round to understand user decisions
Researchers role during game play	Facilitator

Application of Design Game	
Participants	4 Participants with a background in Urban Citizenship and experience with Tsako Thabo Secondary School, South Africa, were selected for design game play. These participants were selected to bridge the lockdown gap, due to the COVID-19 pandemic, that prevented contact with participants from the case study school. Participants took on user personas, developed based on interaction with user groups on site over a two year period, to guide their decisions during game play
Participation	Throughout game play, players were able to place themselves in the position of the user profiles to guide their decisions. The game play, however, did not lend itself to stimulate discussion amongst participants but rather was directional between researcher and participant. However communication was fruitful throughout game play
Challenges	The base layer showing the plan could not be locked down on Google SlidesTM. Therefore, when participants selected their colour token to place on the plan, in some cases that base plan shifted.
Opportunities	The digital platform of Google SlidesTM allowed the opportunity to easily duplicate a slide to include extra questions that were not considered before hand
Documentation of game play	To document the design game application, the researcher sets up the google meeting and shares their screen with the google slides. Thereafter, they can record the session using the google meet option which then gets backed up to the linked google drive. This is beneficial for documenting the conversation had each round. Physical documentation was achieved after each round using the google slides.
Outcomes	Participants found the design game easy to engage with and were able to take on the user personas with ease
Contribution to the design process	Design game play highlighted a shortcoming in the programmatic layout that clustered programme therefore limited movement throughout the site and negatively contributed towards creating inactive areas on site

Fig. 1. Persona cards (Naidoo 2020)

APPENDIX 2.F

2.F

STAKEHOLDER
Digital Design Game

Digital Design Game: Stakeholder	
Creation of Design Game	
Format: Digital or Analogue Game	Digital
Intention: Which part of the design process do I need assistance with through co-design	The intention of the game was to collectively involve participants in how we can potentially redefine the built environment of the classroom
Precedent	The game mechanics were influenced by @Stake (Engagement Lab @ Emerson College 2020) - A game from EngagementLab at Emerson College intended to stimulate discussion amongst participants
Adaptation of precedent for research focus	User personas, participants hidden agendas during game play and the questions per round were adapted to directly relate to the the users within Mamelodi East and questions pertaining to redefining the classroom
Challenges	Converting the format of the game into a medium that would be user friendly for the participant group was an initial challenge. Using Google SlidesTM as a digital platform to host the game was successful, however it was limiting with the tools available such as a timer needed for game play

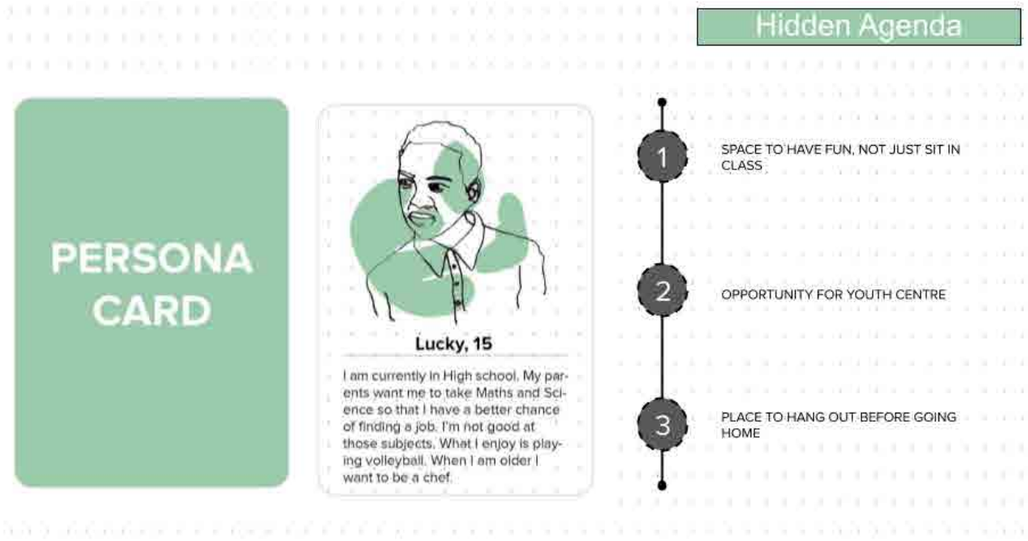


Fig. 1. Stakeholder design game player card (Naidoo 2020)

STAKEHOLDER
Digital Design Game

Design Game Rule Book	
Design Game Title	Stakeholder
Design Game Objective/Overview	Stakeholder is a role play game based on collective democratic decision making (Engagement Lab @ Emerson College 2020) . Throughout the game players voice their opinions and solutions to issues within the built educational environment. Participants provide proposals that redefine an alternative learning environment that is cognizant of varied learning styles as well as the use for community.
Platform for Game Play	Google SlidesTM- for visual interaction with game elements Google MeetTM- for voice communication during game play
Game Pieces	• Slide sequence explaining game play • Slide showing questions per round • Slide to send to participants with their hidden agenda and persona • Timer
Number of players	4-6 Players dependent on the number of user profiles
Duration of play	Introduction to the game: 8-10 minutes Each Round of Play: 10-15 minutes
Game Play	**1. Introduction** • Introduce game objective to participants • Highlight theme for the game session (ie. The focus of this session is on the 'classroom' spaces of public schools in Mamelodi East) • A question is presented each round for players to find a solution to, that resolves the issue • Each player receives a persona card to roleplay as a specific character. Each player is to take on the qualities of their character when making decisions throughout the game • Along with the persona characteristics, each player has a hidden agenda each round. Your goal is to present a solution to the presented issue and integrate your hidden agenda into the solution • Each round is guided by a player whose role is the decider. The decider selects the winning player from the best proposal. The winner receives all the coins from the pot • After a winner is selected, the hidden agendas are revealed. If agendas are included in winning proposal, that player earns bonus coins • The winner of the round, becomes the Decider in the next round. The player with the most coins at the end of three rounds wins! • Start Round 1 (Researcher as the Decider for Round 1). Each player starts with 200 coins and the house pot holds 300 coins • Give each player their persona card with hidden agenda. Allow them to introduce their persona (but not their hidden agenda) **2. Think** • In this phase participants will have 60 seconds to think of a proposal that addresses the question for the round *Round 1: How can we adapt the built environment of the classrooms to accommodate varied learning styles?* *Round 2: How can the built environment of the classroom be adapted for activities other than learning?* **3. Pitch** • Now each participants will have 60 seconds to pitch their proposal to the group **4. Deliberate** • The Decider leads an open discussion with all participants about their proposals **5. Double Down** • Each participant has the option to spend 50 coins to buy an extra 30 seconds of time to add to their proposal or question another participant **6. Decide** • The round Decider selects the best proposal and winner of the round • Participants reveal their hidden agendas to see who will receive a bonus 100 coins for having their agenda in the winning proposal **7. Score** • Which ever participant is in the lear will go on to be the decider in the next round. • Game play ends after all the rounds have been played (2-3 rounds) (Engagement Lab @ Emerson College 2020)
Researchers role during game play	Facilitate game play and guide players through game play in first round.

Application of Design Game	
Participants	4 Participants with a background in Urban Citizenship and experience with Tsako Thabo Secondary School, South Africa, were selected for design game play. These participants were selected to bridge the lockdown gap, due to the COVID-19 pandemic, that prevented contact with participants from the case study school. Participants took on user personas, developed based on interaction with user groups on site over a two year period, to guide their decisions during game play
Participation	Throughout game play, the game mechanics allowed for a stimulating discussion on the question posed per round. Participants were also prompted to question and challenge each others proposals. This lent itself to a fruitful discussion and opened up a wider thought process regarding the game topic
Challenges	Having to use a YouTubeTM timer on Google SlidesTM was problematic in getting it to play fluidly
Opportunities	The structure of play of the game is clear enough to be able to use the same game mechanics with other themes present in a project. The clear structure maximises time and game output, therefore when time constraints are an issue, this game is particularly useful in achieving a great deal within the timeframe
Documentation of game play	To document the design game application, the researcher sets up the Google MeetTM and shares their screen with the Google SlidesTM open. Thereafter, they can record the session using the Google MeetTM option which then gets backed up to the linked Google DriveTM.
Outcomes	**Round 1:** How can we adapt the built environment of the classrooms to accommodate varied learning styles • Player 1 Proposal: "Classrooms become open to the public on certain days, almost like an open day. It can be repetitive like on Mondays and Wednesdays or Saturdays. That would encourage people to move through the school. To encourage more people to attend, you can have sports days or market days on the same days community members can come in so that there are many different people interacting with the school and learning differently". • Player 2 Proposal: Agreed with Player 1's proposal and added "Spaces to allow for both formal and informal learning. The spaces should be multifunctional, where we use them as learning spaces but also social spaces. Maybe to host a wedding or church event in there as well" • Player 3: "I think we should have spaces that are adaptable to various purposes and get rid of the boring approach to education. It would be nice to include physically active engaging learning instead of sitting all day listening to the teacher. Spaces that allow me to be physically active as if I'm playing, but at the same time I get to learn something. Maybe the spaces incorporate visual learning and make me transition physically as part of my learning" • Player 4: "I propose to have classrooms that expand beyond their boundaries. Maybe become a form of mobile learning. Having maybe trolleys of knowledge that pass through the school and thy share knowledge and learning. It could be in the form of a kitchen or library that it connects the classrooms with. Events could be linked to these. It could relate to co-curricular activities". **Round 2**: How can the built environment of the classroom be adapted for activities other than learning? • Player 1: "Have market days. It would be interesting for the classrooms to be adapted in ways that can open up to the street and to the internal courtyards so it invites people in and catches peoples attention as they walk past. Perhaps there can be live music stations. Places where you can buy food and come and sit down. It becomes a nice social space. So its an attraction for the community and for students to come in and have a vibe, spend time with their family and friends" • Player 2: "Multifunctional spaces that can accomodate different activity throughout. It can be dedicated spaces for music and sport but within those spaces it can change for multifunctionality. It has that element of adaptability. It must accomodate different qualities like say a sacred space vs a fun space" • Player 3: "Im thinking how it can be to incorporate many more people. So maybe the current boundaries can be extended or they could be made open. The boundary of the classroom could be open or closed when needed. It could be adapted to accomodate booths for various people to use. Expand the connections to the outdoors. Maybe the surrounding neighborhood to be connected in a way that supports physical engagement with the school"
Contribution to the design process	Three themes emerged from the collective discussion regarding the redefinition of the classroom: adaptability/multifunctionality, social activity of learning and knowledge beyond the boundary

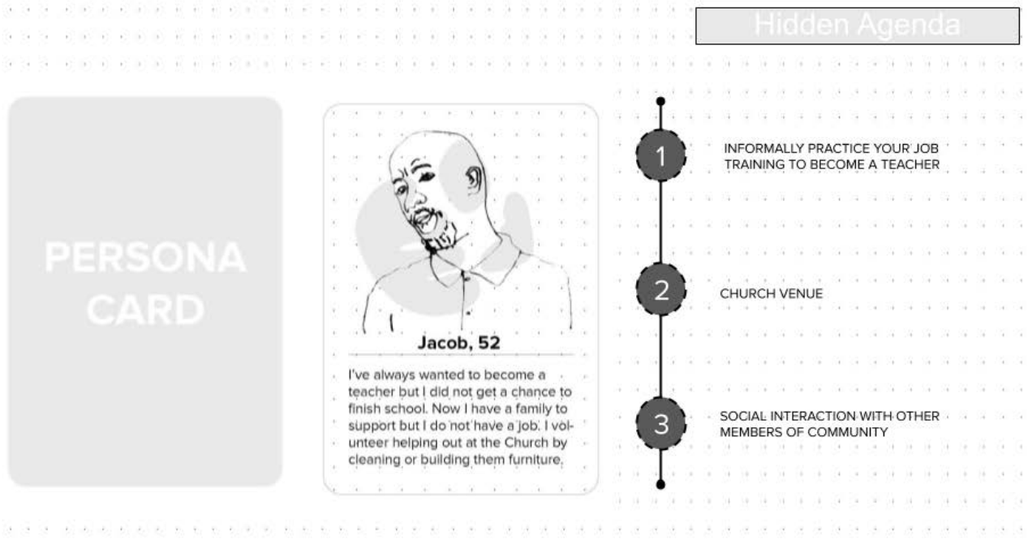


Fig. 2. Stakeholder design game player card (Naidoo 2020)

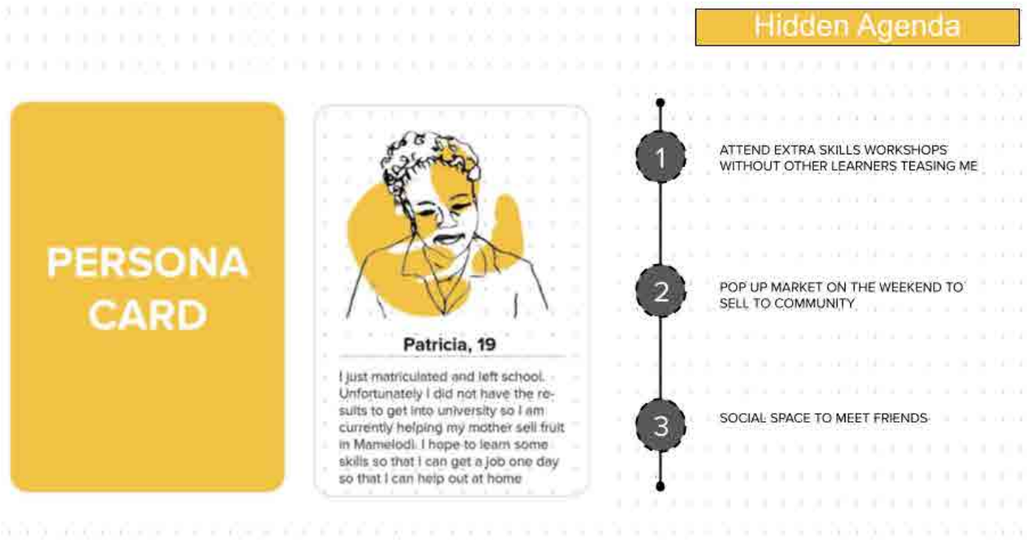


Fig. 3. Stakeholder design game player card (Naidoo 2020)

Stakeholder

Architectural Design Game

Adapting the game @stake to a Master of Architecture Dissertation

1 INTRO 2 3 4 5 6 7

Stakeholder is a role play game based on collective democratic decision making. Throughout the game players voice their opinions and solutions to issues within the built educational environment

Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)

STAKEHOLDER

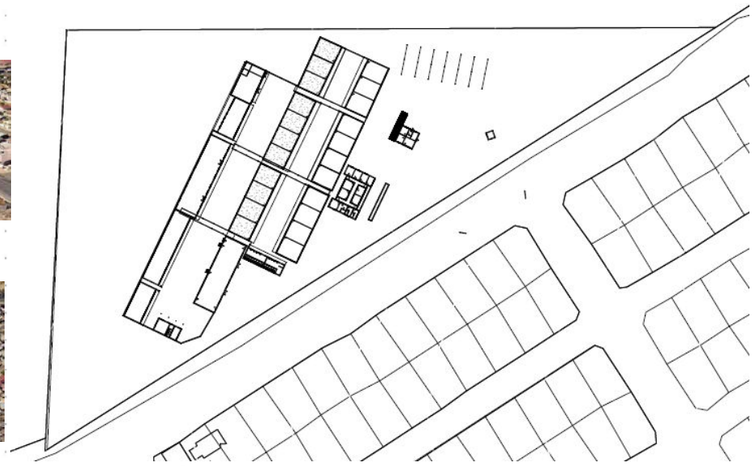
Digital Design Game

1 INTRO 2 3 4 5 6 7

The focus of this session is on the ‘classroom’ spaces of public schools in Mamelodi East

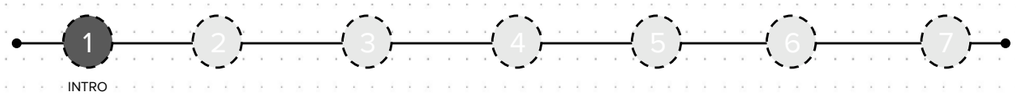
Adapted from https://atstakegame.org/

1 INTRO 2 3 4 5 6 7



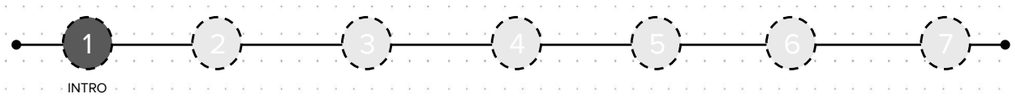
Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)



A question is presented each round for players to find a solution to, that resolves the issue

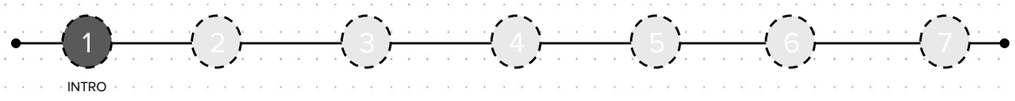
Adapted from https://atstakegame.org/



Each player receives a persona card to roleplay as a specific character. Each player is to take on the qualities of their character when making decisions throughout the game

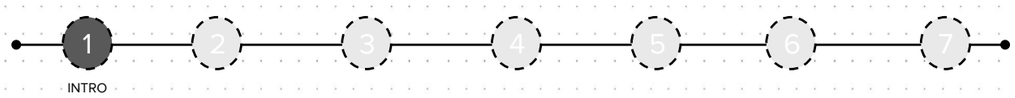
Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)



Along with the persona characteristics, each player has a hidden agenda each round. Your goal is to present a solution to the presented issue and integrate your hidden agenda into the solution

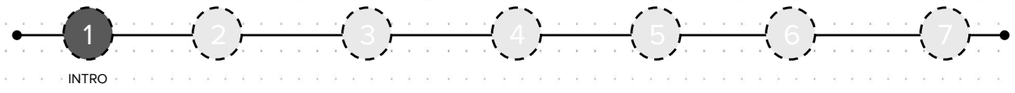
Adapted from https://atstakegame.org/



Each round is guided by a player whose role is the decider. The decider selects the winning player from the best proposal. The winner receives all the coins from the pot

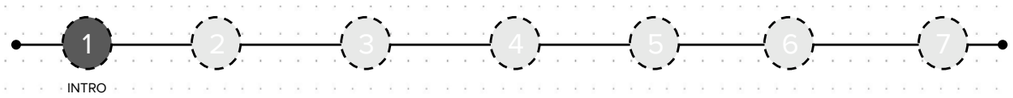
Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)



After a winner is selected, the hidden agendas are revealed. If agendas are included in winning proposal, that player earns bonus coins

Adapted from https://atstakegame.org/



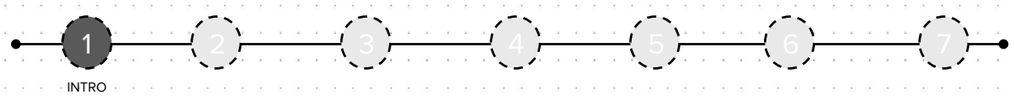
The winner of the round, becomes the Decider in the next round. The player with the most coins at the end of three rounds wins!

Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)

ROUND 1

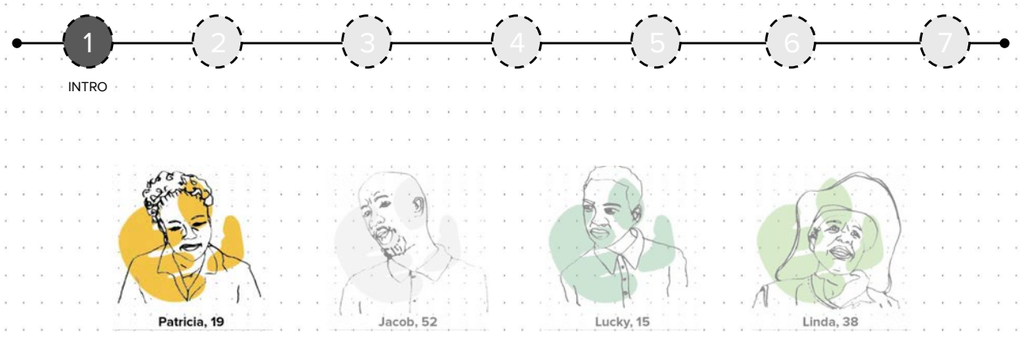
Stakeholder

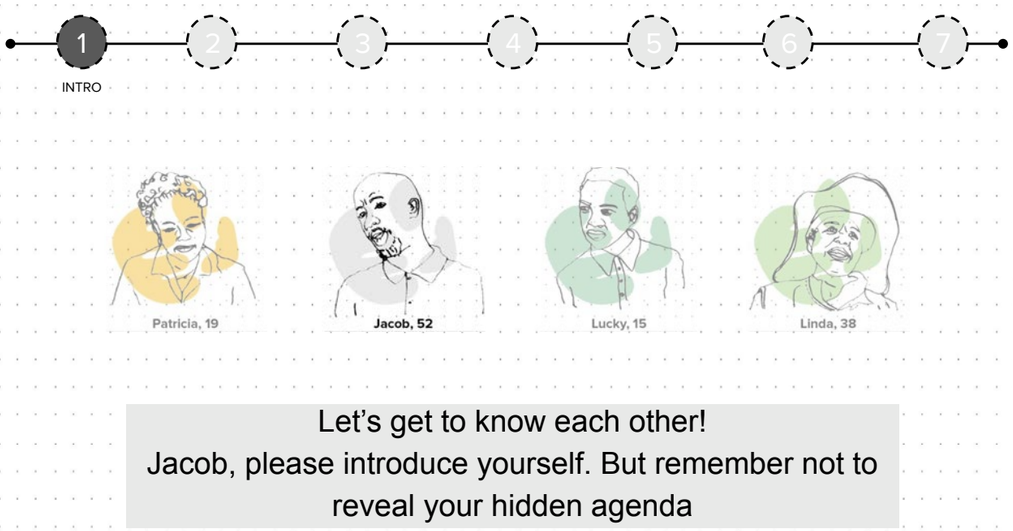


For Round One, I will be the Decider. Everyone have a look at your Persona Card

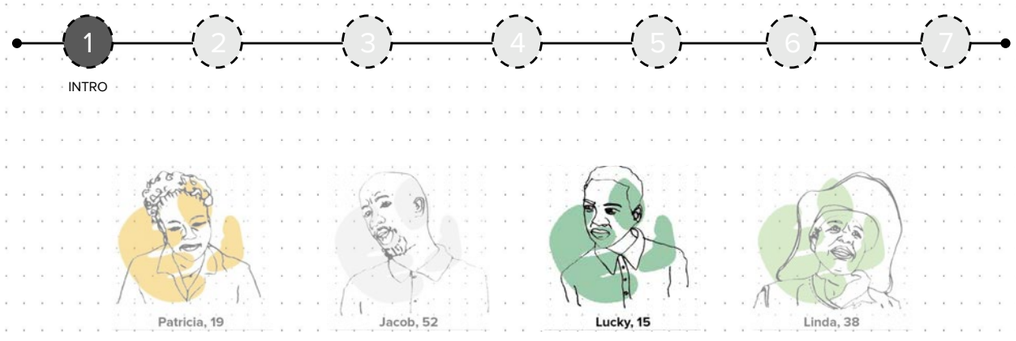
Adapted from https://atstakegame.org/

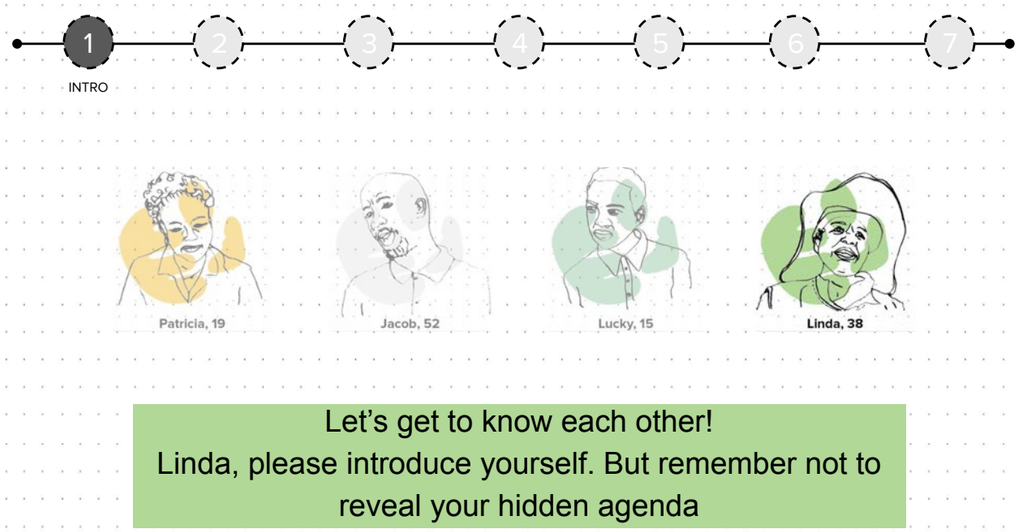
Stakeholder design game process of play (Naidoo 2020)





Stakeholder design game process of play (Naidoo 2020)





Stakeholder design game process of play (Naidoo 2020)

1 2 3 4 5 6 7

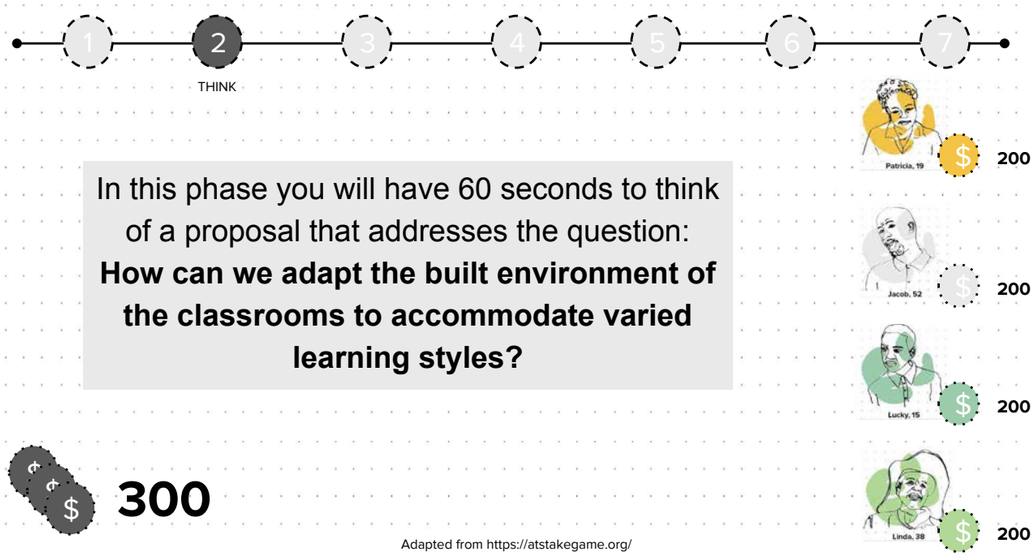
THINK

Now let’s move onto the problem solving phase!

Adapted from https://atstakegame.org/

1 2 3 4 5 6 7

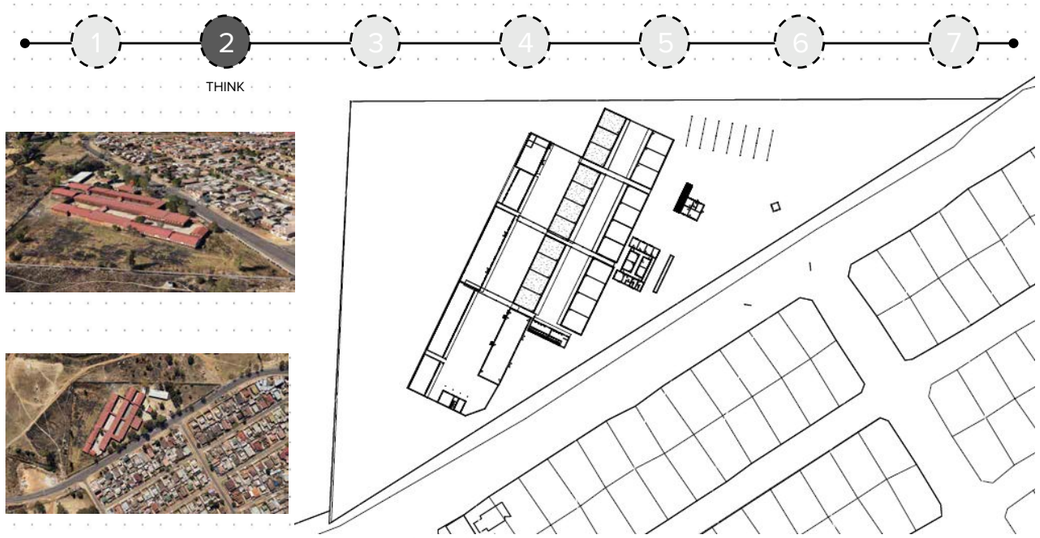
THINK



In this phase you will have 60 seconds to think of a proposal that addresses the question:
How can we adapt the built environment of the classrooms to accommodate varied learning styles?

Adapted from https://atstakegame.org/

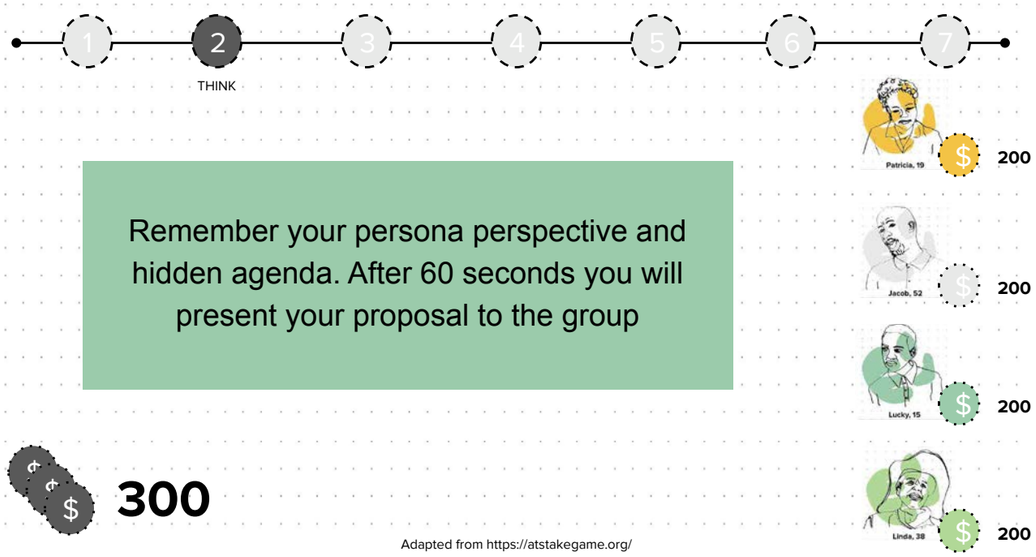
Stakeholder design game process of play (Naidoo 2020)



Adapted from https://atstakegame.org/

1 2 3 4 5 6 7

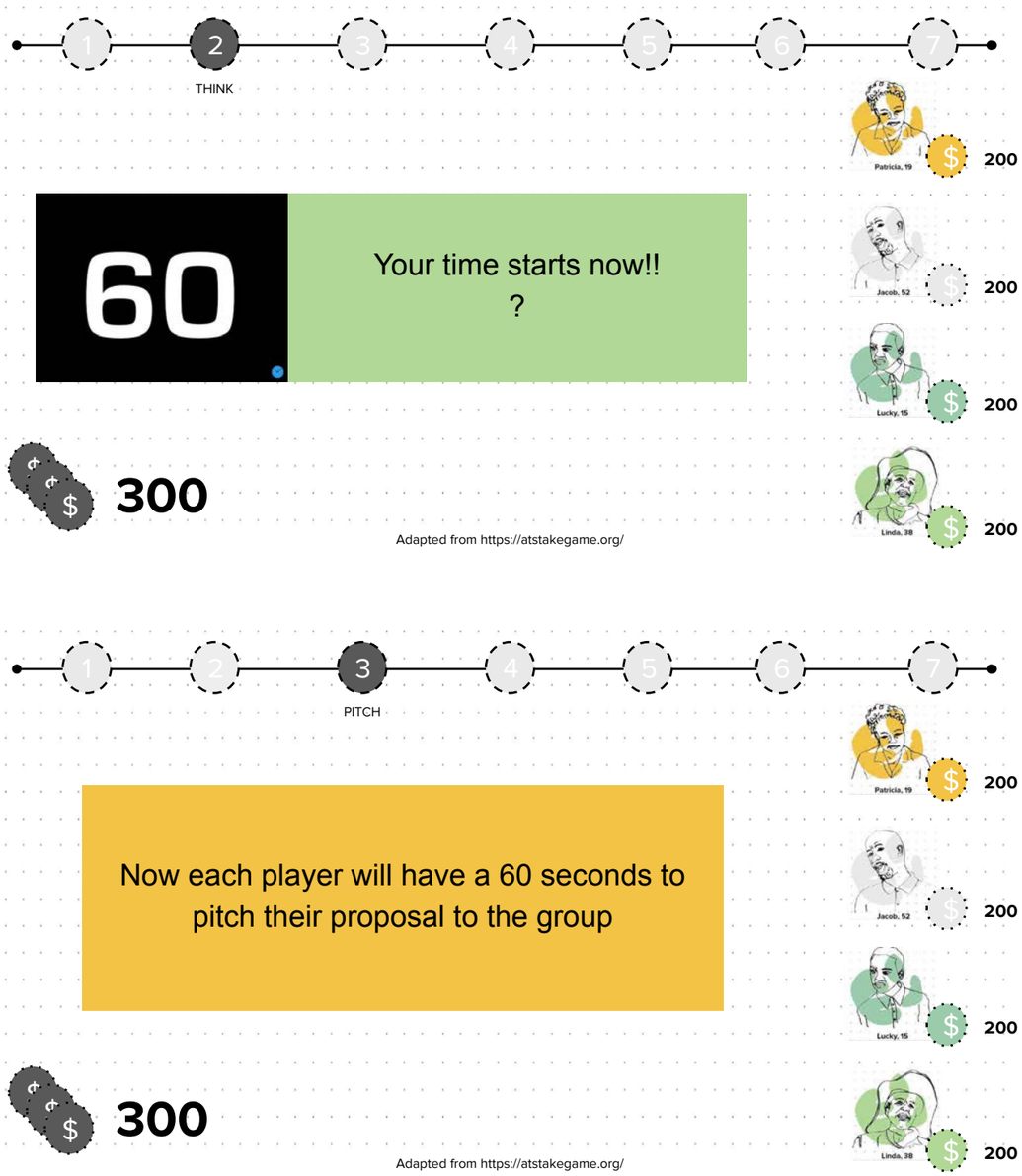
THINK

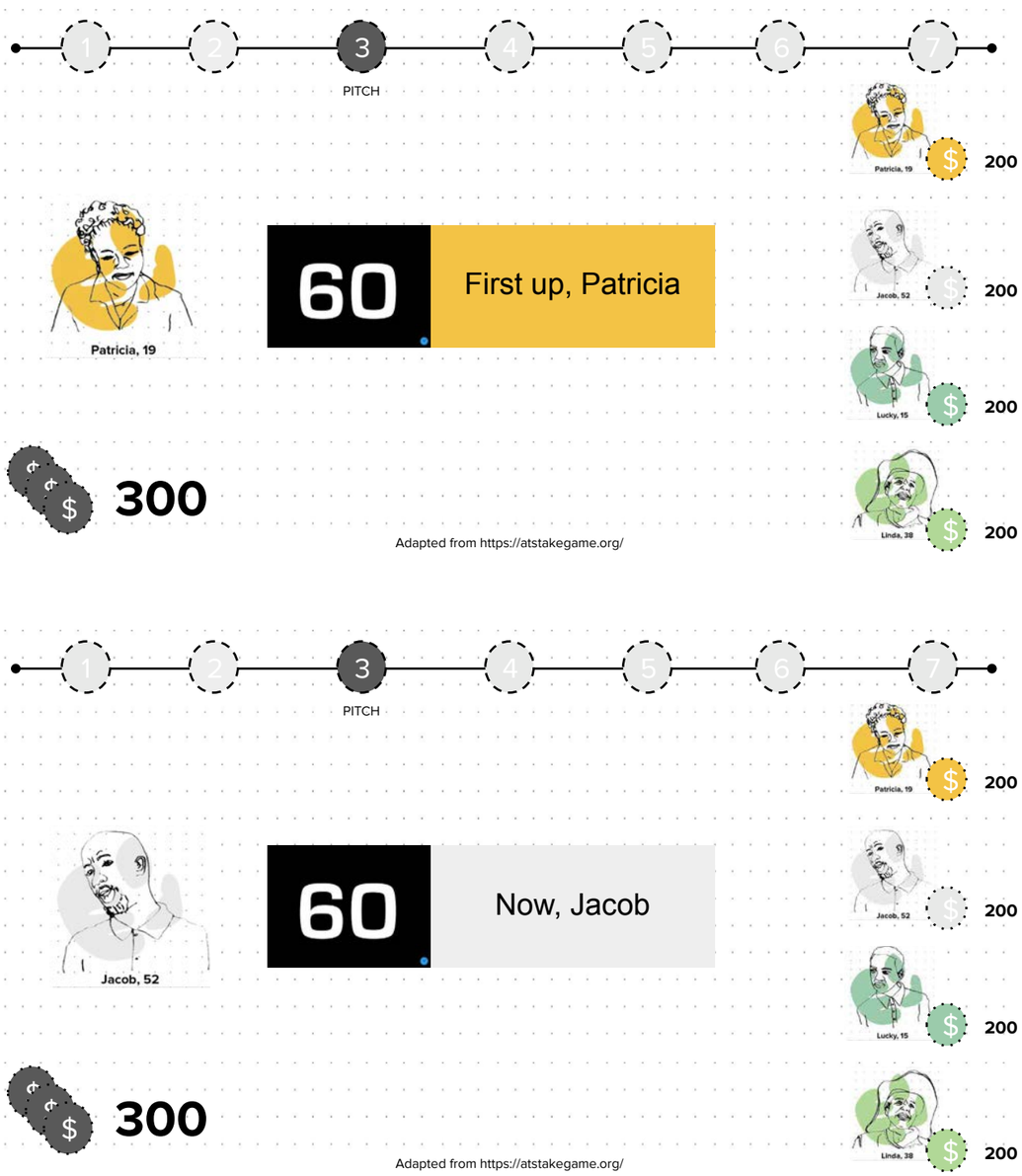


Remember your persona perspective and hidden agenda. After 60 seconds you will present your proposal to the group

Adapted from https://atstakegame.org/

Stakeholder design game process of play (Naidoo 2020)





Stakeholder design game process of play (Naidoo 2020)

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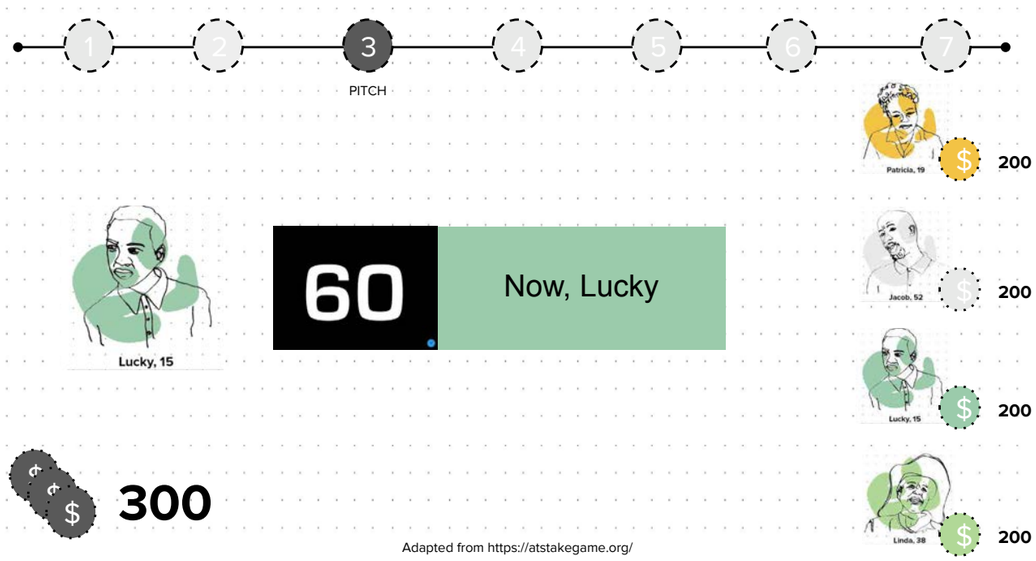
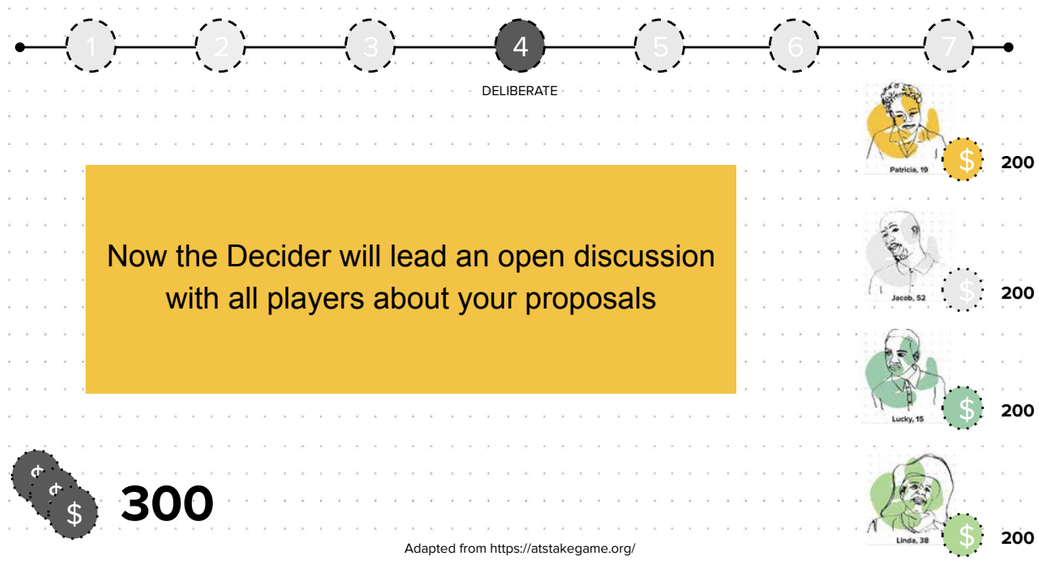
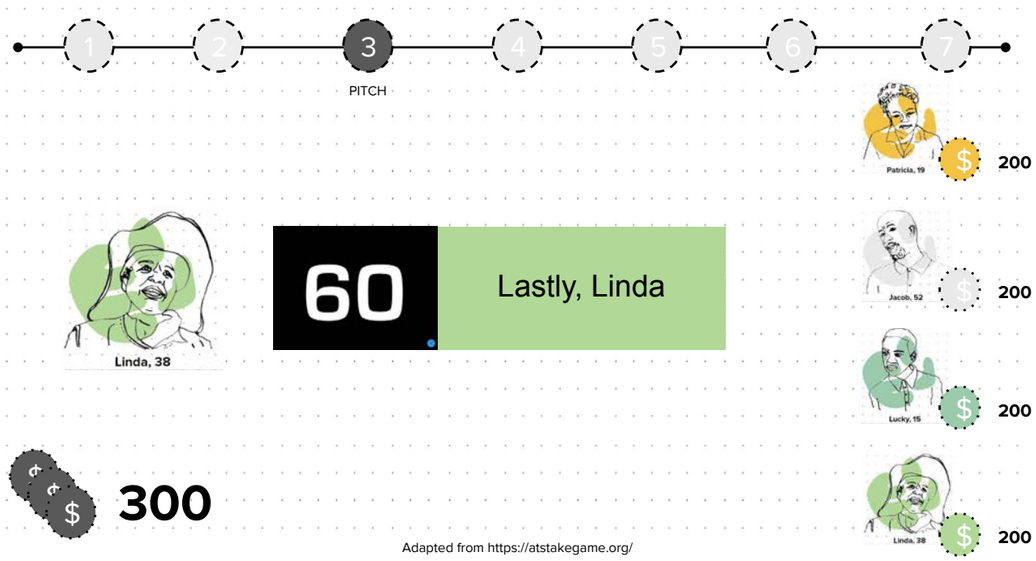
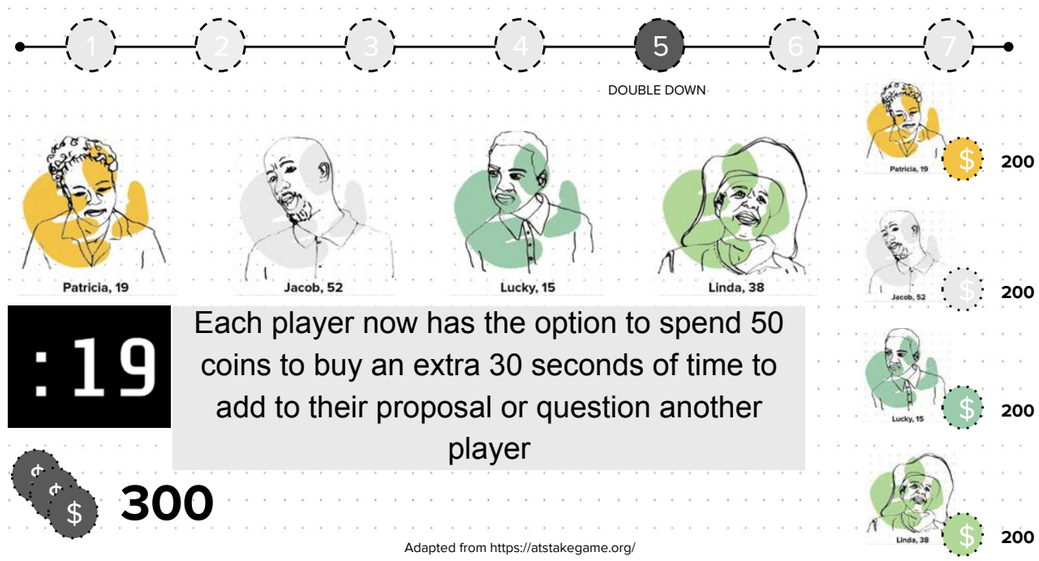






Stakeholder design game process of play (Naidoo 2020)



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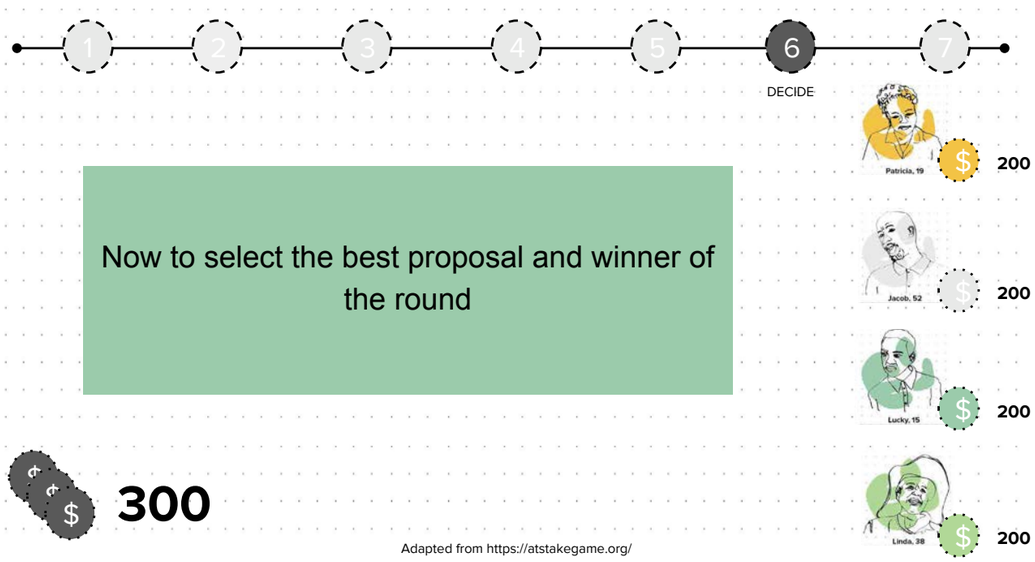
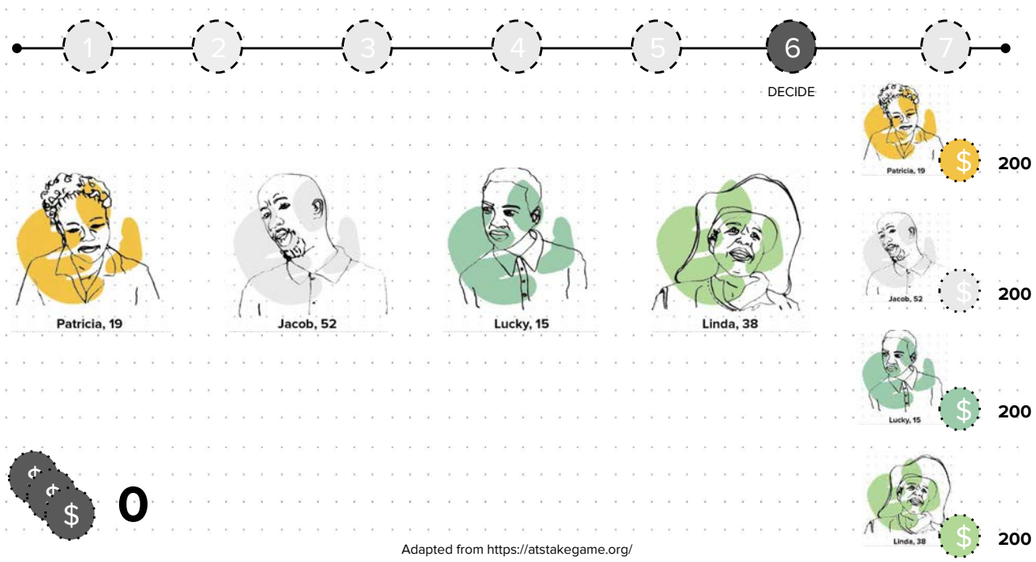
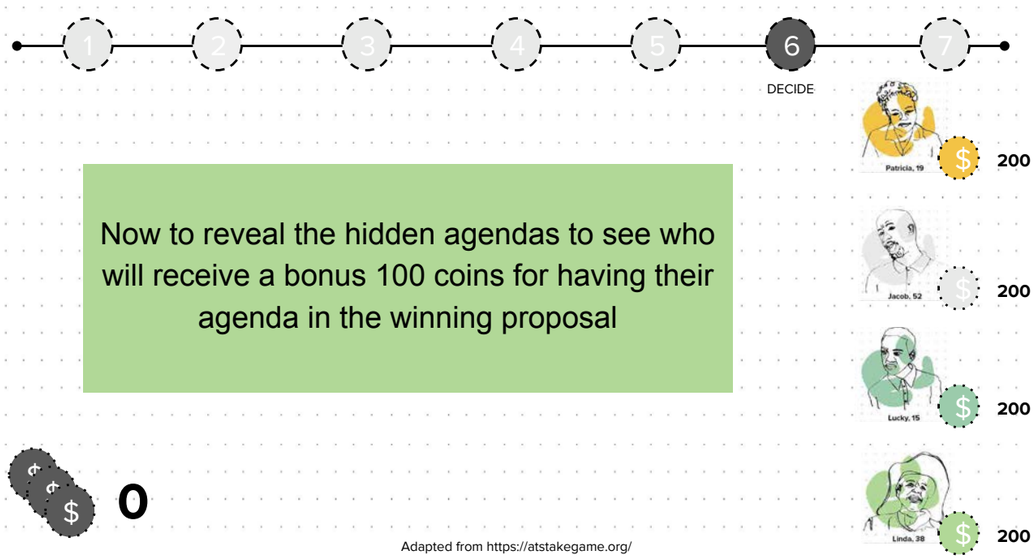
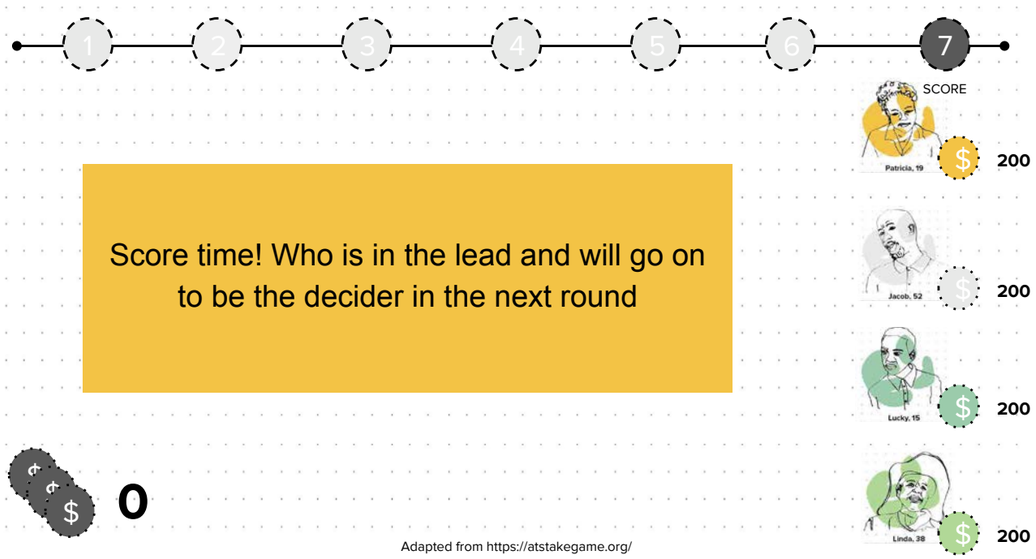








Stakeholder design game process of play (Naidoo 2020)

Stakeholder design game process of play (Naidoo 2020)

APPENDIX 2.G

2.G

INTERFACE
Digital Design Game

Digital Design Game: Interface	
Creation of Design Game	
Format: Digital or Analogue Game	Digital
Intention: Which part of the design process do I need assistance with through co-design	A part of the dissertation was repositioning the school environment within Mamelodi East as publicly accessible. Due to this, there needed to be cognizance of the interaction between varying degrees of public and private. The game intention is to collectively define the articulation of these urban edge interfaces that deal with the presented conditions
Precedent	-
Adaptation of precedent for research focus	-
Challenges	Finding an appropriate platform that would be accessible to all participants

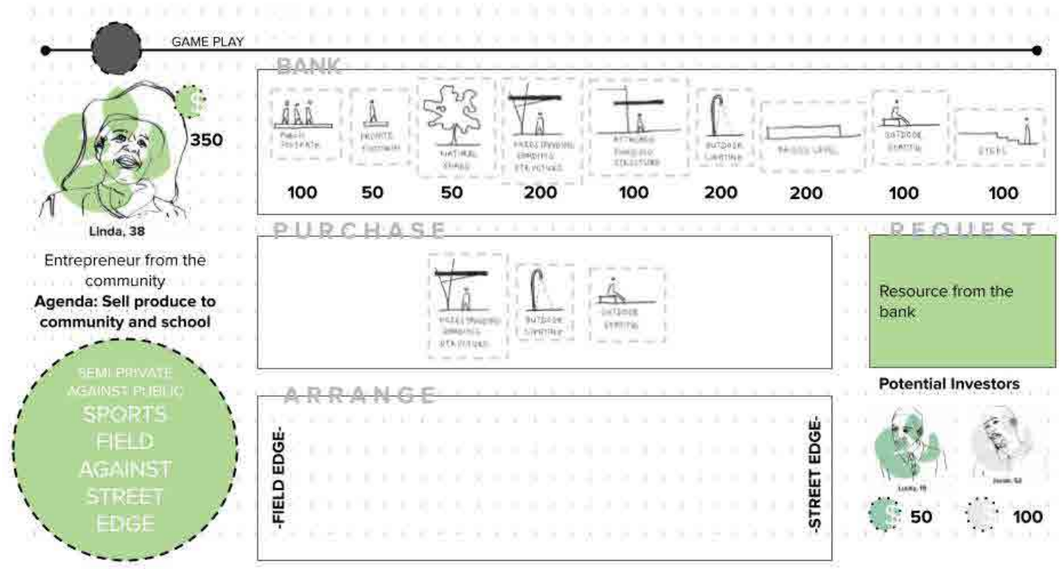
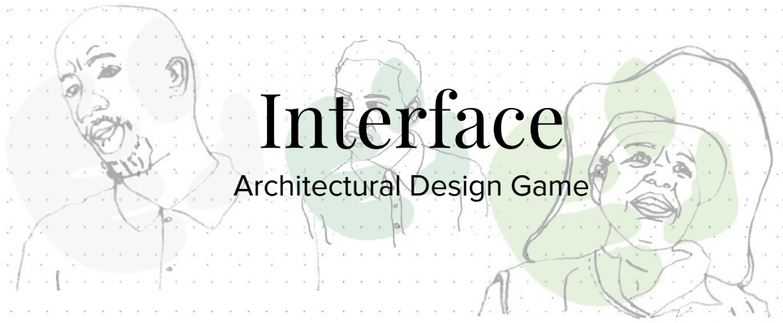


Fig. 1. Interface design game application (Naidoo 2020)

Design Game Rule Book	
Design Game Title	Interface
Design Game Objective/Overview	Interface is a design game based on constructing the urban edge interface between a school and its context. Participants take on the personas of affected stakeholders to guide decisions during game play
Platform for Game Play	Google SlidesTM- for visual and physical interaction with game elements Google MeetTM- for voice communication during game play
Game Pieces	• Slide sequence explaining game play • Slide setting up game interface
Number of players	4 Participants
Duration of play	Introduction to the game: 8-10 minutes Each Round of Play: 20-25 minutes
Game Play	**1. Introduction** • Introduction of design game objective to participants • A specific urban edge condition is presented for which participants must construct the interface qualities • Throughout the game, each participant has an agenda that directs their decisions • Participants receive a loan from the bank with an allocated budget to construct their urban edge • Participants spend their budget on urban edge qualities from the bank • During game play the other participants can invest some of their budget in the lead participant of the round's proposal • The player who pitches the best urban edge proposal has their loan converted to a donation by the bank • Each round is guided by the number of participants • In each round, a player guides the session with the remaining players acting as potential investors **2. Agenda** • All participants are given an agenda and persona to guide their decisions during game play **3. Context** • Round 1: Participant 1 is allocated a site condition that they have to consider the urban edge condition for **4. Purchase** • Participant 1 has the opportunity to spend their budget to purchase urban edge interface qualities from the bank **5. Negotiate** • Participant 1 can thereafter negotiate with participants 2-4 to invest in their urban edge site. If investors see the proposal aligning with their personal agendas, they have the option to spend a portion of their budget on participant 1's site **6. Arrange** • Now that participant 1 has gathered their interface qualities, they have to arrange them according to how they will sit from the private edge on site to the public edge **7. Request** • Participant 1 can thereafter make a special request from the bank if the bank did not stock a specific urban edge quality that was necessary for the proposal **8. End turn** • Participant 1 ends their turn and the next round begins with a new context location and participant 2 as leader. Therefore, participant 1 becomes an investor in the following rounds **9. Score** A winner is collectively decided by the group according to the participant who effectively spent their allocated funds, was successful in negotiation and whose final proposal best aligned with their persona and agenda
Researchers role during game play	Facilitate game play and guide players through game play in first round.

Application of Design Game	
Participants	4x Social Inclusion Studio (Department of Architecture) Lecturers from Chalmers University of Technology, Sweden
Participation	Throughout game play, the game mechanics allowed for a stimulating discussion. Participants were also required to interact with each other which allowed for a more fruitful game outcome
Challenges	Time constraint was the biggest challenge. The game required in depth thinking from participants and interaction between them to guide decisions, therefore allowing a lengthier window of time would benefit the game outcomes
Opportunities	Having point 7 of game play widens the scope of the game to stimulate creativity from the participant group. Therefore, specific qualities that were not decided beforehand by the researcher can be introduced into the game and incorporated for future applications
Documentation of game play	To document the design game application, the researcher sets up the google meeting and shares their screen with the google slides. Thereafter, they can record the session using the google meet option which then gets backed up to the linked google drive.
Outcomes	Participants were able to interact and engage with their personas to let it guide their decisions. Participants also widened the scope of the game by opening up the site to interpretation and adding on function/scenarios to consider in their decision making process
Contribution to the design process	Articulation of urban edge interface qualities for: Public-Private interaction Semi-public and Public Interaction Public Interaction



Interface

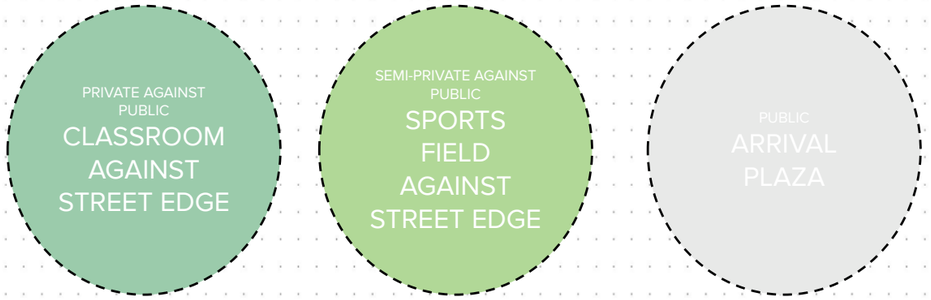
Architectural Design Game

Interface design game process of play (Naidoo 2020)

WHAT IS THE GAME ABOUT

Interface is a design game based on constructing the urban edge interface between a school and its context

GAME OVERVIEW



A specific urban edge condition is presented for which players must construct the interface qualities

Interface design game process of play (Naidoo 2020)

GAME OVERVIEW

Lucky, 15

Learner within the school

Agenda: Feel safe within the school

Linda, 38

Entrepreneur from the community

Agenda: Sell produce to community and school

Jacob, 52

Community member who lives close to the school

Agenda: Place to socialise

Throughout the game, each player has an agenda that directs their decisions

GAME OVERVIEW

Lucky, 15

$ 450

Linda, 38

$ 450

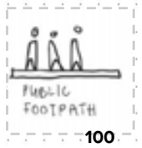
Jacob, 52

$ 450

Players receive a loan from the bank with an allocated budget to construct their urban edge

Interface design game process of play (Naidoo 2020)

GAME OVERVIEW



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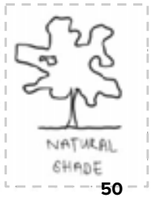

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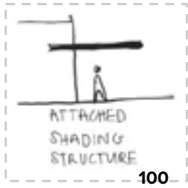
200



100

200

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100

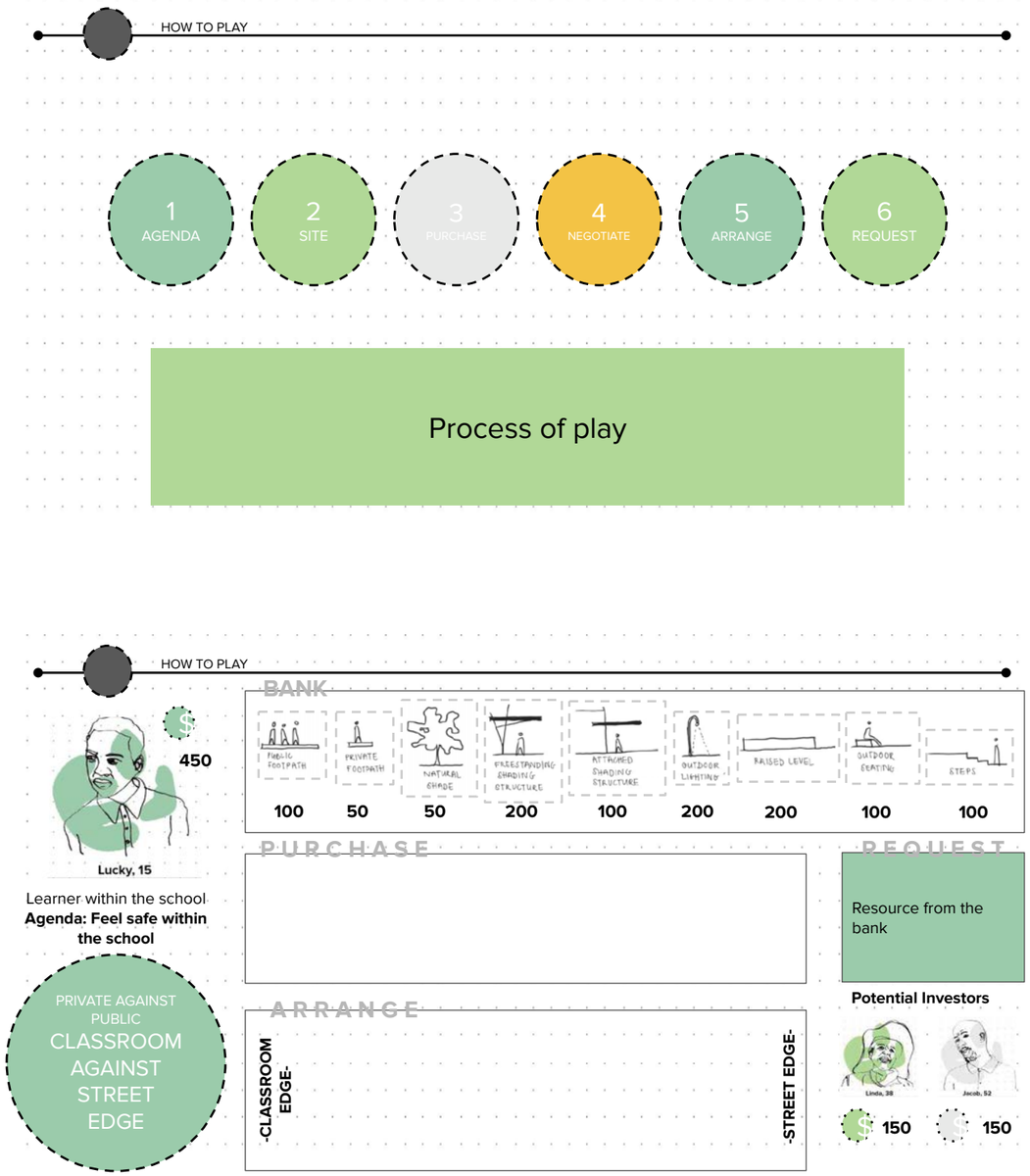
100

Players spend their budget on urban edge qualities from the bank

GAME OVERVIEW

The player who pitches the best urban edge proposal has their loan converted to a donation by the bank

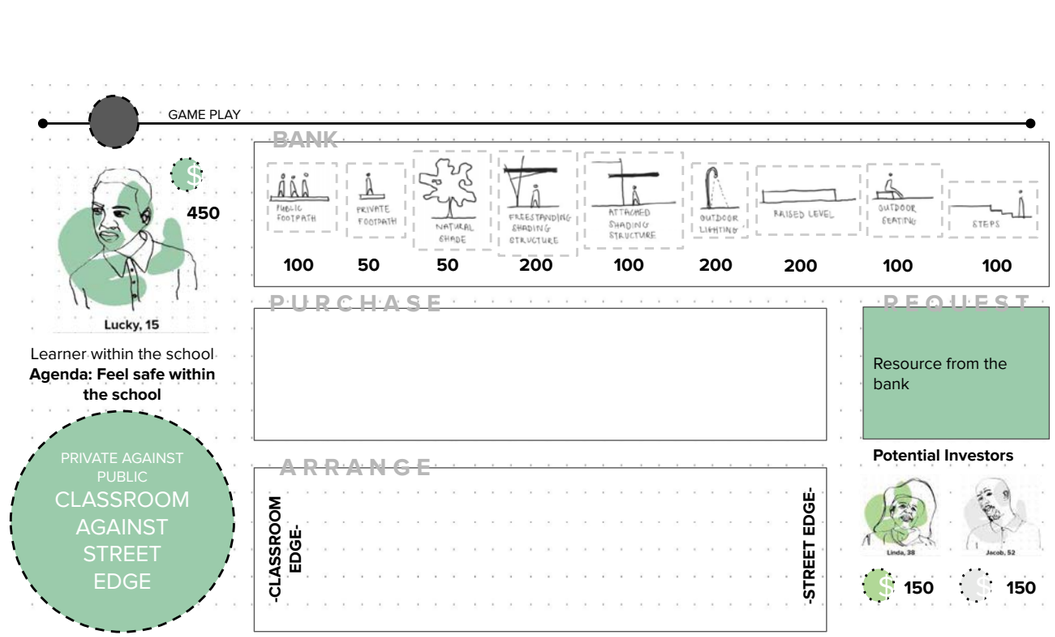
Interface design game process of play (Naidoo 2020)



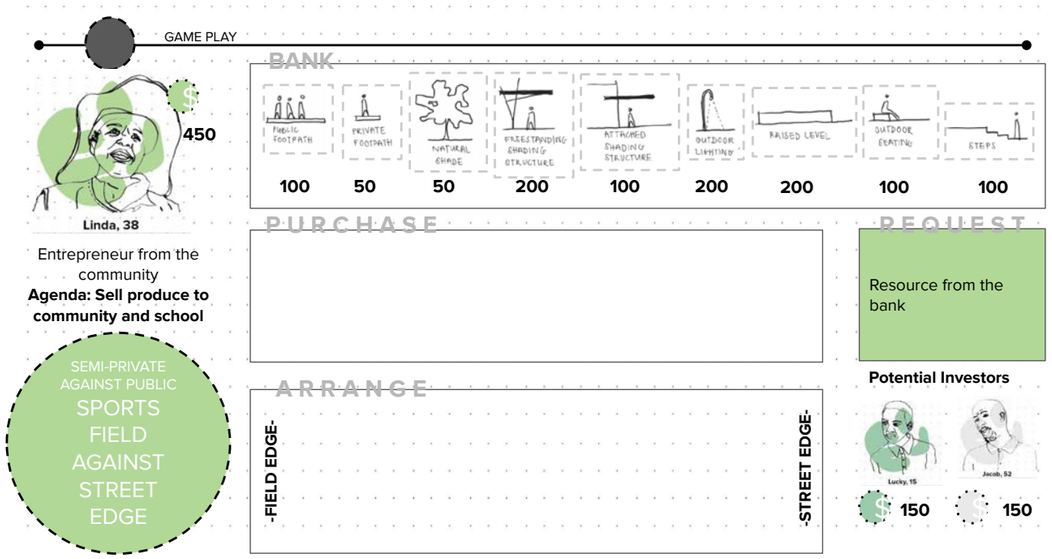
Interface design game process of play (Naidoo 2020)

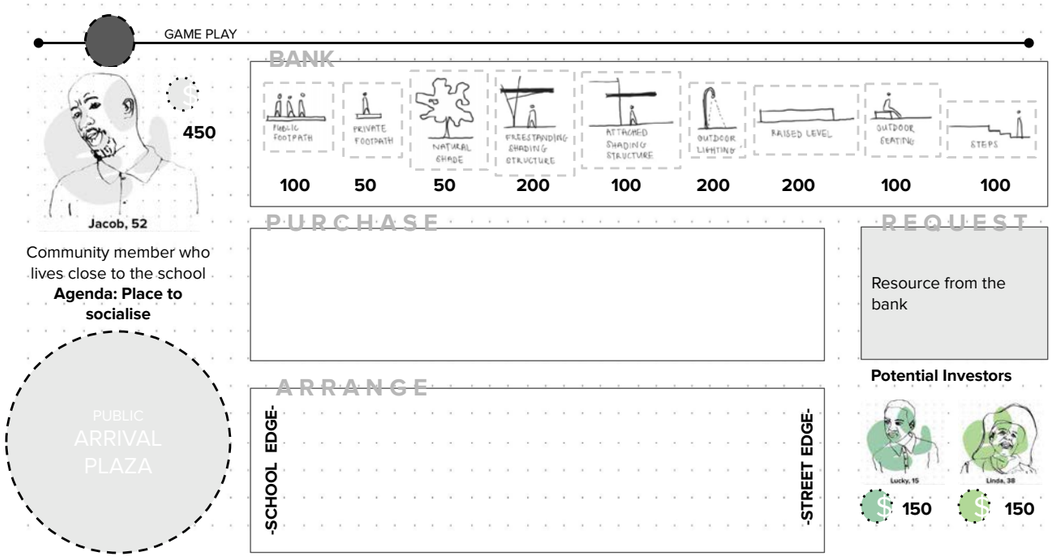
LET'S PLAY

Interface

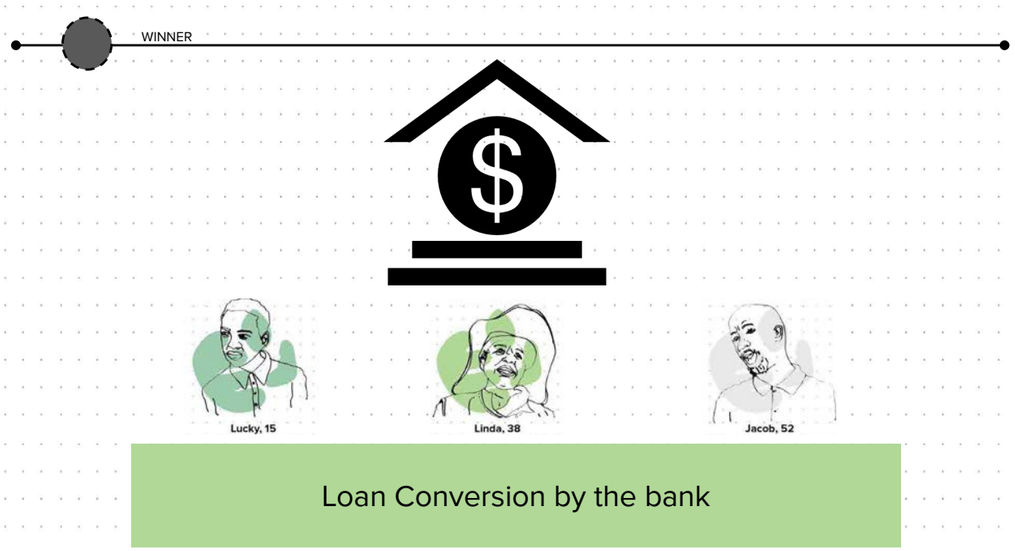


Interface design game process of play (Naidoo 2020)





Interface design game process of play (Naidoo 2020)



Interface design game process of play (Naidoo 2020)

APPENDIX 2.H

2.H

DESIGN GAMEKIT

Digital Presence through Website

DESIGN GAMEKIT
Website
https://purllnaidoo.wixsite.com/designgamekit

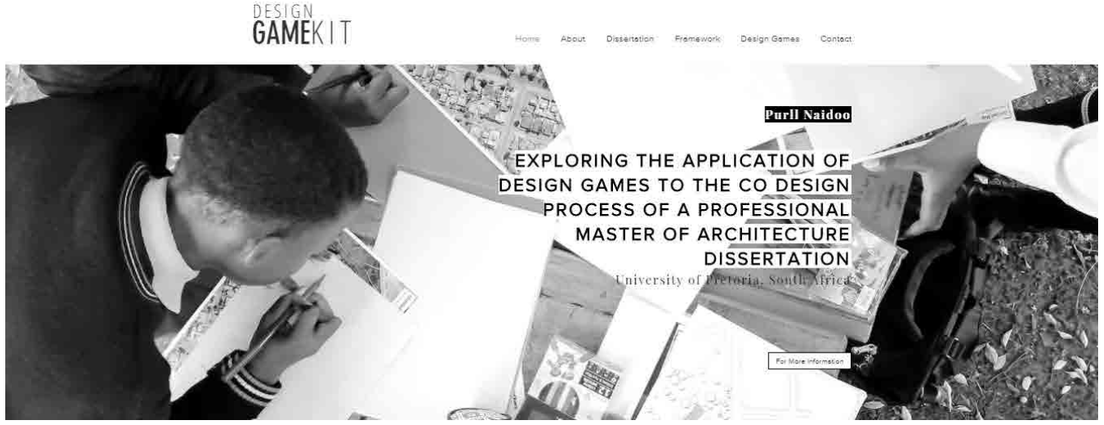


Fig. 1. Design GameKit Home Page (Naidoo 2020)

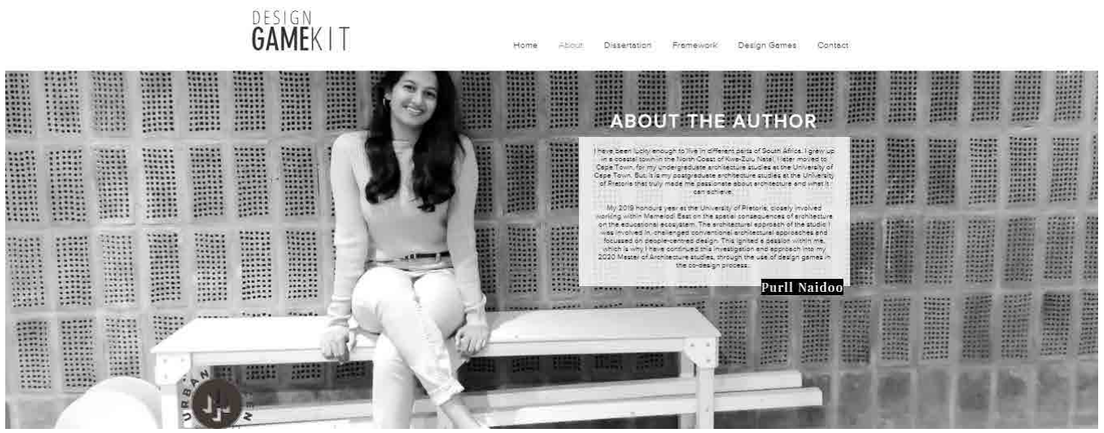


Fig. 2. Design GameKit About Page (Naidoo 2020)

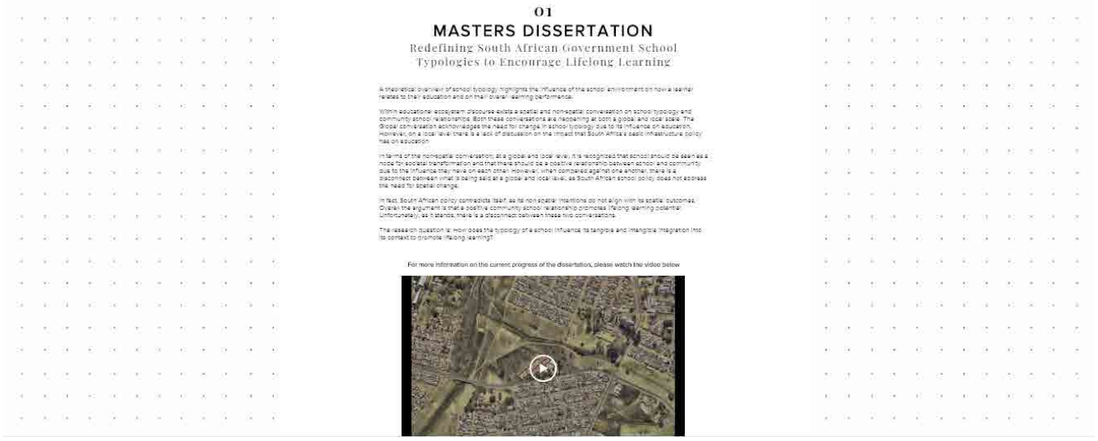


Fig. 3. Design GameKit dissertation page with presentation video (Naidoo 2020)

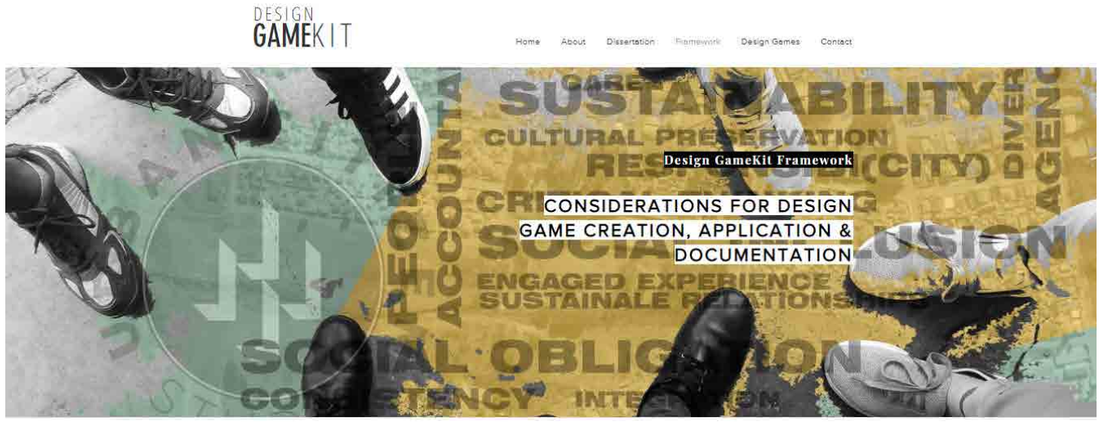


Fig. 4. Design GameKit framework page (Naidoo 2020)

DESIGN GAMEKIT
Website
https://purllnaidoo.wixsite.com/designgamekit

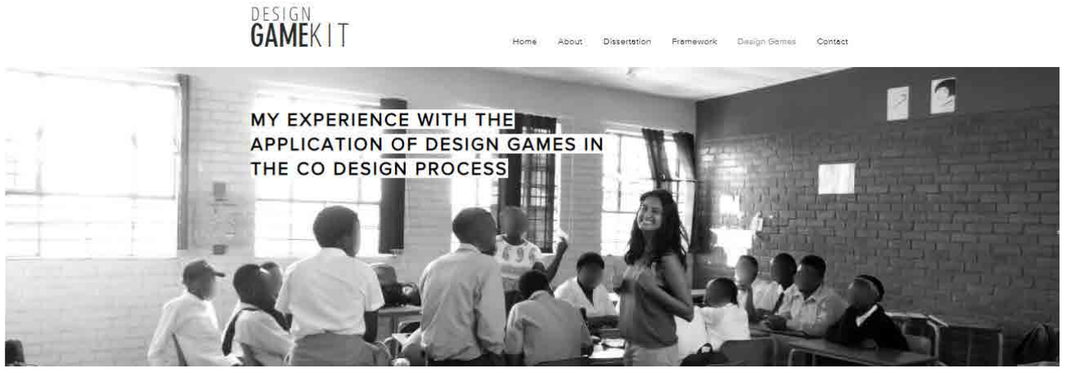


Fig. 5. Design GameKit design games page (Naidoo 2020)

Fig. 6. Design GameKit Tour Guide game page (Naidoo 2020)

Fig. 7. Design GameKit Tour Guide game page (Naidoo 2020)

Fig. 8. Design GameKit AutoCorrect game page (Naidoo 2020)

APPENDIX 2.I

ETHICS APPROVAL

EBIT Research Ethics Committee

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

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

Reference number: EBIT/117/2020

Miss P Naidoo
Department: Architecture
University of Pretoria
Pretoria
0083

Dear Miss P Naidoo

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Approval is granted for the application with reference number that appears above.

1. This means that the research project entitled "Redefining South African Government School Typologies to Encourage Lifelong Learning Potential" has been approved as submitted. It is important to note what approval implies. This is expanded on in the points that follow.

2. 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 Research Ethics Committee.

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

4. 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.

5. 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

100 1908 - 2008 UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

10/03/2020

EBIT FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY
Dear Prof Chan,

ETHICS RENEWAL 2020

In terms of document reference number: EBIT/9/2018

HONOURS STUDENTS, DEPARTMENT OF ARCHITECTURE: “STITCHING THE CITY: FROM MICRO-DATA TO MACRO-VIEWS”

In terms of the conditions of approval granted for research to be undertaken as part of the RFS and RFP modules in the Honours programme, I would like to notify the committee that the research will be ongoing for the 2020 academic year. I understand that all the conditions and responsibilities as stipulated in the approval will remain applicable to the project.

Kindly note that the method of investigation will apply to two distinct geographic areas, namely Mamelodi (specifically centred around the Tsako Thabo Secondary School) and Moreleta East (specifically centred around the informal settlements of Plastic View and Cemetery View). Students will be engaging with ad-hoc members of the affected community as informants rather than subjects.

I would like to declare that the following MArch(Prof) students will be involved with the project as a continuation of their Honours work undertaken during 2019 and will make use of the data for their mini-dissertations:

Student number	Surname	Name
15042482	**du Bois**	Morné
15203329	**Khoswe**	Vitukumbe
15001700	**Konstantinou**	Lauren
12148131	**Matena**	Dipuo
15032371	**Mulder**	Idelette
15362282	**Naidoo**	Purll
15209106	**Simeon**	Aimee
13070330	**Smith**	Kelsey

Yours sincerely,

Dr C Combrinck
Senior Lecturer: Department of Architecture
University of Pretoria
Tel +27 (0)12 420 6536
Email carin.combrinck@up.ac.za

Masters 2020

“It is what it is...”