# THE IMPACT OF 21ST-CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE

Towards an Interdisciplinary Design School in Durban

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A Dissertation Submitted in Partial Fulfilment of the

Requirements for the Degree of Master of Architecture in

The School of Built Environment and Development Studies

University of KwaZulu-Natal

Durban, South Africa

January 2021

## DECLARATION

I, Wendle Dwaine Naidoo, as a result of this, declare that this dissertation is the result of my investigation and research and that this has not been submitted in part or full for any degree or any other degree to any other university.

14/01/2020

W.D. Naidoo Date

## DEDICATION

I wish to dedicate this research project to all universities facing the challenge of conventional pedagogical methods in architecture.

**ACKNOWLEDGEMENTS**

Special thanks go to the Almighty God for providing me with the ability, knowledge, strength and opportunity to undertake this research study without which I wouldn't have been able to complete it. I would also want to thank The University of KwaZulu-Natal for allowing me the opportunity to conduct this research. My supervisor, Dr Yashaen Luckan**,** thank you so much for guidance and mentorship throughout the study. I appreciate that. Finally, I would like to thank the Research Coordinator, Dr Majahamahle Nene Mthethwa for his unwavering help, support, and time. It could have been impossible to complete this study.

## ABSTRACT

The study identified the impact of 21st - century pedagogic transformation on architecture towards an interdisciplinary school of design in Durban. The study aimed to investigate the advances in learning space design and teaching approaches of the 21st-century to derive architectural principles for a proposed design school that will transform such spaces from confined disjointed physical space to collaborative learning environments. The study adopted a qualitative approach based on a phenomenological philosophy to underpin an inquiry into a "lived experience" of a phenomenon in which conventional pedagogical approaches such as teaching methods and learning space design are critically interrogated to define the complex interrelationship between the allied design disciplines in architecture. Preliminary evaluation of similar knowledge and theories was done through a critical literature review relevant to architecture pedagogy to understand the phenomenon in depth. This qualitative research comprises of interviews with students and lecturers explicitly drawn from within the University of KwaZulu-Natal, as the primary case study.

The interviews were semi-structured, which allowed the participants to express their subjective experience of pedagogy and spatial design, the research adhered to ethical standards and most importantly, all the participants' confidentiality and anonymity were protected through pseudonyms.



Keywords: 21st-century, architecture, interdisciplinary, learning space design, pedagogy, pedagogic transformation

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4IR - Fourth Industrial Revolution

AR- Augmented Reality

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# CHAPTER 1

# INTRODUCTION

## 1.1. INTRODUCTION

An architect typically requires a broad set of knowledge and skills from interrelated design disciplines such as media design, civil engineering, mechanical engineering, and interior design. These disciplines are all interconnected in the real world, virtual or physical. However, design pedagogic methods, generally prevalent at South African universities do not harness these 21st-century pedagogic methods. Conventional teaching in conventional spaces for design, which don't present the architectural narrative of design in learning spaces, internally and externally, prevails. Some of these universities lack spatial cohesion, making use of conventional learning systems such as classroom and class board teaching, which are outdated and not connected to interrelated programmes/disciplines.

This study focuses on the advances in learning space design of the 21st-century and how universities can use the associated knowledge of architecture and design to transform spaces from confined disjointed physical spaces to collaborative learning environments. The following chapter presents the study's background and significance. It outlines the research problem contextualised in architectural design learning spaces defined as confined disjointed physical spaces that show no coherence in the many fields of design. This chapter also outlines the research aims and objectives used to find architectural principles of design towards an interdisciplinary design school in Durban, which harnesses 21st-century pedagogy.

## 1.2. IDENTIFICATION OF VARIABLES

### 1.2.1 Independent Variable

21st-Century Pedagogic Transformation

### `1.2.2. Dependent Variable

Architecture

## 1.3. BACKGROUND

Berand and Llecot (2018) refer to pedagogy as teaching and learning methods, mainly in an academic subject or theoretical concept. They further note that 20th-century pedagogy differs from that of the 21st-century as the former uses conventional teaching methods such as the typical classroom and class board. These, according to various researchers, are experienced in most South African universities that offer architecture and its closely allied professions such as interior design, civil engineering, and media design. Most universities and schools of design offer programmes that do not present the architectural narrative of design in learning spaces, internally and externally, thereby negating the possibilities afforded by 21st-century pedagogy. These buildings treat the various design programmes as separate and scattered in multiple buildings and campuses which are not innovative, lack creativity and tectonic design potential of 21st-century pedagogic learning, which is directed towards collaborative learning with the influence of a combination of many tectonic designs strategies from digital, physical and virtual worlds.

Berand and Llecot (2018) state that 21st-century pedagogy focuses not only on the physical learning environment but also virtually. Virtual learning is done in different spaces anywhere and can be assessed through virtual reality and augmented reality tools, critical in the fourth industrial revolution. Hans, Wilhelm, Günter, and Roland (2010) maintain that the use of virtual environments in design can incrementally enhance the design and generate a shift in user experience in architecture, which can be portrayed physically and virtually as interactive buildings

with user interaction. Technological advances such as artificial intelligence, innovative materials, 3D printing, holographic interactive displays, robotics, cloud computing, augmented reality, virtual reality, and other 21st-century technologies form part of the 21st-century pedagogic environment in the fourth industrial revolution.

Gladden (2019) suggest that the design of virtual and augmented environments in architecture used by its occupants such as the Community, students, professionals and even users internationally, these environments should encompass the social, economic, political and cultural aspects of its external environment and not just merely configuring three-dimensional spaces within a building. These aspects are recognised implicitly by 21st-century architects who emphasise that architecture is not just about configuring three-dimensional spaces, with the utilisation of walls, windows, roofs, doors and many other physical elements that form a building instead it is a process overlapping a set of physical, virtual, experiential, social, economic, political, technological, ecological and cultural spaces which interact in complex ways towards a holistic approach in design.

Xing and Marwala (2019) argue that today all design students are transformed by the world of technology such as unlimited access to the internet of things, cloud computing, and most influential social media. These technologies create many challenges for conventional learning, such as teacher-centred approaches in contrast to 21st-century interdisciplinary academic approaches in design, which requires a holistic approach in design based on the combination of ideas, technology, and student-centred approaches in design learning. Most importantly, this holistic approach addresses students' differences in developing crucial transferable skills, which will prepare students for post-graduation practice. Reference to alternative, 21st-century pedagogic approaches, influenced by the interrelationship of various design disciplines and latest technological advances, is vital.

This dissertation argues that the South African design education approaches must reform to benefit from the potential of the technological advancement and progressive methods of 21st-century pedagogic transformation. Therefore, it is vital to develop innovative design solutions to society's problems today and in the future. Students' success depends mainly on students having the critical

skills required, either as entrepreneurs or in the job market, while contributing to socio-economic advancement through design Khathu (2019).

## 1.4. MOTIVATION/JUSTIFICATION OF THE STUDY

The researcher's experience in design environments shows that there is no link between the various design occupations stemming from universities, which contradicts the fact that in the modern-day working environment, all designers such as architects, media designers, interior designers and many other closely allied professions are required to work much more cohesively. Therefore, these universities lack connectivity and collaboration, which the 21st-century pedagogic approach presents. The various design facilities that the researcher has experienced demonstrate that universities and schools do not optimise collaboration, creativity, and design, be it physically in the buildings and within the classroom spaces. Traditional curricula and learning environments do not adequately support collaborative learning and technological transformation and is confined to the physical learning space. In contrast, 21st-century pedagogic spaces focus on both the physical and virtual spaces in its architecture.

Fisher (2005) believes that these buildings should adapt to the 21st-century environment to stimulate design collaboratively and creativity with architectural innovation in response to its current surroundings, forming part of social constructivism theory. Interactions of people with their culture, society, and community development are significant in social constructivism. Through this social process, communities negotiate and evaluate every conversation and interaction, which presents opportunities for new knowledge or present knowledge expanded to be obtained, be it physically or virtually. According to Fisher (2005) Social constructivism theories can influence architecture, the design arena, learning spaces, and the need to shift and be reshaped according to the 21$^{st}$-century pedagogic approach. This approach will offer public design schools equivalent or better experiences than the private sector, with new infrastructure and technology being environmentally sustainable. Fisher (2005) proposes that classrooms require a rethinking of the current conventional design school to succeed. Advances in the technology of the 21$^{st}$-century and the current Covid-19 pandemic have finally forced lecturers and students out of the constraints of a bounded classroom. Still, this significant collaboration that is currently being achieved outside

the classroom can be extended to pedagogical practices of the 21st-century, be it virtually and physically.

Fisher (2005) claims that this student-centred, socially peer-peer collaborative approach not only requires computer labs and teacher-centred classrooms but also requires flexible spaces, breakaway spaces, virtual environments, which contains multiple entry points and accessible pathways to knowledge creation and knowledge expansion, focusing on the development of the student's interests, intern creating a broader and inept understanding of design. This is an interdisciplinary approach towards the design of the university's curriculum, teaching, and learning, supporting an "inquiry" approach and "social constructivism," which is not just based on the design of the classroom, but supports collaboration and a problem-based learning model which interacts with its external environment, physically, virtually or beyond it. These high levels of collaboration, consultation, and inclusivity within the design process in which designers learn more about 21st-century pedagogy, a standard "spatial literacy" of future 21st-century learning environments can emerge. Therefore, responsive learning space development is critical for pedagogic transformation in the 21st-century.

## 1.5. DEFINITION OF THE PROBLEM

The researcher's own experience as an architectural student at two recognised universities in South Africa has revealed that while the curriculum may progress rapidly in response to technological advancement, architectural design learning spaces continue to be defined as confined disjointed physical spaces that show no coherence in various fields of design. The current quality of learning spaces in design programmes is confined by their original structures that are difficult to adapt and adjust to the 21st-century learning paradigm's demands. Consequently, this current quality of learning spaces could compromise the effective transfer of knowledge and skills through practice in contemporary societies.

Saidi (2005) argues that teaching and learning strategies linked to 21st-century pedagogy in architecture create well educated, socially conscious architects equipped with skills for their era.

### 1.5.1 Problem Statement

As a developing country, South Africa is lagging in terms of 21st-century pedagogy, be it physically or virtually; this, in turn, compromises the potential of knowledge and technology transfer to society and the economy. Many global universities are already using approaches such as robotics, virtual reality, 3D printing, augmented reality, and collaborative approaches in architecture. In contrast, the dominant system in South Africa is confined to the conservative physical learning environment utilising traditional teaching and learning approaches. These universities are internalised spatially with confined disjointed physical spaces which are not aligned to the 21st century external environment. This research develops an inquiry based on various research sources to understand alternative architectural design learning models in the 21st-century.

### 1.5.2. Problem Mind Map

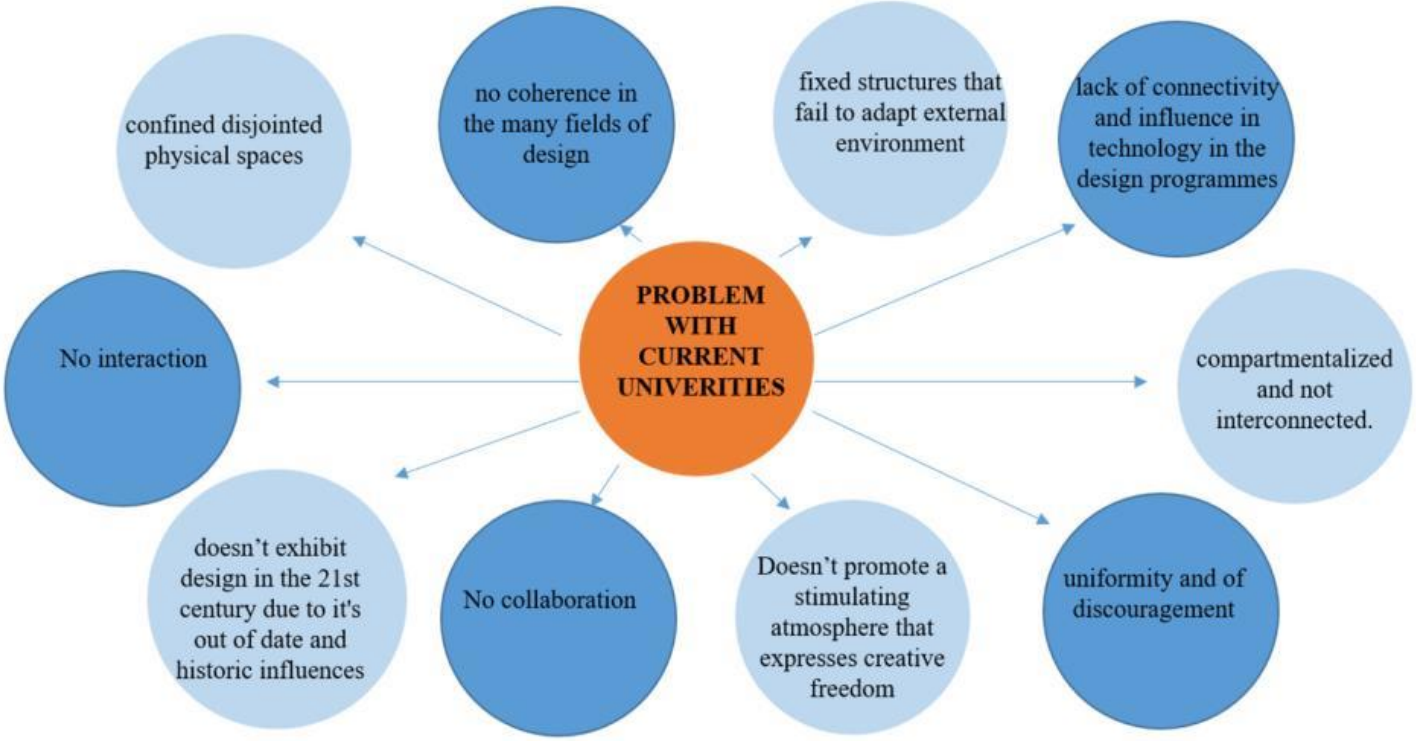



Figure 1.1. Problem with Current Universities Mind Map (Author 2020)

## 1.6. Aim Of The Study

This research aims to investigate the advances in learning space design to derive architectural principles for a proposed school of design that will promote interdisciplinary collaborative learning environments for 21st-century design education.

## 1.7. Objectives

The key objectives of this study are:

- To understand the historical evolution of architectural pedagogy
- To understand how architectural curricula and pedagogy have advanced in the 21$^{th}$century
- To understand how 21$^{st}$century pedagogy has influenced architectural learning space development
- To identify the 21$^{st}$century pedagogic tools that optimally promote design learning within the 21$^{th}$century learning paradigm
- To define the architectural design principles of a 21$^{st}$century interdisciplinary design school

## 1.8. SETTING OUT THE SCOPE

### 1.8.1 Delimitation of Research Problem

The following research focuses on 21$^{st}$-century pedagogic approaches with reference to learning space development for architectural design programmes. The research will be limited to learning spaces for design disciplines such as interior design, media design, and graphic design, closely allied to the architectural profession. Similarly, a reference to the fourth industrial revolution will be contextualised within learning space design limits.

The context of this research will be mainly based on state-funded institutions of higher learning, such as universities. Therefore, the study will not necessarily elaborate on other education levels such as private colleges and training institutions within South Africa as this will require separate and intensive research. The following research will predominantly focus on a critical inquiry of conventional pedagogy and learning space development. The University of Kwa-Zulu Natal, Howard College Campus, Architectural Learning spaces will form the case study area. The research is also informed by literature reviews and references broader ideologies, theories, and concepts vital to propose a 21st-century school of design.

### 1.8.2 Definition of Terms

**Pedagogy**: is how learning and teaching are practised in an academic subject.

**Architecture*:*** a process of planning and designing towards the construction of building and structures

**Interdisciplinary**: learning that involves combining many academic disciplines in one university. It acquires knowledge from many interrelated programmes or unrelated such as Architectural design, Graphic design, Multimedia design, Interior design, Fashion Design, and Fine Art. It is about creating something by thinking across boundaries.

**Virtual reality**: replaces reality, taking the user somewhere else.

**Augmented reality**: 21st-century technology that uses tools that superimposes images that are computer generated onto surfaces of the real world into one composite view

**Conventional Learning Spaces**: Pedagogic spaces of learning that compromises of chalkboards, confined spaces in which the only resources that student has access to are pens and paper.

**Fourth Industrial Revolution**: The Fourth Industrial Revolution is a concept that describes the obscuring of boundaries between the physical, computerised and biological worlds. It compromises a fusion of tools such as robotics, artificial intelligence (AI), the internet, 3D printing, and other technologies. Its collective force impacts many of the 21st-century products and services that are becoming essential to modern-day living.

### 1.8.3 Anticipated Problems/Limitations

- Limited theory on 21st-century pedagogies and learning space development due to this being an emerging field of study. The assumption is that the aim will be for a noteworthy theoretical contribution. The research intends to utilise and interpret theory in conjunction with a robust empirical study to overcome this.
- The volume of data from the qualitative research analysis and interpretation is assumed to be time-consuming. Purposive sampling of critical informants and posing clear and concise questions will help alleviate this limitation while providing essential information relevant to the research applicable to a broader population sample.
- The research project timeline poses a limitation when considering that the researcher cannot dedicate all hours of the stipulated time frame to this research project. Overcoming this will be by assigning specific timeframes to each research project's objective and strictly adhering to these timeframes.

### 1.8.4 Stating the Assumptions

It is assumed that the conventional design of learning spaces restricts the opportunities afforded by 21st-century design learning environments. Alternative, 21st-century approaches to design learning and learning space development will challenge the conventional design learning spaces' spatial assumptions and norms and enhance collaboration between various participants in learning.

### 1.8.5 Key Questions of The Study

The key questions are:

- What is the historical evolution of architectural pedagogy?
- How has architectural curricula and pedagogy advanced in the 21st-century?
- How has 21st-century pedagogy influenced architectural learning space development?
- What are the pedagogic tools that optimally promote design learning within the 21st-century learning paradigm?
- What are the architectural design principles for a 21st-century interdisciplinary design school?

### 1.8.6 Hypothesis

It can be hypothesised that the 21st-century pedagogic transformation can influence the design of learning spaces and architecture, which will widen the sphere of learning from the confines of the conventional classrooms to a world transformed by technology and its architecture. This 21st-century pedagogic transformation will enhance collaboration in diversity, ultimately translating into more responsive practices in the contemporary South African built environment.

### 1.8.7 Structure of The Dissertation

**Chapter 1- Introduction**

Chapter 1 presents an overview of the research at hand that will inform the reader of what one expects from the following study. This chapter outlines the study's background, the motivation of the study, the problem statement, research objectives, and the research questions. It also further outlines the study's hypothesis, limitations, and delimitations of the study.

**Chapter 2- Research Methodology**

Chapter 2 will discuss the study's research methodology, its research paradigm, the research approach, and the research design used in the study. The chapter will similarly discuss the study's data collection instruments and analysis strategies used to collect data, analyse it to achieve the research objectives and answer the research questions.

**Chapter 3- Literature Review**

Chapter 3 critically analyses the various literature in conjunction with the different theories and concepts used in this study. This literature will then be used to achieve the study's research objectives and answer the research questions.

**Chapter 4- Precedent Studies**

Chapter 4 will present a critical analysis of critical projects that were done, which directly impacted the current research and the different theories and concepts.

**Chapter 5- Results, Discussions, and Interpretation of Findings**

Chapter 5 will analyse the primary data from the various questionnaires from the multiple participants; it will also interpret the results, discuss and present its outcomes.

**Chapter 6 - Conclusions and Recommendations**

Chapter 6 presents the study's results and findings, recommendations, principles, and conclusion.

## 1.9 THEORETICAL AND CONCEPTUAL FRAMEWORK

### 1.9.1 Introduction

The following section focuses on the critical discourse around the historical development, theories, and concepts of knowledge and knowledge transfer. Educational theories and learning space development are analysed as part of the theoretical and conceptual framework development.

### 1.9.2 Phenomenology

Based on the researcher's experience as a student of architecture at different higher learning institutions, most South African universities lack architectural design narrative to enhance the identity of place in its time. Nikolic (2016) affirms that architects use light, colour, materials, volumes to achieve a phenomenological experience of place. Norberg-Schulz (1979) maintains that designing an experience is the responsibility of the designer. Phenomenology can enhance such experience to reveal an architectural design narrative beyond the visual experience.

#### 1.9.2.1 Place-making

In Phenomenology, Place, and Place-Making, both concepts are vital in response to local communities' improvement and upliftment (Menin, 2003). This concept inspires local communities to reimagine and revitalize spaces to strengthen the connection between people and the places that form part of the Community. The place-making approach collaboratively shapes our public realm to maximise the local Community's shared value and not just focuses on urban design. It facilitates layers of different physical, social, and cultural identities that define a place and its evolution (Paul, 2016).

#### 1.9.2.2 Digital Placemaking

Digital placemaking is the process of utilising powerful digital tools that not only give value to public spaces but provide opportunities for local communities, such as it can educate the public,

provide economic growth, awareness, cultural prosperity and improve the livelihoods of local communities. At the core of digital place-making is the focus on communities' upliftment through modern technology, which will attract communities of all types, deepening connections, and communication with the public realm (www.Calvium.com).

### 1.9.3 Learning Space Theories

#### 1.9.3.1 Introduction

The researcher has been compelled to use a conceptual framework of social constructivism due to the study's social nature. The social constructivism framework enables the researcher to understand how students utilise social networks to develop supportive environments that promote collaboration in learning environments to broaden their knowledge.

#### 1.9.3.2 Social Constructivism Theory and the concept of Collaborative Learning

Isaacs (2013) argues that utilising a social constructivists approach as a theoretical lens will help understand 21st-century learning environments, how learning occurs within this pedagogical space, and most importantly, help broaden the perception of these learning environments. This social constructivist approach views learning and teaching through interaction, shared knowledge, and communication as critical drivers. Social constructivists believe that knowledge can be obtained and shared due to social interaction in contrast to an individual's experience. Considering the above, the researcher used social constructivism's theoretical lens to understand collaborative learning as a concept (Mayer in Liu & Mathews 2005).

### 1.9.4 Fourth Industrial Revolution

According to Schwab (2017) the Fourth Industrial Revolution describes a world where users shift between digital spheres and reality using technology to communicate, connect, and manage their lives. With conventional learning spaces in architecture mainly done in classrooms and studio environments, which are physical spaces, the concept of students engaging in non-physical spaces

such as virtual reality extends beyond the classroom where learning communication and knowledge can be accessed anywhere.

### 1.9.5. Tectonic Design

From his experience, the researcher believes that the many schools of design, current architecture do not reflect design and art with the innovation of the 21st-century. Maulden (2001) defines tectonics in architecture as "the science or art of construction and artistic design." In other words, it not only refers to the "activity of making materially requisite construction that answers certain needs but rather to the activity that raises this construction to an art form." Tectonic design relies on the modelling, layering, and the connection of technology and material into physical presence towards the metaphysical world.

### 1.9.6 Theoretical and Conceptual Framework Mind Map

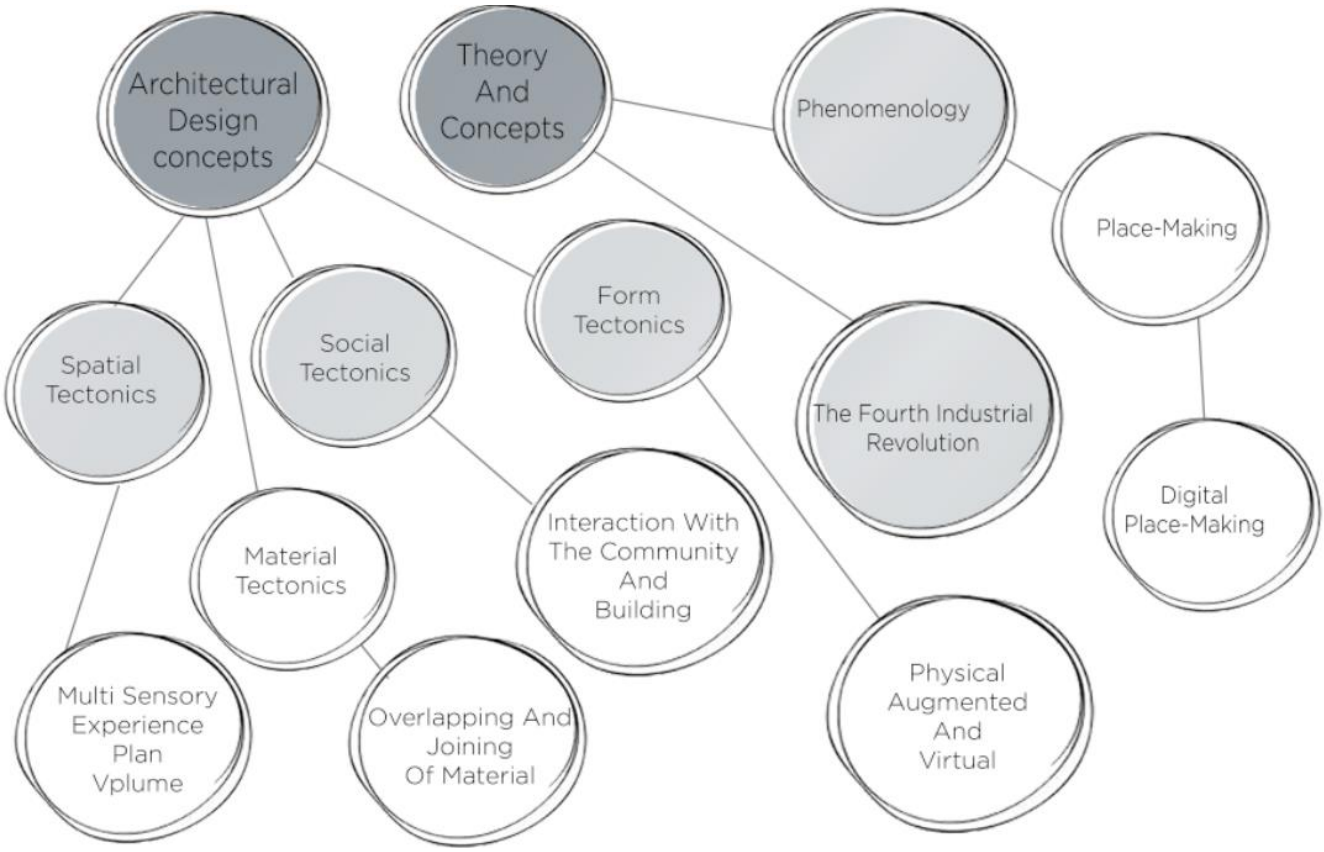



Figure 1.2. Theoretical and Conceptual Framework Mind Map (Author 2020)

## 1.10 CHAPTER CONCLUSION

This chapter discussed the background of the study, giving an overview of 21st-century pedagogy in architecture. The chapter also addressed the problem statement and outlined the research objectives, the research questions, the scope of the study, and the motivation behind undertaking this study. The chapter also focuses on the critical discourse around the historical development, theories, and concepts of knowledge, knowledge transfer, and uses Educational theories and learning space development as part of the theoretical and conceptual framework development that sets the foundations of this study. The next chapter will discuss the research methodology, research approach, and research design used in this study. The next chapter will also discuss the data collection instruments utilised to achieve the research objectives and answer the research questions.

# CHAPTER 2

# RESEARCH DESIGN AND METHODOLOGY

## 2.1. INTRODUCTION

This chapter discusses the research methodology, research design, and the research approach used in this research study. This chapter similarly outlines the various data collection methods and instruments used to collect primary and secondary data for this study. Validity, reliability and ethical considerations were adhered to in this study which is also discussed at length in this chapter

## 2.2 RESEARCH DESIGN

This study adopted an exploratory research design to understand the universities' difficulties that offer design with the problem of confined disjointed physical spaces that show no coherence in the various fields of design. Precedent studies and questionnaires are essential in this research to obtain specific information about the current pedagogic learning spaces and those of the 21$^{st}$-century. This research utilised a combination of empirical and non-empirical sources by using primary and various secondary data sources.

## 2.3. RESEARCH PHILOSOPHY

For the following research, an interpretative philosophy was used, which has subjective meanings towards a social phenomenon. The **interpretative** philosophy is used for qualitative research to investigate a smaller sample size.

## 2.4. RESEARCH METHODS

A qualitative methodology was used to analyse and evaluate non-numerical data in this study. It was used to understand the intangible evidence, such as subjects' feelings and emotions (Mohajan,

2018). Saunders, Lewis and Thornhill (2015:162) state that qualitative research is subjectively used to explore, understand, and analyse the research problem. The following study followed the qualitative method to investigate the impact of 21st-century pedagogic transformation on architecture towards an interdisciplinary school of design.

## 2.5. RESEARCH APPROACHES

This qualitative research utilised the inductive approach in which the researcher collected and analysed data (from the participants) related to the topic under investigation. This process enabled the researcher to identify emerging patterns from the collected data and worked with a unified theory to explain those patterns and offer recommendations.

### 2.5.1. Qualitative Approaches to Inquiry

A qualitative study and the phenomenological approach were used in this study because this qualitative phenomenological research is therefore used to describe a "lived experience" of a phenomenon.

## 2.6. SAMPLING STRATEGY

This study utilised a purposive sampling method, which forms part of Non-probability sampling. The researcher selected a sample of university students and lecturers within the Architectural Masters programme based on their knowledge about the study, representing the population.

### 2.6.1 Non-Probability Sampling

In this non-random sampling procedure, a sample of students and lecturers that represent a cross-section of the population who are exposed to confine disjointed Architectural and design learning physical spaces that show no coherence in the many fields of design will be selected for the purpose of this research.

The following outcome of this research was achieved through online emailed questionnaires, which were textual and descriptive. These responses provided the researcher with a foundation to create a brief for a proposed Interdisciplinary Design School, which would transform such spaces from confined disjointed physical space to collaborative learning environments.

### 2.6.2 Target Population

The target population for this research only consisted of Architectural Master Students and their Lecturers. The selection of this population is essential to this study within the architectural design programme. These participants know the built environment in architecture and have a spatial understanding to make up a 21st- century interdisciplinary school of design. The target population was made up of the following demographics;

**Age Group**: 25years – 55 Years

**Race**: All the major racial groups in South Africa were included in the study.

**Gender**: Males and Females

### 2.6.3 Sample Size

This study's sample size was 16 participants in total, comprising of fifteen students and one lecture drawn from the university's architectural programme. The sample size choice was determined, bearing in mind Latham (2018), who noted that a sample should have a minimum of 15 and a maximum of 99 participants for qualitative interviews. He further states that these participants must be homogenous, i.e., has a position or level in the organisation; thus, in the case of this study, lectures, and students

## 2.7 DATA COLLECTION INSTRUMENTS

### 2.7.1 PRIMARY DATA COLLECTION

#### 2.7.1.1 Questionnaires

Questionnaires were used to collect understandings and judgments about people's beliefs, their feelings, and experiences about the research problem. These questionnaires were designed in an open-ended format to enable the respondents to express their views freely and openly to achieve the research objectives. The questionnaires were distributed Architectural Master Students and their Lecturers by email instead of the face-to-face interviews due to the Covid-19 pandemic lockdown restrictions.

### 2.7.2 SECONDARY DATA COLLECTION

The secondary data was sourced from various sources. The researcher obtained the data from both internal and external university sources.

#### 2.7.2.1 Literature Review

The study's literature review was comparatively analysed against the research questions using theories and concepts to understand how 21st-century pedagogic transformation can impact architecture towards an interdisciplinary design school. It also comprises of external secondary data collection methods such as libraries and internet sources, where broad knowledge about different areas within 21st-century pedagogic transformation in architecture was utilised in the literature review.

#### 2.7.2.2 Precedent Studies

Precedent studies of the relevant design learning sites such as architectural design, interior design, and media design were undertaken to develop and understand the respective design learning sites' current pedagogic approaches and learning spaces. The development of how the various 21st-century pedagogic approaches can influence these spaces was drawn from the synthesis of the data extracted from precedent studies and the information drawn from the literature review.

The following precedent studies were;

1. Durban University of Technology (DUT)
2. Local precedent: Tshwane University of Technology (TUT)
3. International precedent: Orestad College

However, due to the COVID-19 pandemic, it was impossible to do case studies in UKZN. The researcher, however, did precedent studies that are tied to research and its theoretical and conceptual frameworks such as the critical analysis of other universities that relate to the impact of 21st-century pedagogic transformation on architecture concerning UKZN architectural master's studios

## 2.8 PILOT STUDY

A pilot study is undertaken before carrying out intended research. Wigdorowitz (2018) states that "This should be on a smaller scale, mainly to eliminate potential errors that may occur and result in a lot of effort and time being wasted. In this study, a pilot study was carried out on two participants, one lecturer and one student, to assess outcomes and potential improvement towards attaining the study's desired results". The initial data collection instrument was face-to-face interviews, but the Covid-19 pandemic lockdown regulation being implemented by South Africa affected the initially selected instrument's choice. Thus, the pilot study indicated that conducting face to face interviews under the lockdown regulations was highly unlikely and called for the use of electronic questionnaires as an alternative research instrument.

## 2.9 DATA ANALYSIS

Wigdorowitz (2018) defines a "Thematic analysis (TA) analyses qualitative information to systematically gain knowledge and empathy about the Architectural Master Students and their Lecturers ". Thelab (2018) notes that patterns will need to be recognised in the dataset. Thematic

analysis can be done through a proper detailed data familiarisation process, coding the data, and developing a theme and last revision. In this study, data obtained from questionnaires were analysed, coded, and themes derived from them to generate architectural principles for a 21st-century school of design.

### 2.9.1 Approach to Thematic Analysis

Wigdorowitz (2018) stipulates that "A thematic analysis approach involves a seven-phase process that can be done inductively". Below is the seven-phase process of thematic analysis as identified by Wigdorowitz (2018).

1. **Familiarising the data** is a process of transcribing the data and its content, with the outcome of providing a summary of the findings.
2. **Coding the data** is a method of creating a grouping of similar labels and critical features, with the intention of collating these similarities.
3. **Searching for codes for themes** is the process of identifying trends within these codes and providing themes in line with the research objectives.
4. **Reviewing the themes** is examining the reliability and viability of each theme against the dataset and literature in order to find its authenticity.
5. **Defining and naming themes** is the analysis of each theme and labelling each one.
6. **Write up** involves collating the data and its themes, creating a critical analysis of these themes concerning the existing literature and generating design principles.
7. **Design recommendations,** which are design strategies of the various principles found.


Figure 1.3. Thematic Analysis of Qualitative Data (Author 2020)

## 2.10. ELIMINATION OF BIAS

Reference is made to Finch (2017) who cites that qualitative research aims to answer research questions without bias. The researcher took the following measures to eliminate bias to the Architectural Master Students and their Lecturers:

- All participants were treated equally and given enough time to think and answer questions.
- Gender-neutral terms such as men and women.

- Identifying respondents by their race, religion, and ethnic group were avoided; wherever necessary, it was handled with sensitivity.
- Preventing the creation of assumptions about the various participants.

## 2.11 ETHICAL CONSIDERATIONS

Ethical consideration refers to the respect and appropriateness of conduct concerning the participants' rights of the research (Finch, 2017). In this study, the researcher adhered to the following ethical considerations;

- Participants were given Informed Consent, i.e., the researcher provided the respondents with full knowledge and background of the research and explained the study's objectives. The researcher requested the respondent's permission to participate in the study before their participation.
- The researcher assured the participants that the study's findings were strictly for academic purposes and guaranteed them the findings that will result from this study would not be held against them. Participants were also advised that their participation in the research was wholly voluntary and free to withdraw from the research at any given time.
- Anonymity and confidentiality of the respondents were guaranteed. The researcher used pseudonyms to refer to respondents and ensured that the respondents' data was used for the research purposes only and kept confidential. All input received on the email was securely stored to protect the information and the respondents. Only the researcher and supervisor had access to the respondents' input, as it was only used for research purposes.
- The researcher was granted Ethical clearance from the university and a letter of permission to conduct the research.

## 2.12 VALIDITY, RELIABILITY AND RIGOUR

Viriri (2019) states that in qualitative research, due to the lack of scientific rigour, inadequate justification of its approaches, the lack of transparency and subjective meaning, with its findings being merely a collection of respondents feelings, opinions and the bias from the researcher, (Viriri, 2019) maintains that "a qualitative research must ensure dependability, credibility, transferability and confirmability, and trustworthiness criteria ensure the rigour of the research findings".

For this research, rigour was achieved using clear and concise questions relating to the study's objectives and aim. Validity and credibility were determined by attempting to achieve commonality of data from the various informants for interpretation to satisfy the objectives set out. To ensure reliability in the use of qualitative research, the examination of trustworthiness is crucial. Thus, in this study, the questionnaires attempted to gain the informants' trust, who provided trustworthy feedback.

## 2.13 DATA MANAGEMENT

Confidential electronic files such as questionnaires were encrypted and password-protected on a shared folder. These files are only accessible to the researcher and the supervisor electronically. Electronic data disposal will include deleting files from the folder and the operating system. After that, a total wipe of the hard-drive and the physical destruction of the hard drive after at least one year after the degree is completed. Hard copies will be securely locked away in a locked filing cabinet that the researcher can only access; these documents will be shredded and disposed of after at least one year after the degree is completed.

## 2.14. SUMMARY (USE ATTACHED MATRIX)

| Objectives | Research Question | Data Collection Question | Data Sources & Sample Size | Data Collection Methods | Data Analysis Methods | Data Presentation Forms/ Style |
|---|---|---|---|---|---|---|
| To understand the historical evolution of architectural pedagogy | What is the historical evolution of architectural pedagogy? | What are the traditional pedagogy and learning methods? | Published literature | Document/data study from online resources | Document analysis | Themes, images, text/ narrative, illustrations |
| To understand how has architectural curricula and pedagogy advanced in the 21st century? | How has architectural curricula and pedagogy advanced in the 21st century? | What are the 21st-century architectural curricula and pedagogy? | Published literature | Document/data study from online resources | Thematic analysis Document analysis, and precedent studies | Themes, images, text/ narrative, illustrations |
| To understand how has 21stcentury pedagogy influenced architectural learning space development? | How has 21stcentury pedagogy influenced architectural learning space development? | What does 21st-century pedagogy learning space development compromise of? And how does it influence these spaces? | Literature precedent study Published literature | Online resources | Document analysis, precedent studies | Themes, images, text/ narrative, illustrations |
| To identify 21st-century pedagogic tools that optimally promote design learning within the 21st-century learning | What are the 21st-century pedagogic tools that optimally promote design learning within the 21st-century learning paradigm? | What is the 21st -century pedagogic tools that can optimally promote and advance design learning? | 15 students and staff member, Published literature | Interview key informants and collect secondary and primary data, Online Resources | Thematic analysis, textual analysis, | Themes, images, text/ narrative, illustrations |
| To define the architectural design principles for a 21st-century Interdisciplinary Design school | What are the architectural design principles for a 21s-century school of Interdisciplinary Design school? | What drives 21st-century pedagogy concerning its architecture within an interdisciplinary design school? | Literature precedent study Published literature | Document/ data study from online resources | Thematic analysis, textual analysis, | Themes, images, text/ narrative, illustrations |

Table 1.1. Summary Matrix (Author 2020)

## 2.14 RESEARCH DESIGN AND METHODOLOGY STEPS

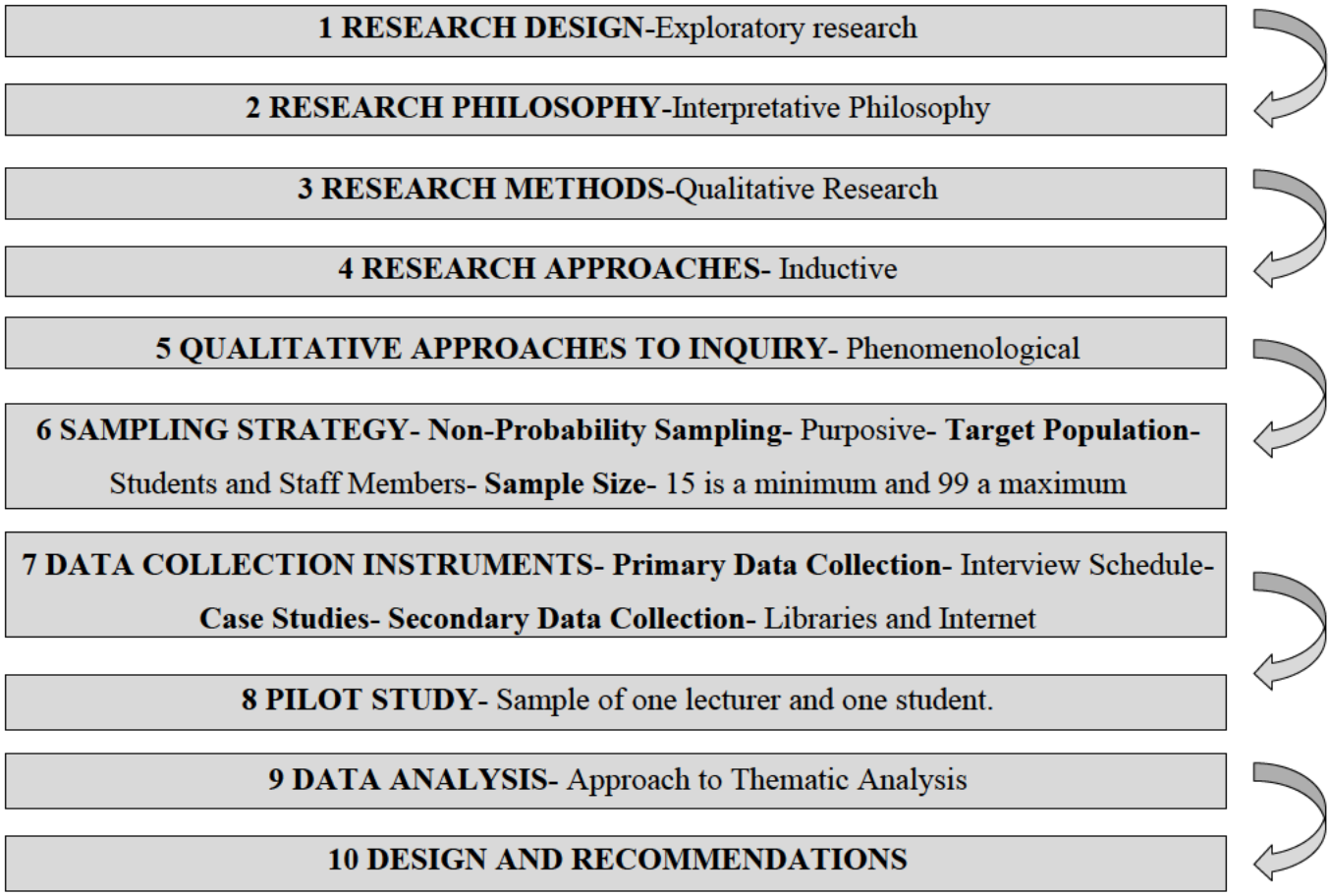



Figure 1.4. Research Design and Methodology Steps (Author 2020)

## 2.15. CHAPTER CONCLUSION

This chapter discussed the research methodology, research approach, research design, and the research instruments used to collect primary and secondary data. This chapter also discussed the ethical considerations the researcher adhered to when gathering primary data from the Architectural Master Students and their Lecturers and how bias was avoided. The next chapter will review and discuss various literature related to the study, particularly looking at architectural pedagogy's history and evolution, the different architectural pedagogic approaches, and the theoretical and conceptual framework development.

# CHAPTER 3

# LITERATURE REVIEW

## 3.1 INTRODUCTION

This chapter provides a review and discussion of existing literature related to 21st-century pedagogic transformation in architecture. The literature includes current knowledge, substantive findings, theoretical, conceptual and methodological contributions towards an interdisciplinary design school in Durban. This chapter will discuss, in detail, the history of architectural pedagogy and various theoretical and conceptual frameworks that impact 21st-century pedagogy in architecture.

## 3.2 HISTORY AND EVOLUTION OF ARCHITECTURAL PEDAGOGY

### 3.2.1 BEAUX-ARTS SYSTEM: TEACHER CENTRED ENVIRONMENTS

#### 3.2.1.1 Introduction

According to the researcher, the most common architectural design trend amongst 21st-century architectural students is highly influenced by modernism. Many students in developing countries ignore the beaux-arts principles, which is that of a collaborative approach and moved towards a unilateral approach based on modernist principles. The beaux-arts principles are essential as they were the foundation for the modernist approach and paved the way towards 21st-century pedagogy in architecture. The Beaux-Arts system was developed in the 17th century in France when the French government placed architecture under the fine arts discipline (Cret, 2001). During the 17th century, the arts discipline collaborated with other disciplines as they shared their workshop for training and apprenticeships provided by the corporations guided by master craftsmen (Gulgonen, A. and Laisney, F., 1982).

This collaboration was of utmost importance as students collaboratively shared knowledge from other disciplines towards a holistic approach in architecture. It contrasted with that of many of the current architectural universities in South Africa that view architecture as a single facet disjointed from other allied disciplines.

#### 3.2.1.2 History and Evolution of the Beaux-Arts System, 1648-1793

During the 16th-century in Paris France, the Secretary of state, Colbert formed the Academie Royale de Pointuroet deSculpture, an Art academy. The structure of this academy set the structures for most of the academies of that era in Rome. Its principal function was to scalp and educate the artist of the future (Gresh, 2017).

Colbert then authorised the formation of the Royal Academy of Architecture in the late 16th-century. The artists from these academies met weekly in order to establish the structure and rules of their art. Due to their rise in success, they were granted privileges, such as working on government projects and entering global competitions.

At the end of the 16th-century, as these academies advanced, one of the most formalised Art academies of that era gave birth, the French Academy in Rome. This academy selected the most advanced students to study the art of antiquity for five years at the academy. Only a selected number of students were selected for the Prix de Rome from the academy, a world-famous competition in Rome established in 1720 (Luckan, 2016). After that, in the middle of the 17th-century academies became independent, under the King of France's control. These academies were located at the Louvre guided by the structures of the 16th-century. However, at the end of the 17th-century, the National Convention took notice of the monarchical structures and then established the Institu de France, a National Institute (Cret, 2001).

This institute compromised of five classes, which used an interdisciplinary approach which included disciplines such as painters, sculptors, craftsmen, artisans, composers, and architects, in contrast to the previous academies which only included art. These classes evolved and developed into the Academie des Beaux-Arts founded by Cardinal Mazarin (Luckan, 2016). The Academie

des Beaux-Arts focused its curricula on crafts and theory, thereby raising the status of architects and artists from master artisans to becoming philosophers.

#### 3.2.1.3 Ecole Des Beaux-Arts, 18th-Century

The Academie des Beaux-Arts remained under the French government's power through the period of the French Revolution and beyond. However, in the 18th century, Emperor Napoleon III ordered that the Academie des Beaux-Arts become independent of the French government, hence the birth of Ecole des Beaux-Arts'. Even though apprenticeship and training methods still existed, the formalisation of architecture as an academic course multiplied and increased the need for a formally controlled schooling system (Cret, 2001). However, it was only until the mid-18th century when the Ecole des Beaux-Arts started to gain dominance and grow, leading to the decline within the apprentice system. The Ecole des Beaux-Arts then separated from the Instituto in 1807 and continued to appoint academics as teachers and won the Prix de Rome (Luckan, 2016).

Many students of the 18th century were then, however, inclined to follow the structures of The Ecole des Beaux-Arts and the Academy in Rome. Due to the lack of interdisciplinary approaches and their strict traditions, many talented architectural students and academicians often critically challenged the Ecole's teaching architectural methods. The Beaux-Arts' fall and rise of The Ecole des Beaux-Arts led to architectural pedagogy shift from a student-centred collaborative approach towards a teacher-centred behaviourist approach (Gresh, 2017).

The Ecole harnessed a behaviourist approach, in which lecturers would pass judgements to students and give their personal views and styles towards the student's submission, even though hypothetically in principle the system was structured so that students could have the freedom to explore and express their designs from their own experiences and styles (Cret, 2001). Many students never critically analysed these cases and only had the intention of pleasing their judges. Furthermore, the emphasis was placed on their presentation and not functional and responsive architecture. These competitions and examinations, which were judged by a jury, were the principle forms of assessment, like the current schools of design in South Africa, who still use this form of assessment. These students were driven by an output such as renderings that would amaze

these lecturers, which consisted of rich detail in difficult media such as watercolour (Luckan, 2016). Projects were comprised of many architectural drawings that were squeezed in a short amount of time and were due for various critiques by experienced and qualified studio masters. This showcase included various tough competitions in which students showcased and awed judges who made the highest assessment level.

The Grand Prix de Rome prize was one of the most significant competitions in that era where winners were given prizes and scholarships to study in Rome. The Ecole regarded the robust imperial classicism as one of the eternal truths of architecture. This tradition then continued until the late 19th century where the Ecole system's ideologies and philosophies were critically challenged as students and academics questioned the system's relevance in contemporary societies.

Soon after Le Duc, Gilbert, Duban and Labrouste Ecole des Beaux-Arts later referred to as modernists used new technologies and materials such as steel and concrete that would break away from the precedents of the neo-classicists of the Beaux-Arts who employed traditional systems and collaboration of allied disciplines in architecture. In turn, they transformed the Academy and the Ecole and moved towards a behaviourist approach but were partially successful as these institutions were slow to transform. This system was closely linked to the neo-Gothicism which resulted in a major crisis, which didn't favour students, as they protested to enforce any official system, but instead fought for the school's liberal traditions. This protest brought about Liberalism which was the central tradition of the Ecole (Gresh, 2017).

The liberalism led to the restructuring and introduction of new pedagogical methods in 1966 at the Ecole, which reformed its pedagogic approach which transformed their identity and was separated into semi-autonomous pedagogical units, each with its ideological position. Although the Ecole continued, the former hierarchical structure and formality were later abolished (Luckan, 2016). Contemporary architecture then began, and its new system defined by substantial theoretical positions on urban form and structure with sensitivity to heritage and historical urban centres were at the centre of this liberalism. The Ecole thereby evolved from a rigid system of strictly defined outcomes to promoting diversity and emphasising tradition.

### 3.2.2 THE BAUHAUS, 1919–1933

#### 3.2.2.1 Introduction

The Bauhaus movement and architectural pedagogic approach were founded in 1919 by a German Architect Walter Gropius (1883–1969) in Weimar Winston. The main objective was its radical concept in which materials would reflect the unity of art in all aspects of architecture. This expression infused many disciplines such as architecture, sculpture and painting into a single expression in a unified manner (Westphal, 1991). Gropius developed a craft-based curriculum that produced artisans and designers who could create architecture and objects towards a modernist approach that was appropriate to this new system of living in the 19th century. The Bauhaus infused fine arts and design elements in their education system, in contrast with most South African universities, as it singles out architecture, without other closely related disciplines. The curriculum commenced with courses that focused on materials, colour, theory and its relationship to architecture which immersed the students from different social and cultural backgrounds.

Within this school students were surrounded by workshops which included metalworking, furniture making, typography, painting and even sculpture. However, Gropius's initial aim was towards the unification of arts and crafts within architecture, yet it was financially impractical and resulted in the repositioning of his goals in 1923. In 1925 the Bauhaus relocated to Dessau where Gropius designed a new building which would later house these students. This school later became the hallmark of modernist architecture which emphasised its tectonic design which boasts steel, glass curtain walls, and an asymmetrical pinwheel plan. Gropius distributed studio, classroom and administrative space to gain maximum efficiency and spatial logic (Dearstyne, 1962). This building embodied the Bauhaus principles, which were authentic, a complete work of art as the building and its interior was designed by students allowing them to express their desire to be an architectural and fine art school. The complex was interconnected with different layers and sections. Each area has its purpose but connected to other layers. Gropius used new materials like reinforced concrete and emphasised innovation within its design (https://www.metmuseum.org/). Clean, cubic shapes, large windows, and simplicity were repeated in the building's exterior and interior, though they were destroyed in 1945 during the World War II bombings.

### 3.2.2.2 The Bauhaus Characteristics

Like most 21st-century universities that offer design courses, particularly in developed countries, the Bauhaus style of architecture still exists with its pedagogical approaches, such as collaboration with other disciplines, compared to the developing countries such as South African universities that reflect a behaviouristic influence (Dearstyne, 1962). Many of the 21st-century University buildings that offer design learning embodied masonry and steel and right angles like the Bauhaus style. Together, creating designs that resulted in buildings that some historians criticised did not influence humans' hands-on creation within their structure, as it boosted minimal designs with no ornamentation clean and modern. This modernist and straightforward approach to its architectural aesthetics favoured function and mass production and was influential in the worldwide design to everyday buildings that did not reflect any form of hierarchy structure.

The Bauhaus style had no precedent, but its infusion of arts and crafts with a modernist approach to design emphasised the building's function to bring art into everyday life. Thus, the typical Bauhaus designs, whether its art, architecture or interior design featured little or no ornamentation and focused on balanced forms and hits of abstract shapes. The Bauhaus art and architecture featured open plans and lots of glass inspired by the American Arts and Crafts movements giving it a polished look with harmoniously balanced geometric shapes with its emphasis on function, a genre popularized by master architect and Prairie School pioneer Frank Lloyd Wright. Furthermore, this modern architecture movement heavily inspired the look of mid-century modern homes that borrowed the functional design and clean lines of Bauhaus buildings. Bauhaus interiors are renowned for their simplicity and openness. Minimally adorned with iconic furniture, including the Wassily Chair, a model named after Kandinsky, and uncomplicated accents, they perfectly echo their exteriors (https://www.metmuseum.org/). Although the Bauhaus promoted a style of popular standardised architectural design, it did not involve itself in worker housing estates despite ideas shared by several other professional architects across Germany. The development of large-scale housing projects for workers was not the main priority of Gropius, Meyer or Mie's. Gropius intended to create a modernist movement, but not to standardise architecture which many architects did. It was based on function and colouration of many design disciplines into one building as its pedagogic approach and within its architecture.

### 3.2.2.3. The Bauhaus Pedagogy, 1933

Walter Gropius had a clear pedagogical vision which is still used in most of the 21st-century universities. This unprecedented pedagogy represented by a single cycle suggests the holistic nature of the Bauhaus education in which individual students representing diverse disciplinary backgrounds were to come together to pursue a shared mission to reform art, design, and society (Puspito, Djoko & Adi, 2008).

Students would begin in the outer ring within half of the year of the introductory course before moving into one of several workshops to concentrate on a specific medium such as ceramics, woodworking, weaving, metalworking, and so on. Once they had achieved a degree of proficiency in their chosen medium, all students would converge again in Bau (building) to construct total environments, designing everything from the architecture to furniture (Puspito, *et al.*,2008). Students were taught skills common to all areas of art and design, which was one enduring innovation of the Bauhaus. Projects were free-form and generally without practical application and were intended to develop students' perception and creativity. After completing these workshops, only selected students were able to study architecture. The design of their buildings featured prominently at the Bauhaus curricular diagram centre and the final year.

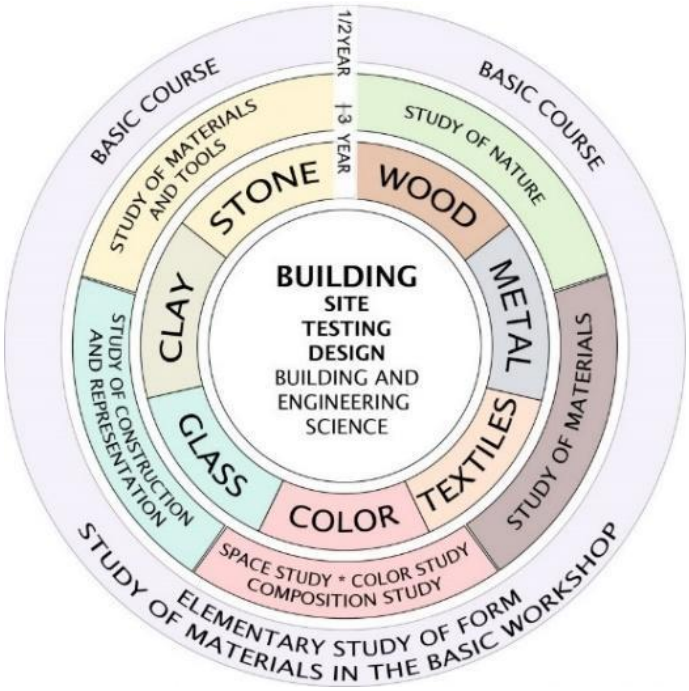



Figure1.5. The Bauhaus Curriculum (Puspito, *et al.*, 2008)

#### 3.2.2.4 Death of the Bauhaus Movement, 1933

Abdou (2020) claims that the Bauhaus movement lasted only a few years, even though it still influences most 21st-century design universities worldwide. However, due to the various diverging opinions within the school and political pressures, authorities were forced to close the school. Gropius resigned as the Bauhaus director in 1928 and was succeeded later by architect Hannes Meyer (1889-1954). Meyer maintained an emphasis on the modernist approach but eliminated parts he felt were overly formalist. However, he emphasised the social function of architecture and design instead of favouring public luxury, towards the public good. This approach prompted the introduction of advertising, photography and marketing, which still forms part of the architecture of the 21st-century. Due to pressure from the municipal government, Meyer resigned ending his term as the Bauhaus director in 1930. Ludwig Mies van der Rohe replaced him. Mies once again reconfigured the curriculum with an increased emphasis on architecture. Lilly Reich (1885–1947) collaborated with Mies on several private commissions assumed control of the new interior design department. The increasingly unstable political situation in Germany, combined with the Bauhaus's perilous financial condition, caused Mies to relocate the school to Berlin in 1930 where it operated on a reduced scale. He ultimately shuttered the Bauhaus in 1933

### 3.2.3 THE EVOLUTION OF ARCHITECTURAL PEDAGOGY IN SOUTH AFRICA

#### 3.2.3.1 Introduction

The history of architecture as a profession and within academia's discipline came to the Southern African shores through colonization, specifically the founding of the Cape Colony. The history of the formalized teaching of architecture inevitably followed this chronology in which the once prevailing attitudes of race, gender and class systems reflect these historical imbalances. According to the researcher's experiences in many design universities in South Africa, this historical impact has not advanced through its conventional teaching methods since colonization. The following sections discuss and unpack the historical evolution of architectural pedagogy in South Africa and its inability to shift towards 21st-century pedagogy in architecture.

### 3.2.3.2 Evolution of Architectural Pedagogy in South Africa

Architect Louis Michel Thibault, a mercenary military engineer, free-lance architect and surveyor in the Dutch services, was the first known architect to occupy the Cape in South Africa (1975-1802). His earliest formal involvement in architectural pedagogy was not to teach but in formulating various architectural curriculums still being used today in most universities. After his death, he was succeeded by Anton Anreith. Thus, his death also marked the end of this enterprise. A new revolution of architectural pedagogy emerged. Anton Anreith Pupil Teubes, who was considered the first formally trained architect in South Africa, started educating various military people, especially in the Royal Corps of Military Engineers and multiple Departments of Public Works. (www.artefacts.co.za/lexicon).

With the rise in the British's influence in South Africa in the 19th-century, most occupants engaged with British-trained architects for their services; therefore, the developments situated itself parallel to the British's design principles and not that of South Africa's identity. The Institute of British Architects was founded in London in 1834 during Britain's rising influence in Southern Africa through its colonisation of the Cape (1806) and later Natal (1843). This colonisation led to the creation of the Department of Public Works, which initially employed engineers, most of whom were responsible for civil structures such as bridges and harbours, inevitably turning their hands to the design of buildings. It can be deduced that their vocational direction as architects was influenced by their experience in the workplace, talent, ability and personal preference for the profession. While most professionals in the built environment were brought to South African shores after training in Britain, locals taken into public service developed independent expertise to present themselves to the public as British influence architects.

The late 19thcentury saw, in Great Britain, through what by Royal Charter had become The Royal Institute of British Architects, a formalization of the architectural profession and with it the education of architects (www.artefacts.co.za/lexicon). The 20th-century this impacted on the way the architecture as a discipline was regulated, and those who chose to enter the discipline were educated there.

Soon after In South Africa, two western cultures held sway, that of the British and the Dutch. A parallel and alternative mode took hold in South Africa. The then President, Paul Kruger, deliberately sought expertise from the Netherlands to bolster both the staunch Calvinism of the 'Golden Republic' he wished to foster and stave off British Imperialism, spear-headed by its avowed and powerful advocate Cecil John Rhodes. The traditions of education here were different from those of Britain and were allied to the cultural divide there, that of Christian Catholicism in contrast to Dutch Calvinism (www.artefacts.co.za/lexicon).

The Second Anglo-Boer (South African) War saw the loss, after the expulsion or internment of all Dutch immigrants during the British occupation in the War that led to the independence of the South Africans to British Colonial rule as the Transvaal Colony. In 1907 a private Act was passed in the Transvaal Colony, now under 'home rule,' to protect the architectural profession. This required that all practising architects in the Colony be members of the RIBA which meant that they would have sat the examinations of this body. These were all British trained architects. In 1910, with the promulgation of the Union, the dispensation of the Private Act of the Transvaal Colony fell away, and the profession immediately agitated for a replacement of the private Act which was vehemently opposed by some of the profession and particularly members of the government. Pivotal to the Act was the matter of architectural education and who might be considered qualified to present themselves as architects.

Practising architects ever-increasingly engaged themselves in education matters by helping set up reading rooms, preparing candidates for examination by the RIBA and generally agitating for and fostering the formalisation of architectural education. In Durban at the Natal Technical College on 9th and 10$^{th}$ July in 1923. At the conference, it was underwritten that the proper place for architectural education and the appropriate examining authorities be the universities. This stance was taken to align the status of the architect as a professional with Law and Medicine. By 1924 these negotiations were successful, and the year saw the establishment of the Michael is School of Fine Art the following year. Courses offered were Bachelor of Arts in Architecture and the Diploma in Architecture.

The Federal Council on Architectural Education held its first meeting in Cape Town in 1924, adopted two standard architecture courses, i.e., the degree and the diploma. The Federal Council

also accepted as the model for its diploma, the University of the Witwatersrand's diploma course, and the University of Cape Town's full course. With this, both geographical and academic divide became two spheres of tradition and influence. The University of the Witwatersrand initially took the responsibility of qualifying graduates from Natal as professional architects (www.artefacts.co.za/lexicon). Until 1945 all of the architecture was focused on the colonial rule until the rise of National Botanical Research Institute (NBRI) of the CSIR which was of the earliest institutes that were researching housing for the urban poor, in particular, those for 'black', or as then termed *'Bantu'*, urban dweller. The CSIR was established by the Scientific Council Research Act (33 0f 1945), an Act of Parliament of the then Union government as one of the many institutional initiatives spearheaded by Jan Smuts after World War II. Even with the fall of colonial rule, most universities of design in South Africa still follow the pedagogical methods of traditional learning and teaching influenced by colonialism.

## 3.3 THE ADVANCEMENT OF ARCHITECTURAL PEDAGOGY AND LEARNING IN THE 21ST-CENTURY

### 3.3.1 Introduction

Most design students of higher education in South Africa experienced both face-to-face and online classes. However, some universities do not take advantage of these technological advances and still believe in 20th-century traditional learning approaches. The traditional learning environment of a confined classroom is considered convenient compared to learning in cyberspace as educators are still stuck in the past and not looking more closely at the students' best experiences learning in architecture in the 21st-century. Weegar (2012) notes that learning theories are how students absorb, process, and retain knowledge during learning. In the 20th-century, learning theories focused on cognitive, emotional and environmental influences and past experiences. All play a vital part in understanding knowledge and the creation of skills. However, the advances in technology educational theories have expanded from the four common theories that the following chapter will explain in detail.

The following four common learning theories will be explained, behaviourism, cognitivism, humanism and constructivism theoretical frameworks, with the addition of Connectivism within the 21st-century. Educators must understand the common learning theories and those of the 21st-century so that the learning interventions and schools they design are learner-centred compared to the 20th-century, which was teacher-centred. Learning theories become more critical as there is a need to integrate technology, social media and informal methods into their learning design to create blended programs aligned to 21st-century pedagogy.

### 3.3.2 Behaviourism in 20th Century Learning Theory in Architecture

Educationdegree.com (2020) points out that behaviourism learning theory in architecture and universities are out of date and lack spatial cohesion. Behaviourism learning theory uses conventional learning systems such as classroom and class board teaching. The theory further suggests positive and negative reinforcement ideas to modify students' actions through a punishment and rewards systems approach. Most students in universities of architecture don't have the freedom to express their designs and innovation, due to their educator's style, thinking and experiences. Imitation drives this learning theory and not critical thinking and self-expression.

Milrad (1999) claims that this form of learning is not suited in design studio environments because the intention of a design studio opposes this idea of student passivity, which is common amongst universities in South Africa. Students have access to many different learning methods and access to knowledge, and therefore, controlled environments that promote behaviourism demotivates students which restricts them from pursuing their full potential.

### 3.3.3 Teacher Centred Environments (Behaviourism)

According to the researcher, most South African universities with architectural facilities such as studios, seminar rooms, and social spaces are disjointed spaces and have no relation to the 21st-century pedagogic approaches. Most of the studio environments are teacher-centred environments used in the 20th-century pedagogic teaching and learning styles where students focus on their teacher. Students work alone in structured 3D dimensional space which shows no connection to 21st-century architecture. These environments should have an overlapping physical, virtual,

geographical, existential, experiential, psychological, social, political, economic, technological, cultural, and ecological spaces that interact in complex ways to activate the students' full potential and promote innovation and design of the 21st- century.

With social media dominance and many other communication platforms, students are always communicating and collaborating all the time. Therefore, students should work in collaboration, be it within the class or externally. Figure 1.6 depicts that most South African universities are structured in a confined and restricted environment compared to 21st-century teaching and architectural learning environments.

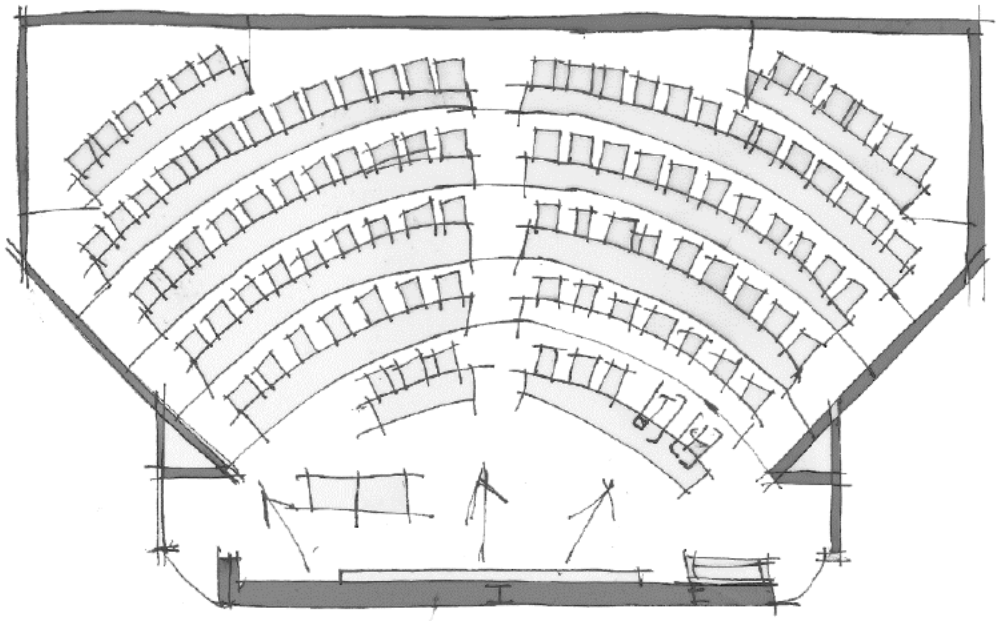


Figure 1.6. Teaching-Oriented Learning Space, Scale: 1:200 (Adapted from Luckan 2016)

### 3.3.4 Student-Centred Environments (Connectivism and Constructivism)

The teacher-centred classroom doesn't allow Architectural Master Students and their Lecturers students to express their understandings, experiences, actions and prohibit the usage of technology in the classroom. Student-centred pedagogy is based on constructivist and democratic principles, and because we live in a digital age, the importance of technological access to and from these classrooms is of utmost importance. Students are stimulated in these environments, which develops their reflective, and critical thinking and sense of responsibility come to the fore in student-centred pedagogy. Therefore, there is the integration of student-centred learning

techniques without compromising student learning outcomes both academically, socially and most importantly, technologically to transform architectural environments in line with 21st-century pedagogy.

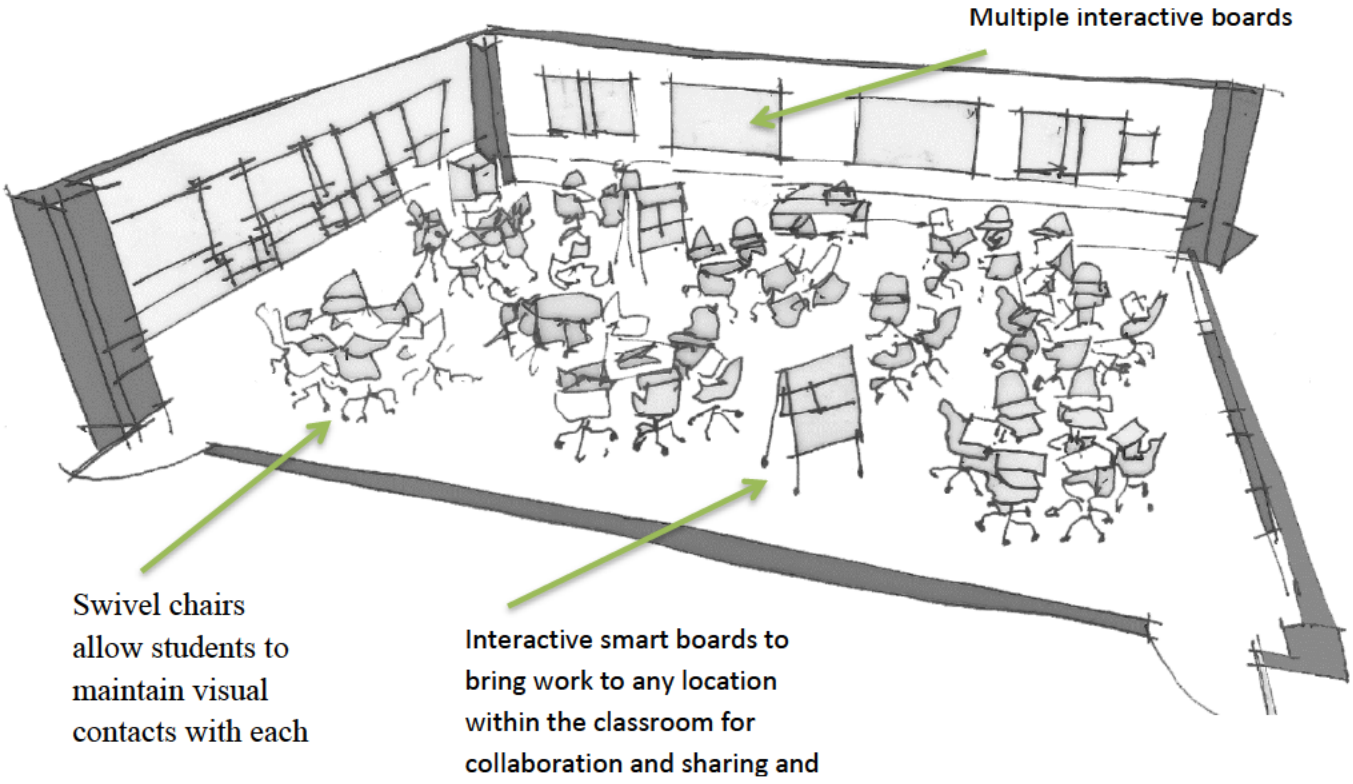



Figure 1.7. Student-Oriented Learning Space (Adapted from Luckan 2016)

The design and layout of classrooms, as illustrated above, define the pedagogic approaches of those rooms. A classroom of rows of desks orientated to the front of the room towards a board or lecture podium suggests a teaching-oriented pedagogy (Figure 1.6) while clusters of desks with students facing each other indicate a collaborative-learning oriented pedagogy (Figure 1.7) (Luckan, 2016).

### 3.3.5 Cognitivism

Cognitivism manifested in the 20th-century as a reaction towards behaviourism. This learning theory mainly focuses on the students' ability to read, memorize instructions and theory from textbooks. The 21st- century pedagogy opposes this as it emphasizes that learning can be accessed

from any source, experiences, technology, virtually and physically from around the world. Cognitivism mainly deals with learning (swatting), regurgitation and not critical thinking (Rhalmi, 2015). In cognitive learning theory, students are not considered recipients anymore, but rather active participants. All students are standardized and do not have their identity and freedom of expression compared to 21st-century pedagogy. The learners are restricted to their classrooms and a universal academic programme in which there is no collaboration with the local community, culture, social constructivism, and learning within their context and environment. In this theory, students are regarded as machines, not people. Information is processed and categorized through memory in storing data, but not learning about real-world applications, experiences, and the ability to explore through the means of innovation and technology.

The role of memory is essential but not compared to the position of experience within 21st-century pedagogy. As information was stored and organised using the cognitivism approach in the 20th-century, 21st-century students are encouraged to use advanced techniques such as analogies, (hierarchical relationships) and technology to acquire new information to add to knowledge to retrieve data from memory.


Figure 1.8. 20th-Century Learning Theories (Rhalmi 2015)

### 3.3.6 Humanism

Humanism pedagogy focuses on students as a free act and expresses themselves freely. Humanism centres its education strategies on human values, capacities, needs, worth, and dignity. It believes that students should not be confined within four walls but should be exposed to the external environment to have unlimited growth and development. The 20th-century pedagogy refers to

acquiring knowledge behaviours, skills, and values through study, practice, and experience, but humanistic learning theory focuses on specific humanistic creativity, critical thinking, personal growth and choice. The following are some of the requirements that the 20th-century learners should consider when trying to achieve a 21st-century humanistic pedagogic approach in universities. Milrad (1999) maintains that "Learners should be trusted to find their own goals and should have some options or choices in what and how they learn at school".

- Students should set their standards and should evaluate their work.
- The school experience should help students to develop positive relations with their peers and other disciplines
- The humanistic approach is learner-centric, with the emphasis on the individual's potential rather than the specific learning materials

### 3.3.7 Constructivism in 21st-Century Learning Theory in Architecture

Milrad (1999) states that "constructivism is the idea in which students are responsible for creating their own understanding and gaining knowledge using what they know and linking experiences and new information to construct their meaning". Constructivism influences the interaction with their surroundings and brings their attitudes and interests in the way they learn. Milrad (1999) further notes that several learning theories can be applied in architectural design studios, but the most recommended technique preferred in the 21st-century is constructivism.

Constructivism includes a procedure in which students actively participate in every learning stage contrary to behaviourism, in which students are passive listeners. Constructivism emphasises discovery in which teachers avoid encouraging architectural students to be passive listeners, and instead, it supports discussions, interaction with other disciplines, interactive environment and most importantly, a critical analysis of their designs.

These outcomes are beneficial to students as this improves creativity as the process and the product are dealt with equally. Since students of the 21st-century are regarded as distinct individuals from different backgrounds, societies, culture, influences and races, they will not learn the same way. In the same vein, architectural and design studios should not be using a single method of learning

and teaching, as in it should be a collaborative effort using a blend of several ways appealing to a more significant number of students to reach their potential. Constructivist teaching involves various methods and is considered a fruitful approach in which architectural education can bring an equivalent learning level to differing individuals.

Universities should create a flexible and healthier an environment throughout this process of assessment to develop architects with individual identities of the 21st-century as compared to a behaviourist approach that uses traditional methods of assessment (teacher orientated) methods based on testing, formal spaces and confined spaces restricting students to a classroom creating very concretive architects which are of the past (Ceylon, 2010).

### 3.3.8 Connectivism: A Learning Theory for the Digital Age

"21st-century learning spaces are not only physical, non-physical spaces such as virtual space may also serve as the new social space in contemporary society (Luckan, 2016) ". 21st-century learning spaces has a significant impact on the definition of learning space and questions the structure of traditional architectural learning spaces and learning theories. These current learning theories, principles, and processes should always reflect the underlying social environment and technological advancements and still be an ongoing adjustment to innovation and technological advances. Connectivism represents a learning model that recognises the tectonic shift in which learning is no longer internal and an individualistic activity but how we use new specialised tools and communication methods to acquire new knowledge anywhere around the world. This relatively new learning theory recognises learning tools and environmental changes that previous learning theories failed to do as this provides insight into learning skills and tasks needed for learners to excel in a digital era.

Educators and universities have an essential role in teaching by using digital technologies as this theory are one of Milrad (1999) **"**key drivers of the 21st-century pedagogy. This theory suggests that people no longer learn from formal education but continue to gain knowledge from other avenues such as networking, experiences and access to information with new tools in technology**".**

### 3.3.9. 21st-Century Learning Models

It has been established that the needs of Generation Z students and 21st-century pedagogy in architecture are evolving, and to support those needs, new emerging learning models have been designed as depicted below:

**Student-Centred or Learner-Centred Learning-** This is achieved by effectively and efficiently engaging students with unrestricted difficulties associated with a specific area, everyday lives, interests, culture and practices, that correspond to the respective student. This learning enables a unique learning experience, that is well-rounded with a more extensive understanding.

| Teacher Centred | | Learner Centred |
|---|---|---|
| Content focussed | >>> | Process focussed – learn to learn |
| Memory | >>> | Critical thinking |
| Rote learning | >>> | Ability to communicate |
| Individual testing/ competitive | >>> | Work in teams/ collaborative |
| Problems not 'real' | >>> | 'Authentic problem solving' |
| Set tasks within subject | >>> | Project based learning |
| Within discipline | >>> | Cross disciplinary learning |
| Rigid timetables & supervision | >>> | Self organise/ self-directed |

Figure 1.9. Student-Centred Learning Chart (Kolb 2015)

**Problem-Based Learning-** This type of learning allows students to examine problems, justify and decipher real-life problems, enabling them to make judgements based on analyzing data. Problem-based learning allows enhanced participation (self and socially) while stimulating their critical thinking abilities.

**Project-Based Learning-** Involves students developing and executing authentic, everyday life projects, outside of traditional theory through various learning activities. This learning challenges students, enabling them to become innovative, based on their own experiences whilst executing projects.

**Blended Learning –** Allows the freedom of learning away from home, with supervision. It allows students the flexibility and the ability to manage their own time, direction and pace.

**Cooperative/Collaborative Learning** – Creates a forum whereby students are blended into various groups with a collection of abilities and interests, thus motivating originality and deep thinking, while indirectly increasing performance and social interaction. This learning is a direct result of students' diversity (Darling, Flook, Cook, Baroon & Osher, 2020).

### 3.3.10 Experiential Learning

Experiential learning is an education-based program which combines functional experience and in-depth evaluation leading to sensible concepts. In architecture, the main emphasis is on creating knowledge through experience (Kolb, 2015). It is a process whereby students enhance their practical skills outside of the ordinary. (Kolb, 2015) maintains that, experiential learning consists of other apprenticeships, service-learning, undergraduate research, international studies and other creative work experiences. Well designed and executed "experiential learning programs can effectively stimulate academic enquiry by promoting multi-skilled learning, social interaction, career development, cultural awareness, leadership and other soft and hard skills".

Experiential learning is a powerful teaching tool that most architectural universities are offering within their curriculum. However, according to Kolb (2015) experiential learning is disjointed and is treated as a separate entity within classrooms. Therefore, companies and universities need to align with each other to keep up with students' and the external environment to reach their full potential. Whilst many traditional learning techniques address the intellectual domain, experiential

learning offers a change of pace from the traditional classroom as students can relate to subject matters in lives and experiences, especially students who struggle with literacy and completing written tasks may find themselves stimulated in the form of a project that they can relate to, from their understanding and practices.

**Experiential Learning in Architecture**

Experiential learning has a crucial role in the success of Architectural Master Students, Lecturers students. Planners, architects, engineers and builders must create spatial awareness to real-world problems and critical thinking to untrained individuals. It also makes them more employable, with attaining vital skills for the future of education in architecture. Experiential learning enhances students' attitudes and skills to better understand the built environment, preparing them for lifelong learning.

According to Kolb (2015) the following are the requirements to shift from 20th-century conventional learning towards 21st-century experiential learning

- Arranging a favourable climate for learning aligned with 21st-century architectural companies.
- Assisting the student to ascertain clear goals and objectives and intent of learning.
- Structuring resources to support the 21st-century technologies and easily accessible to the learners.
- Harmonizing “soft” and “hard” components of education.
- Connecting with learners in a free and equal manner.
- To enable learning.
- The student should be adequately assisted and aligned when the need for doing so arises.

**Experiential Learning in an Architectural Framework**

Experiential learning begins with the experience that students within architecture have had from companies relating to the architecture and the built environment, followed by their ability to reflect

on what they have learned. After that, students may draw up conclusions from their experiences leading to future decision making and designs in which they experiment with different behaviours and skills. This experiential learning then begins a new cycle as students have new endeavours arising from their experimentation. Although experiential learning is typically a cycle, any order may be beneficial. Components consist of both concrete and conceptual.

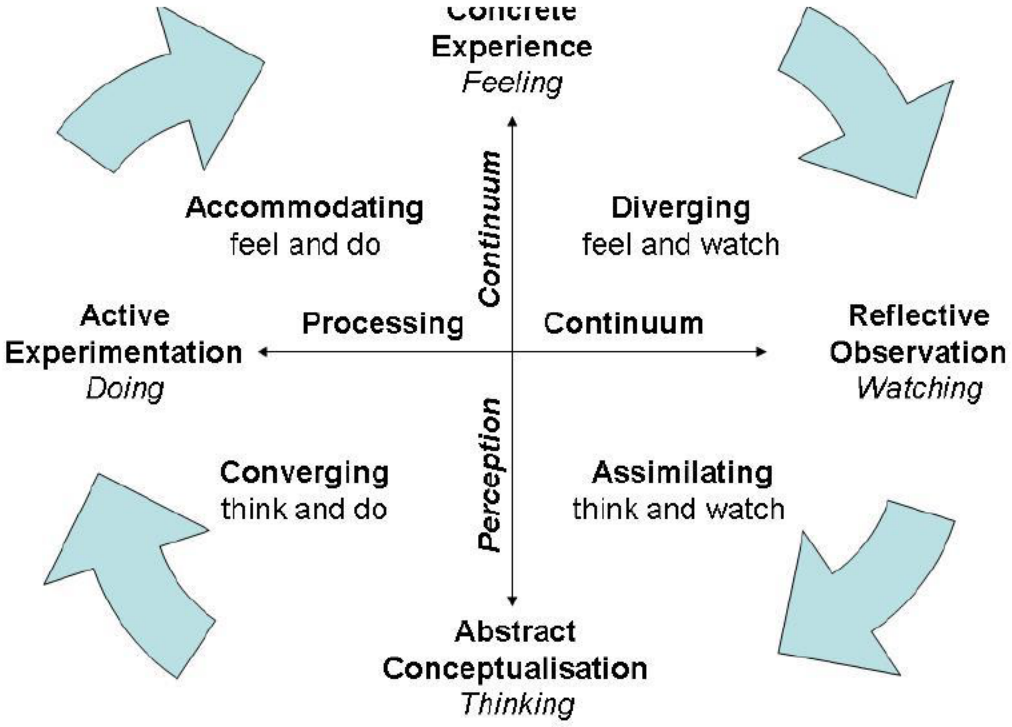



Figure 1.10. Four Learning Modes of Experiential Learning Theory (Kolb 2015)

Kolbe (2015) states that the cycle of experiential learning is based on hands-on experience and help students understand teamwork, materials, finance, construction and public relation management. With these abilities, technological skills, an interdisciplinary collaboration this will ultimately prepare for them for the real-world working environment.

### 3.3.11 Conclusion

With the digital revolution of shared knowledge, the architectural profession finds that increased interdisciplinary collaboration flattened hierarchies and redefined emerging architects' experience

today. Universities, therefore play a vital role in preparing architectural students to be aligned with their external environment and transform from a cognitivist approach, which is the typical classroom, four walls, confined, internalized and a very teacher orientated approach, towards the influence of a mix of constructivism, which is a student-centred approach. Architecture should promote discovery, collaboration with other disciplinaries, a humanistic approach in guiding students to reach their full potential. Experiential learning should relate to various companies that emit 21st-century learning within their office environment and, most importantly, connectivism, within the universities. Learning should be done in a physical environment and virtually to access and gain knowledge from anywhere in the world. There is also a need to network with other countries as this is important as it creates more opportunities for students' exposure and provides a critical analysis of the architecture of the 21st-century.

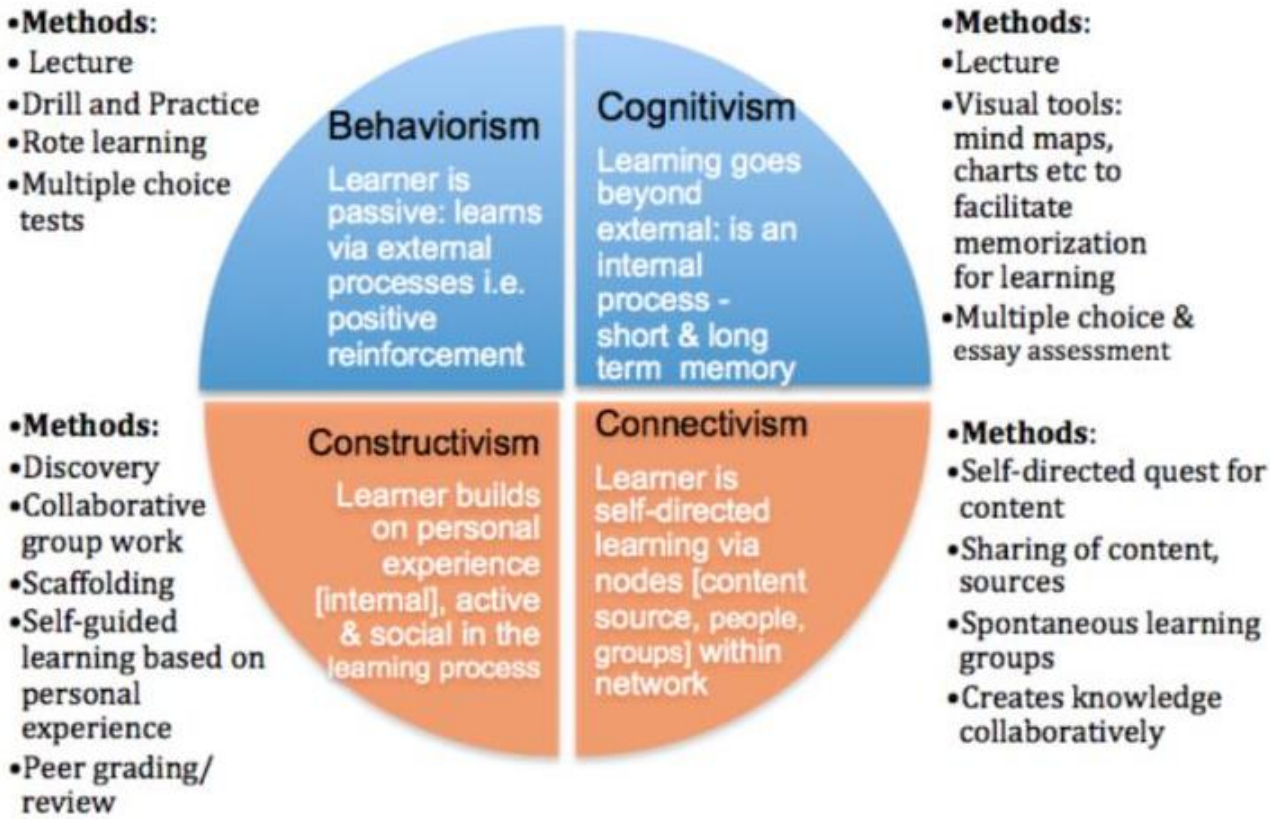



Figure 1.11. Four Learning Theories in Architecture (Weegar 2012)

## 3.4 RETHINKING THE CONVENTIONAL ARCHITECTURAL DESIGN STUDIO TOWARDS THE 21ST CENTURY

### 3.4.1 Introduction

As a learning environment, the 21st-century architectural design studio includes its pedagogy, history, and interaction forming a 21st-century architectural design studio, in contrast with traditional classrooms. A typical studio environment in architecture involves engagement intellectually and socially and continually shifting from analytic, synthetic, and evaluative thinking models through different programmes. The architectural design studio is the fundamental core structure in architectural pedagogy and is considered the standard architectural design practice in all countries. However, many design studios' central role in the conventional pedagogical system in design education does not respond to the global context, current social context, economic, ecological, multi-disciplinary structures, and, most importantly, the 21st-century technological changes (Burkay, 2017).

"Conventional studios are limiting students' potential regarding students' engagement and motivation, especially when projects are fictional and detached from context or reality. However, the 21st-century as a Virtual Design Studio has created valuable learning environments as students take advantage of the various instruments and approaches that 21st-century pedagogy in architectural has to offer. These include communication and interaction and live realistic projects with 1:1 scale projects, budgets and timeframe constraints for students to work collaboratively with other disciplines to prepare students for the real world and achieve a common goal (Rodriguez, Hudson & Niblock, 2018".

Burkay (2017) states that "university students are some of the earliest adopters of social media and WEB 2.0, even though these 21st-century pedagogy tools were not offered at local universities. Therefore, these pedagogical approaches should be the focus to inform better collaboration through the design process from the initial conceptualization to construction". The following chapter introduces the history of the conventional architectural design studio and how universities can move towards the 21st-century architectural studio by introducing a virtual design studio and the effectiveness of the live project, not just fictional simulation.

### 3.4.2 History and Theory of the Design Studio

Burkay (2017) asserts that "the first known designs within a design studio in architectural education wherein 1819 when the classical private workshop or studio system of the initial French Royal Architectural Academy transformed into École des Beaux-Arts. This Beaux-Arts program was not only aimed to be artistic but also to produce analytical and structural thinking systems for architectural students. The Beaux-Arts School was a curricular structure which had two purposes for practical and formal pedagogy in which the designs studios were not central but lateral. The valuable education referred to craft training in which architectural students learnt to work with stone, timber, metal, clay and glass. Formal education concentrated mainly on the architectural forms and the problems associated by it through observation, representation, composition and theories such as space, colour and design. In this two-fold pedagogy structure, knowledge was gained through many skills such as learning about materials by creating a form with it, learning geometry, colour, space and design by designing, painting and model making". It was one of the most influential schools in the 19th century, symmetrical in plan, and its teaching system was mainly based on lectures combined with practical work in studios and an architectural office. Its conception of architecture was based on the composition of well-proportioned elements in the asymmetrical and often monumental scheme.

Figure 1.12. Students Entering Concours Worked in Small Cubicles in Which They Had Twelve Hours In Which To Study The Program And Draw Their Preliminary Sketches.'Ecole Des Beaux-Arts, 1819 (Adapted from Burkay 2017)

### 3.4.3 Conventional Studios

"Conventional studios have become very popular in architectural education worldwide since the Bauhaus movement in the 1930s in Germany. These studios have been the centre of architectural education for many decades, with numerous critical and pragmatic thinking advantages. In most universities that practice studio-based exercises, students are given a brief with a hypothetical design problem that allows them to direct their learning in search of potential responses to the design problem within their studios' confinement. During this process, lecturers guide students by questioning their design proposals face-to-face and reviewing their critical thought process and encouraging them to search for a variety of solutions. This pedagogic method has been formalized as problem-based learning and used in many interrelated disciplines (Burkay 2017) ".Even though interacted within the real-world, these disciplines are never connected in studios or universities, not preparing students for the natural working environment. This format is criticized because architects in the real-world environment engage and learn from other disciplines in the 21st-century. Therefore, it is essential that these universities harness this 21st-century pedagogical teaching and learning within their studios, be it physically or virtually. These designs students produce are limited to the spaces they work in and access to 21st-century digital tools and infrastructure.

There are many variations in the design of architectural studios, most South African Universities that offer architecture include studios that are confined and internalised. These design studios are often isolated from everyday life and the community and tend to promote theory without practice and exclude a world rich in colour, diversity, collaboration and sustainability as a 21st-century should include. These environments tend to lead to social seclusion and narrow-minded thinking and breed detachment from reality compared to 21st-century pedagogy. The following section is a comparative analysis of the various kinds of architectural studio environment of the 20th and 21st-century.

### 3.4.4 Virtual Design Studio (VDS)

Virtual design studios refer to a learning method in which students communicate and collaborate within architecture and other disciplines, mainly using digital tools, therefore overcoming

geographical or spatial barriers. This type of digital tools is widely utilized in a student's-centred pedagogic approach based on the constructivist theories. They allow architectural students to start classes anytime and study in isolation which is currently recommended due to the COVID-19 pandemic that the world is now facing. Students can communicate with lecturers and classmates by using interactive technologies such as video conferencing and social networks like Skype and Facebook as well as virtual reality interfaces, positioning them at many places at once. Other sophisticated tools standard in architecture are computer-aided architectural design, digital prototyping, automated construction methods and WEB 2.0.

VDS stimulates creativity and, most importantly, empowers and enhances students' creativity to access their imagination with the use of technological advances comfortably compared to traditional studio environments. The implementation of this 21st-century learning method can generate interaction and collaboration amongst students within these physical and virtual environments, which fosters a sense of community and interest in society. Most importantly, VDS concerning architectural education is a shift from traditional, linear learning and teaching methods towards the 21st-century. It also provides meaning opportunities, such as the encouragement of teamwork, efficiency, spatial awareness which is not possible in traditional classroom settings Rodriguez et al. (2018).

However, in South African universities, this area remains untouched, and due to the traditional methods of learning such as face-to-face in-studio learning environments, most universities are reluctant to use the VDS format or other technological advancements. This conventional architectural method is linked to technical and practical constraints, such as the resources in-studio environments, typically because of large student groups, lack of updated software, language and cultural differences between participants or time differences between regions. This conventional learning method isn't appropriate for the 21st-century, in many cases students lack opportunities to interact physically and virtually with other disciplines and don't receive feedback and social support, leading to less engagement and broadened skills and knowledge. There are also growing concerns about VDS such as the exposure of students to too much of freedom will be hard to regulate their learning and can hinder their progress., therefore it is critical that's there is strict

management and constant communication between students and their lecturers for this method to be effective Rodriguez et al. (2018).

### 3.4.5 Live Projects

Live projects are the essential pedagogic methods directly linked to the external environment in architecture and its interrelated disciplines. In architectural education, it has been used in many developed countries as an alternative to real design problems, but not in developing countries due to lack of space and resources that cater for this scale 1:1 project. Live projects are practical 21$^{st}$-century pedagogical strategies that connect academia with the world outside, although they require more significant administrative efforts and careful time management than the traditional studio.

In universities, there is a studio environment dominance, which is not linked to the external environment. In 21st-century pedagogy, live projects reduce the studio's dominance and are directly related to the real-world whilst capitalising on the notion of pedagogical events. Even though Design studios provide a risk-free environment, controlled conditions in isolation, on the other hand, exposure to live projects is different. It exists in complex, unpredictable circumstances where students need to apply their experiences and additional skills to deliver results under changing conditions. For example, in an architectural context, a live project would compromise a timescale, budget, and real-life problems that need to be resolved between a client and an educational institution (Rodriguez et al., 2018).

Rodriguez et al. (2018) argue that live projects provide higher levels of interest and motivation, strongly linked to real-world scenarios. These live projects between students and lecturers give the perception of client and architect cases in the real world working environment, in which students feel proud as they see their project come alive which  Students talk about ‘making a difference’ or a ‘lasting effect’ and feeling ‘proud’ knowing that the result would be used.

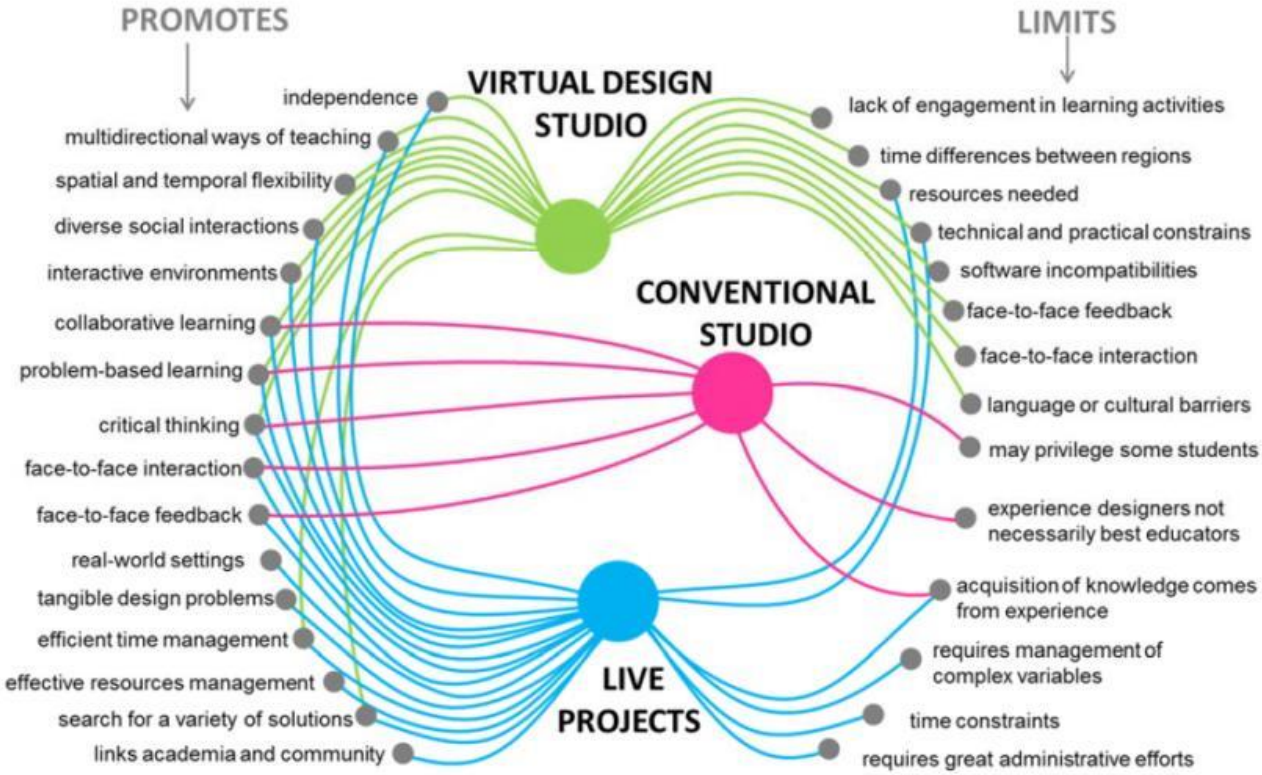



Figure 1.13. Opportunities and Limitations from the Use of Virtual Design Studio, Conventional Studio and Life Projects in Architectural Education (Rodriguez et al. 2018)

### 3.4.6 Combining Conventional Studio, Virtual Design Studio and Live Projects

21st-century pedagogy and learning Virtual Design Studio (VDS) have created learning instruments, environments, communication, and interactions with architectural students and other interrelated disciplines compared to conventional methods in which students are confined to their classroom only. These spaces (VDS) have influenced spaces that foster opportunities for collaborative learning, engagement and motivation. This promotes real-world live projects in which conventional studios are mainly based on hypothetical projects which do not prepare students for real-world working environments. Information communication technology (ICT) has a vital role in the success of 21st-century pedagogy in architecture as it forms the basis for universities to move from conventional studios towards 21st-century pedagogy and learning. It is not easy for universities to change overnight towards this movement, but the aim is to blend both methods towards a common one which is 21st-century pedagogy in architecture.

Most of the 21st-century architectural universities students interact with peers, teachers and people from the industry. The community interacts with focus on real-world applications such as 1:1 scale project, with budgets and a timeframe constraint compared to traditional universities. According to Rodriguez (2018), students who work collaboratively has the confidence and ability to solve challenges and when placed in a real-world setting. This confidence comes with the interaction and endless access knowledge and exposure with other disciplines, which typically work towards achieving a common goal in a real-world environment. Therefore, the exposure to Virtual Design Studios to broaden these students' knowledge, interaction, and the combination of live projects must work in unison to establish links between the academic environment and the external environment, which is of utmost importance 21st-century pedagogy.

### 3.4.7 Transformation from Conventional Studios towards a Hybrid System

There are many disadvantages and benefits that VDS traditional studio and live projects have over each other pedagogy in separation. The synergy of both pedagogies can help overcome abstraction and detachment from real-world working environments.

Collaboration between students of allied disciplines and cultural backgrounds promotes engagement and motivation rise levels. This collaboration between students of the two mixed pedagogical approach of VDS and live projects forms a hybrid system. This hybrid system identified that students that are exposed to this hybrid approach show that’s a student who works on projects that involve students working together with other disciplines, solving a real problem and working with members of the community outside the institution (e.g. clients or the industry) have more success in the real world compared to those that were exposed to conventional teaching. Collaborative work is enhanced through a selection of means, virtually and face-to-face using digital tools acting in diverse settings, e.g. at a distance and on-site. Technical and practical constraints can overcome having a range of possibilities for interaction.

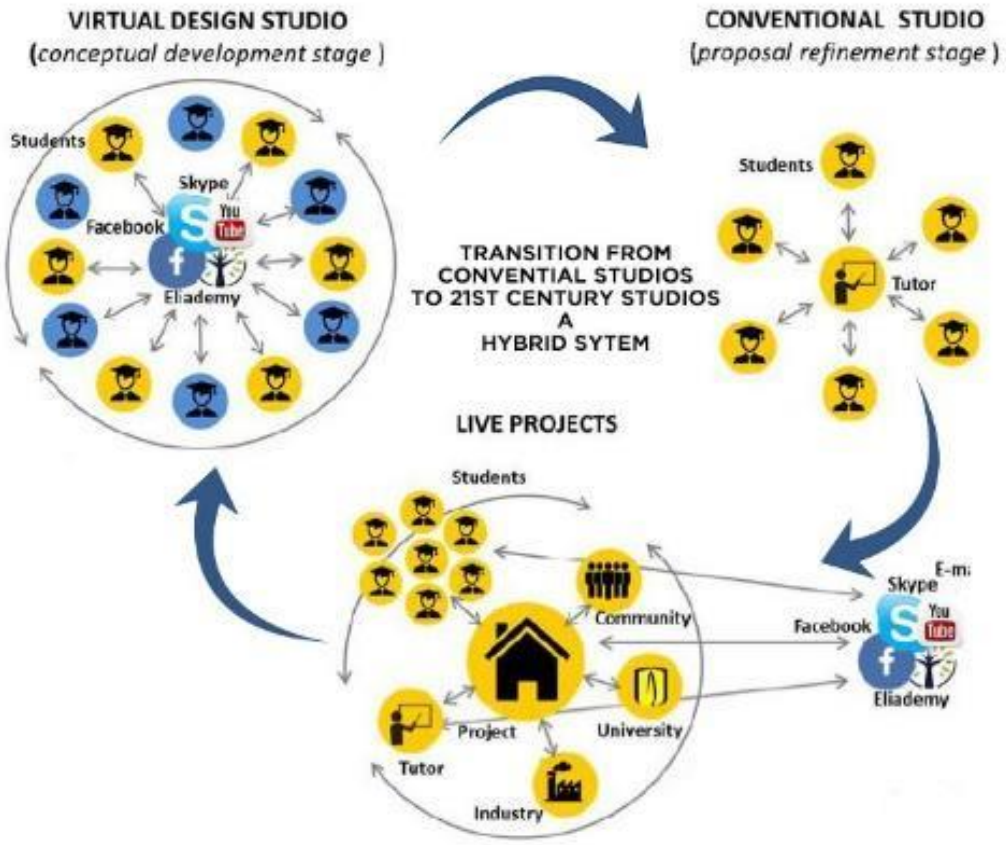



Figure 1.14. 21st-Century Pedagogic Studios in Architecture (Rodriguez et al. 2018)

### 3.4.8 Linking Pedagogy and Space

Throughout history, architects have critically inquired, researched, and responded to the evolution of theory and architectural pedagogy changes. A paradigm shift needs to occur between 21st-century pedagogy in architecture due to technological advances, dependence on social interaction and global exposure. Dr Kenn Fisher supports this shift, and his central ideology is to explore alternatives to architectural pedagogy and its studio environment, linking the pedagogical paradigm with its approach and its spatial prototype. These 21st-century learning environments should evolve beyond the confines of the studios. As students will work through a range of modalities, as depicted in Figure:1.16, collaborating through knowledge learning communities' social construction. Dr Fisher suggests the organization of these spaces can be clustered according to the modalities of learning; Mode 1 (teacher-centred); Mode 2(student-centred); Mode 3 (informal or social). These spaces should be arranged responsively and flexibly to freely move through these spaces according to their needs.

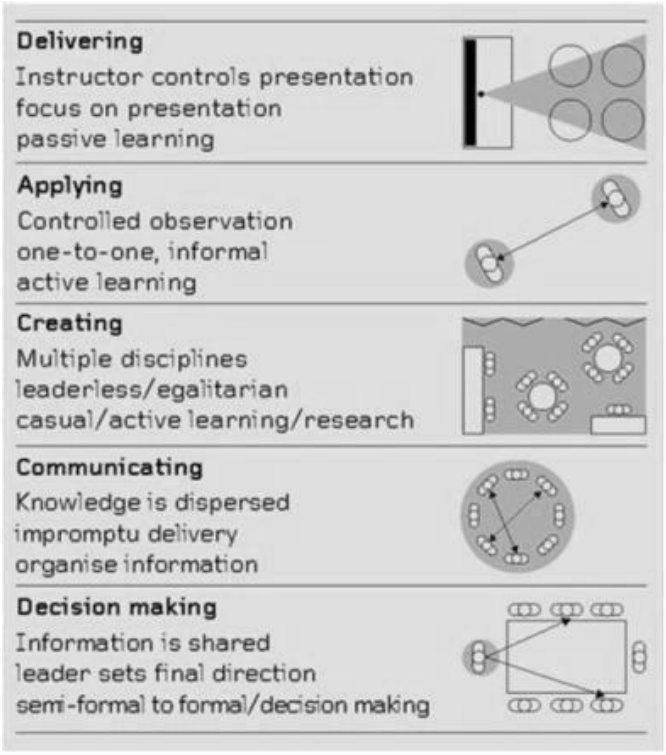



Figure 1.15. Linking Pedagogy and Space (Kolb 2015)

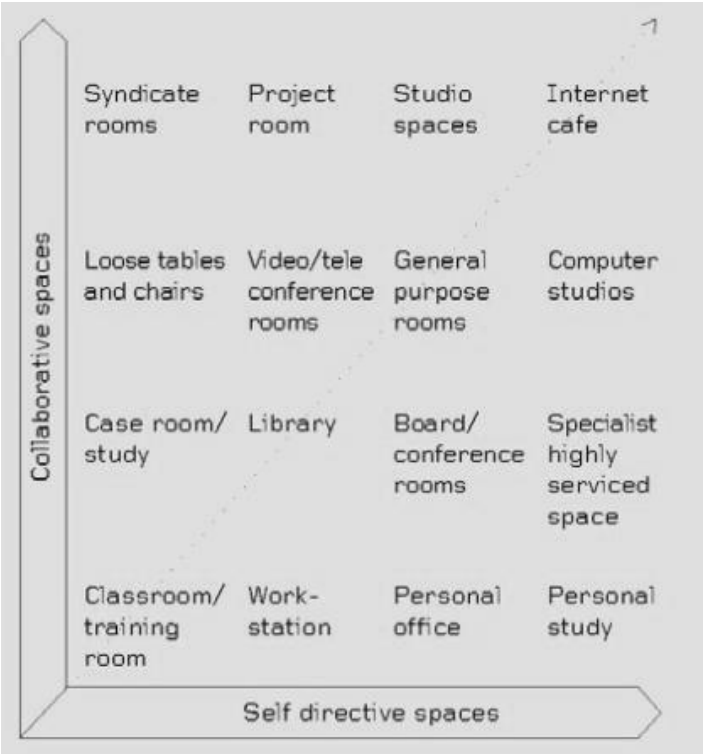



Figure1.16. Range of Modalities Diagram (Kolb 2015)

### 3.4.9 COVID-19 Response: Alternate Design Studio Teaching

According to Hahn (2020) many universities worldwide have been shut down due to the COVID-19 pandemic, and the very aspect of society has been turned on its head. Some private providers of higher education which have been operating online using the 21st-century pedagogic methods of teaching have remained undeterred as their ability to switch to online studies has been an easy response. Due to its virtual studios, meetings, online critiques and interaction using 21st-century digital tools have become a norm for them. With the announcement that all universities in South Africa must switch to online learning platforms, most public institutions are struggling with this sudden change compared to private institutions. This is because all public universities are not equipped with the digital tools to supplement this change and students do not have the relevant platforms and resources such as access to data, digital tools that can replace real-world interactions with virtual alternatives.

Government universities that offer programmes such as Architecture struggle with this change towards online teaching because of poor governance and lack of resources compared to the private sector. Quick decision making and risk management such as alternatives to the traditional pedagogy, were already prepared for, such as the opportunity to continue with the academic calendar with remote working, making the most of their digital tools for maximum productivity and communication while travelling less is required for this sudden change.

Since the recent COVID-19 quarantine restrictions were enforced, the education system in developing countries have come to a halt, many students are questioning how to create a long term plan for studio design, but with poor access to 21st-century learning methods, students are left in the dark without a way forward, as the transition to home-school learning, even with the use social media platforms such as Skype calls, Zoom meetings, WhatsApp and Google Hangouts are not enough. As traditional studios' existence will soon come to an end as face-to-face meetings are not recommended due to this pandemic, many universities need to respond to this change towards 21st-century pedagogy.

## 3.5 PHENOMENOLOGY AS A PARADIGM FOR 21ST CENTURY ARCHITECTURAL LEARNING SPACE DEVELOPMENT

### 3.5.1 Introduction

Norberg-Schulz (1979) relates phenomenology in architecture to one's sensory reaction to build space or how it makes one feel. Some architects use materials, textures, and colours to produce a phenomenon while others use the building itself to achieve the same effect. Most South African universities that offer architecture are mainly mass concrete structures in which students engage and study. These spaces do not embody phenomenology as they are dark hard surfaces filled with noise pollution and have no linkage between their internal and external environments.

Jordaan (2015) maintains a strong link between architects that use, vision, sound, touch and smell with phenomenology within their designs. However, the most critical aspect of a

phenomenological approach in designing spaces is not just physically but virtually and mentally experiencing space. The importance of experiencing space happens in physical reality and through the user's imaginations and perceptual interpretations. However, many of these spaces and commonly shared value systems in architecture within the 21st-century, like the universities and schools of design are represented by concrete human places, with no sense of experience.

This phenomenological approach within architecture and design can begin in architectural universities' classrooms, such as studios, informal spaces, interior and exterior spaces, be it physically or virtually. Introducing this approach would necessarily mean returning to the beginning of the design sequence, running parallel with exploring students' understanding of what architectural experiences they would like to encounter within their classrooms and surrounding environments. The following section ell inquire about the potential values, and endless possibilities of a phenomenological approach have in architectural design Norberg-Schulz (1979).

### 3.5.2 Theory of Phenomenology: Analyzing Substance, Application, and Influence

In the 21st-century architecture has a significant influence of the needs of the community and this can be done by integrating human activity withs its adapted site context, organized programmatic and interstitial space, and materials (Holl, 2018).

Norberg-Schulz (1979) states that designing experiences in architecture is the individual responsibility of the architect. Therefore, the theoretical phenomenological approach acknowledges this responsibility and instils the importance of sensory and experiential design to establish an architectural place, not just space to house its users. Phenomenology in architecture should create memorable experiences and encounters that continually impact humans' senses; this can be achieved by manipulating space, material, light, and shadow in these places. With its integration of sensory perception, this Phenomenological approach as a principle function in architectural design can create experiences beyond tangible, abstract, observed, and perceived. An observational argument for prioritizing the human experience in design will be determined by exploring phenomenology's theoretical construct.

This phenomenological strategy in architectural design and the built environment develops unique experiences, mainly based on its effect on human perception, the sensitivity of space, light, and

form. In contrast, many of the design universities in South Africa portray a rationalist strategy that merely develops a mechanical sense of reason. Jordaan (2014) defines rationalism as a theory in which the criteria of its design strategy are not based on experience and sensory, but intellectual and deductive. This theory produces layers of scientific approaches in contrast to phenomenology delivers layers of sensory and experience, informed by emotion with the manipulation of light, shadow, material and spatial perception.

According to Jordaan (2014), the dynamics of human perception are based on the people and the community. They should have an impact and influence in the architectural design form, its function, circulation, and organization of these influences to produce the sensory of a Phenomenological order. It is essential that architecture serves human activity needs and create relationships between human senses and its architecture to evoke emotion and perception. Jordaan (2015) stresses that "Throughout history, admiration for the human body in architecture resonates, specifically its relationship to human perception the environment influences human beings, which implies that the purpose of architecture transcends the definition given by early functionalism".

Phenomenology emphasized the function of quality in its architecture; and that the architectural design should, therefore, principally consider sensory and its user's experiences within the details in the integration of its collaborative program. Intimate experiences and memories of the place should derive from intricate forms of details and allow for a bond beyond physical and virtual use of a building, an experience fixed in memory.

Norberg-Schulz (1979**)** argues that "the sensory experience between an architectural object and those who encounter it should be critical and complimentary". These experiences are determined to revive emotion-evoking design through "space, material, light, and shadow by expressing these features into both the larger context and personal human perception. Jordaan (2015) suggests that light and shadow create a playful interaction of colour, texture and related emotion associated with the program. The contrast between these can be sharp or blurry depending on the desired effect".

This approach will create depth to the design, displaying texture, lighting, visual communication, experience, sustainability and an architectural narrative key to a phenomenological approach in architecture (Holl, 2018). Within the 21st-century, phenomenology is the physical, virtual and

augmented environment and what one feels in these spaces, Therefore, creating architecture that is sustainable and linked to the comfort levels, experiences and most importantly, the anthropometrics to understand human physical variation in a physical and virtual environment is of importance within 21st-century architectural design.

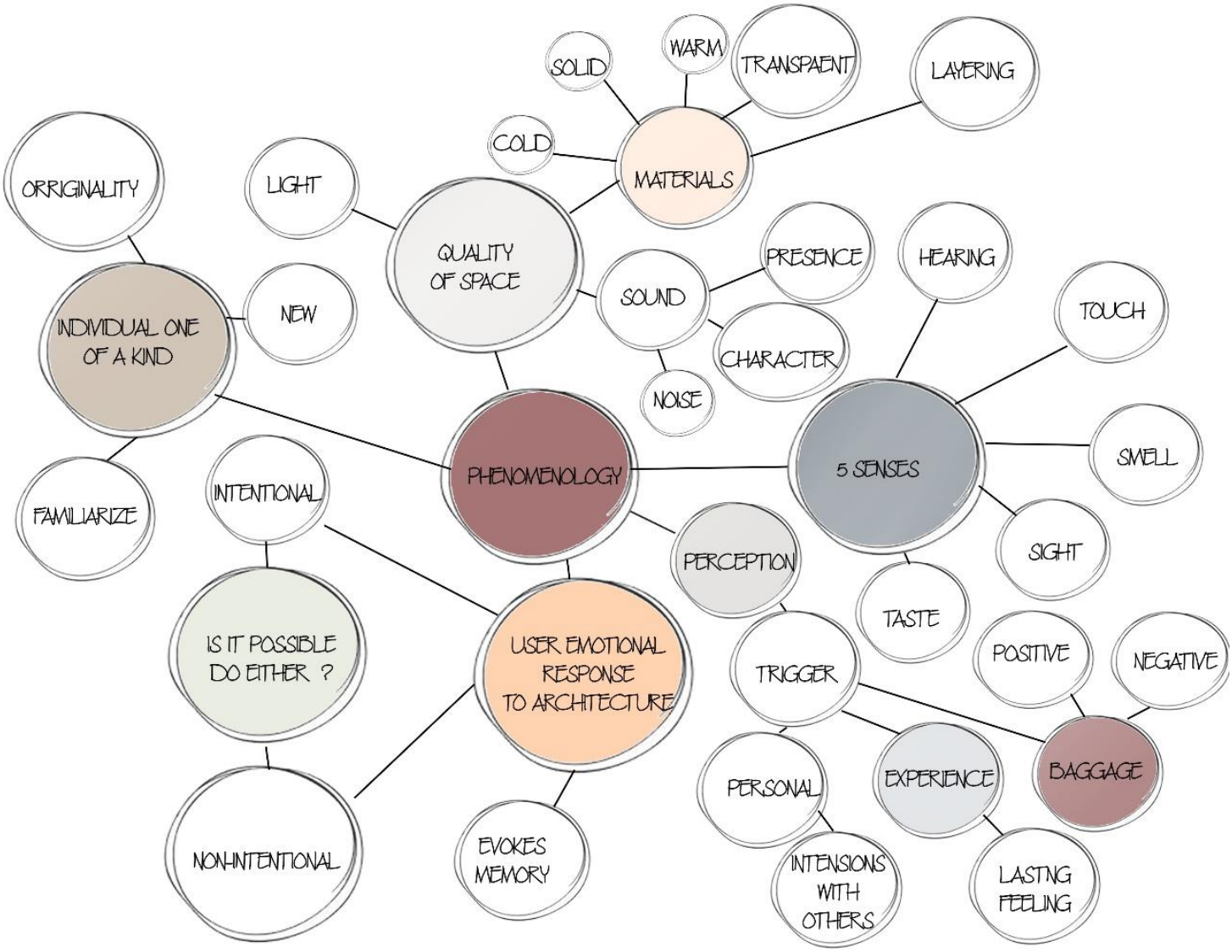



Figure 1.17. 21st-Century Phenomenology System in Architecture

(Adapted from Rodriguez et al. 2018)

### 3.5.3 Phenomenology in 21st Century Learning Space Development

With 21st-century pedagogic principles in architecture, experiences can be much richer when designing spaces for humans, providing depth, believability, impact and full immersion with the extensive wealth of knowledge architects and interior designers have amassed to create rich and meaningful spatial experiences that conventional pedagogic methods could not offer. With these tools and new spaces in architectural schools, architects and students have various new and emerging tools to form experiences, thereby enhancing the phenomenological experience of space.

Virtual reality (VR) devices are one such example whereby technology can simulate the experience of space. However, the depth of the phenomenological experience cannot be confined to sight and sound alone. Like "sense of place" or "presence" in VR space's, phenomenology is an ephemeral concept. Since everyone experiences things differently, their reactions are highly subjective. These pedagogic methods focus on the users' awareness and consciousness during the experience he/she is designing. To fully experience space at a level of consciousness requires a hybrid of physical and virtual experiences, the tactile with cognitive perception. What emerges is a layered process of experiential spatial design. West (2020) poses a relevant question: can the designer subtly manipulate the spatial condition of the experience using phenomenological strategies to affect the psychological and physical relationship between users and the space to change the way users feel about the experience or themselves?

### 3.5.4 Conclusion

Architecture is designed to serve human activity needs; therefore; it creates a relationship between human senses and the building to transform emotion and perception. Throughout history, admiration for the human body in architecture resonates, specifically its relationship to human perception. Holl (2018) stresses that “the environment influences human beings, and this implies that the purpose of architecture transcends the definition given by early Phenomenology is the function of quality”. Design pedagogy of the 21st-century should consider sensory details when integrating a collaborative program. Intimate memories of the place are often derived from intricate forms of detail, allowing a bond beyond physical use of a building, an experience, to be ingrained in memory. “Phenomenology is an ambitious argument for the sensory experience to be

a rigour of architectural design. The integration of phenomenology into our generation of designing will ultimately acknowledge architecture's respect to the human scale. Today, technology advances architectural design strategies, and it is encouraging to know that designers are willing to harness this power towards a more significant human experience, which is what the essence of architecture seeks to accomplish (Holl, 2018)".

## 3.6 PLACE-MAKING IN UNIVERSITIES

### 3.6.1 Introduction

Jordaan (2015) defines the term "place-making" is used in many settings, not just by citizens and organizations committed to grassroots community improvement, but also by planners and developers who use it as "branding" to imply authenticity and quality, even if their projects do not always live up to that promise. However, using "place-making" about a process that is not rooted in public participation dilutes its potential value. Making a place is not the same as constructing a building, designing a plaza, or developing a commercial zone". As more communities engage in place-making, and more professionals call their work "place-making," it is essential to preserve the process's meaning and integrity. Great public space and educational space cannot be measured by its physical attributes alone; it must also serve people as a vital community resource in which function always trumps form. When people of all ages, abilities, and socio-economic backgrounds can access and enjoy a place and play a key role in its identity, creation, and maintenance, we see genuine inclusive place-making in action that further promotes a sense of belonging in place. While the physical attributes of place are vital to a phenomenological understanding of dwelling/belonging, the opportunities presented by virtual place-making have immense value in enhancing the psychological engagement of people with place across a broader time scale. The diurnal-nocturnal activation of public space in the city can thereby contribute to a sense of continual vibrancy and activity that can enhance public spaces' social and economic sustainability. "For the heritage, urban development and local government sectors, digital place-making offers a range of powerful opportunities to add value to public spaces, in ways which can translate into economic growth, cultural prosperity and improved lives for local communities (www.pps.org) ".

### 3.6.2 A Place Making Approach for universities

The approach in designing great place in universities needs to be done comprehensively. Place-making should include a 'top-down' and 'bottom-up' strategy. A place in the 21st-century is a space with meaning, which shows a strong sense of belonging and influences individuals and communities' physical, virtual, social and emotional health. Tibbit (2017) states that "places in universities should foster social networks and build social capital to benefit students and the community. The challenge is to develop the new physical and virtual space as a multi-use destination to which people, both in the university and in the community, have an emotional attachment and feel safe and connected".

According to Tibbit (2017) the following are place-making design principles of the 21st-century universities

- Recognizing the community and students are the expert;
- It is a place, not a design;
- Place-making requires partners;
- Strong and committed stewardship;
- Based on observation and listening;
- Based on a shared vision;
- Triangulation for multi-uses;
- Innovation

Using these principles, a new transition from public spaces to semi-private and private places will evolve, strengthening the community's social fabric. These places should foster local economic development and innovation and promote healthy and sustainable living. Building' place capital' in universities can leverage a wide range of goals. This place-making approach will influence 21st-century university design, the facilities it offers, and the buildings around it to support the vision of the new place.

Universities play a vital role in the ideology of community-based education which seeks to align the universities with the local and global community. Such university-based development will attempt to create a qualitatively different kind of place, a 'learning place' that emphasizes

promoting participation and learning benefits**.** Below are some of the factors or general intentions of 'opening-up' the university to the community, as noted by Tibbit (2017).

- Promoting an understanding in the community of the scope of the university's contribution to knowledge;
- Boosting the visibility of the university's contribution to the local city region;
- Encouraging participation in learning in the community;
- Widening access to learning opportunities for the community;
- Extending and complementing economic opportunities in the surrounding area;
- Blending ideas for innovation from local agencies and businesses with university expertise;
- Facilitating discussion and exchange between members of the university community and the wider community and visiting place users;
- Allowing the university to better appreciate and respond to learning needs within the community and city region.

A learning place should complement its surroundings with added innovation and inspire and facilitate learning, both formally and informally. Most students in architecture work tirelessly on their design projects. However, the inherently introverted learning spaces cut off their engagement with the community. Architecture is a response to community/society and engagement rather than dislocation is critical to the development of responsive architecture. The 21st-century learning space development opportunities afford various opportunities for architectural learning spaces to transform into collaborative learning environments that can synergise with the broader community, including promoting the learning city concept.

Tibbit (2017) mentions that's "a learning city is now recognized as one that promotes learning for all sections of its inhabitants between businesses other allied disciplines related to architecture such as an approach that benefits the city's economic well-being and the health and well-being of its people and students. This learning city approach helps the city adapt better to the social, demographic, climate and environmental change. Universities and colleges have a significant part to play in a learning city. University-based place-making, as explored here, can add to that contribution. The new public learning place developed on place-making principles can be a

valuable community and civic place that can also sustain its community foundations and enhance its civic standing".

### 3.6.3 What Makes a Great Public Place?

Many tools can help communities and universities assist architects in achieving place-making, and active citizens and students become place-makers. The most used tools for improvement start from an idealized result: all the features and activities that make a public space a great place (Badenhorst, 2020). These tools allow for an understanding of what aspects to look for during the place analysis stage and formulate specific questions that can be answered through place observations. The diagram in Figure 1.19 shows four key attributes that apply to all public spaces: its sociability, its uses and activities, the comfort and image of the place, and access and linkages to the site that architects must consider when designing spaces in universities.


Figure 1.18. Benefits of Place-Making (Rodriguez et al. 2018)

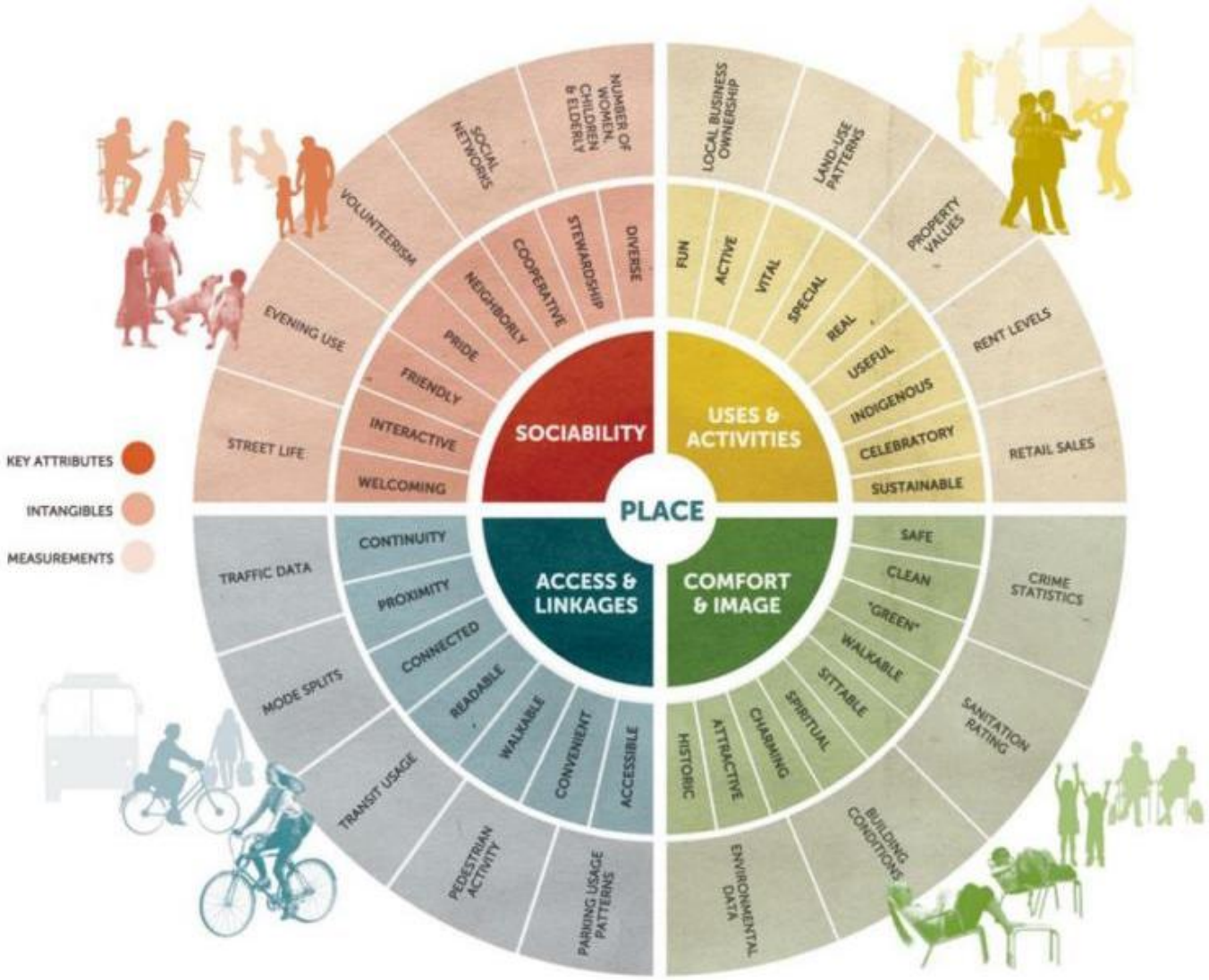



Figure 1.19. How to Make Place? (www.pps.org)

### 3.6.4 Digital Place-Making

Many public spaces and private spaces have become dysfunctional due to mass culture, internalized spaces and globalization, resulting in the creation of dead spaces in most areas within universities. Digital place-making boosts the social, cultural, environmental and economic value of places using location-specific digital technology to foster deeper relationships between the people and the places they inhabit. Simultaneously, increased connectivity and bandwidth will accelerate technological innovation and enable smart technologies like Artificial Intelligence (AI), machine learning and the Internet of Things (IoT) to deliver our future smart towns, cities and connected rural communities. These new digital-first cultural norms and rapidly advancing

technological possibilities offer meaningful, unprecedented opportunities to enhance how communities experience the spaces around them for those working in urban development, regeneration, heritage and local government. The way we interact in public spaces has changed due to technology. Technology has resulted in cyberspace emerging as a new public gathering space. Universities must adapt to change and new hybrid cities; part virtual, part physical are becoming a reality of urban design. Augmented reality systems be an effective urban intervention which causes minimal impact on the existing set with the minimal installation cost. The following diagram shows how universities can use digital media to activate dead spaces. The diagram can also be used when designing spaces for students within universities.

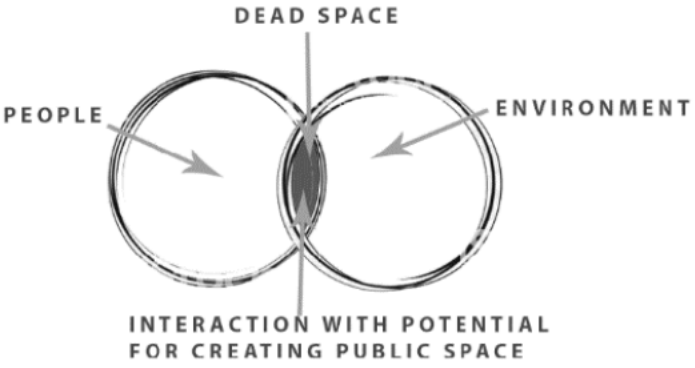



Figure 1.20. Identification of Dead Spaces

(calvium.com)

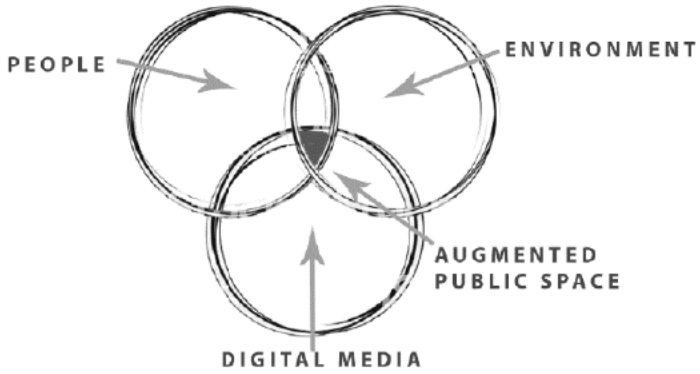



Figure 1.21. Rejuvenating Dysfunctional Spaces

(calvium.com)

(Calvium.com) maintains that "digital place-making creates meaningful experiences for students in public spaces. These inclusive and authentic experiences foster a sense of belonging and can be delivered through fixed means like digital kiosks and other types of connected street furniture or mobile and personal devices, including smartphones and wearable products. Attention is the currency of digital place-making through the creative use of digital technology. This practice focuses people's attention on the place in which they are located. In this way, digital place-making can enhance or even radically transform an individual's experience of his/her time there. Digital place-making should be viewed as a flexible and holistic practice with a set of creative tools, methods and approaches for those seeking to affect the public realm positively. Like place-making, this way is collaborative and context-dependent, requiring multi-stakeholder engagement for best success".

Georgescu (2019) suggests this is because effective engagement considers its intended audiences. While this sounds obvious, it is surprising how often the quality of attention can be overlooked. In the context of digital place-making, this means creating location-specific services, bespoke products or rich experiences that are informed by, and meaningful for, the communities that engage with a place. These communities can include local or prospective residents and workers, commuters, visitors and employers, or any other group that uses space. Irrespective of technological approaches, digital place-making are people and is place centred. Rather than being shaped by one digital technology, like mobile apps or interactive installations, successful digital place-making solutions are determined by **people** and **place**. Spatially, the public realm is conceived as a mix of physical space and digital space; in other words, hybrid space.

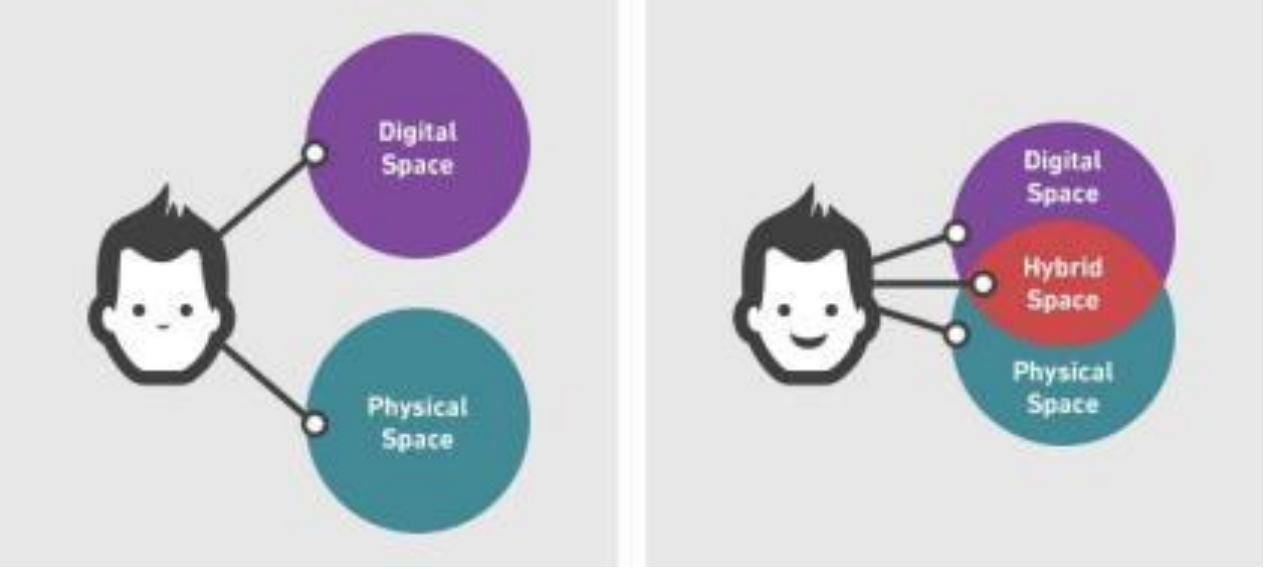



Figure1.22. This New Hybrid Space Expands the Range of Ways, a Person Can Experience the Physical Space around Them (calvium.com)

### 3.6.5 Hybrid Space

In universities, digital places-making is a process that fuses physical spaces with digital spaces to develop a new place-making scenario called 'hybrid space'. Hybrid space is the space where digital place-making happens synergistically with physical place-making and could be internal or external environments used for educational or social purposes. These spaces are created by inviting a new form of digitally enabled services, products, and experiences built into the natural environment

and within its context, enhancing or even transforming the way place is perceived, interpreted and understood. Content is tailored specifically to the location, helping make public spaces more meaningful and attractive. This space provides a valuable expansion to how people can experience and appreciate the physical space around them. Digital place-making is the practice that enhances the formation of the built environment through the development of successful hybrid spaces. Hybrid space is one of several conceptual instruments that can be used to explore the evolving relationships between the built environment and digital technologies in today's hyper-connected era.

There are three methods of using virtual technology to influence a physical space into a hybrid space (calvium.com) these are the areas outlined below

- Moving surfaces with the animation of rigid structures through screen projection, making them light and dynamic.
- Interactive surfaces use recording devices, sensors, heat detection to interact with your environment.
- Online interaction with space, controlling lights, water and sound. Can forge a connection virtually without the need to be present physically

### 3.6.6 Conclusion

Ultimately, 'place-making' or building a community is now an essential part of creating a university that students want to apply to build a life and share their success. To remain profitable and meet the growing expectations of students and parents, spaces that cater to life and work need to support both study and social interaction, recognizing students as valuable consumers and assets to the higher education sector's success and the cities within which they live. Creative designers and technologists are ready to research, plan and implement digital experiences that build social, cultural, environmental and economic value, unifying people, place and technology for the benefit of the communities. In South Africa, the universities are deemed a critical contributor towards the national development agenda and community engagement is an important principle through which universities would bring about social and economic transformation. Digital technology plays a vital role in this transformation as students need access to technology all the time to stimulate

them. This technology can be used to promote social engagement and 21st-century pedagogy. This place-making is of importance as it builds enclaves for the academic community to foster interactions between the faculty, students and attract applicants for whom the aesthetic of the university is becoming more and more important.


Figure 1.23. Example of a Public Space with the Three Human-Environment Interactions (Author 2020)

## 3.7 TECTONICS IN ARCHITECTURAL IN LEARNING SPACE DESIGN

### 3.7.1 Introduction

Maulden (2009) maintains that "tectonics is, in part, a reaction to some contemporary trends in architecture. Although no consensus on the concept of tectonics exists, architectural tectonics was closely related to, according to Maulden (2009) the following terms in three categories: technique and technology; construction and structure; and stereotomy. Based on its etymology, system and material construct, the notion of tectonics common in these three categories signifies the art of framing construction, in which linear elements relate to joints and clad or infilled with lightweight

material. Thus, the art of framing structure as a common concept of tectonics reveals the following characteristics: tectonics is based on framing construction; then it, deals with a higher level of building rather than the mechanical status of the structure and lastly, owing to the organic, double system of the tectonic frame and incrusting or infilling materials, the tectonic body becomes both the ornament and the structure simultaneously. As the art of framing, construction is based on material construction rather than structural or ornamental form".

Most South African university building designs lack significance to the local culture, technological influence, and diversity. On the other hand, compared to 21st-century learning space design, which can create material realities that reveal narrative meaning, ethics, values, and cultural references, are generally lacking in South African universities' architectural learning spaces. Bech (2012) maintains that two concepts provide meaning to architecture, and these are the actual building construction needs and the need to contain narrative layers making possible construing of the meaning embedded in the structure. However, architects of the 21st-century are required to have a close link between creating physical solutions, creating sense from the core of tectonic thinking and a virtual connection with digital tools and technology linking all these solutions harmoniously.

It is argued that understanding the potential of materials, technology and the construction methods used by transforming these into architectural designs solutions; students will be able to reflect and understand the logic of construction, the process of building construction and how these layers link to create a unified structure with meaning and a suitable critical thought process behind its creation.

Maulden (2009) states that "the "death" of architects being craftsman and artisans, with technological advancements in building materials continually developing since the nineteenth century created a new notion for architects, in which there is no precedent. Tectonics takes full advantage of these advancements; the question is not whether architects should use readily available materials and building techniques, but how architects should make a virtue of the typical modes of production".

### 3.7.2 Tectonics, the Poetics of Technology in the 21st Century

This research argues that digitally inclusive designs in architectural learning space development can foster new creations whilst still harnessing culture and an architectural narrative that responds to people's needs and the community, which is essential in developing countries such as South Africa. "New conceptions and definitions of objects are emerging with parametric design. Today, we are witnessing the development of a new kind of "tectonic" with expressive potentials of construction through advanced geometry and technical possibilities, new digital and material technologies that might not be alienating, but instead carrying potentials for a "critical architecture" of experiences? There is a need and scope for the conceptual elucidation of tectonics in architecture by developing a conscious, open and critical approach to the new technological and industrial paradigm (Maulden, 2009)". Therefore, universities need to expose students to these technologies and collaborate with other disciplines to optimally promote 21st-century tectonic designing, ultimately to design globally while innovatively responding to local contextual nuances.

### 3.7.3 Conclusion

Tectonics can be described as the narrative capacity of architecture, and architecture inseparable from construction, lacking in the designs of most universities in South Africa. Tectonics is also modelling a building's physical things such as the structure, the enclosure, materials and organization, bringing it into the metaphysical world. It reveals a conscious attempt by the designer to tell stories about the building itself; how it is made, how it stands, its assembly process etc. Generally, tectonic tells stories about the historical circumstances by which constructions were made, and it is made to concretize and reveal life in its various forms.

"New architecture emerging from new kinds of industrial production and design tools require alternative thinking and conceptions of architecture, both from the designer's perspective and the person experiencing the built environment. New technical possibilities and advanced geometry could promote a new kind of tectonics. They could also make other kinds of thinking and collaborations possible by developing new expressions grounded in structural insights and conditions. Tectonics in architecture can be furthered by development, research and open view on

the latest technological and industrial paradigm of 21st-century pedagogy in architecture (Maulden,2009)".

## 3.8 21ST CENTURY PEDAGOGIC TOOLS THAT OPTIMALLY PROMOTE DESIGN LEARNING

### 3.8.1 Introduction

**The Evolution of Architecture and Pedagogy in the Fourth Industrial Revolution**

Architecture has gone through 3 significant revolutions since the 18th century. The First Industrial Revolution allowed architecture to move from the vernacular towards a more global aspect (uraiqat.com) with the exposure and easy accessibility of materials from other countries. The Second Revolution focused its direction towards a modernistic approach, emphasising places on manufacturers' and mass-produced building materials and components, which allowed architecture to free itself from the strenuous manual labour that it once entailed and move towards a modern world in its standardisation.

The Third Industrial Revolution added computers and engineering software to architecture, such as computer-aided programs that allowed architects to develop accurate and efficient drawings and buildings and allowed architects to be more expressive and freed them from the traditional block form to a more free form building design. This Revolution resulted in a revolution that changed architecture's identity as many of the buildings' designs were unprecedented sculptural building forms.

According to Schwab (2017) the Fourth Industrial Revolution (4IR) is the fusion of physical and digital worlds, with the combination of smart systems, artificial intelligence and the dominance of big data with the introduction of new disciplines such as robotics, networking, nanotechnology, quantum computing and the blockchain technology. However. As technology promotes independent learning, collaboration and communications skills, and most importantly, connectivity all-important for our 4IR-enabled future, Moyo (2019) claim that there is a massive disconnect between the universities that offer architecture and other closely allied disciplines with

these technological advancements. With this advancement, mainly in developed countries, South African architects do not use this system to empower themselves and connect globally to interact with each other collaboratively, be it physically or virtually.

### 3.8.2 Computation in Digitizing Design and Architectural Pedagogy: The Need for Universities to Adapt

At the panicle of 4IR is artificial intelligence (AI) which uses algorithms to search for problems and supplies the various solutions needed. In architecture, this computation can help students prepare themselves for the real-world, increasing production and minimising risk. According to Ndund (2020), many universities' architectural curriculum offers fictitious projects that increase students' likelihood of not being prepared for the working environment. Design students and their lecturers should never fear that robots will design, but its hands over more mundane tasks to the computational tools by feeding data into these machines, making architects focus more on the social, creative part of the design, and minimize the repetitive administrative tasks. Universities are not being exposed to the concept of 4IR, and therefore there is no balance between the tools that 4IR has to offer and the human-centred approach as these tools certainly do not respond to a place and cultural values. These tools can and will solve direct design problems and generate design suggestions for a human to take over and develop further.

Designers believe that the mother of architecture (Frank Lloyd Wright) assured that the qualitative nature of design could co-exist with the more functional aspects of computation. The most successful projects are created with an artist's hands paired with computation of the 21$^{st}$- century. Therefore, universities need to instil 4IR, be it physically or virtually as it is part of the 21st-century pedagogy, which is the way of the future of architecture and how we teach and learn. Although most universities and lecturers are becoming aware of 4IR and the consequences of compulsory technology, most South African universities, both government and private are quite far from using these tools in assisting teachers and students in the architectural class due to inadequate infrastructure. In South Africa, digitization and lecturer training does not seem to be the government's priority, which has led to apathy towards a world of digitization. The 4IR will continue with or without South African universities; students cannot afford being left out as they

will not be able to compete in the job market, internationally they do not possess the technical skills the 21st-century requires.

Ndund (2020) maintains that universities should use the following five steps to join the era of the industry of 4IR**.**

**Gain Computational Knowledge**

Universities should indulge in new research or partner with other universities, internationally, to acquire the skills with new technology rather than starting from scratch. Universities should emphasise the latest technology and programs in the market and learn and study it in a collaborative way, where knowledge sharing is of importance as this is key in 21st-century pedagogic transformation.

**Network within the Computational Design Community**

There are many workshops held in South Africa in which students and lecturers are not being exposed to the computational design community. Universities must discover the latest innovations and find opportunities to collaborate with companies and their latest technology.

**Get Quick, Easy Wins and Build on That Success**

Build an internal working group and research and test 4IR tools used in current assignments and projects as many lecturers and students should experience and experiment with technology.

**Implement a Regular Technology Review on Projects**

Review of technology is essential in projects as it will define the capability of each tool or program as knowledge is shared collaboratively, which puts shared learning at the top of the chart to improve everyone's skills and add to new methods when learning.

**Involve Other Disciplines**

Integration of knowledge is of importance as architecture does not act independently in the construction industry. Communication with other disciplines related to architecture is vital, as a combination of methods, connectivity, ideas, and creativity.

### 3.8.3 The Need for New Education Models in The Fourth Industrial Revolution for Design Students

The World Economic Forum Education (2020) suggests that architecture requires a lot of innovation and creativity skill as its projects include content that fosters many necessary skills to produce innovative designs. The architecture consists of complex problem-solving skills that are analytical and analysis. The 4IR pedagogical methods harness this. It includes tools, techniques, and strategies focused on building awareness of the global environment and sustainability, having a hand and playing an active role in its international competition, not what local universities instil in their students, curriculum and buildings. Even though the technology is at the centre stage of architecture, the universities at the same time play a key role in instilling values and norms that emit positive human interaction.

In addition to technical skills, universities must foster human-centric skills, empathy, social awareness and global citizenship, shaping future architects and societies that are inclusive and equitable. The standard pedagogic approach, which is currently being used today in most South African universities, was primarily influenced by the First and Second Industrial Revolutions'. Mass production required uniform talent, which was utilized for repetitive production in which many architectural companies needed young architects to do. However, this approach is not what the 4IR stands for as it promotes critical and individual thinking in an interconnected world as it expects future students to collaborate with other disciplines and create massive shifts in the skills that can contribute to society and architecture.

However, the current education system relies heavily on passive forms of learning and teaching, architecture focused primarily on direct instruction and memorization, rather than interactive methods that promote critical thinking needed in today's innovation-driven society. Most future architects will be expected to collaborate with many disciplines, professions and industries in the real world in various parts of the globe; hence, students need to understand different cultures, languages and people. The use of digital tools will enable these new types of interactions as the world is not small. Therefore, universities should not be limiting students.

### 3.8.4 Innovative 21st Century Pedagogies That Harness 4ir

Pedagogy is a combination of different teaching approaches and learning principles that underline many education systems. While many techniques exist in universities, 4IR literature has suggested many different techniques that drive innovation. According to The World Economic Forum Education (2020), the following are some of the techniques that drive innovation:

- **Experiential:**

This approach uses technology that integrates content into real-world application, which is project-based and focuses on critical thinking and inquiry.

- **Social Interaction**:

Is an approach which makes learning joyful as generations like integration with technology and people, meaning learning through active thinking and social interaction.

- **Computational**:

An approach that uses technology to solve problems.

- **Embodied**:

An approach that incorporates technology and the physical body into learning through movement

- **Multi-literacies**:

An approach that focuses on context, diversity and shared learning mainly through cultural awareness

The following are eight critical characteristics in learning content and experiences and have been identified to define high-quality learning in the Fourth Industrial Revolution, "Education 4.0" related to design students (World Economic Forum Education, 2020).

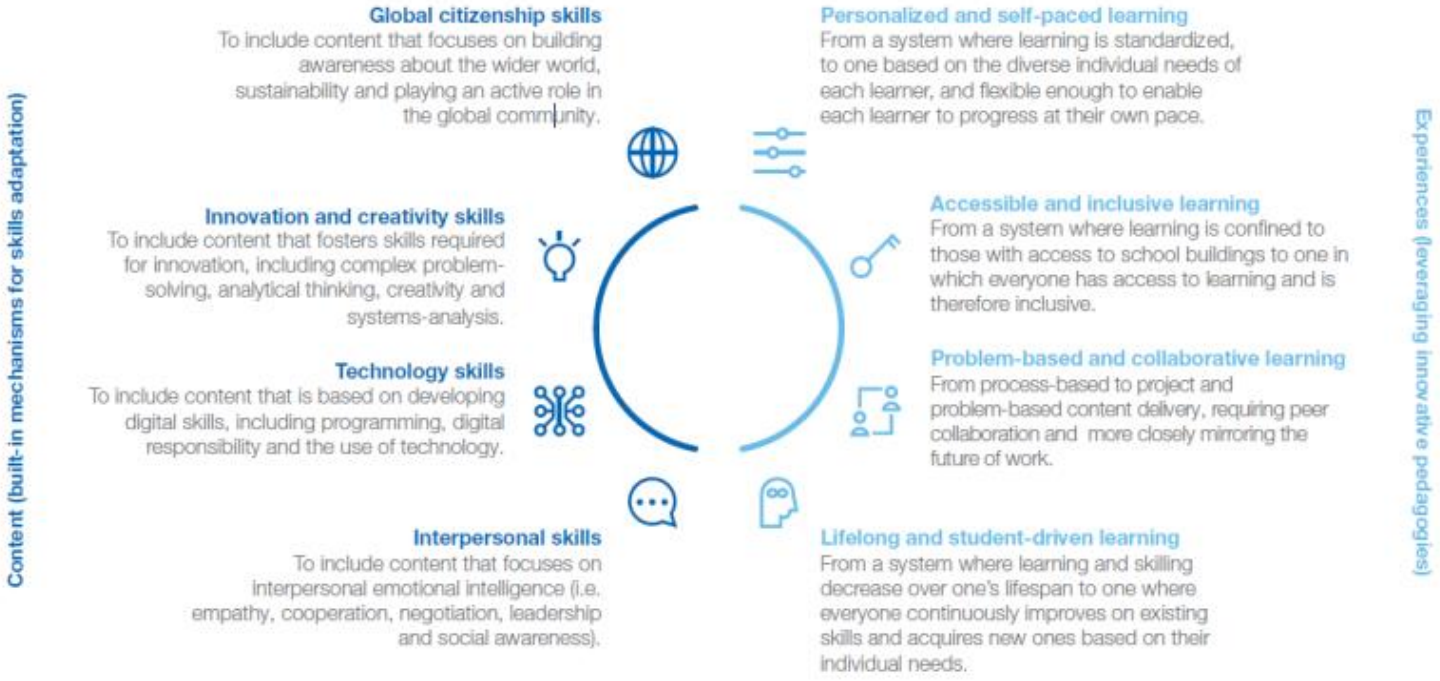



Figure 1.24. 4IR Framework for Design Students (The World Economic Forum Education 2020)

### 3.8.5 How the Coronavirus Will Speed Up the Fourth Industrial Revolution in Universities

Goldstuck (2020) maintains that the current COVID-19 pandemic the world is experiencing has left the South African education system and pedagogic approaches in shambles. The researcher's experience also indicates that architecture and other design disciplines, because it is a hands-on course, have left lectures and students distress and with nowhere to manoeuvre. COVID-19 is forcing the developing countries, like South Africa to embrace many tools of the 21st-century pedagogy approach and methods they have been avoiding, believing that the conventional ways work best. Large corporations with access to technologies underlying 4IR include cloud computing, artificial intelligence, the internet, digital collaboration and can even go as far as virtual workspaces are succeeding in this pandemic. However, universities lack the resources and

exposure to the different tools that are the concept of the 4IR, leaving many students at home, losing the opportunities of learning from home thus the perceptions that conventional pedagogic methods work were destroyed.

Most correspondence and the 21st-century enabled schools moved to online teaching, but many government universities failed to deal with online classes. Architectural students are bearing the brunt, and if these 4IR tools were accessible, they could access the world remotely from the comfort of their homes. Webinars will be in use as many students can interact virtually as this will only benefit the student and change the course of its architectural design as students incorporate the 4IR within their innovations. Thus, the transformation to 21st-century pedagogy comes with the transformation of its architecture to 21st-century designs. The coronavirus will have many positive outcomes, but one that stands out from the rest is using technology to enable students.

### 3.8.6 Tools of the Fourth Industrial Revolution for 21st Century Pedagogic Transformation in Architecture

According to Schwab (2017), many AR tools in the 4IR can be used for innovation and change towards the 21st century. These tools can assist students in a demanding environment that always require new ways of making life simple.

#### 3.8.6.1 Robotics in Design Learning

Lovell (2017) notes that using robots for fabrication in collaboration with other disciplines will create simulations of structures that can be constructed and can mitigate many risks that might occur in contestation to save cost and reputations in construction. The 3D geometry that can accurately describe any shape from a simple 2D line, circle, arc or curve to the most intricate 3D organic form surface or dependable robots is ideal for real-time design or construction. Where computers cannot work with different material physical properties, students can bring their design to life. Architecture students have a wide range of tools such as laser scanners, water jet robots and 3D printers. Robots are different from most machinery used in architecture as they are capable of learning. Adapting and acting on their senses and perception is ideal for assisting students in

architecture as they also learn from these robots, bringing a whole new meaning to 21st-century transformation on architecture.

#### 3.8.6.2 The Impact of Virtual Reality on Present and Future Architecture and Design

Most architectural learning space designs mainly focus on rudimentary physical models, which are useful in the initial design stages. However, there is evidence that most clients are exposed to technology and are demanding. Therefore, the 21st-century pedagogic calls for realistic and accurate designs in which VR produces. VR is also important in logistical issues as people can be in two places at once if there is an unexpected issue. People can be in a class or want to communicate with other universities across the world to enter a virtual world as an avatar (Quirk, 2017). The merger of the physical and virtual world is perhaps the most exciting thing for VR/AR technologies in the architectural profession, as most 21st-century universities are at the forefront of this new innovative way of using these tools to enhance their designs.

### 3.8.6. What Is Augmented Reality, And How Can It Help Architectural Learning Space Development

Yoders (2020) describes augmented reality (AR) as a live, copied view of a real-world view in time in which added elements such as a 3D model of design are superimposed within the real-world environment augmented or supplemented by a computer sensory input. It is different from VR as this replaces the real world with simulated ones. Augmented reality takes the real-world and adds on it, in the case of architecture, a 3D model of your design. Conventional pedagogy teachings do not help students with these innovations as they are not exposed to these tools, and lecturers are too stuck in the 20th-century pedagogic teaching and learning.

Augmented reality in architecture involves manipulating a 3D model of a proposed design into an existing space using mobile devices and computers. Its utilization matured in the architectural industry as many architects began using it to show their clients their design within existing conditions. The users' main intention is to educate their clients and use it to help them visualize their building before the project starts. Users will be able to have a 360-degree view of their project. Augmented reality is not only used for visualization; it goes beyond that as it can be used as an

analysis tool to pick up various clashes by walking through a complete model. All professionals must collaborate as this mitigates risk for professionals and on-site. Augmented reality can assist with changes that have to happen between the design and construction due to structural engineers' changes and constructability issues. It can also help with the prefabrication of building components such as interior and media design components within a building. Tomorrow's designers, software developers, engineers, and lecturers will need the skills to leverage this technology to keep up with the global environment and enhance the architecture locally.

#### 3.8.6.4 How Big Data Is Transforming Design Learning

The 21st-century has seen many unprecedented technological advances and numerous amounts of data available for the built environment. Online, vast amounts of data are generated, be it through social media or online sources. Meanwhile, there has also been an increasing number of technological advances in the built environment such as gadgets that track heat generated from buildings, glare from curtain walls, the amount of pollution a building emits, electricity tracking and even goes up to detect how many people are in the building at any given time. These gadgets generate data which clients need, and with this data, clients will be able to plan and monitor according to their needs. With this data becoming available, governments can efficiently plan and manage their cities, thus creating smart cities. Architecture is facing change more rapidly, and the students need to acquire new techniques and skills. Data should be readily available, and the volume and speed of this data are essential as this data provides new possibilities to understand people and places to inform their design. (www.The Innovation Enterprise.com) describes Big Data as a term used to gather a collection of complex data stored and analysed for the performance of a building; this is important as captivating visuals will not be enough to sell your designs. Companies and students need to prove that their plans can back up their prediction with real big data.

#### 3.8.6.5 3d Printing in Architecture

Architecture mainly involves varied, intricate designs and impressive structures which we see in everyday life. Since the 2D drawings do not tell much about the design itself, the 3D physical models must be constructed. However, the 3D physical models are time-consuming which most

universities in developing countries utilize. Today the entire process has changed and has become much cheaper, faster and easier to do with 3D printing technologies. Most clients prefer to see and feel the architects' idea more than hearing it. 3D printing allows for the creation of scale models much faster than laser cutter or handcrafted (models3dinsider.com). This technology means that architects and students will construct durable and complex models in class or their offices, direct from the software data files with unique detailed smooth prototypes using various natural materials. What would take a single person-days could take the 3D printer hours to do with improved quality and details.

Figure 1.25. Largest 3D Printed Building in the World, Dubai (www.engins.org)

The 4IR is one of the most effective approaches used in the 21st-century pedagogic transformation on architecture. Its digital tools can be used for many reasons such as timesaving, cost-saving and better productivity. Most importantly, its tools are used to provide better communication and connection with all disciplines relating to the build environment and architecture. Many students and lecturers can communicate and learn globally through 4IR tools. The 4IR concept in architecture focuses on essential tools, unlike theories in architecture, focusing on thinking strategies, discussion, and social process, with its central ideology towards promoting critical thinking in architecture. The 4IR promotes technology, social interaction and shared learning

compared to the tools used in the 20th-century pedagogy that current universities are still using. Within the universities, these tools are based mostly on the interior stimulation in revitalized spaces within interactive studios.

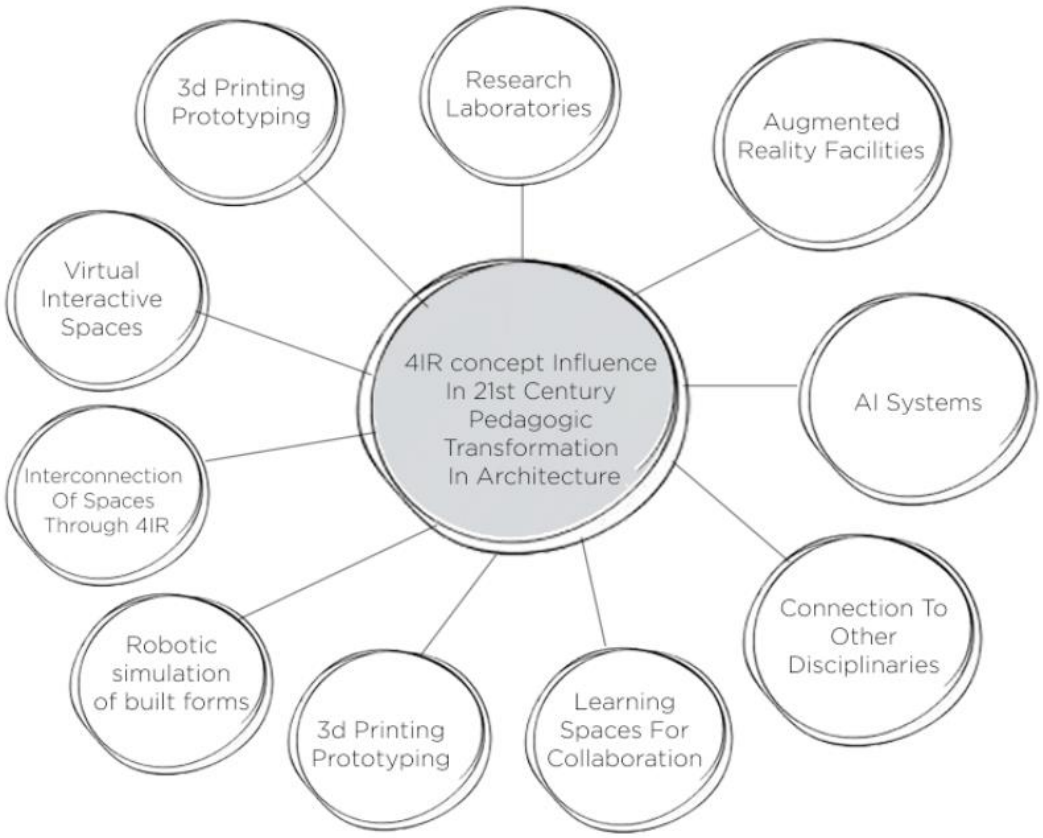



Figure 1.26. 4IR Concept Influence in 21st-Century Pedagogic Transformation in Architecture (Author 2020)

## 3.9 CHAPTER CONCLUSION

This literature's importance is that it reviews existing historical literature of pedagogy as a foundation for this research study and includes current knowledge, substantive findings, theoretical, conceptual and methodological contributions towards an interdisciplinary design school in Durban. This literature review is a mental road map of the impact of 21st-century pedagogic transformation on architecture. It provides knowledge of the past, present and the future of the above research, has a vital role in achieving the research objectives. This literature review provides a broader understanding of all research questions, creating a piece of writing that is a coherent whole. The next chapter presents a critical analysis of three selected precedent studies which its criteria were based in line with the above theoretical and conceptual framework.

# CHAPTER 4

# KEY PRECEDENT STUDIES

## 4.1 INTRODUCTION

This chapter provides a critical analysis of three selected precedent studies; its criteria was based in conjunction with the studies theoretical and conceptual framework. The first precedent study is Ørestad College, a new 21st-century college in Copenhagen, Denmark, that harnesses most of the 21st-century pedagogical approaches such as its learner-centred spaces and interdisciplinary learning encouragement. The second precedent study is the Tshwane University of Technology is the only design university that can be closely linked to a 21st-century school of Interdisciplinary Design in South Africa. The third precedent study at the Durban University of Technology is like UKZN in its pedagogical approaches and spaces. Due to the COVID-19 pandemic, a case study could not be done at UKZN, so DUT was selected to analyse its methods compared to UKZN critically.

These precedent studies were from selected criteria as its requirements need to relate directly to the research objectives. The purpose of the following precedent studies is to help the researcher resolve a design problem: architectural and design learning spaces that continue to be defined as confined disjointed physical spaces that show no coherence in the many fields of design. Advancement in the 21st-century pedagogic learning affords many opportunities to enhance student learning by typically overcoming these restrictions in design learning spaces. These different precedents offer different solutions, experiences and architectural responses. A combination of precedents can help develop ideas and responses holistically by critically assessing these designs and questioning them to derive architectural design principles for a 21st-century school of Interdisciplinary Design.

## 4.2 INTERNATIONAL PRECEDENT: ØRESTAD COLLEGE

### 4.2.1 Location

The college is noted for its innovative architecture, favouring open studying environments instead of traditional classrooms and its media-oriented profile focusing on media, communications, and culture. The college boasts 21st-century technological advances, with informal study environments, compared to conventional classrooms of the 20th-century.

### 4.2.2 Interdisciplinary Collaboration

Ørestad Gymnasium, also known as OEG, is one of the only 21st-century colleges in Denmark that is entirely digitized and fitted with the latest technological advances and tools in line with the 4ir. All teaching materials are digital and its interdisciplinary approach, as it digitally and virtually collaborates with the universities around its such as the IT University of Copenhagen and DR University. Its interdisciplinary approach is also externalized, and apart from the standard business courses, students are offered creative academic programmes such as interior design, Multimedia, Media, Design and Art.

Three critical elements make this a 21st-century interdisciplinary school: it eliminates the division between science humanities and design. It boasts a variety of learning and working methods, which results in multiple means of communication and interaction, creating a synergy between students and lecturers. The buildings' interior has multiple displays of creative interpretation of flexible open spaces, limited amounts of students, and assembly areas, reflecting a dynamic and lifelike studying environment (Fairs, 2017).


Figure 1.27. Ørestad College Site Plan, Scale: 1:5000 (3xn.com)

### 4.2.3 Built For 21st-Century Pedagogy

The final design of Ørestad College came about after a thorough analysis and research into the students' needs and ideas like the study at hand. The staff, students and educational experts, were the consultants. The college does not have a typical traditional classroom, with conventional class boards, tables and chairs, but has a free spatial configuration, with multi-flexible furniture creating teamwork and group study sessions. These approaches and configurations were made to facilitate interaction, communication and interdisciplinary learning that supports collaboration, creativity and critical thinking essential for 21st-century pedagogy in schools (3xn.com).

The flexible configurations and multiple breakaway spaces encourage virtual, physical interaction and communication between students, lecturers and global interaction. The interior configuration is described as a tree, with a central staircase as the trunk connecting different split levels that support visual communication and harmonious walkability as branches of a tree. Ørestad College is a multi-storey building, which allows for shorter distances between the many allied disciplines within the building; this gives better visual contact and openness. This openness is vital as it does not isolate students and other disciplines but foster interaction and connection. This multi-storey design and stack floor configuration are generally done with larger surface areas, and if the floor plates were too small, it is more efficient to keep all function on one level. This open, flexible

building accommodates both activities that require privacy and interaction between students and lecturers, making the diversity of spaces to suits all needs are paramount in 21st-century schools (3xn.com).

Figure 1.28. Ørestad College Free Spatial Configuration (3xn.com)

### 4.2.4 Spatial planning and Spatial Relationships Interconnected - Vertically and Horizontally

The building's interior spatial layout comprises of four-floor plates that are boomerang-shaped. This layout creates a robust superstructure that makes up the building's overall frame that's simple and highly flexible. There are four study pods each that occupy each floor plate, which is all visually connected, as this avoids, each floor being stacked on top each other which enables the different pods and spaces to interconnect and overlap with no distinct borders. These boomerang-shaped floor layouts are rotated, creating a triple volume central atrium that forms a shared space with visual connections that promote interdisciplinary relations.

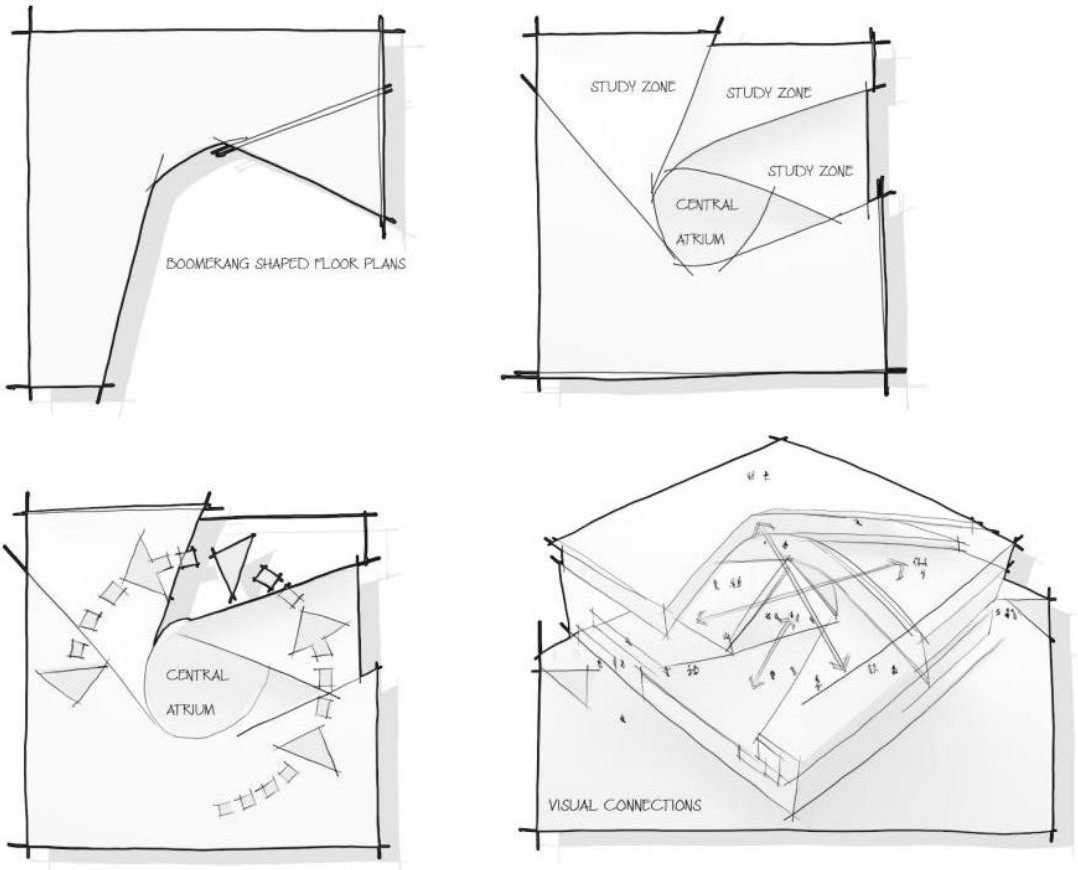



Figure 1.29. Boomerang Shaped Floor Plan (Adapted from 3xn.com)

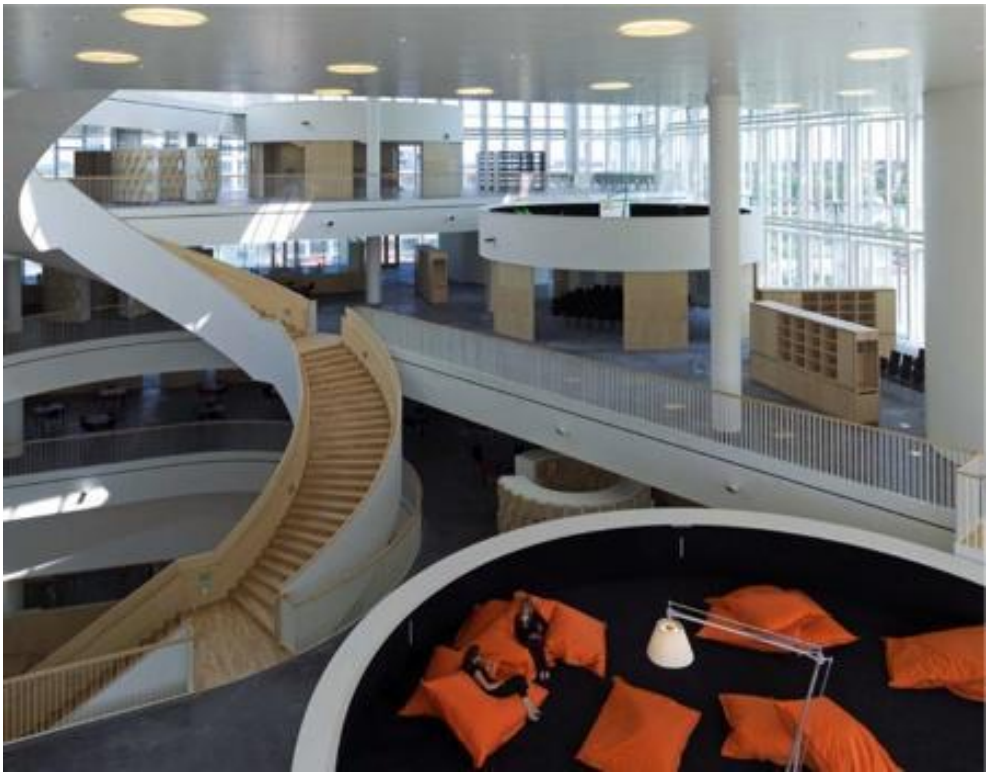


Figure 1.30. Interconnected Vertically and Horizontally (3xn.com)

Figure 1.30 and figure 1:31 refers to the rotation of each floor plate, depicting a vertical central atrium with visual communication that promotes interaction; this creates and encourages its users' ambition for interdisciplinary education.

Figure 1.31. Central Atrium (3xn.com)

### 4.2.5 Interconnected Spaces

The horizontal floor bands are intermittently broken, making double or triple interior volumes that lend movement to the whole building. On the exterior, vertical blades in semi-transparent coloured glass act as brise-soleil and project beams of changing coloured light onto the inside. The critical node is the intersection of floors and a large central staircase spiralling upward to a roof terrace on the interior. On the plan, the four above-ground floors resemble a series of boomerangs set in staggered fashion around the axis of the staircase. In this way, spaces and volumes open out from the ample stairway creating a functional and perceptive dynamic. Study, meeting, teaching and socialising environments flow on

from one another, defined by the shape, quality and furnishings attributed to each spatial distribution.

Every aboveground floor is an integrated study area equipped for interdisciplinary learning, while standard services like the gym and library have been placed below grade. The building's structural frame is not a regular grid module. Hinged to the floors departing from the central staircase, three large cylindrical elements near the outer perimeter serve as "structural columns".

These, together with other smaller pillars, connect to the horizontal structures and distribute the loads. The cylinder structures contain accessory stairs linking all floors. The different functions of the succession of open and closed spaces are evidenced by variation of the materials used. At the stair access and landings, the magnetite flooring gives way to the same wood as the steps. The railings are also in wood. The cylindrical "island" volumes dedicated to studying and meetings comprise thick insulated walls with micro-perforated sliding panels to allow for various uses.

### 4.2.6 Communication

This design's central concept emphasizes the synergy of interaction and communication, which is critical in the design of 21st-century schools. The intention was to enforce students into collaboration and work in teams instead of individually, like the real-world working environment. Its innovative teaching and study environments with its public functions draw surrounding communities and business in encouraging interdisciplinary learning and its cultural facilities, such as its functional virtual auditorium, multimedia halls, studios all play a vital role in strengthening interdisciplinary relations and the surrounding communities and businesses.

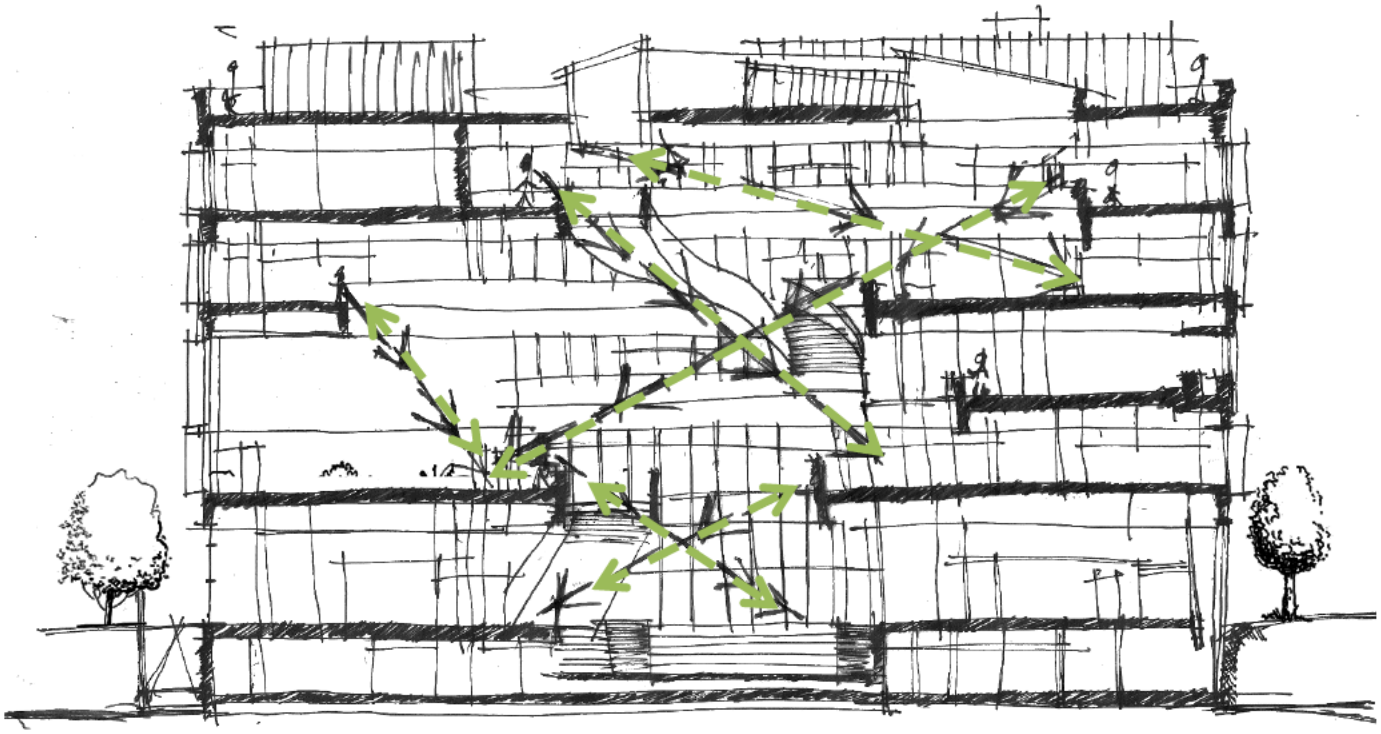


Figure 1.32. Analytical Sketch of  Visual Communication with Split Levels (3xn.com)

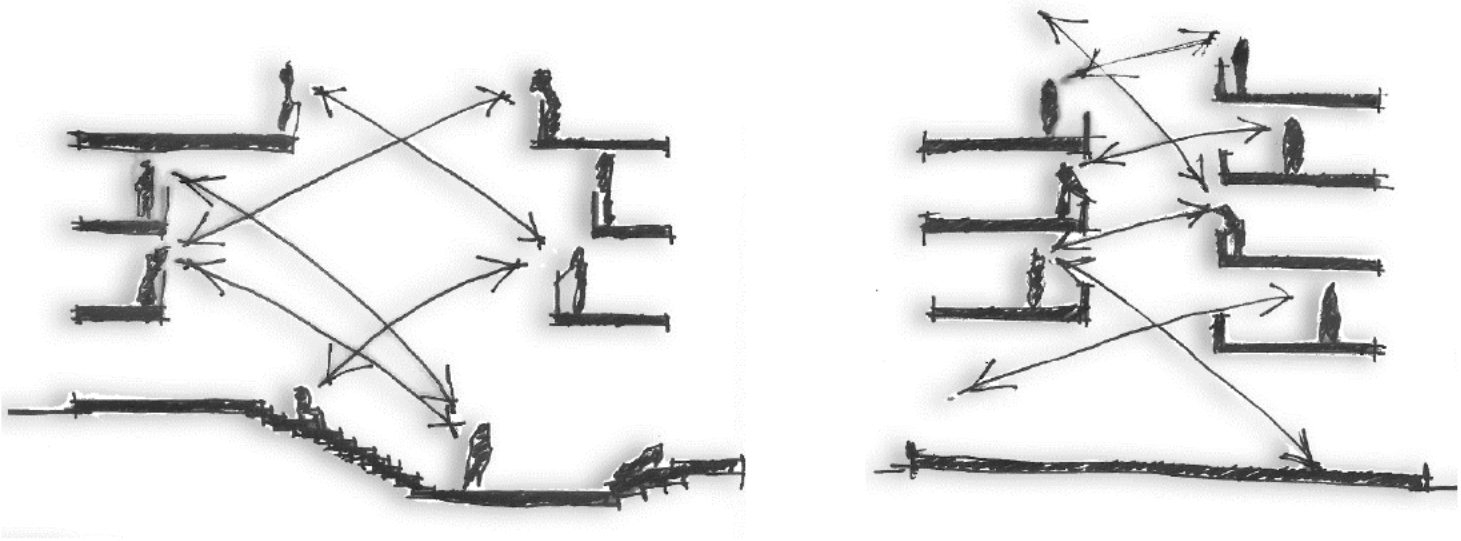


Figure 1.33. Central Atrium Visual Connections in Local Universities in South Africa Vs Ørestad College (Author 2020)

### 4.2.7 Exterior Relationship

The dominance of 21st-century pedagogy in architecture in Ørestad College is mainly within the building's interior, as there is evidence of place-making and interdisciplinary approaches in 21st-century pedagogy in architecture. However, there is no relationship to the different linkages and interconnected spaces externally.

Figure 1.34. External Relationship with the External Context (3xn.com)

### 4.2.8 Conclusion

The overall building is influenced by 21st-century pedagogy, from its emphasis on visual communication, collaboration, 21st-century pedagogic tools, circulation spaces, breakaway spaces, informal meeting areas and the overall spirit of the place of many universities that offer design in South Africa. Its primary focus is recognising that all pedagogical spaces are interrelated and connected, be it virtually or physically. This precedent's key issue is the lack of connection between the community and the building in creating a place, not only inside the building but also inside its relationship to the external context.

## 4.3 LOCAL PRECEDENT: TSHWANE UNIVERSITY OF TECHNOLOGY (TUT)

### 4.3.1 Location

The Architecture Department at TUT located in Building 11, Staatsartillerie Rd, Pretoria West, Pretoria at Tshwane University of Technology (TUT) is housed in a new building constructed specifically for architectural design


Figure 1.35 Location –TUT Department of Architecture , Scale: 1:5000 (Adapted from Luckan 2016)

The Department of Architecture at TUT is well-positioned close to some allied disciplines such as the engineering departments (Figure 1.35), but not close to other connected fields, such as media design and interior design. With the use of the 21st-century pedagogy tools, the potential for interdisciplinary collaboration is lucrative. Its high interconnectivity level within the interior makes interaction easy, with its suitable quality learning environments foster an architectural narrative. It is well equipped as a 21st-century learning pedagogic environment and defined by a high level of connectivity through its advanced IT infrastructure and spatial layout (Luckan, 2016).

### 4.3.2 Spatial Planning and Spatial Relationships

The building's design consists of a central core and two wings on either side, one on the west and one on the east. This configuration creates a central courtyard for interdisciplinary interactions. The façade on the north and south consists of extensive glazing to maximise natural light, ventilation, visual communication and solar penetration during winter. Louvres protect these facades in summer months and buffer sound from the street below. The two wings on the east and west are long and thin designed to maximise cross ventilation. Sustainable mechanisms are essential, such as the cooling of the air with mist sprayers on the southern side of the building using rainwater harvesting from the roof, creating a building that sustains itself all year round (Crafford, 2012).

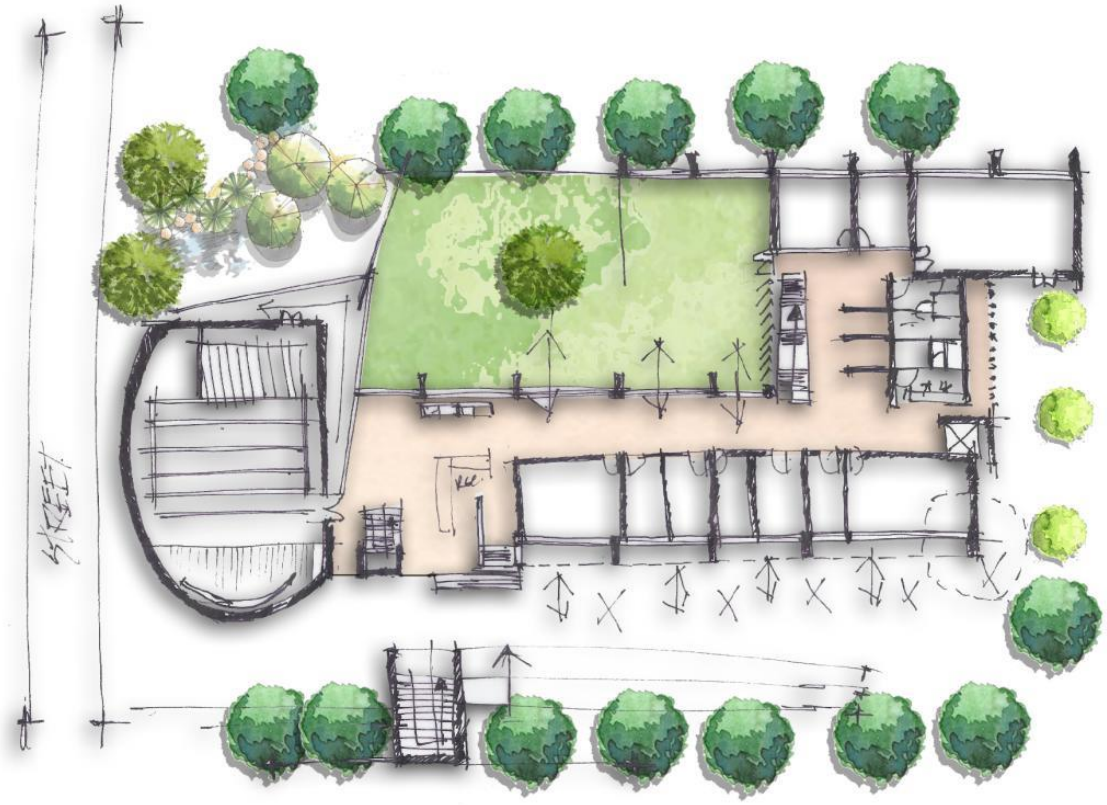


Figure 1.36. Site Plan - TUT Department of Architecture , Scale: 1:250 (Author 2020)

The spatial configuration of the linear building is centred on a central core in which there is enough and adequate use of space used for various informal occasions such as exhibitions, guest lectures, awards functions, demonstrations and multimedia projections and breakaway spaces parts. This

pluralistic central spine extends upwards in multiple volumes, flanked by learning spaces, staff offices, meeting rooms, relaxation pods and many other functions associated with an ALS. Furthermore, the building's design's significant success is the intentional pluralistic nature of circulation and foyer spaces, such as the 'digital pod' in Figure 1.34. This activation of the central circulation spaces further promotes inter-level learning and high interaction between students and staff. Figures 1.37-1.39 illustrate the scale of pluralistic circulation spaces that connect the different specialized functional areas. The staff offices flank the ground floor circulation space (Figure 1.36) which afford ease of consultation and interaction between staff and students.

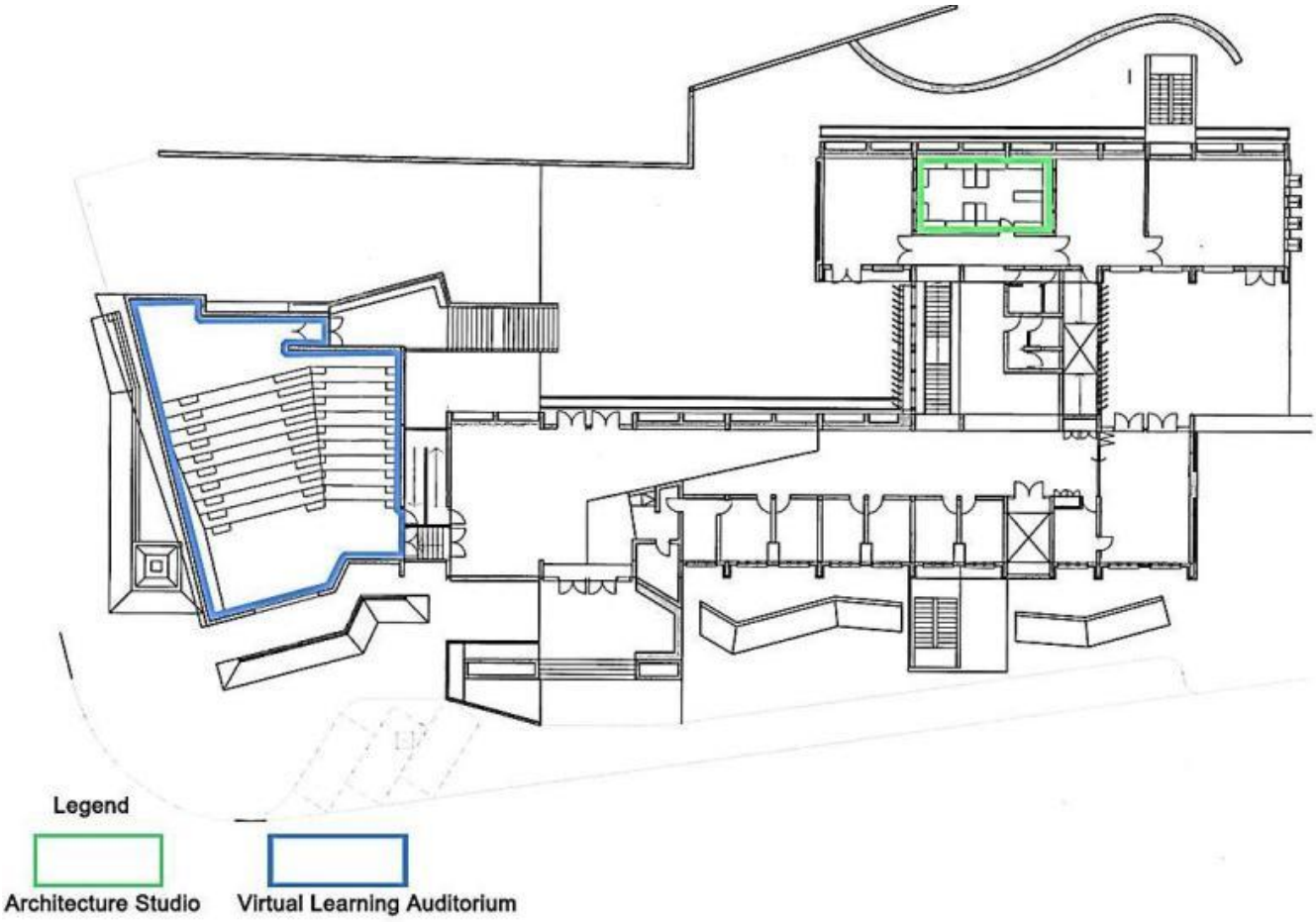



Figure 1.37. Ground Floor - TUT Department of Architecture, Scale: 1:250 (Luckan 2016)

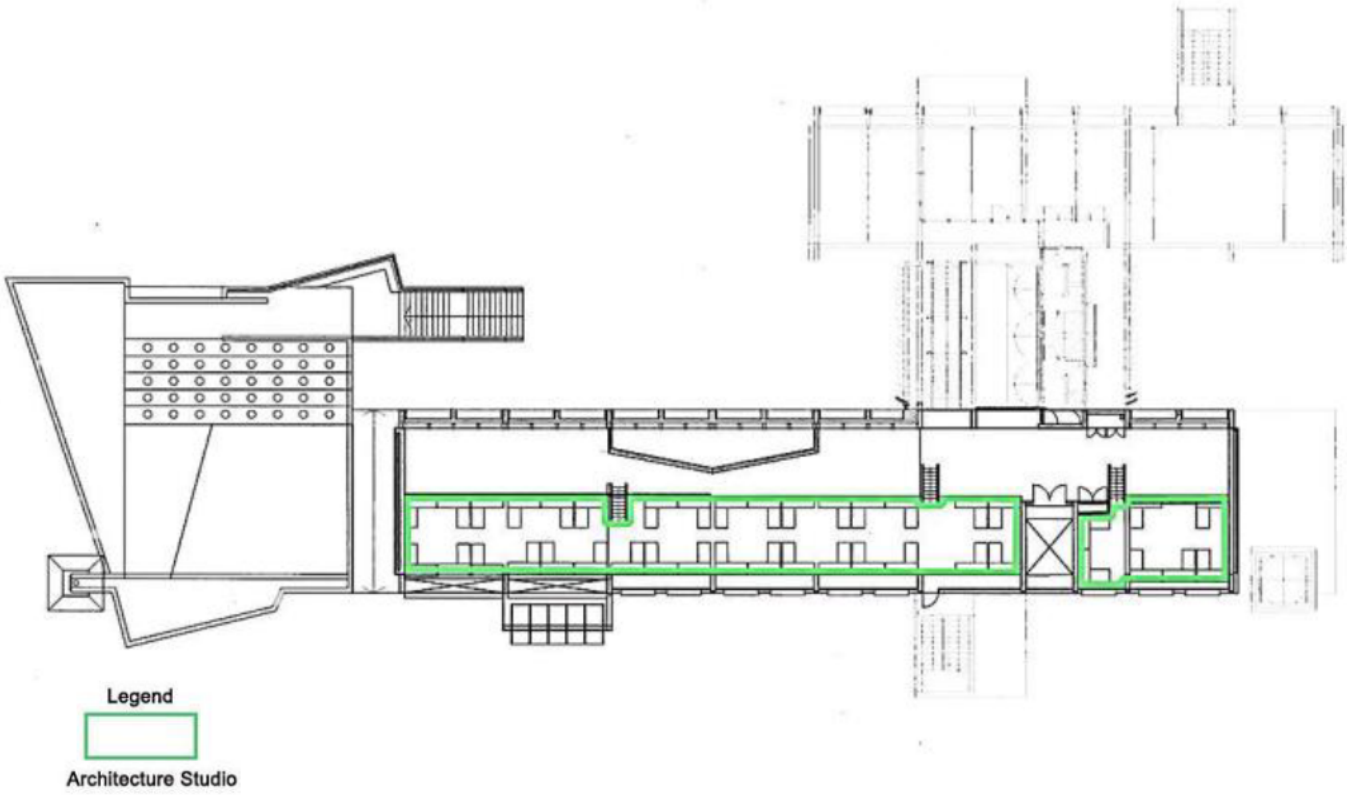



Figure 1.38. Mezzanine Floor - TUT Department of Architecture, Scale: 1:250 (Luckan 2016)

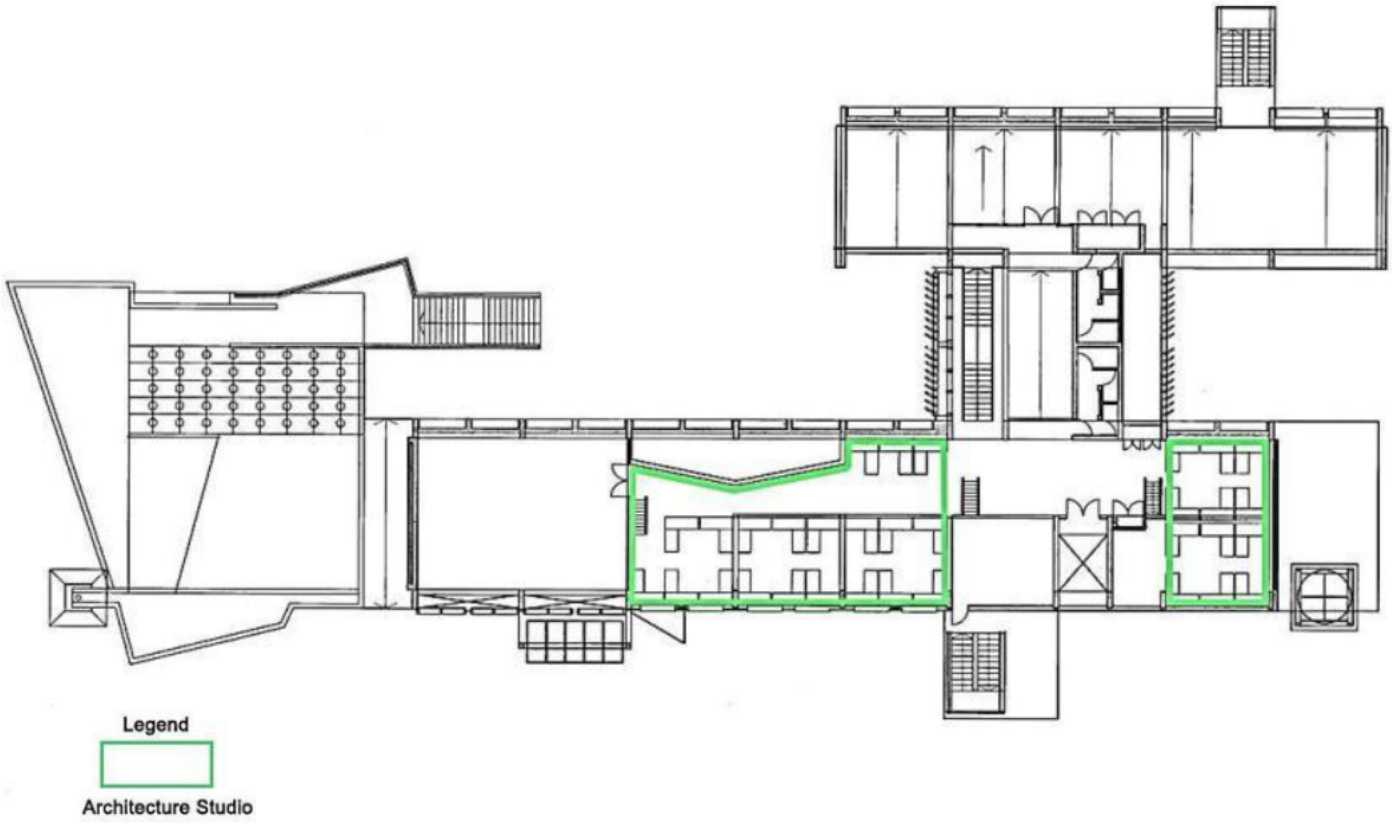



Figure 1.39. First Floor - TUT Department of Architecture , Scale: 1:250 (Luckan 2016)

### 4.3.3 Interconnected Spaces

The design of the building has many layers of connectivity. Figure 1.40 illustrates the interconnected fusion of different spaces such as a studio at the mezzanine level overlooking the library and lower floor circulation/display space. However, even though these spaces are connected physically, the lack of visual communication link between these layers is vital in 21st-century pedagogy as visual connections promote interdisciplinary establishment. The design avoids changes in levels and stacked floor plates, which maximizes flexibility and openness, enabling multiple teaching and learning spaces to interconnect with distinct borders (Luckan, 2016).

Figure 1.40. Interconnectivity- TUT Department of Architecture (Luckan 2016)

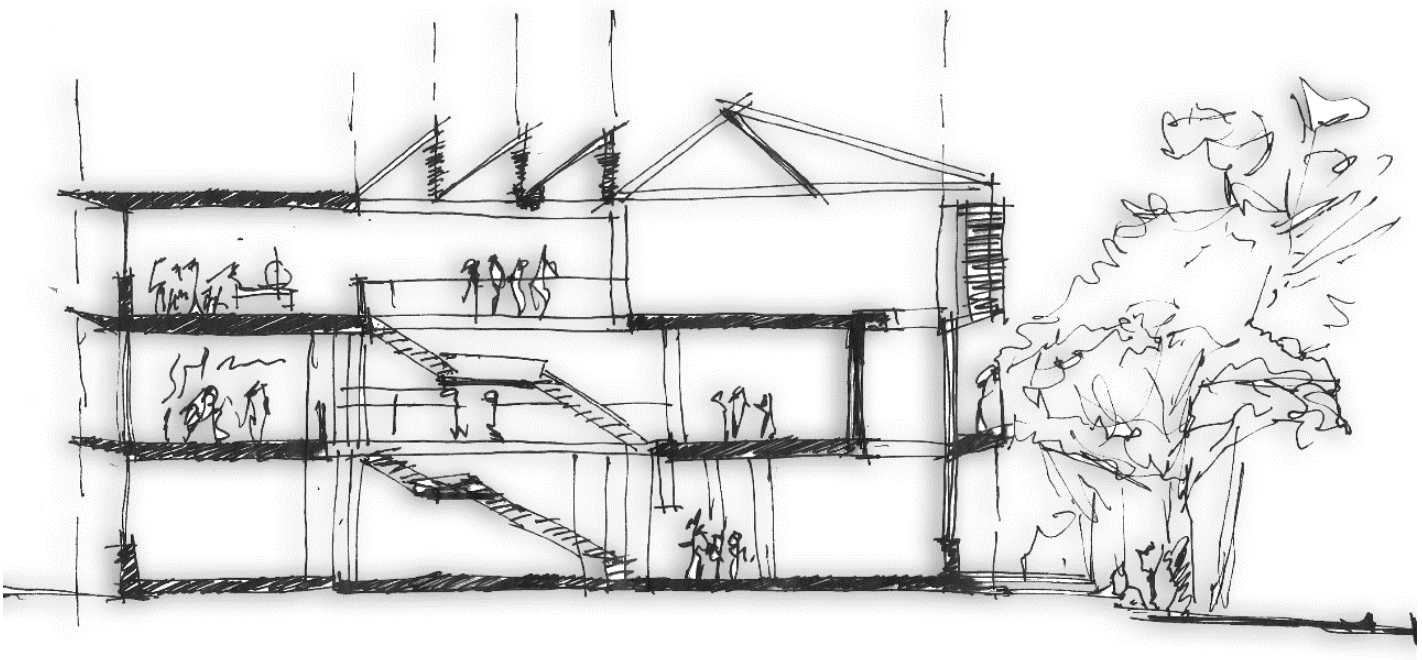


Figure 1.41. Analytical Sketch of Interconnected Spaces – TUT Department of Architecture
Author (2020)

The essential difference of the architectural learning spaces at TUT compared to DUT is the utilization of volumes, allowing for interconnectivity and flexibility in the arrangement of related areas. Figure 1.41 shows the interrelation of three different, yet related, spaces in triple volume: the lower foyer digital learning environment, the mid-level student lounge, and the studio at the upper mezzanine level. This arrangement fosters incidental interaction between students at various levels of study which encourages a 'vertical studio' integrated curriculum pedagogic approach. But these interactions are minimal and restricted to just one direction because the building is narrow.

Figure 1.42. Interconnected Spaces in Triple Volume (Crafford 2012)

### 4.3.4 Tectonic Narrative

Another deliberate design feature of the building was to enhance its tectonic narrative by exposing the structure and the expression of technology, materials and the contrast of space in three dimensions; hence, the building becomes a living/organic exhibition. However, with the advancement of technology and the concept of 4IR, there is a need for interactive surfaces to interact with your environment and the community and the building is vital in 21st-century pedagogy in architecture.

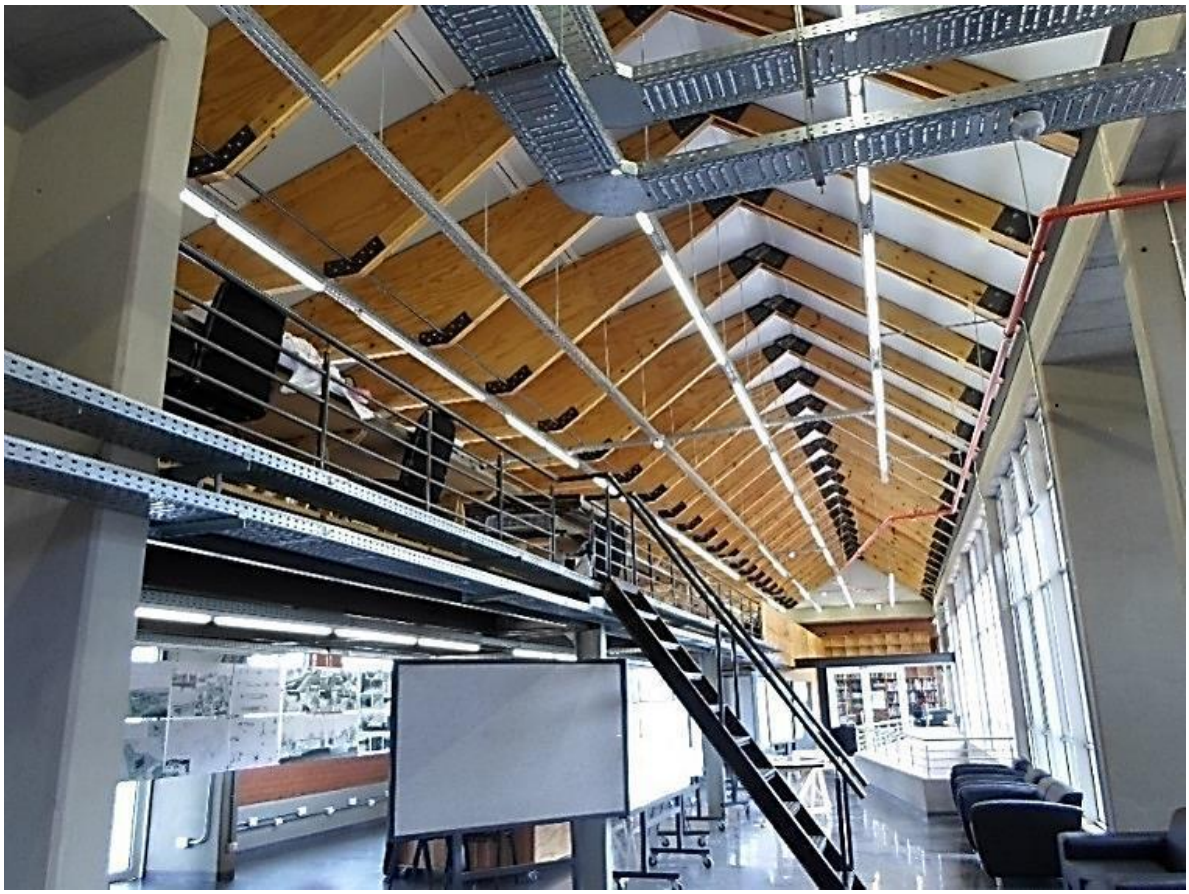


Figure 1.43. Varied Circulation Spaces and Tectonic Expression Luckan (2016)

### 4.3.5 Adaptive Reuse of Spaces towards 21st Century Pedagogic Spaces in Architecture

The possibilities offered by the 21st-century pedagogic tools and the concept of 4IR to transform existing spaces towards virtual learning is depicted below as the existing auditorium was converted to a virtual learning auditorium which can be used for various forms of learning in architecture including design critiques and communication between other disciplines. The interactive whiteboards and overhead high-focus roving cameras allow for sharing design critique within this collaborative learning space and "podcasts" to adjacent areas and remote learning locations. The options afforded by such technology offer unlimited potential for collaborative learning. TUT is the only architecture school in South Africa with a fully equipped digital interactive learning auditorium located on the west end of the building (Figures 1.44). The IT infrastructure in the

space affords extensive possibilities for collaborative work within the learning space and via digital links to other learning environments.

Figure 1.44. Interactive Virtual Learning Auditorium (Crafford 2012)

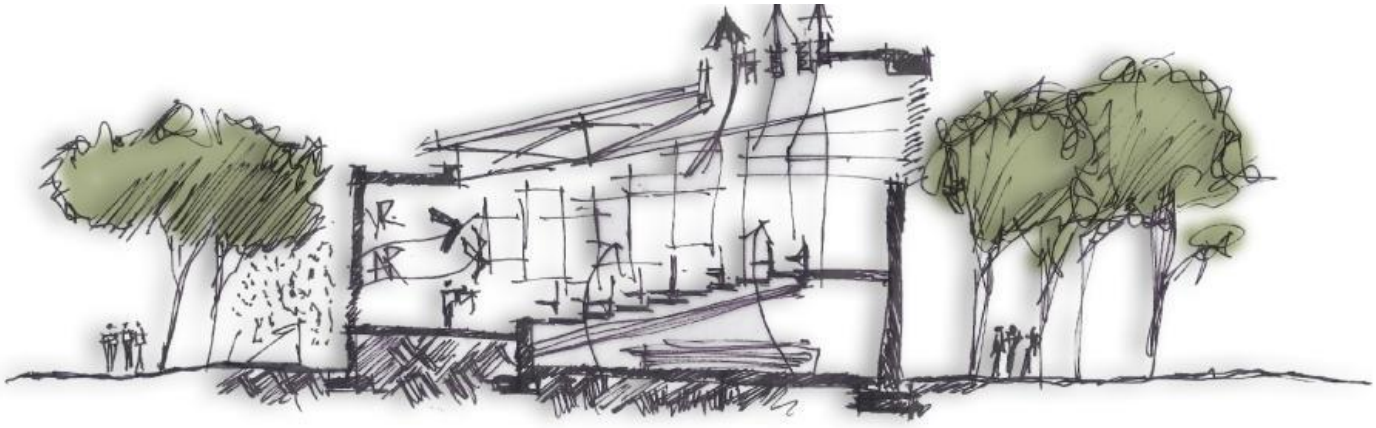


Figure 1.45. Interactive Virtual Learning Auditorium Section (Author 2020)

### 4.3.6The Importance of the External Response to 21st Century Pedagogy

The lack of place-making from the street to the inside of the building courtyard is disregarded, as the emphasis of place and building a community from the street to the entrance is just a mere space with no link between its internal environments. Even though the building boasts its tectonic expression, there is no architectural narrative that emits 21st-century pedagogy such as the importance of sensory experience, memorable experiences, and technology that can create an

architectural narrative to communicate with the help of innovation. A new transition from public spaces to semi-private and private places will evolve by using these principles, thereby strengthening the community's social fabric in which it is located.

Figure 1.46. No External; Response to the Community- Poor Place-Making (Author 2020)


Figure 1.47. No External Relationship to Community (Crafford 2012)

### 4.3.7 Conclusion

TUT seems to be far ahead of most universities in South Africa compared to DUT and UKZN. The quality of its various learning environments promotes 21st-century pedagogy in architectural universities with its proximity to allied architectural disciplines, its high level of connectivity through its unique layout and its use of the various 4IR tools embedded in 21st-century pedagogy. Tectonic expression of structure portrays an architectural narrative and is a quality of 21st-century pedagogy.

## 4.4 DURBAN UNIVERSITY OF TECHNOLOGY (DUT)

### 4.4.1 Introduction

Due to the COVID 19 pandemic, a case study of UKZN could not be done. The researcher had to use the precedent study of Durban University of Technology (DUT) which the architectural studios, administration rooms and pedagogy are like those in UKZN. Most of the lecturers in DUT are currently in UKZN, in which from the researcher's experience, the pedagogical and environments they are situated in are similar.

### 4.4.2 Relationship to other allied learning spaces and broader campus and the impact on architectural education

The Department of Architecture is located at Steve Biko Campus Musgrave Berea within a building that accommodates all the Engineering and Built-Environment Departments (Figure 1.48). Though most allied disciplines are on different floors, there is little or no interaction and communication with each other as these disciplines are treated in separation with no collaboration, which is not what 21st-century pedagogy in architecture displays. However, the building accommodates most of the applied sciences, and there is potential for collaboration like the selected allied disciplines. The Department of Architecture's seminar and lecture rooms spread throughout the building at different floor levels and have become an 'in-between' shared space for collaborative engagement with other disciplines but not structured and purposive places.

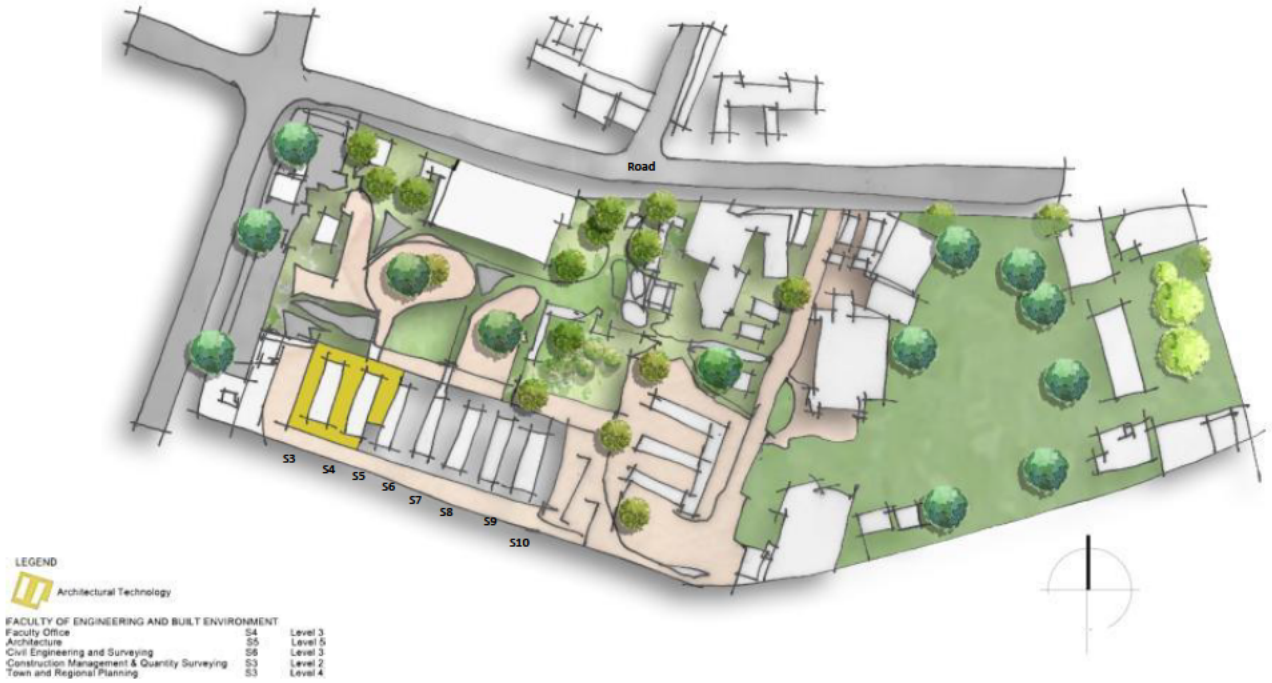



Figure 1.48. Relationship to other Allied Learning Spaces , Scale: 1:5000
(Adapted from Luckan 2016)

However, the department is disconnected from the broader campus as it is primarily located on the fifth floor. This disconnection further hinders students' access to campus' amenities such as the food court and social spaces at ground level. Therefore, most students are restricted and confined to their classrooms and are not in touch with their external environment (Luckan, 2016).

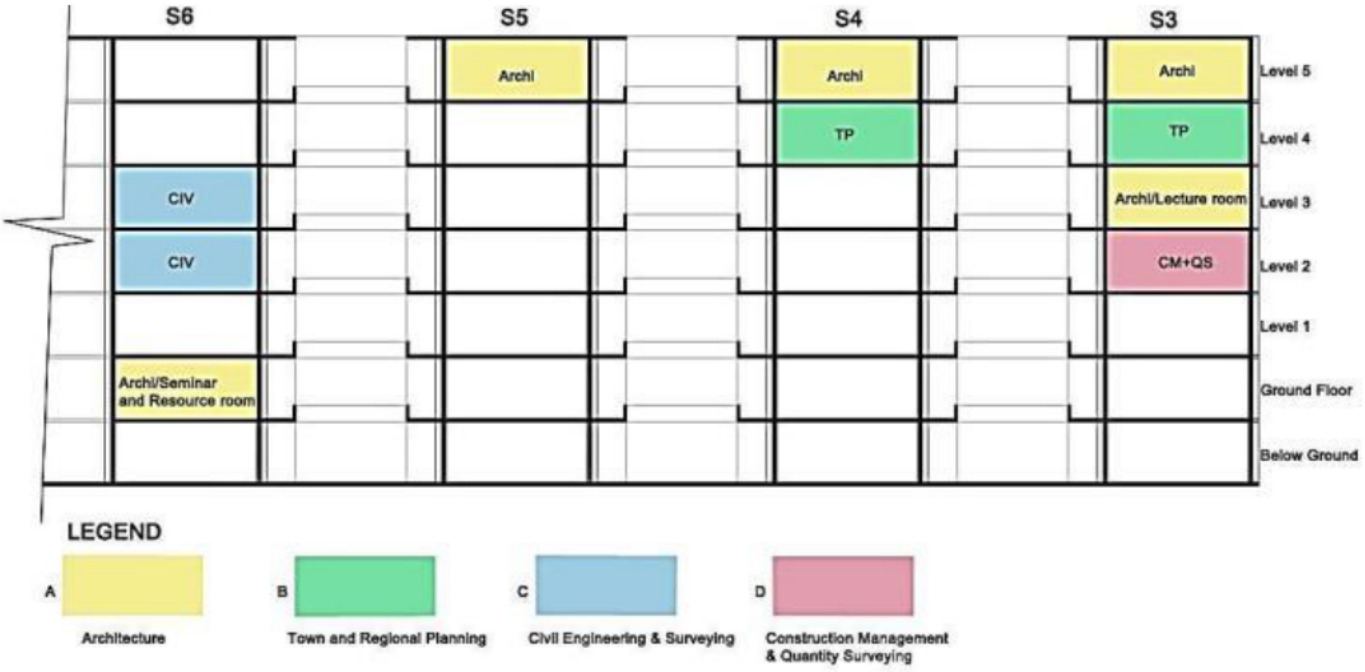


Figure 1.49. No Inter-Level Connectivity (Luckan 2016)

### 4.4.3 Typology of Learning Spaces and Impact on Pedagogy

Figure 1.50.Typical Studio Space (Luckan 2016)

These typical studios, like those of UKZN, has collaboration, but in segregation. There is no flexibility and informal spaces that promote more comprehensive engagement with the whole class, physically or virtually with other disciplines. Spaces within these studios are very confined and give one little or no options to the external environment. The motivation to design these studios is very minimal as these spaces are uncomfortable and not spacious. In a design course, one needs to have ample room to manoeuvre drawings, models and even the potential to use the 21stcentury pedagogy tools, such as 3D printing, robotics and virtual reality pods, in which students can access information and the potential for innovation and enquiry (Luckan, 2016).

Figure 1.51.Multimedia Lecture Room Space (Luckan 2016)

Learning spaces at DUT comprises both the design studio (Figure 1.50) and the teacher-centred space like that of UKZN, lecture rooms (Figure 1.51). These rooms are not equipped with the technology and spatial organization in a 21st-century interdisciplinary school of design. These spaces offer no room for flexibility and adaptively as their fixed furniture and hard surfaces depict no relation to 21stcentury pedagogical areas which should be innovative and most importantly harness collaboration. There is no sense of visual communication connectivity with the students as it is a one direction communication approach. Here lecturers are the only source of knowledge as this is a more traditional or conventional approach in which information is presented to the students, who are expected to passively receive the experience being offered (Luckan, 2016).

### 4.4.4 Spatial Planning and Spatial Relationships

Figure 1.52. Lecture Room Space and Studio Space (Luckan 2016)

There are no longer CAD Labs as computer stations are incorporated within the studios' workspaces (Figure 1.52). The negative attribute of the spaces' overall configuration is that the different studios' different levels are arranged in a cellular structure, individually accessed from an external walkway. This arrangement hinders inter-level connectivity as the transitional space is an exterior walkway which also serves as a fire escape. This arrangement differs from the transitionary spatial layout of the TUT.

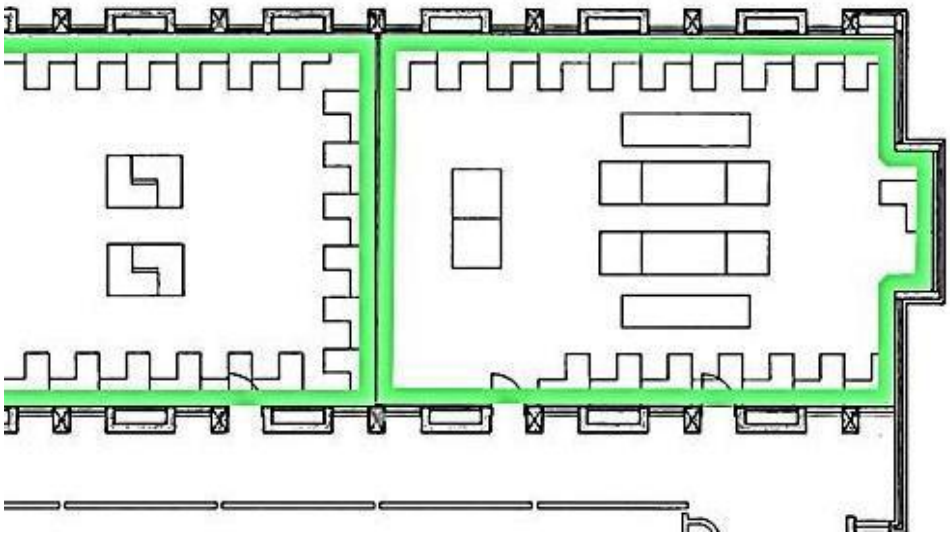


Figure 1.53. Multimedia Lecture Floor Plan , Scale: 1:250 (Luckan 2016)

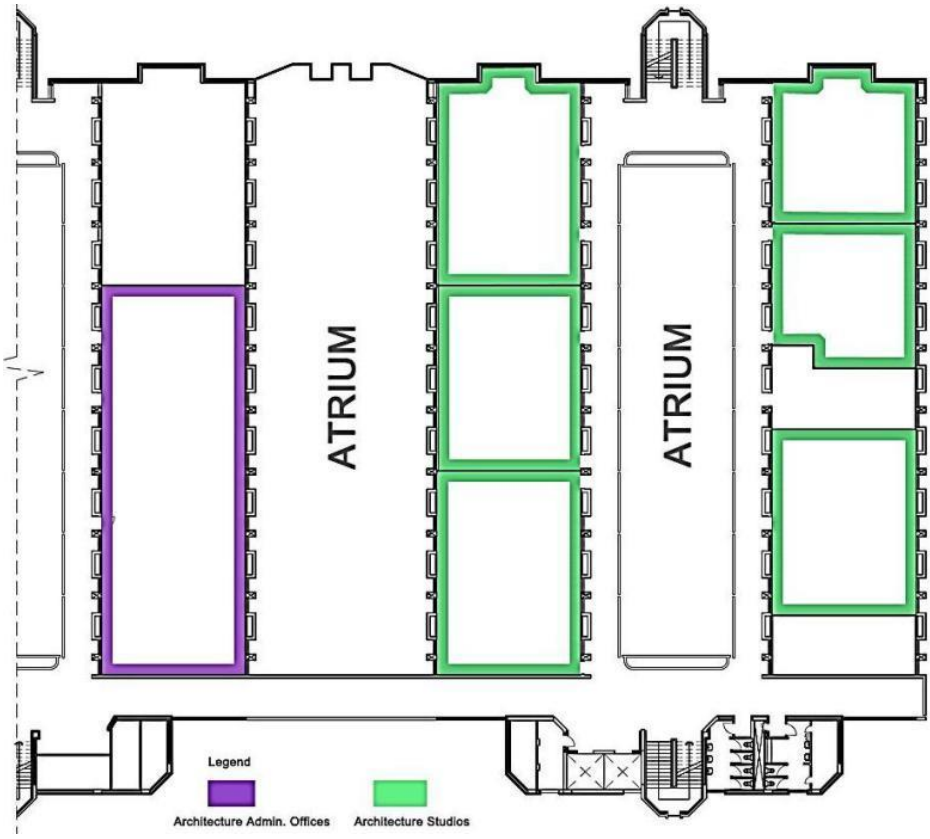



Figure 1.54. Floor Layout showing relationship of Learning Spaces to Admin , Scale: 1:250 (Luckan 2016)

One of the negative aspects of the school, from a pedagogic perspective, is that the administration offices of the department, which accommodates the academic staff, is disconnected from the studio spaces (Figure 1.54). This compromise 'incidental interaction with staff'. Another feature of the school is that it is disconnected at different building levels (Figure 1.49). The low spatial relationship between lecturers and students act as a barrier of communication, in that students do not have easy access to all lecturers and even to other disciplines which is not what the 21stcentury pedagogy on architecture stimulates, as this is of shared knowledge and easy access to the many allied fields in architecture (Luckan, 2016).


Figure 1.55. Floor Layout Showing Studios , Scale: 1:250 (Luckan 2016)

The studio spaces at DUT are on the one-floor level, allowing for a greater degree of synergy between different years of study (Figure 1.55). These studios are linked via narrow walkways with no possibility of breakaway spaces for collaboration and interconnectivity. The studios are only equipped with movable and fixed pin boards, whiteboards/chalkboards and projection screens

which are the only means of sharing of ideas and communication as opposed to the 21st-century pedagogy and the concept of 4IR, which offers many innovative ways of communication and accessing knowledge, be it physically or virtually. The hard surfaces and lack of connection to the external environment and community that characterize it make it a jail-like place due to its isolation, confinement, and lack of connection to the public, semi-private and private connection. The physical building has architectural tectonics such as layering, light and shadow, material and spatial perception. All these tools and principles lacking within this university and similarly in UKZN are what turn these spaces in 21st-century pedagogical places of design (Luckan, 2016).

### 4.5 Comparative Analysis of Precedents

The following is a list of purposive questions that were responded to of the three selected precedents selected to achieve 21st-century pedagogy principles on architecture.

| Critical Questioning | Ørestad College | Tshwane University of Technology | Durban University of Technology |
|---|---|---|---|
| How does it link pedagogy and space in comparison with 21$^{st}$century pedagogy on architecture? | Open, flexible studios and pods achieving a more dynamic and life-like environment towards a learner-centred teaching approach | Its high level of interconnectivity within the open learning interior makes interaction easy, with its suitable quality learning environments which foster an architectural narrative. | Fixed furniture, teacher-centred environments, with confined spaces detached from each studio does not harness 21$^{st}$century pedagogy on architecture |
| Does the technological innovation link to the concept of 4IR? | Yes, robotics, virtual reality auditoriums and access to 21$^{st}$ century pedagogic tools are accessible internally, a need to expand this in the external environment to take place is a possibility | High level of connectivity through its advanced IT infrastructure and spatial layout, as well as virtual reality infrastructure, but a need to add more 4IR tools if of importance | No, it does not, studios and media are installed with outdated, and even not working technology, a need for a technological upgrade aligned with the 4IR concept is of importance |

| | | | |
|---|---|---|---|
| Does it have an interdisciplinary approach, and is it useful? | Yes, as the many allied disciplines are within proximity to the same building, access can be physical or virtually | Proximity to some allied disciplines but not close to many other connected disciplines such as media design and interior design potential for virtual interdisciplinary collaboration is lucrative | No, many of the allied disciplined does not connect, due to a lack of connectivity spatially, physically and virtually |
| Does is adaptive to its external changes? | The building is very internalized, with no relations to outdoor spaces, the street and the community, engagement is needed with the building, its surroundings and the community | Good connectivity with the private and semi-private spaces such as the studios and courtyards, but there is a lack of engagement with the community and the street | Classroom and studios are internalized, and there is no connection between the students and the community, there is no external influence |
| Is there a sense of place-making? | Yes, within the building there is with the interaction and communication between students, faculty and staff, but not with outside engagement hinders the place-making with the external environment | Within the building with its triple volume spaces create a sense of place, yes, but the closed-off spaces that border the building from the street have no interconnectivity | No, occupants are in spaces, which are just enclosures and not places that harness 21$^{st}$century pedagogy in architecture |
| Does it promote collaboration? | Yes, studios and classrooms have no borders, and restrictions, circular pods evoke collaboration and interaction, informal and flexible furniture allows for this collaboration. Mulita disciplinary learning nearby | yes internally, with its open and informal studios, but they need to engage with other disciplines seem to be inaccessible | No collaboration because of the lack of easy accessibility to other interrelated departments and last of technology to aid this connectivity that is needed |
| Is their architectural tectonics? | Yes, to a certain extent, there is enough light, the use of steel and an overall sense of modernity is evoked, but a lack of layering and overlapping of materials of externally | Yes, expression of technology and materials as well as the contrast of space in three dimensions. | Poor ventilation, lack of light and sensory perception |
| Is there creation of experience beyond tangible? | Yes, virtual reality, smart screens, augmented reality and as well as connectivity through many different technological innovations are assessable to all | Yes, minimal through its virtual auditorium the need for Interactive surfaces to interact with your environment | No, students are confined to just their studios with no virtual, augments interaction |

| | | | |
|---|---|---|---|
| Does is communicate, visually, horizontally and vertically? | Split level changes maximize the organizational flexibility as much as possible and enable the different teaching and learning spaces to overlap and interact | Yes, effectively with its, triple volume space, informal and circulation spaces | No, a lack of connectivity because the level is stacked on top of each other with no layers of connectivity |
| Does the design convey Architectural a narrative? | layers and connectivity that's within the building is not reflected outside the building external façade and structure | Different layers pane, materials that reflect the modern contemporary architecture, but they need to respond and communicate externally is of importance | No, the external façade is a mere concrete box with no sense of experience, culture, and history as well as most importantly innovation |

Table 1.2. Critical Analysis of the Selected Precedents Author (2020)

## 4.6 CHAPTER CONCLUSION

The chapter briefly explained various aspects of architectural universities' learning spaces, linking them to 21st-century pedagogy on architecture. To learning spaces and *vice versa,* holistic, student-centred learning was explained, and traditional teaching such as teacher-centred approaches was identified and analysed in various universities. The second part focused on the importance of interdisciplinary collaboration and integration with most allied disciplines of architecture and 21st-century pedagogy within the universities. This collaboration and integration set out how most allied fields should be interconnected and how they should not. The third part established the connection that the universities have with external environments, be it physically concerning place-making and tectonics or virtually through the concept of the 4IR. Lastly, the chapter concludes by giving a critical analysis overview of the three precedents involving 21st-century pedagogy on architecture and the shortfalls these universities have, as this will lead towards defining architectural design principles for a 21$^{st}$-century Interdisciplinary Design school. The next chapter will present the findings, analyse, and discuss the data obtained from the research respondents through questionnaires, towards achieving the studies research objectives towards design principles for a 21$^{st}$-century interdisciplinary design school.

# CHAPTER 5

# ANALYSIS AND DISCUSSION

## 5.1 INTRODUCTION

This chapter will present the findings, analyse, and discuss the data obtained from the research respondents through questionnaires. The chapter will explore the 15 interview questionnaires that were transcribed and summarised in this qualitative research. This chapter analyses these interview questionnaires by scanning the participants' thoughts using keywords to find codes with their respective meanings and the relationship between these various codes, categorising them, and developing themes and sub-themes. The data will be interpreted in line with the research objectives.

An inductive process was followed in this current study. It aims to investigate the advances in learning space design of the 21st-century and derive architectural principles for a proposed school of design that will transform such spaces from confined disjointed physical space to collaborative learning environments. This qualitative study sought to answer the following research questions:

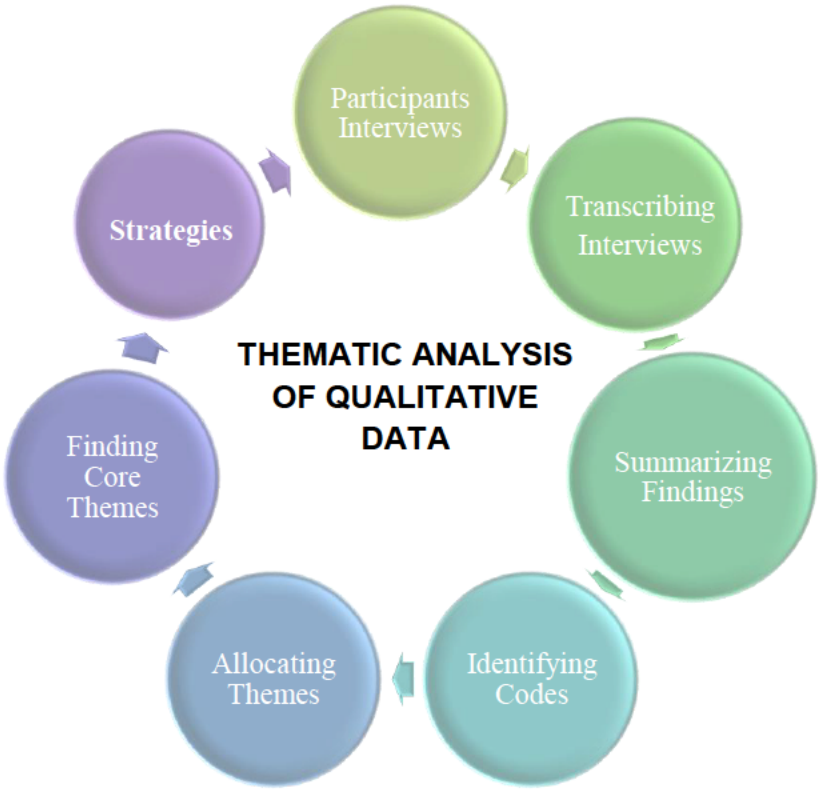
- What is the historical evolution of architectural pedagogy?
- How has architectural curricula and pedagogy advanced in the 21st -century?
- How has the 21st-century pedagogy influenced architectural learning space development?
- What are the pedagogic tools that optimally promote design learning within the 21st-century learning paradigm?
- What are the architectural design principles for a 21st-century interdisciplinary design school?

## 5.2 THEMATIC ANALYSIS OF QUALITATIVE DATA

### 5.2.1 Summary of Findings

The process is as follows: transcribing the data, familiarising the data sets and its various content and providing an overview. The following section provides a summary from the transcribed interview questionnaires that were administered on 15 participants. The summary provided the researcher with critical features of the interviews used to identify codes and the various trends between the students and lecturers within the university. All codes were collated from the summaries, and themes were placed in the multiple codes' integrated sets.

Figure: 1.56 Thematic Analysis of Qualitative Data




Source: Wigdorowitz (2018)

The following summary was drawn from the results of the questionnaires concerning the research objectives

| Participant No | What are the ways in which you think the university can improve its architectural design spaces? |
|---|---|
| Participant 1 | Interaction allied disciplines into communal social spaces |
| Participant 2 | Recreational activities in-between learning spaces to stimulate your mind |
| Participant 3 | More collaborative spaces, facilitating spaces which promote more interaction |
| Participant 4 | Create a more encouraging atmosphere close to the community and the world |
| Participant 5 | Exposure to nature, light and outdoor spaces as well as informal seating |
| Participant 6 | Flexible spaces without a hierarchy of learning, work, play and rest spaces |
| Participant 7 | Spaces should be vibrant, such as using different textures and colours on walls |
| Participant 8 | Communal participatory design, spaces to allow for students to be more creative |
| Participant 9 | Incorporate nature and change the colours of the spaces to enhance learning. |
| Participant 10 | Expressive design methods, sustainable design, social spaces, views and nature |
| Participant 11 | Studio spaces considering the lack of social and creative spaces |
| Participant 12 | A smaller amount of people at a time so everyone is seen and can participate freely |
| Participant 13 | Social spaces, food outlets, public/semi-public to private spaces |
| Participant 14 | Creative looking spaces, social spaces within studios and refreshments |
| Participant 15 | Natural lighting and ventilation flexible layouts and more interactional spaces |

Table 1.3. Summary of Findings in which Participants Suggest Ways in which the University can Improve their Design Spaces (Author 2020)

| Participant No | What do you think is 21st century pedagogic teachings? |
|---|---|
| Participant 1 | Methods to improve learning breaking from traditional student-teacher spaces |
| Participant 2 | Online learning, study virtually from anywhere in the world |
| Participant 3 | Interactive teachings with virtual studio sessions and with students from other disciplines |
| Participant 4 | Conducive learning environments that will influence a new paradigm of learning |
| Participant 5 | Students that are comfortable and willing to express ideas and responses |
| Participant 6 | Where learners interpret the world in their ways free to express ideas |
| Participant 7 | Knowledge from online resources and digital platforms and social integration |
| Participant 8 | Methods to develop critical thinking, independence and focus on technology |
| Participant 9 | Teachings that are influenced by a broader context that is linked globally |
| Participant 10 | Technologically advanced learning methods, through online and virtual platforms |
| Participant 11 | Teaching through Collaboration and learning from a more global context |
| Participant 12 | Interaction between diverse groups of people and teachings outside of the classroom |
| Participant 13 | Exposure to international standards through virtual space as a means of learning |
| Participant 14 | Unintentionally learning-based knowledge through society, community and experiences |
| Participant 15 | 4IR technologies when we can learn from anywhere |

Table 1.4. Summary of Findings in Which Participants Describe21st-Century Pedagogic Teachings (Author 2020)

| Participant No | What do you think are the traditional and 21st-century pedagogy and learning methods? | |
|---|---|---|
| | Traditional pedagogy learning methods | 21st-century pedagogy learning methods |
| Participant 1 | Books and paper | iPad and tablets (online) |
| Participant 2 | The teacher speaks, and students listen | Online learning and teaching |
| Participant 3 | Square uncomfortable spaces | Collaborative spaces, transparency and problem-solving spaces |
| Participant 4 | linear approach | visual perception, multi-tasking, socio digital networking and cooperation |
| Participant 5 | lecturer as a knowledge source and student as a recipient | The world, community and experiences as a knowledge source |
| Participant 6 | The lines of been taught through reciting and memorizing | Critical thinking and interpreting information |
| Participant 7 | Teaching linked to very internalised spaces | Teaching linked to the external environment |
| Participant 8 | Methods use visual data projectors, the internet, and access to online library | Methods that work in conjunction with the 4IR |
| Participant 9 | Teacher-centred methods | Learner-centred methods |
| Participant 10 | Chalkboard or whiteboard and possibly projected slides | Online classes, electronic submissions, interactive videos or seminars and virtual |
| Participant 11 | Content-focused methods | Interactive and participative |
| Participant 12 | Right and wrong methods | Guiding strategies from lecturers |
| Participant 13 | Dictation from lecturers on subjects | Students views on subjects |
| Participant 14 | Project-based | Problem-based |
| Participant 15 | Isolated learning | Group and interactive learning |

Table 1.5. Summary of Findings in which Participants Describe Traditional and 21st-Century Pedagogy and Learning Methods (Author 2020)

| Participant No | What does 21st-century pedagogy learning spaces compromise of? |
|---|---|
| Participant 1 | Contemporary spatial planning and use of electronic devices rather than books |
| Participant 2 | Learning spaces are not orthogonal, and that does not break cross verbal interaction |
| Participant 3 | Flexibility, conveys interaction, open spaces and aids in the interaction between groups and visual communication |
| Participant 4 | Open environments with a close relation to nature and the outdoor environment as well as fit with the latest technology |
| Participant 5 | Interaction, open-minded approach, encourages learning overachieving an outcome; create environments of meaning rather than function. |
| Participant 6 | Space for active movement, colours that inspire thought and bring a sense of peace, calm and encourage imaginative thoughts, digital spaces and flexible spaces |
| Participant 7 | Breakaway spaces, double volume spaces, spaces that are adequate size, with lounges and interactive areas |
| Participant 8 | Online learning and interaction, access to information are virtual, access to people is virtual, metaphysical relation to 'being.' |
| Participant 9 | Flipped classrooms, kinaesthetic learning, |
| Participant 10 | Inquiry-based learning |
| Participant 11 | Interactive rooms or spaces, digital walls and floors, access to technological tools |
| Participant 12 | Teaching through smart boards, teaching through flipping classrooms and teaching through technology |
| Participant 13 | Dynamic interactive learning spaces |
| Participant 14 | Creating social learning spaces |
| Participant 15 | High-speed internet connections to enable the Internet of Things, e.g. various sensors, cameras and other data-driven technology |

Table 1.6. Summary of Findings in which Participants Describe 21st Century Pedagogy Learning Spaces (Author 2020)

| Participant No | What closely allied disciplines in relation to architecture need to be incorporated within an interdisciplinary design school of the 21st century? |
|---|---|
| Participant 1 | Interior design, property development, building construction, mechanical engineering, geotechnical engineering, quantity surveying and graphic designing |
| Participant 2 | graphic design and arts |
| Participant 3 | Town planning, urban design, civil engineering, interior design and structural engineering |
| Participant 4 | Civil engineering, mechanical, electrical and mechatronics |
| Participant 5 | Urban planning, interior design, engineering, landscaping and social sciences |
| Participant 6 | Civil, structural engineering, interior design, town planning and Industrial design |
| Participant 7 | Engineering |
| Participant 8 | Psychology, Philosophy, Anthropology, Structural, Civil Engineering, Landscape Design, Interior Design, Development Studies, Town Planning. |
| Participant 9 | Engineering, construction management and quantity surveying |
| Participant 10 | Engineers, Interior Designers and Surveyors |
| Participant 11 | Engineers, landscapers and interior designers |
| Participant 12 | Town planning, housing, engineering, social science, geographers, mechanical, construction and artisanal trade |
| Participant 13 | land surveying, business management and civil engineering |
| Participant 14 | Project management, land surveyor, landscaping, engineering and interior design |
| Participant 15 | Interior design, marketing and IT |

Table 1.7. Summary of Findings in which Participants Describe Closely Allied Disciplines in Relation to Architecture (Author 2020)

| Participant No | What are the 21st century pedagogic tools that optimally promote design learning within the 21st-century learning paradigm? |
|---|---|
| Participant 1 | Online platforms and technology |
| Participant 2 | Big data and IOT and blended methods |
| Participant 3 | Access to hardware and software and a strong internet connection |
| Participant 4 | Laser Cutter 3D printer |
| Participant 5 | Virtual interaction between various disciplines |
| Participant 6 | free software, to international standards |
| Participant 7 | Robotics, 3D printers, 3D scanners |
| Participant 8 | Augmented reality and virtual reality systems |
| Participant 9 | Continuation research or the latest hardware and software |
| Participant 10 | High speculation computers and laptops |
| Participant 11 | Simulations tools |
| Participant 12 | Drone usage |
| Participant 13 | Cloud-based systems |
| Participant 14 | Digital sketch pads |
| Participant 15 | artificial intelligence |

Table 1.8. Summary of Findings in which Participants Describe 21stCentury Pedagogic Tools that Optimally Promote Design Learning Within the 21st-Century Learning Paradigm (Author 2020)

| Participant No | What do you think are the principals of a 21st century school of design? |
|---|---|
| Participant 1 | Indoor-outdoor spaces, tectonics and cognitive development, the spirit of place, use of light, ventilation, open spaces |
| Participant 2 | Inclusive spaces that allow for interaction |
| Participant 3 | Collaboration, learner-centred, historical relevance and problem-based learning principles |
| Participant 4 | Socialization, sustainability, right quality environment and good connectivity |
| Participant 5 | Inclusivity connection to data systems at the local council, creativity, truth to materials and vibrancy, actively engage with people globally |
| Participant 6 | Research and information fluency, problem-solving and critical thinking, collaboration, visual communication and creativity and innovation |
| Participant 7 | Collaborative learning, digital learning, interactive building, flexible spaces and public spaces |
| Participant 8 | Online virtual communication and resource access, augmented reality and virtual reality, dynamically responsive, futuristic |
| Participant 9 | Incorporate nature to improve the comfort levels use of technology and transparency to enhance collective learning spaces |
| Participant 10 | Technological and sustainable designing, thermal comfort and ventilation and access to outdoors |
| Participant 11 | Collaborative learning spaces, high technologically based, public spaces, ease of access, nature, street interaction |
| Participant 12 | Interdisciplinary people work in a collaborative manner utilizing problem-based learning focused on current contexts and their dynamics |
| Participant 13 | Community-based architecture and traditional and technological influenced |
| Participant 14 | Social needs, health needs, comfort, inspiring spaces and technology |
| Participant 15 | A data-driven and Internet of things focused principles, design through technology |

Table 1.9. Summary of Findings in which Participants the Principals for a 21st-Century School of Design (Author 2020)

## 5.3 CODING AND FINDING THEMES IN QUESTIONNAIRES

Qualitative coding is a process in which the researcher uses keywords that participants in the interview emphasise (Saldana, 2015:52). In this study, coding involved finding the common denominator and after that, examining current codes and identifying the trends, patterns and relationships linked to theory. These codes were assigned to themes. The following tables are divided into seven sections directly related to the research objectives.

| Codes | Themes |
|---|---|
| Social, communal, interaction, recreational, in-between learning, community, encouraging, stimulate, flexible, play, rest, participatory, expressive, sustainable, food outlets, refreshments, interactional | 1 Social Constructivism |
| Vibrant, textures, colours, nature, creative, ventilation, natural lighting, views | 2 Phenomenology |

Table 1.10 . Codes and Themes in which Participants Suggest Ways in which the University can improve its Design Spaces (Author 2020)

### Theme 1 Social Constructivism Theory

Participants believe that universities can improve their design spaces by applying social constructivist principles, which according to Isaacs (2013) argues that areas need to be designed in such a manner that promotes collaboration with others such that emphasis is placed on social interaction, shared rather than individual experience. The use of flexible furniture, breakaway spaces, and social spaces that students can acquire knowledge through interaction and communication with other students, physically within the university, and virtually, worldwide.

**Theme 2 Phenomenology**

The participants strongly believe that there is a need to experience the spirit of the place through many features such as light, colour, volume, etc. These form part of the phenomenology in architecture to one's sensory reaction to build space, Bongnar (2020). Architects use materials, textures, and colours to produce phenomena while other architects use the building itself to achieve the same effect.

| Codes | Themes |
|---|---|
| Online learning, virtually, online resources, technology, technologically advanced, virtual platforms, linked globally, broader context, connectivity, outside of the classroom, digital platforms, virtual studio | 3 Connectivism |

Table 1.11. Codes and Themes in which Participants Describe 21st Century Pedagogic Teachings (Author 2020)

**Theme 3 Connectivism**

Due to the lack of technology and facilities within universities, participants are only exposed to traditional pedagogic teaching forms, such as chalkboard, books and pens. In contrast, 21st-century pedagogic teaching embodies the concept of connectivism which is learning that recognizes the tectonic shift in which education is no longer internal and an individualistic activity, but how we use new technological tools and communication methods to acquire new knowledge anywhere from around the world.

This relatively new learning theory recognizes learning tools and environmental changes that previous learning theories failed to do as this provides insight into learning skills and tasks needed for learners to excel in the digital era.

| Codes | Themes |
|---|---|
| Traditional pedagogy and learning methods<br>iPad and tablets (Online), collaborative, transparency, multitasking, visual perception, digital networking, community and experiences, external environment, 4IR, electronic submissions, online classes, virtual, problem-based, interactive | 4 Student-Centred Learning |
| 21st-century pedagogy and learning methods<br>Books and paper, uncomfortable, linear approach, student as a recipient, memorizing, internalised, reciting, chalkboard | 5 Teacher centred environments |

Table 1.12. Codes and Themes in which Participants Describe Traditional and 21st Century Pedagogy and Learning Methods (Author 2020)

**Theme 4 Student-Centred Environments**

According to the participants, the 21st-century learning methods should be student-centred, and the focus should be on students rather than lecturers, as students of the 21st century are independent and have their means and techniques through the use of technology to access information and acquire knowledge. The responsibility of learning should be left in students' hands instead of traditional teacher-centred methods.

**Theme 5 Teacher Centred Environments**

The participants place this similarity between traditional pedagogy and the teacher-centred classroom. The teacher-centred classroom does not allow students to express their understandings, experiences, actions and most prohibited is the usage of technology in the classroom. Whereas the role of student-centred pedagogy is based on constructivist and democratic principles, and because we live in a digital age, the importance of technological access to and from these classrooms is of utmost importance, as students are stimulated in these environments that develop their reflective and critical thinking. A sense of responsibility also comes to the forefront in the student-centred pedagogy. Therefore, there is a need to integrate student-centred learning techniques without

compromising student learning outcomes both academically, socially and most importantly technologically to transform architectural environments in line with 21st-century pedagogy

| Codes | Themes |
|---|---|
| Electronic devices, flexibility, interaction, open spaces, visual communication, latest technology, active movement, digital spaces, online learning, metaphysical relation, dynamic, social learning, data-driven, various sensors, cameras, high-speed internet | 6 Virtual Design Studios |

Table 1.13. Codes and Themes in which Participants Describe 21st Century Pedagogy Learning Spaces (Author 2020)

**Theme 6 Virtual Design Studios**

Virtual design studios in the 21st-century pedagogy learning spaces offer students the ability to communicate and collaborate and students from many other disciplines around the world. Students will no longer be confined to a classroom and using digital tools will virtually overcome geographical or spatial barriers. These types of tools are widely utilized in students centred pedagogic approach based on constructivist theories.

These tools allow students to start classes anytime and to study in isolation which is currently recommended due to the COVID-19 pandemic that the world is currently experiencing, as students can communicate with lecturers and classmates by using interactive technologies such as video conferencing and social networks like Skype and Facebook, as well as virtual reality interfaces positioning themselves as many places at once.

| Codes | Themes |
|---|---|
| Online platforms and technology, big data and IoT and blended methods, hardware and software, Laser Cutter 3D printer, virtual interaction, free software, augmented reality, high speculation computers, robotics, 3Dprinters, 3D scanners, drone usage, simulations tools, artificial intelligence digital sketch pads, cloud-based systems | 7.Fourth Industrial Revolution Tools |

Table 1.14. Codes and Themes which Participants Describe 21st Century Pedagogic Tools that Optimally Promote Design Learning Within The 21st-Century Learning Paradigm (Author 2020)

**Theme 7 Fourth Industrial Revolution**

According to the participants, the 21s-century pedagogic tools that optimally promote design learning within the 21stcentury learning paradigm were within the lines of the concept of the 4IR. Within the universities, these tools are mostly based on internal stimulation. However, they can influence public connectivity and interaction of people and place this relationship between public and private spaces which is vital in architectural place-making with the influence of the 4IR.

| Codes | Themes |
|---|---|
| Graphic design and arts, interior design, property development, building construction, mechanical engineering, geotechnical engineering, quantity surveying, structural engineering, urban planning, landscape design, business management, marketing and IT, land surveyor, project management, anthropology, mechatronics, industrial design | 8.Interdisciplinary design |

Table 1.15. Codes and Themes in which Participants Describe Closely Allied Disciplines in Relation to Architecture (Author 2020)

**Theme 8 Interdisciplinary Design**

Intuitively designers know that teamwork is necessary to produce a cohesive project. Collaborative partnership, or collaboration across disciplines, is a fundamental basis in the real world. However, within the Masters in the Architecture programme, there seem to be many pedagogical challenges with the interdisciplinary design approach as the design of the 21st century has become more complicated due to the advancement of technology, new materials and sustainability. Architecture in a real-world environment involves different layers and connectivity of various disciplines, but students do not have many opportunities to collaborate with the other allied disciplines in architecture. Consequently, they lack knowledge regarding other professions and, most importantly, structural engineering as real-world environment architects and engineers work closely to adapt their ideas and requirements holistically on a project. Such collaborations are required from the early stages of the design process onwards as this mitigates any unforeseen problems as the design process progresses. The above findings suggest that there are many other closely allied disciplines concerning architecture that would prepare students for the real world and decision making, other than engineers.

| Codes | Themes |
|---|---|
| High technologically based, data-driven, internet of things, design through technology, | 9 Digital enhanced experience |
| Public spaces, ease of access, nature, street interaction, transparency, views, place-making, retail features, uneasy staircases, lifts do not work | 10 Walkability |
| Thermal comfort, use of light, ventilation, open spaces, the use of different materials local, volumes, the spirit of place, externalised, | 11 Tectonic design |
| Inclusivity, cultural response, local involvement, platforms for local architects, improving people lives, development, upliftment | 12 Community based |

| | |
|---|---|
| Indoor-outdoor spaces, access to information globally, connection to data systems at the local council, networks, visual communication | 13 Connectivity |
| Interdisciplinary, active process, actively engage, converse with peers, learner-centred | 14 Collaborative |
| Interactions, group-based learning, inquiry-driven, historical relevance, knowledge growth, participating | 15 Social constructivism |
| The interactive building, virtual platforms, interactive devices. incorporation of interactivity, dynamically responsive, futuristic | 16 Interactive dynamic space physical and virtual |
| Studios at hours, 24-hour access | 17 Diurnal and nocturnal revitalization of the place |

Table 1.16. Core Themes identified in which Participants Describe the Principals for a 21st-Century School of Design (Author 2020)

## 5.4 CHAPTER CONCLUSION

This chapter focused on presenting the results of the findings of the data. A thematic analysis was used to identify this study's various research objectives concerning the existing literature reviewed. These findings derived from the questionnaires were analysed and sorted into codes, themes and core themes which stand out the most and seems to be having the most significant impact amongst the participants and the universities. Understanding these core themes assisted the researcher to suggest recommendations. From this study, it can be hypothesised that the 21st-century pedagogic transformation can influence the design of learnings spaces and architecture which will widen the sphere of learning from the confines of the conventional classrooms to a world transformed by technology and its architecture. The following chapter will interpret the findings, draw conclusions and make recommendations to the universities offering architectural design courses in South Africa and worldwide.

# CHAPTER 6

# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 INTRODUCTION

This chapter presents this research's findings in line with the research objectives and answering the research questions. The chapter will also provide recommendations to the universities offering architectural design courses in South Africa and beyond. These recommendations could help improve or address the problem of architectural and design learning spaces that continue to be defined as confined disjointed physical spaces that show no coherence in most design fields. Advancement in the 21st-century pedagogic learning affords many opportunities to enhance student learning by overcoming these restrictions, especially in design learning spaces.

## 6.2 FINDINGS FROM THE STUDY

The study's findings suggest that architectural students at the university being researched are not in 21st-century pedagogical environments, including traditional chalkboard and internalized studios with no connection to the external environment. Allied disciplines have no collaboration with students and the studios, be it physical or virtual. These studios are not equipped with 21st-century pedagogical tools and are not highly technologically based, studios are uncomfortable thermally as they lack ventilation views and social engagement. These universities have the potential to advance into a 21st-century interdisciplinary design school. In the section below the researcher suggests recommendations to the universities offering architectural design learning.

## 6.3. RECOMMENDATIONS

The following are the core themes which are principles that could be implemented not only towards an Interdisciplinary Design School in Durban but also amongst all design schools and universities facing the problem of architectural and design learning spaces which continue to be defined as confined disjointed physical spaces which show no coherence in the most fields of design. These core themes below stand out the most and seem to be having the most significant impact among the participants.

### 6.3.1 Digital Enhanced Experience

Advancements in technology and digitization are impacting 21st-century architecture and pedagogy around the world. Universities that use traditional pedagogical methods hinder the employability and student experience of design of the 21st-century. Many students bring their expectations of digital experiences to universities and are left behind due to the lack of access to these 21st-century digital experiences. 21st-century students are stimulated by digital experiences to acquire new skills, connect, and, most importantly, allow them to participate in society by using digital experiences compared to 20th-century students. The conventional chalkboard and classroom will not bring out the best of 21st-century students as these environments do not provide them with the 21st-century skills and competencies such as collaboration, digital literacy, critical thinking and problem-solving which help students thrive in today's world.

### 6.3.2 Collaborative Learning Environments

There is a disconnection of design students from the real working world. Therefore, students need to have a multidisciplinary cross-curricular connection through collaboration with other allied disciplines. Students must know that teamwork is necessary to produce a cohesive project in the real world and be enforced within universities. Most of the universities that offer design do not collaborate with other allied disciplines in architecture as this is important because the architectural design is a process that involves complex layers that involves different actors and students currently work alone and are not exposed to opportunities to collaborate with other professions. Consequently, they lack the knowledge regarding other professions which forms part of the vital knowledge needed in the real world.

Furthermore, their future professional careers need to collaborate with other professions and adopt their ideas and requirements. Such collaboration is required from the early stages of the design process onwards. With the advancement of technology, this collaboration needs to be physical and virtual, such as obtaining knowledge from other disciplines around the world in the classroom's comfort. Therefore, universities must enforce collaboration as the knowledge of other disciplines is necessary for an architect to develop the students' competency to prepare them for the real-world.

### 6.3.3 Social Constructivism

Knowledge in architecture and design is not individually based, unlike in 21st-century pedagogy, social constructivism in universities should be recommended as many students are not comfortable with engaging with other students. Social constructivism is based on the knowledge that develops as a result of social interaction, communicating globally in which skills, language and experiences are shared rather than an individual experience. This is therefore important and can be stimulated in universities by designing spaces that allow for encouraging teamwork and collaboration and promote discussion or debates. This process of learning requires that the learner actively participate in creative activities and self-organization of students to come up with their own questions, make their own theories and test them for viability through a process reflecting and problem-based design rather than a project-based design in social constructivism.

### 6.3.4 Connectivity

Connectivity through technology and spaces that should be linked to architectural studios such as interdisciplinary connectivity, visual connectivity and connectivity to the public is of importance. These spaces should form an architectural narrative and should not just be internalized areas. Creating spaces that stimulate innovation through contact and sharing of ideas is of importance as it gives students a sense of identity and is the basis of place-making through connectivity. Connectivity within the design school, physically and virtually, with its external surroundings and with the global community is of importance. This is an architectural strategy used to create buildings that accommodate and connect people of all types and diversities. Connecting students through various technological infrastructure is vital as accessing information enables students to find out what they want to know more quickly and more independently than ever before. Connectivity is important not only for design students but also for the local community to connect to the facility, physically or virtually and this helps to awareness through many different facets such as the built environment, sustainable and engagement of the community

### 6.3.5 Tectonic Design

Poor tectonics such as the lack of architectural narrative within and on the actual design school is recognized in this research and various design universities that use conventional and traditional pedagogy. With the introduction of tectonics as the art of construction concerning artistic design in architecture, these materials will be used in construction that gives identity to the building externally and internally, modelled through the physical and metaphysical world. These overlapping and interconnected spaces with materials, volumes, light and meaning provide a sense of belonging. Tectonic is primarily concerned with the making of architecture in a modern world but considers the neural circumstances of a building, (physical, social, political and economic factors.

### 6.3.6 Community-based Learning

Concrete landscapes and unimaginative buildings such as most design universities in South Africa have caused higher stress levels and demotivation and are not inspiring and encouraging to students and the local community. Any of these buildings are detached from the community and are not approachable. Designing schools of the 21$^{st}$-century should combat this, whether it be beautiful, awe-inspiring architecture or merely a conscious connection to nature helps humans feel more relaxed, happy and engaged, and, most importantly, have a sense of identity and belonging. The community is the end-user of the work of architecture and therefore, their preferences, requirements, and culture determine the nature of architecture. Lack of interest in critical social issues from the architectural profession that holds such high responsibility within a community is a problem that should no longer be avoided.

### 6.3.7 Walkability

Most of the participants believe that their architectural and design studios are secluded from the world, and if they had to engage with the community, the ease of access is not visible. These universities and design schools lack movement, boast dominance of vehicular and large open car parks, no integration with the street and community, high rise uneasy staircases, and distant from all amenities. Walkability is assessed through connectivity, accessibility, safety/security and comfort. These walkable universities should have interconnected subtle flow of movement levels

connected by sight and breakaway spaces of engagement that increase collaboration and communication, visual interest and aesthetics in the area, access to the commercial, retail areas from across campus, sidewalks and crosswalks connected to the community. These factors are essential as they are at the forefront of a sustainable university. The encouragement and implementation of walkable transport into a 21st-century school of design maximizes the community's health, economic satisfaction, and reduces pollution and expenses within the university.

### 6.3.8. Interactive Dynamic Space Physical and Virtual

Due to the current COVID-19 pandemic, universities should emphasise interactive virtual spaces because of social distancing. Most learning spaces in universities are confined whilst virtual space, on the other hand, is not, and students will be able to access the world at their fingertips. The new situation, which resulted from radical modifications of interpersonal communications, transformed students' relationships in the 21$^{st}$-century universities and schools, which led to the introduction of "virtual dimension of being". Advances in multimedia technology urged people to accept virtual relations as the new and most favourite type of communications.

### 6.3.9 Diurnal and Nocturnal Revitalization of Place

The current university under research and its architectural design studios are not accessible during the night. Most architectural students of the 21st-century tend to work late during the night because of tight deadlines and heavy workloads, like architects in the real world. With architectural students being diverse and many working during the day, it is vital that universities become nocturnal, not only for students but also for the community's engagement at night will influence those people's well-being. It is a powerful vehicle for bringing about environmental and behavioural changes.

## 6.4 RESEARCH OBJECTIVES DISCUSSED

The following is an analysis and evidence from the study that discusses the research objectives. The research objectives are:

**Objective 1**

To understand the historical evolution of architectural pedagogy

- Beaux-arts system (France) 17th century
- The Bauhaus, 1919–1933
- Evolution of architectural pedagogy in South Africa Cape in South Africa (1975-1802).
- Behaviourism the 20th-century learning
- Constructivism the 21st-century learning
- The 21st-century connectivism

**Objective 2**

To understand how architectural curricula and pedagogy have advanced in the 21thcentury

- Teacher centred environments to student-centred learning

**Objective 3**

To understand how the 21stcentury pedagogy has influenced architectural learning space development

- Virtual Design Studios (electronic devices, flexibility, interaction, open spaces, visual communication, latest technology, active movement, digital spaces, online learning, metaphysical relation, dynamic, social learning, data-driven, various sensors, cameras, high-speed internet)

**Objective 4**

To identify the 21stcentury pedagogic tools that optimally promote design learning within the 21thcentury learning paradigm

- Fourth Industrial Revolution Tools(Online platforms and technology, big data and IoT and blended methods, hardware and software, Laser Cutter 3D printer, virtual interaction, free software, augmented reality, high speculation, computers, robotics, 3D printers, 3D scanners, drone usage, simulations tools, artificial intelligence digital sketch pads, cloud-based systems)

**Objective 5**

To define the architectural design principles of a 21st century interdisciplinary design school

- Digitally enhanced experience
- Walkability
- Tectonic design
- Community-based
- Connectivity
- Collaborative
- Social constructivism
- Interactive dynamic space physical and virtual

## 6.4 CHAPTER CONCLUSION

Through evidence and research, the researcher suggested recommendations for the universities and other institutions offering architectural design learning to advance their design learning spaces towards the 21st-century and beyond. The recommendations also suggested how universities can use the architectural principals of design to transform such learning spaces from confined disjointed physical spaces to collaborative learning environments. With these recommendations, most South African design schools can bridge the gap internationally and most importantly, within the design environment linking the various allied disciplines to align the real-world environment to local design schools. New insights from the research was obtained such as that , universities must enforce collaboration as the knowledge of other disciplines is necessary for an architect to develop the students' competency to prepare them for the real-world, promote social interaction, communicating globally in which skills, language and experiences are shared rather than an individual experience, Connectivity through technology and spaces that should be linked to architectural studios such as interdisciplinary connectivity, visual connectivity and connectivity to the public is of importance, The encouragement and implementation of walkable transport into a 21st-century school of design maximizes the community's health, economic satisfaction, and reduces pollution and expenses within the university and most importantly due to the current COVID-19 pandemic, universities should emphasise interactive virtual spaces because of social distancing.

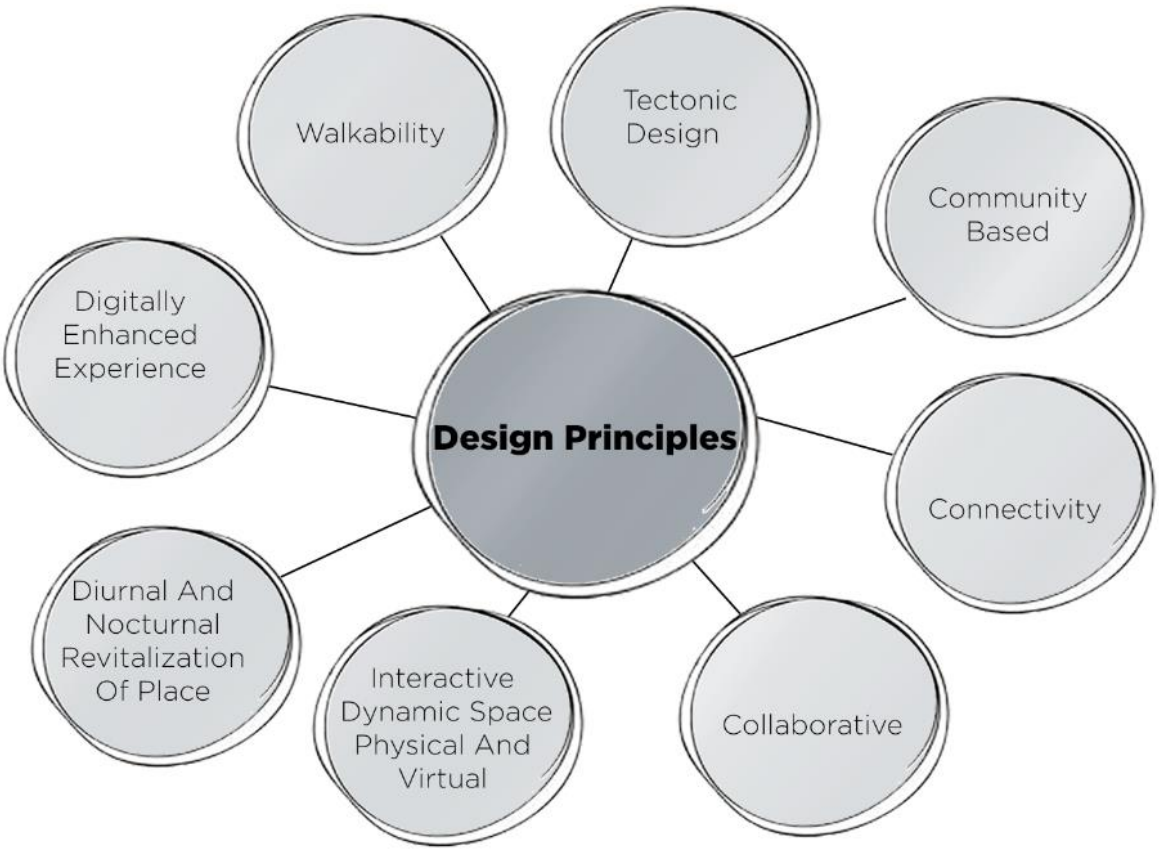



Figure 1.57. Core Themes (The Principals for a 21st-Century School of Design) (Author 2020)

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**ANNEXTURE A: INFORMED CONSENT**

**UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)**

**APPLICATION FOR ETHICS APPROVAL**

**For research with human participants**

**INFORMED CONSENT**

**Information Sheet and Consent to Participate in Research**

**MASTERS RESEARCH TITLE: THE IMPACT OF 21ST CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE TOWARDS AN INTERDISCIPLINARY SCHOOL OF DESIGN IN DURBAN**

Date:

Dear Informant

My name is Wendle Dwaine Naidoo from The School of Built Environment and Development Studies at the University of KwaZulu-Natal.

You are invited to consider participating in this study that seeks to investigate the impact of 21st century pedagogic transformation on architecture. The aim and purpose of this research are to investigate the advances in learning space design of the 21st century, to derive architectural principles for the proposed school of design which will transform such spaces from confined disjointed physical space to collaborative learning environments. The study is expected to enrol fifteen participants comprised of thirteen students and two lecturers. You will therefore require answering the questionnaires truthfully and remain anonymous as much as you can.

The study may not involve any risk or discomforts. We hope that the study will improve the current quality of learning and interaction in design.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number: HSSREC/00001806/2020).

In the event of any problems or concerns/questions, you may contact the researcher, his supervisor or the UKZN Humanities & Social Sciences Research Ethics Committee on the details provided below.

**RESEARCHER**

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**SUPERVISOR**

School of Built Environment and Development Studies
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**HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION**

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Private Bag X 54001
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4000
KwaZulu-Natal, South Africa
Tel: 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to terminate participation.

If you agree to participate, you will be given a signed copy of this document as well as the participant information sheet, which is a written summary of the research.

Participation in this research study does not include any costs; neither is it intended to incur any costs.

Efforts will be made to keep personal information confidential. We would like to retain some of the information in storage for possible future research related to the present research question.

The duration of storage will be one year from the date of information gathering

---

**CONSENT**

I _____ have been informed about the study entitled **The Impact of 21st Century Pedagogic Transformation on Architecture towards an Interdisciplinary School of Design in Durban.**

I understand the purpose and procedures of the study, as described above.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I am usually entitled to.

If I may have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at wendlenaidoo@gmail.com.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researcher's, then I may contact his supervisor on yashaenlucka@gmail.com

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

_____ _____

**Signature of Participant** **Date**

_____ _____

**Signature of Witness** **Date**

**(Where applicable)**

_____ _____

**Signature of Translator** **Date**

**(Where applicable)**

## APPENDIX B: QUESTIONNAIRE FOR STUDENTS

## QUESTIONNAIRE INSTRUCTIONS

## MASTERS RESEARCH TITLE: THE IMPACT OF 21ST -CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE TOWARDS AN INTERDISCIPLINARY SCHOOL OF DESIGN IN DURBAN

Researchers Contact Details: Mr Wendle Dwaine Naidoo

Email: wendlenaidoo@gmail.com.

Cell: 0845374465

Supervisor Contact Details: Dr Yashaen Luckan

Email: LuckanY@ukzn.ac.za

Tell: 031-266 1838

Social Sciences Research Ethics Committee Approval Number: HSSREC/00001806/2020)

Name Of University: University Of Kwa Zulu Natal: Architectural Department

Signarue Of Informant ……..

Highlight the level of study below and indicate the level of study

Degree/ Diploma/ Masters Level of Study (eg 1st year)……..

I. Indicate the appropriate response by marking it with a tick [ ✔ ]-copy and paste the tick electronically

ii. Please answer all questions with honesty and objectively

### SECTION A: DEMOGRAPHIC CHARACTERISTICS

**1. Tick the appropriate age bracket you fall in:**

20-29: [ ] 40-49: [ ] 60-69: [ ]

30-39: [ ] 50-59: [ ] 70-79: [ ]

**2. Indicate your sex:**

Male [ ]

Female [ ]

**3. Indicate your race:**

**4. Tick your current marital status:**

Divorced [ ] Married [ ]

Single [ ] Widowed [ ]

**5. Tick the highest level of education achieved:**

Primary school [ ] Diploma [ ] Degree [ ] Masters [ ]

High school [ ] Higher certificate [ ] Honor's [ ] Doctors degree [ ]

**6. Specify your subjects being currently completed:**

**7. Specify the number of years your current course is:**

**8. Are you financing your studies?**

Yes: [ ] No: [ ]

**9. How many dependents do you currently have?**

**SECTION B: LEARNING SPACES**

**10. Are your Classrooms/ studios technologically advanced (software and hardware)?**

Yes: [ ] No: [ ]

**If so, do you have access to these technologies and is it being used effectively?**

**If not, what are the various technology recommendations you can suggest to the university?**

**11. Are your Classrooms/ studios thermally comfortable?**

Yes: [ ] No: [ ]

**12. Is there enough light and ventilation within these spaces?**

Yes: [ ] No: [ ]

**13. Do you wish to present and submit your work electronically?**

Yes: [ ] No: [ ]

**14. Do your Classrooms/ studios make interaction discussion and group interaction easy?**

Yes: [ ] No: [ ]

**15. is there creativity in the design of theses Classrooms/ studios?**

Yes: [ ] No: [ ]

**16. Are access to healthy social spaces within the vicinity of the classroom/studio?**

Yes: [ ] No: [ ]

**17. Do you get to interact and collaborate with other allied disciplines within the design file, such as interior designer, media design, civil engineers?**

Yes: [ ] No: [ ]

**18. Do you have access to the appropriate tools and collaboration to come up with new and innovative solutions?**

Yes: [ ] No: [ ]

**19. What are the ways in which you think the university can improve theses spaces?**

## SECTION C: TEACHING, LEARNING AND RESEARCH

**20. Are you encouraged to express your ideas without discrimination?**

Yes: [ ] No: [ ]

**21. Are you lecturers supportive? If not please provide reasons**

Yes: [ ] No: [ ]

**22. Are you exposed to discuss ideas with students of other disciplines within the design field?**

**Do you think this exposure is important?**

Yes: [ ] No: [ ]

**23. Ae the current teaching methods in line with external work environment?**

Yes: [ ] No: [ ]

**24. Are the current teaching methods in lie within 21$^{st}$-century learning?**

Yes: [ ] No: [ ]

**25. Are debates and academic augments encouraged?**

Yes: [ ] No: [ ]

**26. Do you feel confident or demotivated after critiques?**

Yes: [ ] No: [ ]

**27. Do you feel confident in reaching out to fellow students?**

Yes: [ ] No: [ ]

**28. Are you being exposed to international learning?**

Yes: [ ] No: [ ]

**If not, what learning would you like to be exposed to internationally too?**

**29. What do you think is 21st century pedagogic teachings, and how do you think it can impact learning space design in architecture?**

**30 What do you think are the traditional and 21st century pedagogy and learning methods?**

**31 What do 21st-century pedagogy learning spaces compromise of? And how does it influence these spaces?**

**32. What are the 21st century pedagogic tools that optimally promote design learning within the 21st-century learning paradigm?**

**33. What do you think are the principals for a 21st-century school of design?**

**34 what closely allied disciplines in relation to architecture need to be incorporated within an interdisciplinary design school of the 21st century**

**Thanks for participating in this research**

## APPENDIX C: QUESTIONNAIRE FOR LECTURERS

## QUESTIONNAIRE INSTRUCTIONS

## MASTERS RESEARCH TITLE: THE IMPACT OF 21ST -CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE TOWARDS AN INTERDISCIPLINARY SCHOOL OF DESIGN IN DURBAN

Researchers Contact Details: Mr Wendle Dwaine Naidoo

Email: wendlenaidoo@gmail.com.

Cell: 0845374465

Supervisor Contact Details: Dr Yashaen Luckan

Email: LuckanY@ukzn.ac.za

Tell: 031-266 1838

Social Sciences Research Ethics Committee Approval Number: HSSREC/00001806/2020)

Name Of University: University Of Kwa Zulu Natal: Architectural Department

Signarue Of Informant ……..

Highlight the level of study below and indicate the level of study

Degree/ Diploma/ Masters Level of Lecturing (eg 1st year)……..

I. Indicate the appropriate response by marking it with a tick [ ✔ ]-copy and paste the tick electronically

ii. Please answer all questions with honesty and objectively

### SECTION A: DEMOGRAPHIC CHARACTERISTICS

**1. Tick the appropriate age bracket you fall in:**

20-29: [ ] 40-49: [ ] 60-69: [ ]

30-39: [ ] 50-59: [ ] 70-79: [ ]

**2. Indicate your sex:**

Male [ ]

Female [ ]

**3. Indicate your race:**

**4. Tick your current marital status:**

Divorced [ ] Married [ ]

Single [ ] Widowed [ ]

**5. Tick the highest level of education achieved:**

Primary school [ ] Diploma [ ] Degree [ ] Masters [ ]

High school [ ] Higher certificate [ ] Honor's [ ] Doctors degree [ ]

**6. Specify your lecturing subjects:**

**7. Specify the number of years lecturing:**

**8. Are you the only source of income in your family?**

Yes: [ ] No: [ ]

**9. How many dependents do you currently have?**

**SECTION B: LEARNING SPACES**

**10. Are your Classrooms/ studios technologically advanced (software and hardware)?**

Yes: [ ] No: [ ]

**If so, do you have access to these technologies and is it being used effectively?**

**If not, what are the various technology recommendations you can suggest to the university?**

**11. Are your Classrooms/ studios thermally comfortable?**

Yes: [ ] No: [ ]

**12. Is there enough light and ventilation within these spaces?**

Yes: [ ] No: [ ]

**13. Do you wish to present and submit your work electronically?**

Yes: [ ] No: [ ]

**14. Do your Classrooms/ studios make interaction discussion and group interaction easy?**

Yes: [ ] No: [ ]

**15. is there creativity in the design of theses Classrooms/ studios?**

Yes: [ ] No: [ ]

**16. Are access to healthy social spaces within the vicinity of the classroom/studio?**

Yes: [ ] No: [ ]

**17. Do you get to interact and collaborate with other allied disciplines within the design file, such as interior designer, media design, civil engineers?**

Yes: [ ] No: [ ]

**18. Do you have access to the appropriate tools and collaboration to come up with new and innovative solutions?**

Yes: [ ] No: [ ]

**19. What are the ways in which you think the university can improve theses spaces?**

## SECTION C: TEACHING, LEARNING AND RESEARCH

**20. Are students encouraged to express your ideas without discrimination?**

Yes: [ ] No: [ ]

**21. Are you supportive of students when ideas are expressed? If no, please provide reasons**

Yes: [ ] No: [ ]

**22. Are students exposed to discuss ideas with students of other disciplinaries within the design field?**

**Do you think this exposure is important?**

Yes: [ ] No: [ ]

**23. Ae the current teaching methods in line with external work environment?**

Yes: [ ] No: [ ]

**24. Are the current teaching methods in lie within 21st-century learning?**

Yes: [ ] No: [ ]

**25. Are debates and academic augments encouraged?**

Yes: [ ] No: [ ]

**26. Do students feel confident or demotivated after critiques?**

Yes: [ ] No: [ ]

**27. Do students feel confident in reaching out to fellow lecturers?**

Yes: [ ] No: [ ]

**28. Are lecturers being exposed to international teaching methods?**

Yes: [ ] No: [ ]

**If not, what teaching methods would you like to be exposed internationally too?**

**29. What do you think is 21stcentury pedagogic teachings, and how do you think it can impact learning space design in architecture?**

**30 What do you think are the traditional and 21stcentury pedagogy and learning methods?**

**31 What do 21stcentury pedagogy learning spaces compromise of? And how does it influence these spaces?**

**32. What are the 21st century pedagogic tools that optimally promote design learning within the 21st-century learning paradigm?**

**33. What do you think are the principals for a 21stcentury school of design?**

**34 what closely allied disciplines in relation to architecture need to be incorporated within an interdisciplinary design school of the 21st century**

**Thanks for participating in this research**

## APPENDIX D: GATEKEEPERS LETTER FROM THE SCHOOL OF BUILT ENVIRONMENT DEVELOPMENT STUDIES, UKZN

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

DATE: 04th March 2020

To whom it may concern

Mr Wendle Dwaine Naidoo is a Masters student in the School of Built Environment and Development Studies formally requests permission to interview staff and students in your institution/department and use the data collected on his Masters Research Project entitled: **(THE IMPACT OF 21ST-CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE**: Towards An Interdisciplinary Design School in Durban) and the findings will be shared with the institution if requested after the study has been completed.

Thank you and Kind regards

Institution/Department: School of Built Environment + Development Studies, UKZN

Name: Prof Ernest Khalema

Position Held: Dean + Head of School

Contact No: 031 260 1759

Email Address: khalema@ukzn.ac.za

Signature: [redacted]

**Dr Yashaen Luckan**
**Supervisor.**
Signature: [redacted]
**School of Built Environment and Development Studies**
**Email:** yashaenluckan@gmail.com
**Tel number:** 031 - 2661838

## APPENDIX E: GATEKEEPERS LETTER FROM THE REGISTRAR

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

4 September 2020

Mr Wendle Dwaine Naidoo (SN 219060828)
School of Built Environment and Development Studies
College of Humanities
Howard College Campus
UKZN
Email: wendlenaidoo@gmail.com

Dear Mr Naidoo

**RE: PERMISSION TO CONDUCT RESEARCH**

Gatekeeper's permission is hereby granted for you to conduct research at the University of KwaZulu-Natal (UKZN) towards your postgraduate studies, provided Ethical clearance has been obtained. We note the title of your research project is:

*"The impact of 21st - century pedagogic transformation on architecture: Towards an interdisciplinary design school in Durban."*

It is noted that you will be constituting your sample by conducting interviews staff and students from UKZN (Taking in account the regulations imposed during the lockdown ie restrictions on gatherings, travel, social distancing etc. ZOOM, Skype or telephone interviews recommended)

Please ensure that the following appears on your notice/questionnaire:

- Ethical clearance number;
- Research title and details of the research, the researcher and the supervisor;
- Consent form is attached to the notice/questionnaire and to be signed by user before he/she fills in questionnaire;
- gatekeepers approval by the Registrar.

You are not authorized to contact staff and students using the'Microsoft Outlook' address book. Identity numbers and email addresses of individuals are not a matter of public record and are protected according to Section 14 of the South African Constitution, as well as the PAIA and POPI Act. For the release of such information over to yourself for research purposes, the University of KwaZulu-Natal will need express consent from the relevant data subjects. Data collected must be treated with due confidentiality and anonymity.

Yours sincerely

[redacted]

**DR KE CLELAND: REGISTRAR (ACTING)**

**Office of the Registrar**
**Postal Address:** Private Bag X54001, Durban, South Africa
**Telephone:** +27 (0) 31 260 8005/2206 **Email:** registrar@ukzn.ac.za
**Website:** www.ukzn.ac.za

1910 - 2010
100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

INSPIRING GREATNESS

# APPENDIX F: HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC) APPROVAL LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

16 September 2020

**Mr Wendle Dwaine Naidoo (219060828)**
**School Of Built Env & Dev Stud**
**Howard College**

**Dear Mr Naidoo,**

**Protocol reference number:** HSSREC/00001806/2020
**Project title:** THE IMPACT OF 21ST-CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE
Towards An Interdisciplinary Design School in Durban
**Degree:** Masters

## Approval Notification – Expedited Application

This letter serves to notify you that your application received on 23 July 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

**Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.**

This approval is valid until 16 September 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

---

**Professor Dipane Hlalele (Chair)**

**/dd**

**Humanities & Social Sciences Research Ethics Committee**
**UKZN Research Ethics Office Westville Campus, Govan Mbeki Building**
**Postal Address: Private Bag X54001, Durban 4000**
**Tel: +27 31 260 8350 / 4557 / 3587**
**Website:** http://research.ukzn.ac.za/Research-Ethics/

# PART TWO

# DESIGN

# THE IMPACT OF 21ST-CENTURY PEDAGOGIC TRANSFORMATION ON ARCHITECTURE

## Towards An Interdisciplinary Design School in Durban

**Wendle Dwaine Naidoo- Student No: 219060828**

### Problem Statemnt

Architectural and design learning spaces continue to be defined as confined disjointed physical spaces which show no coherence in the many fields of design. Advancement in the 21st century Pedagogic learning affords many opportunities to enhance student learning by overcoming these restrictions typically in spaces for design learning.

### Key Questions Of The Study

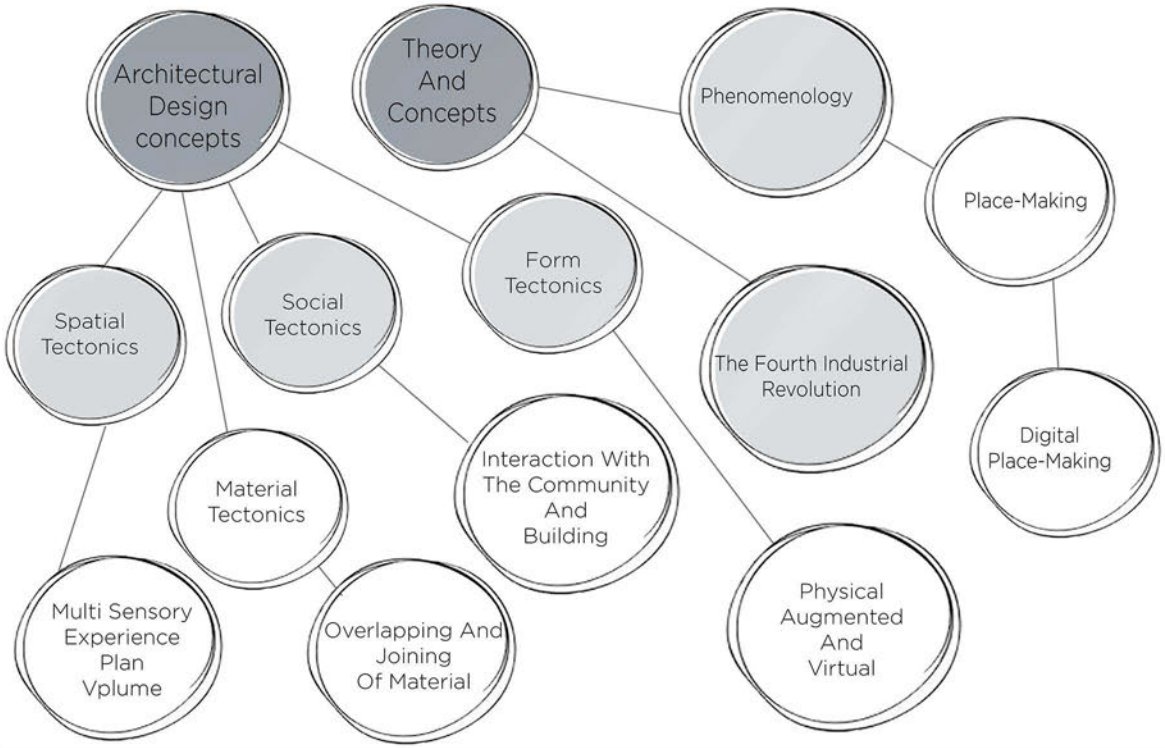
The key questions are:

- What is the historical evolution of architectural pedagogy?
- How has architectural curricula and pedagogy advanced in the 21st-century?
- How has 21st-century pedagogy influenced architectural learning space development?
- What are the pedagogic tools that optimally promote design learning within the 21st-century learning paradigm?
- What are the architectural design principles for a 21st-century interdisciplinary design school?

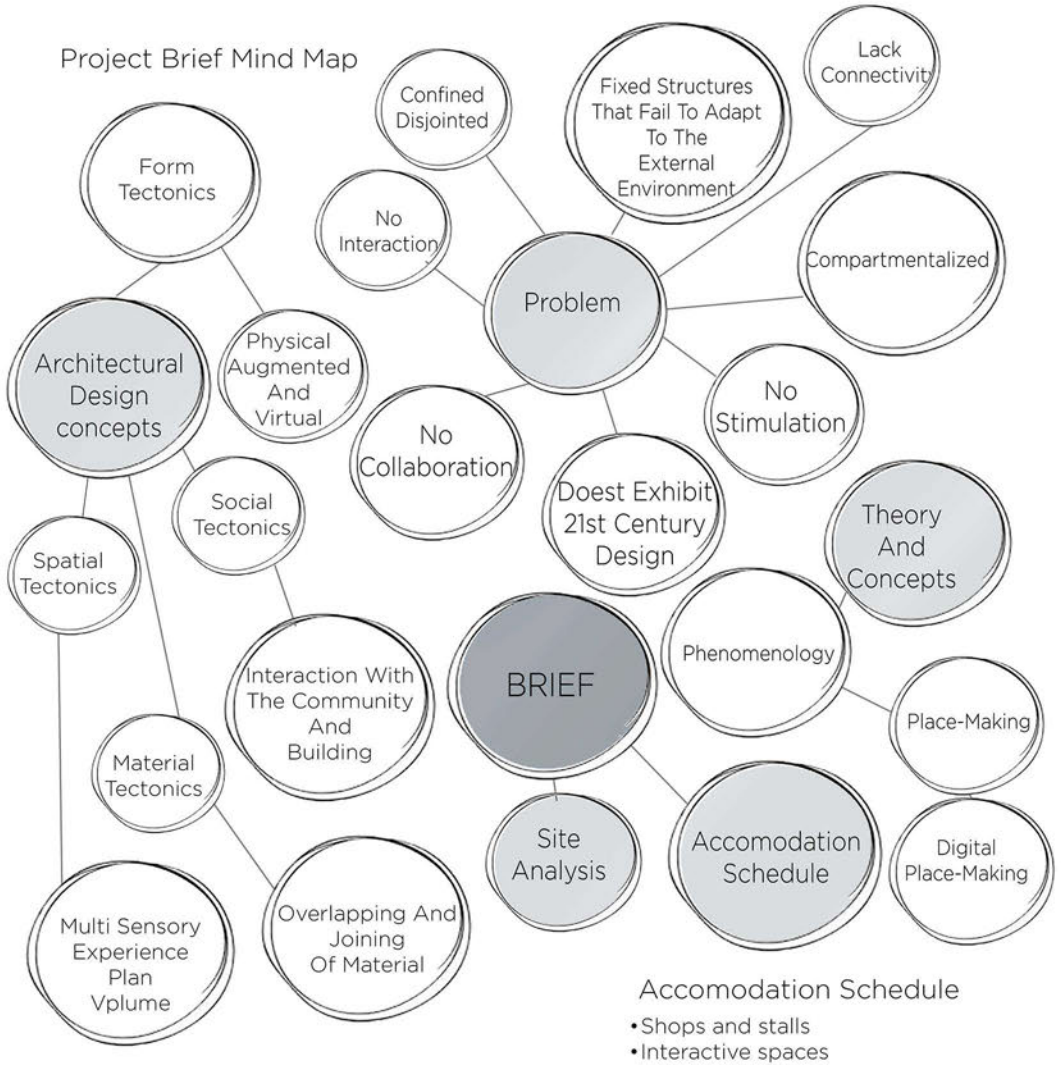
### Motivation/ Justification Of The Study

The researcher's experience in design environments shows that there is no link between the various design occupations stemming from universities, which contradicts the fact that in the modern-day working environment, all designers such as architects, media designers, interior designers and many other closely allied professions are required to work much more cohesively. Therefore, these universities lack connectivity and collaboration, which the 21st-century pedagogic approach presents.

### Theoretical And Conceptual Framework Mind Map




### Project Brief Mind Map




### Description Of Client

Architecture Department - Durban - eThekwini Municipality-In Conjuctoin withThe Department of Public Works

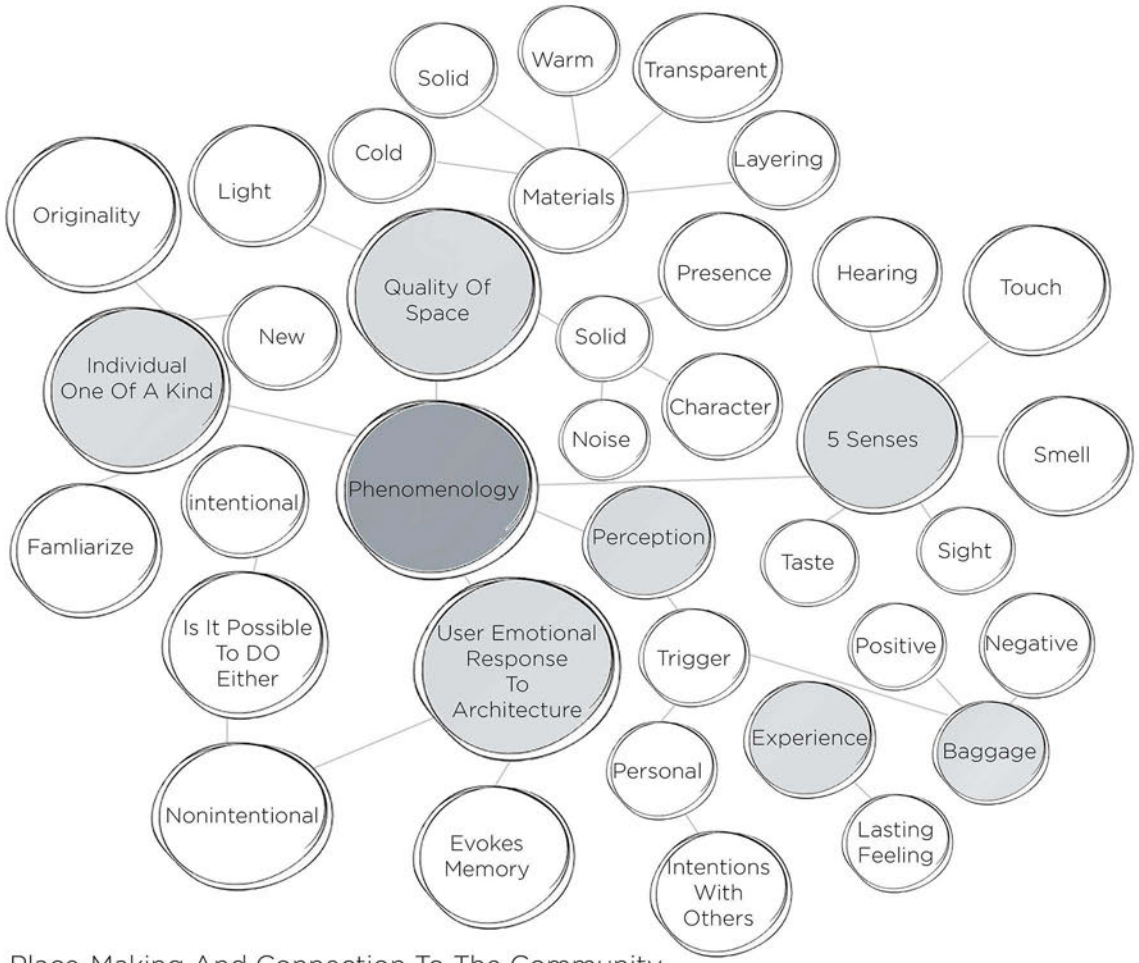
### Description Of User

Students, Architectural Interrelated Professionals Related To The Built-Environment, Local, International Architects, Lecturers, Municipality And Most Importantly The Community

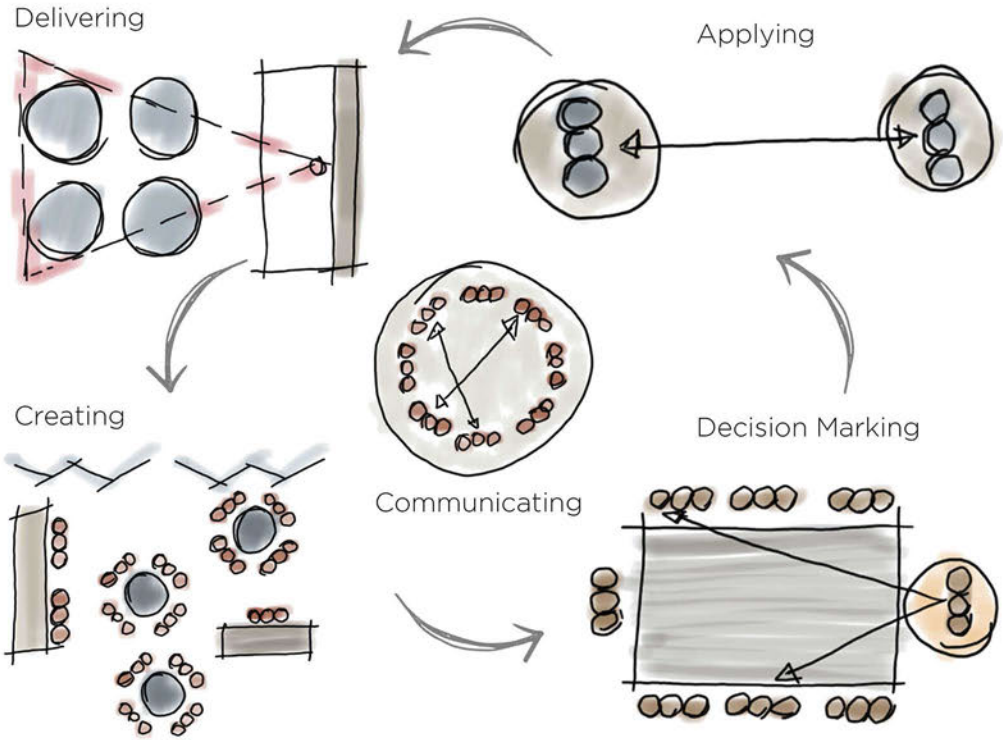
### Accomodation Schedule

- Shops and stalls
- Interactive spaces
- Multi-sensory spaces
- Augment and virtual reality rooms
- Archietcural Breakaway spaces
- Colloborative Studios
- Virtual Reality Studios
- Augemented Reality Studios
- Architectural Pods
- Building Simulation Rooms
- Robotics
- lounges
- Interactive semi private spaces
- Public spaces and its relationship to the CBD

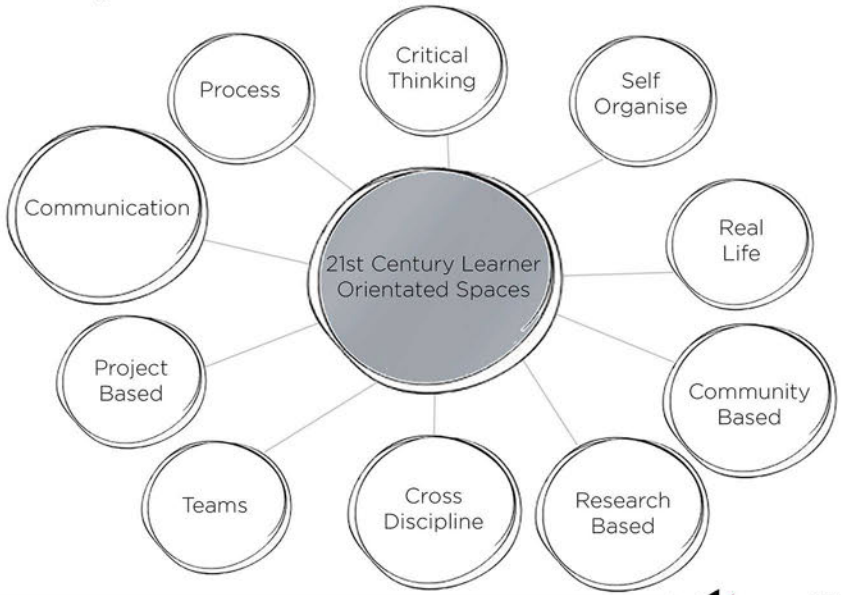
## Phenomenology as a paradigm for 21st century Architectural learning space development



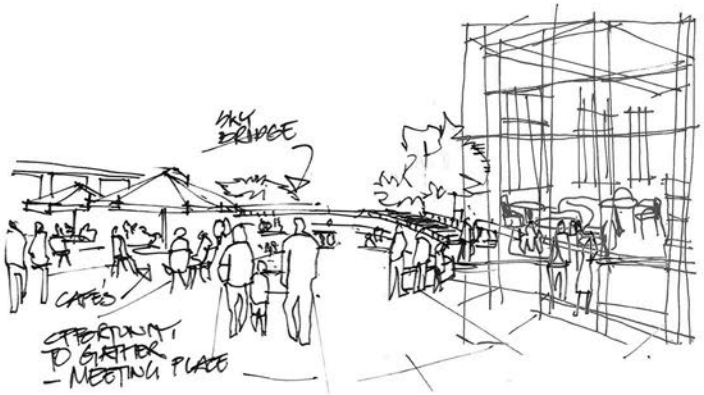

## Linking 21st Century Pedagogy And Space-Social Constructivism Theory and the concept of Collaborative Learning

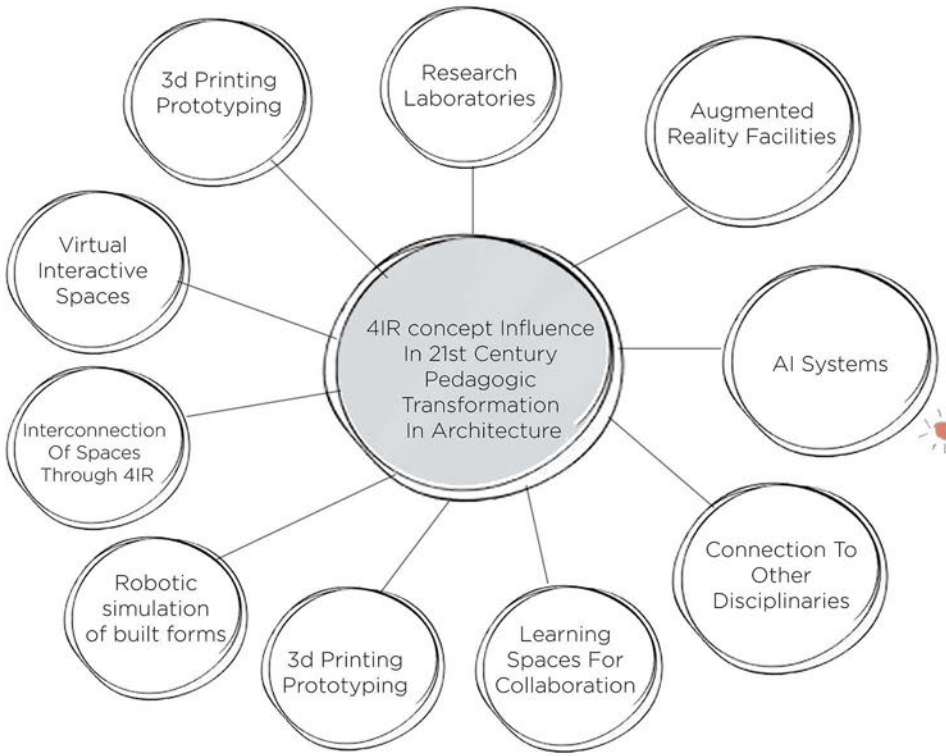



## 21st Century Learner Orientated Spaces

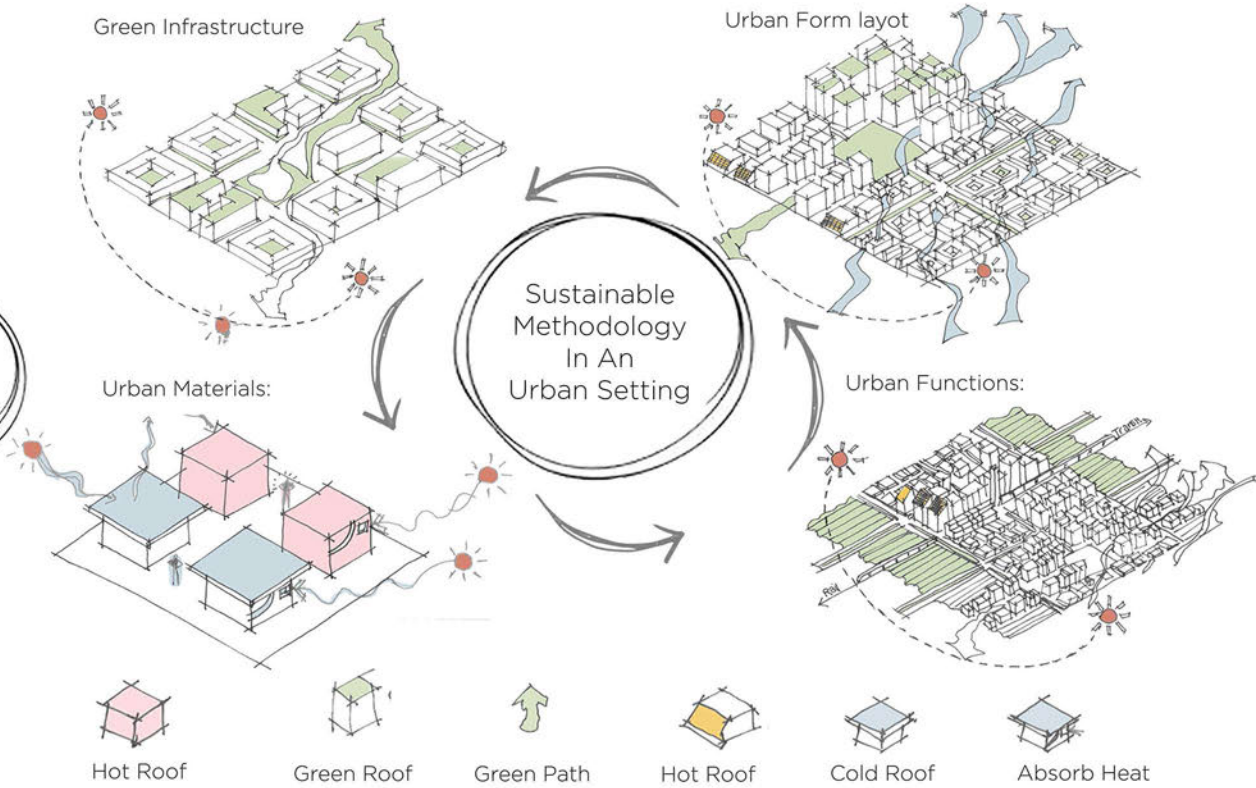



## Place-Making And Connection To The Community



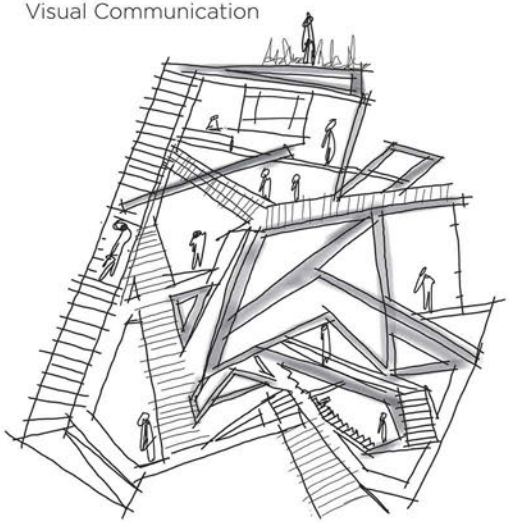



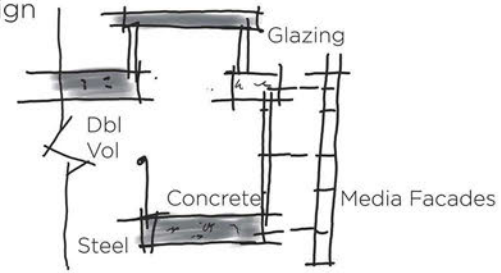


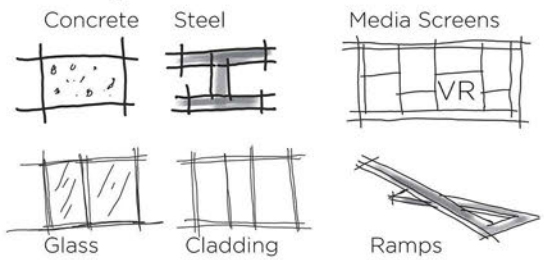

## Tectonics In Architectural Learing Design

Visual Communication

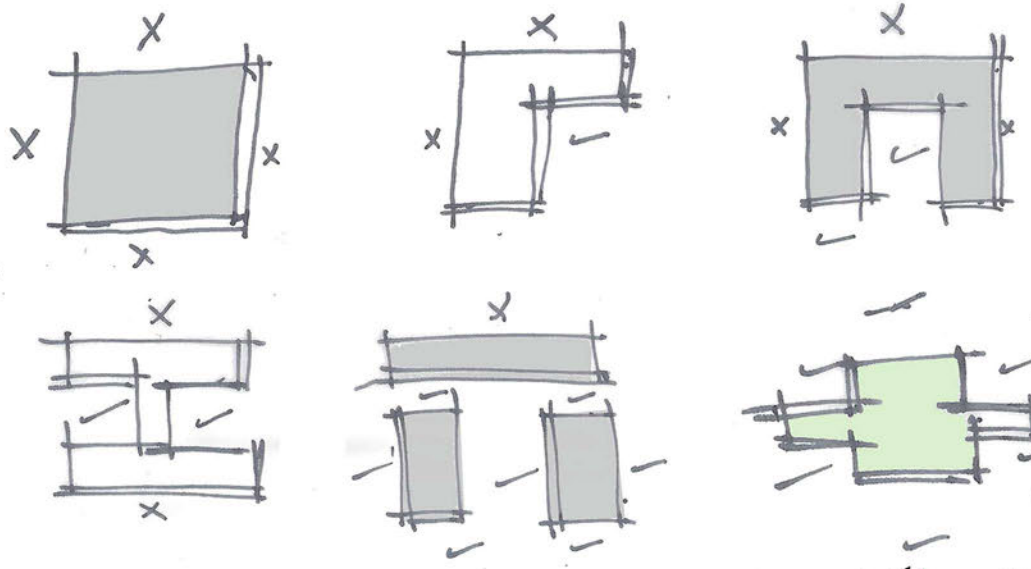




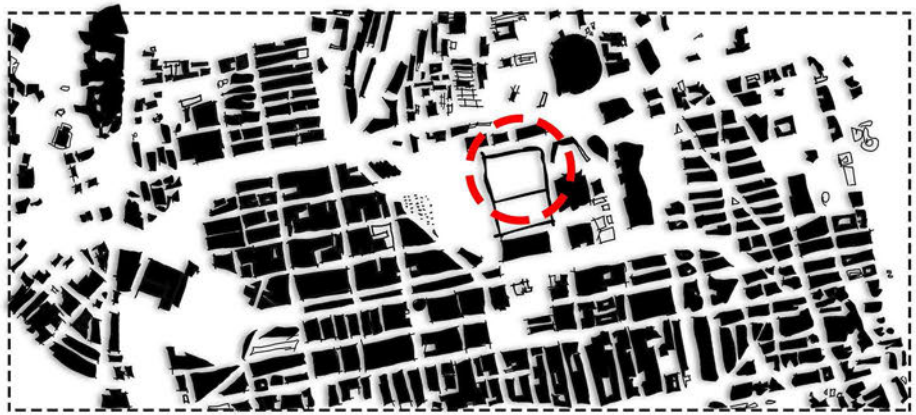

### Layering and Overlapping Of Materials




## Urban Sustainable Forms

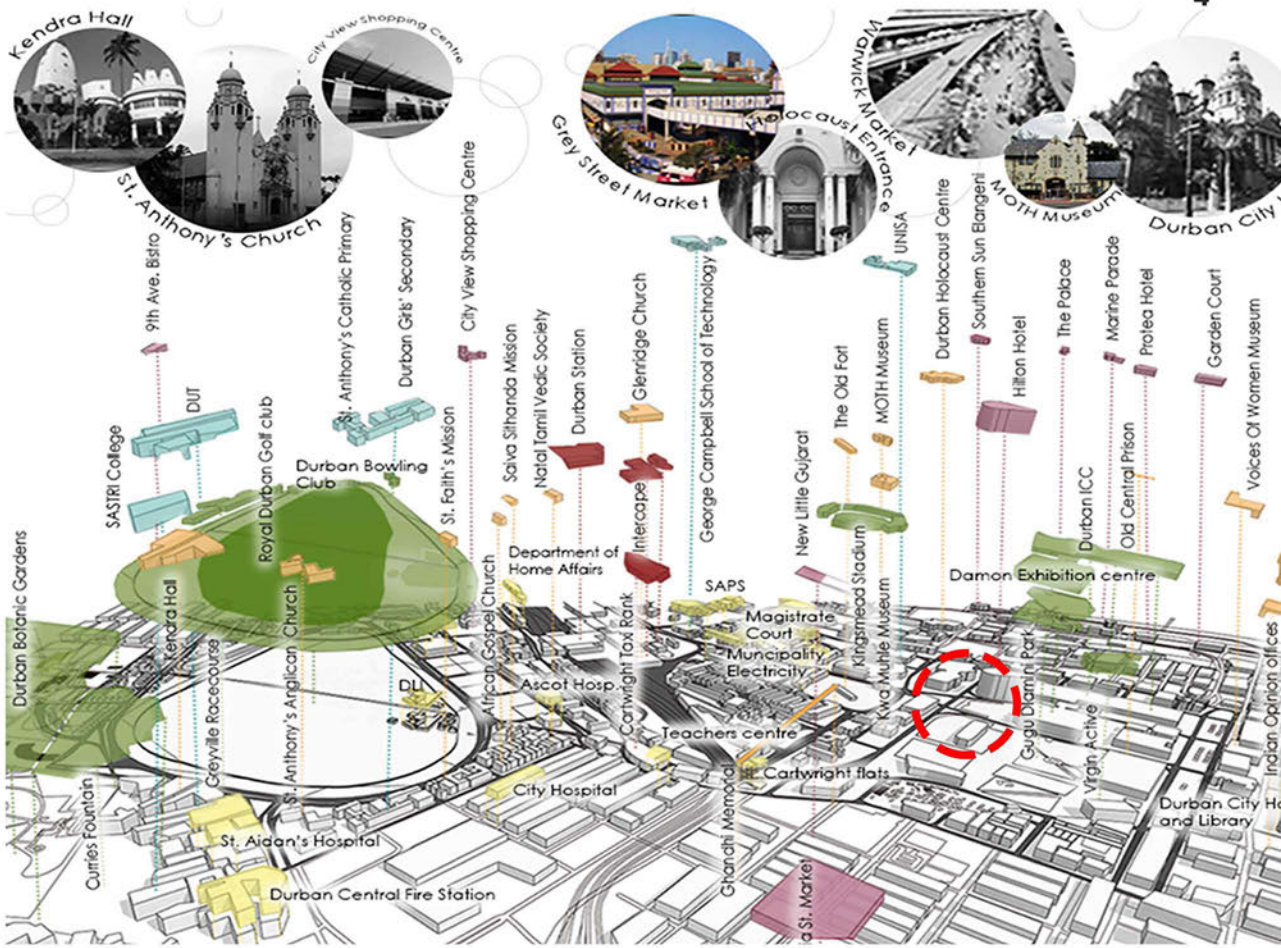


Existing Figure Ground

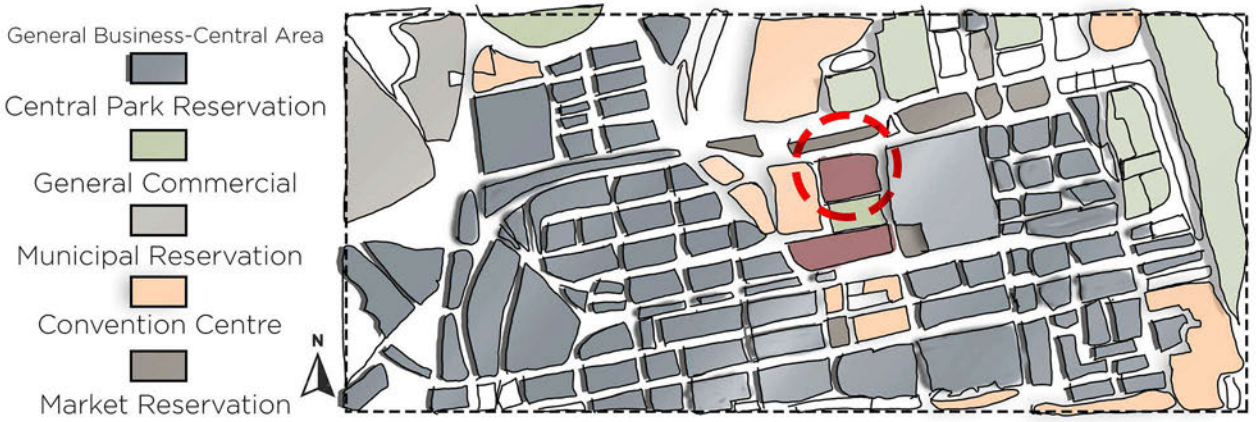


Existing Roads

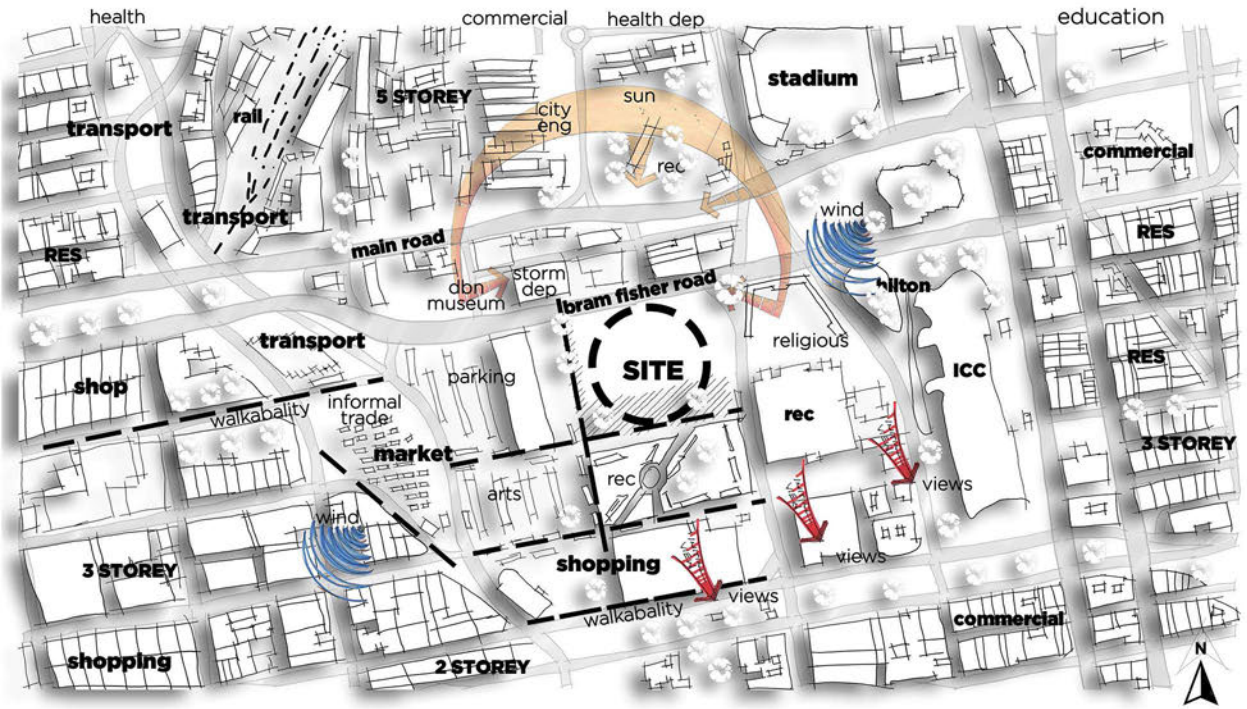
Vegetation


Zoning

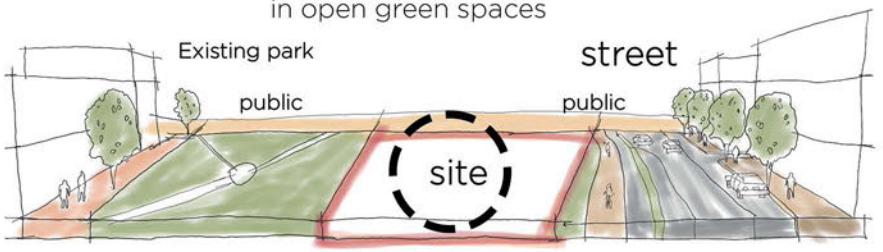


## Contextual Response Bram Fischer Road Suburb-CBD District Durban




## Green Open Spaces Interaction

potential of enhancing public interaction through AR/VR in open green spaces

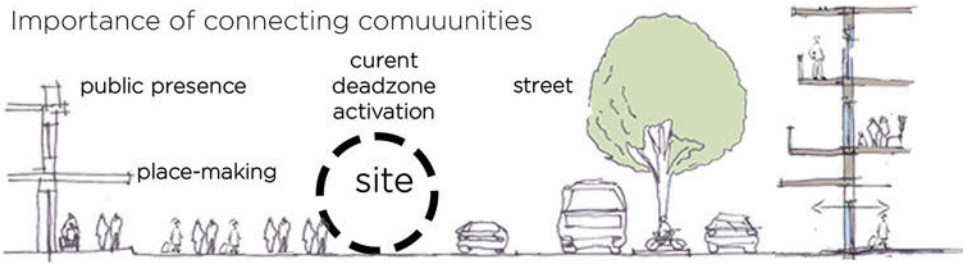



A walkable building public and building interaction And activation

## Community And Public Interaction

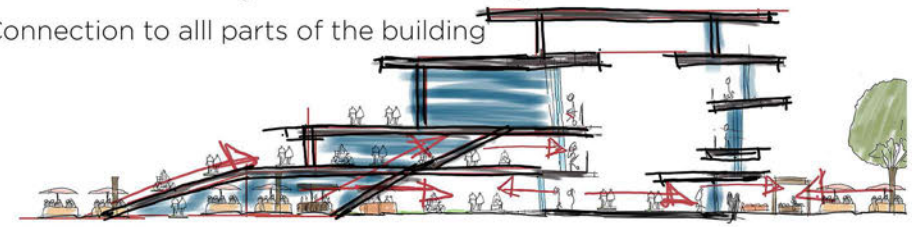
municipality

Importance of connecting comuuunities




## A Walkable Building Public And Building Interaction And Activation

Connection to alll parts of the building



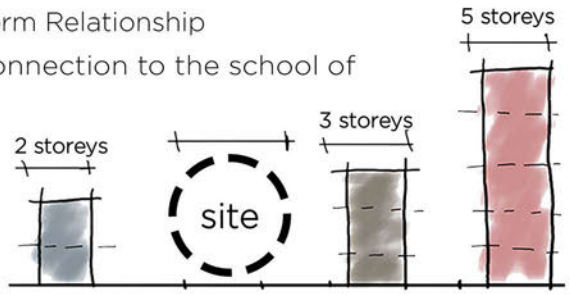
## Zoning

Socially interactive spaces

IMPORTANCE OF HISTORICAL PRESERVATION AND CHARACTER OF NEIGHBORHOODS.

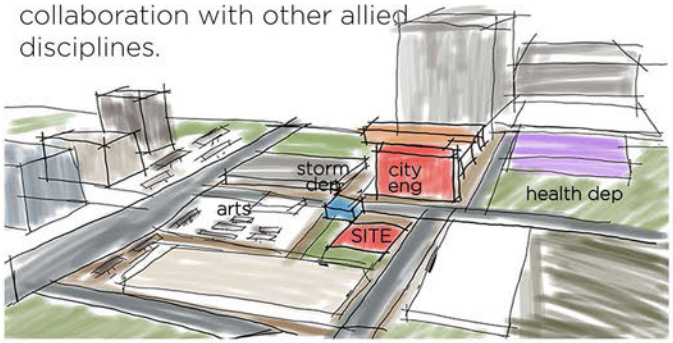
## Building Form Relationship

Scale in connection to the school of design




## Interdisciplinary Opportunities

collaboration with other allied disciplines.




## Recreational Facilities

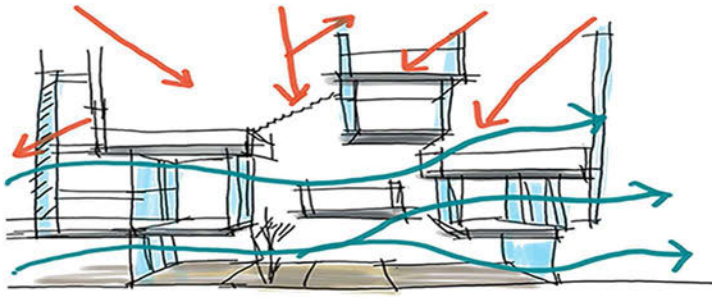
Community upliftment and interaction on the street level

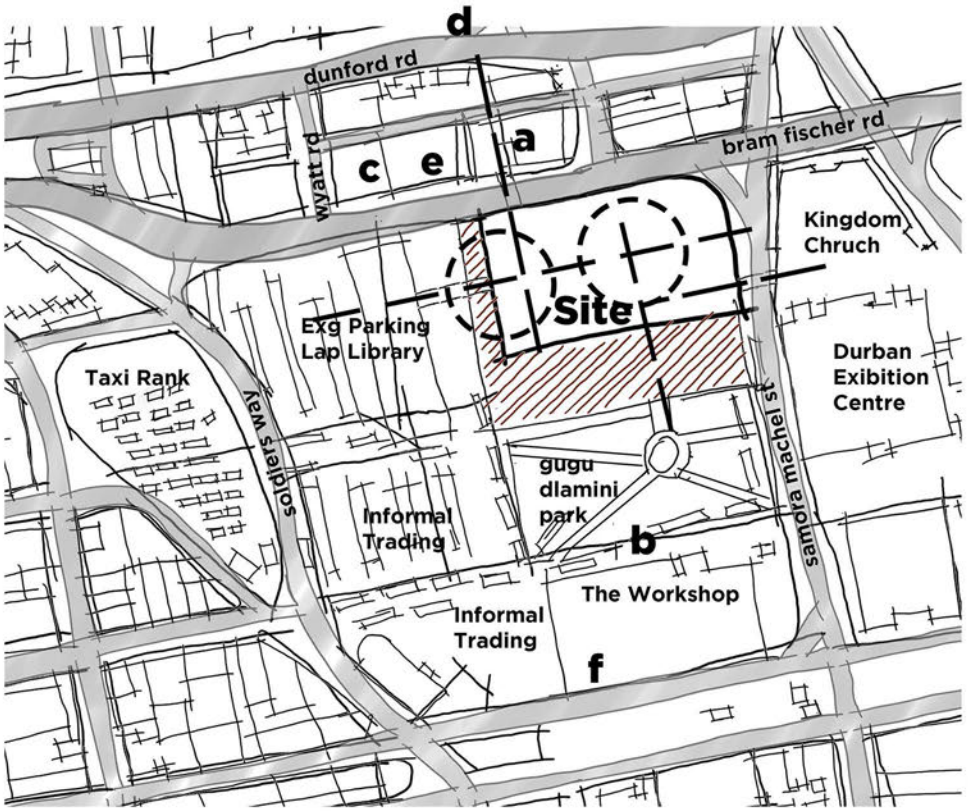
- EMPHASIS AT STREET LEVEL – PEDESTRIANISED SPACES.

← TIGHT-KNIT COMMUNITIES.

- SPACES/PLACES HAVE AN IDENTITY – FOR PEOPLE.

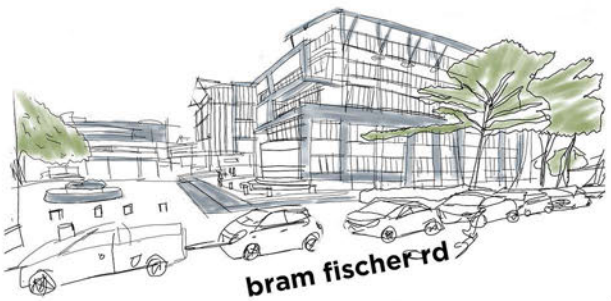
## Climate- A Building As An Living Organism






Storm Water And Engineering Department Barriers Towards The Community, Poor Place-Making

a




The Workshop Opposite The Site- Perfect Example Of An Externalised Environment From Public To Semiprivate

b

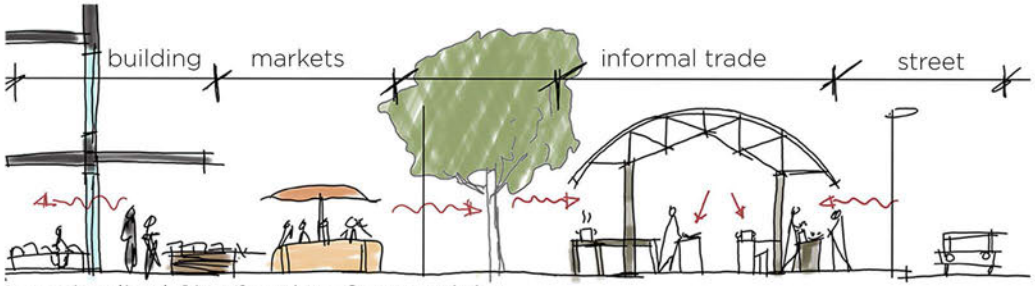
Tectonics In The Building Opposite The Site Of Construction Concerning Artistic Design Gives Identity To The Building Externally

City Engineers, Architecture Department, Electrical, Roads. Health, Sewer, Town Planning All In Close Proximity- Potential Interdisciplinary Connection

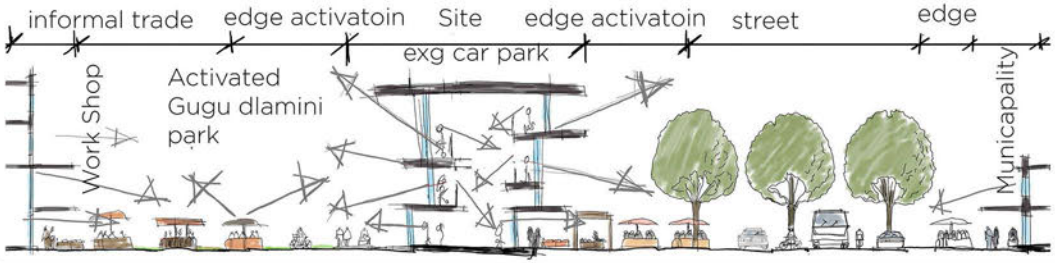
c

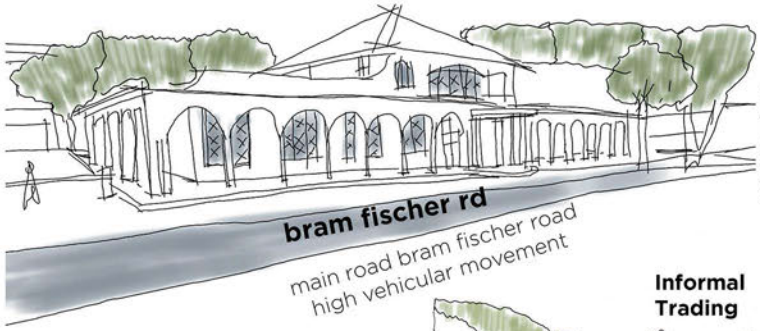

d


Informal Trading And Couumnity Cross Section




Longitudinal Site Section Connectivity




e

Kwa Muhle Museum-Parallel To The Site, With Hard Edges, No Sense Of Community, Not Accessible Of The Street

f

The Workshop Shopping Centre Is A Building That Is Attached To Community And Are Is Approachable, A Form Of Good Place-Making, Presence Culture, Religion And Community Fulfilment Is Depicted


Dominance of hard surfaces

# International Precedent Study: Orestad College

Ørestad College is a new educational building in Copenhagen, Denmark, designed by 3XN architects. Is noted for its innovative architecture, favouring open studying environments instead of traditional classrooms, and for its media-oriented profile focusing on media, communications, and culture.

Location


Interconnected

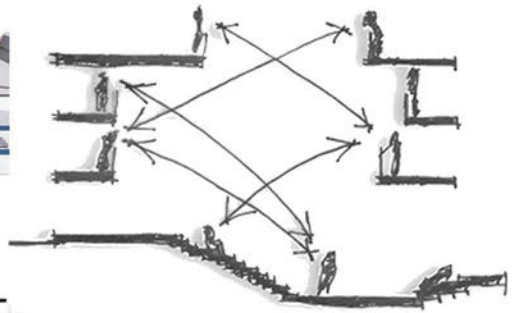
Free Spatial Configuration

Central Atrium

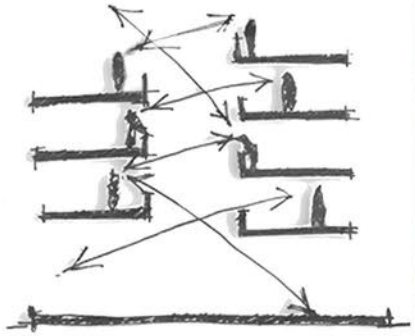
Visual Communication

Offices


Central Atrium Visual Connections Ørestad College

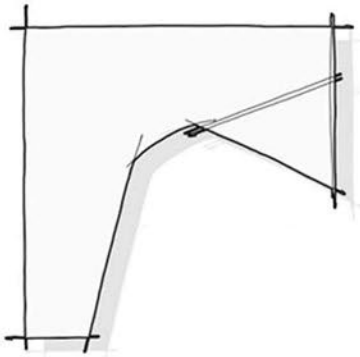


Traditional Universities

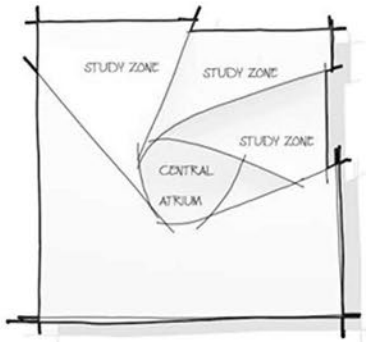


Exterior Relationship

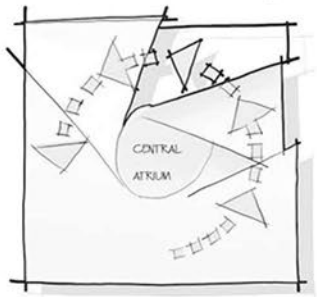
Boomerang Shaped Floor Plan



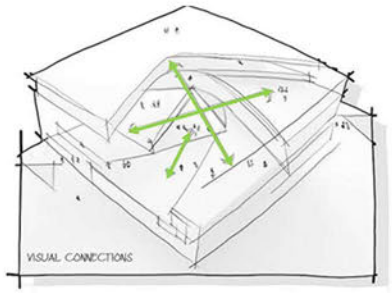
Study Zones Overlap




Avoids, Each Floor Being Stacked



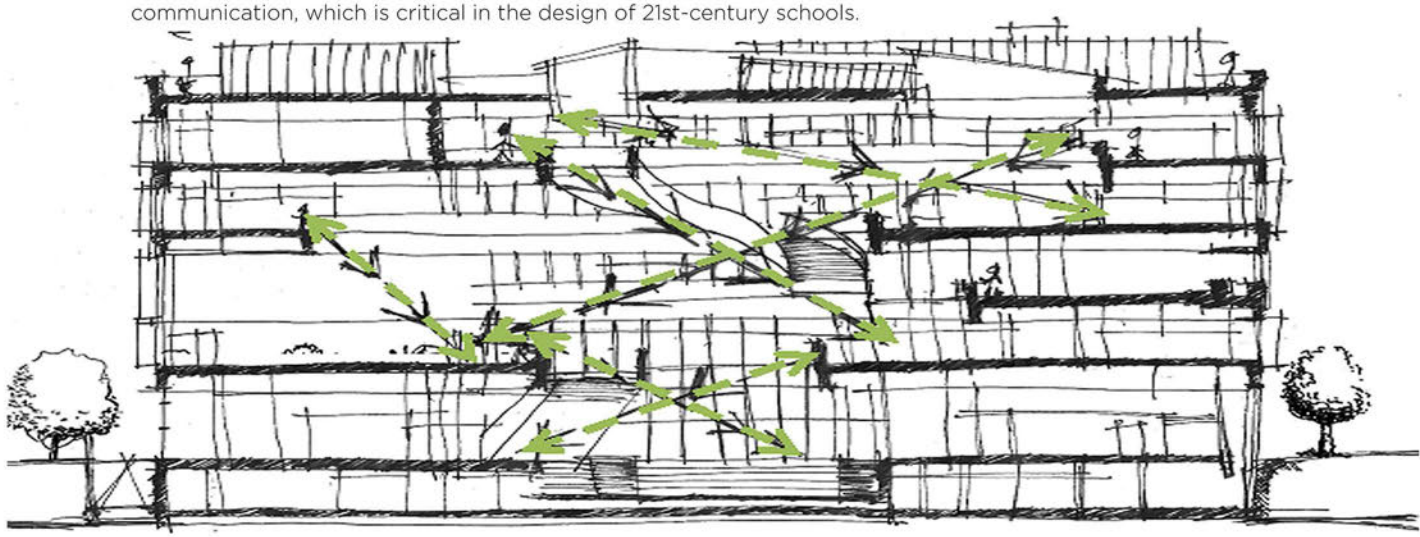

Visual Contact And Openness




Communication With Split Levels

This design's central concept emphasizes the synergy of interaction and communication, which is critical in the design of 21st-century schools.

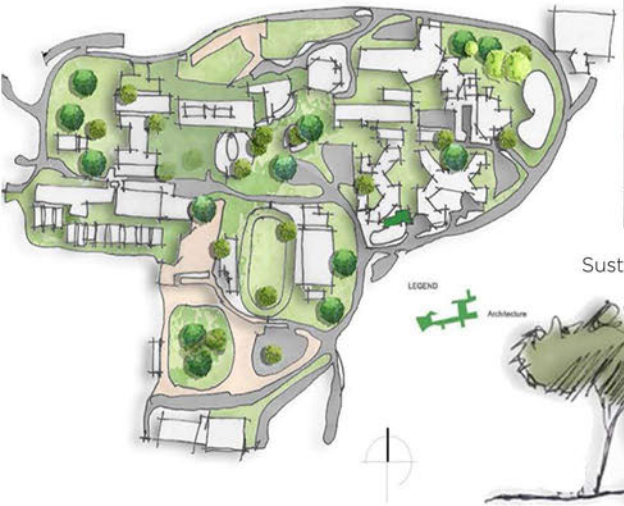
Layers And Connectivity That's Within The Building Is Not Reflected Outside The Building External Façade And Structure



# Local Precedent: Tshwane University Of Technology

The architecture department at TUT located in building 11, Staatsartillerie Rd, Pretoria West, Pretoria at Tshwane University of Technology (TUT) is housed in a new building constructed specifically for architectural design, compared to Durban university of technology and the University of Kwa Zula Natal which architectural learning spaces are housed amongst many other disciplines which have little or no connection at all to architecture

Location



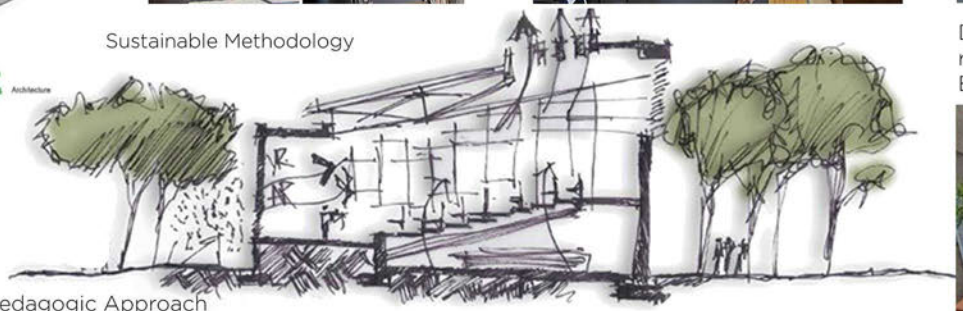

Interconnected Spaces

Triple Volume A Sense Of Place

Tectonic Expression

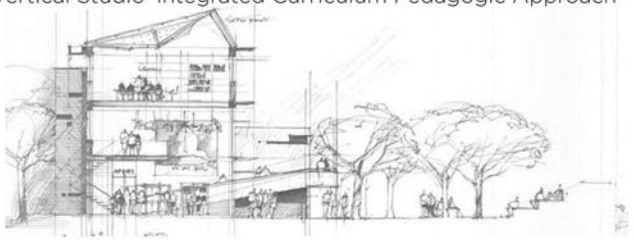
Interactive Virtual Learning

Sustainable Methodology



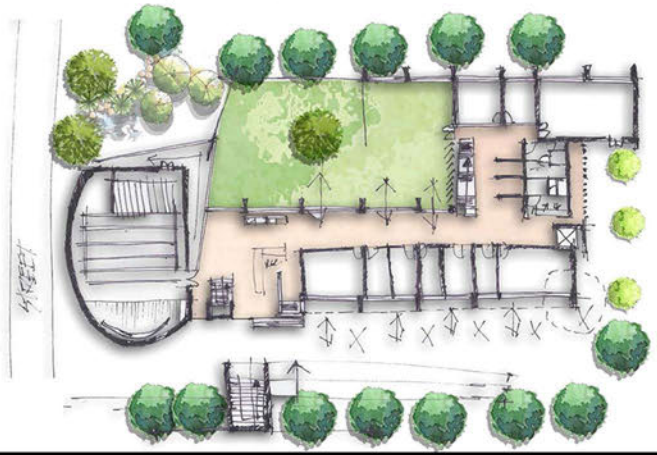
Different Layers Pane, Materials That Reflects Modern Contemporary Architecture , But The Need To Respond And Communicate Externally Is Of Importance


'Vertical Studio' Integrated Curriculum Pedagogic Approach

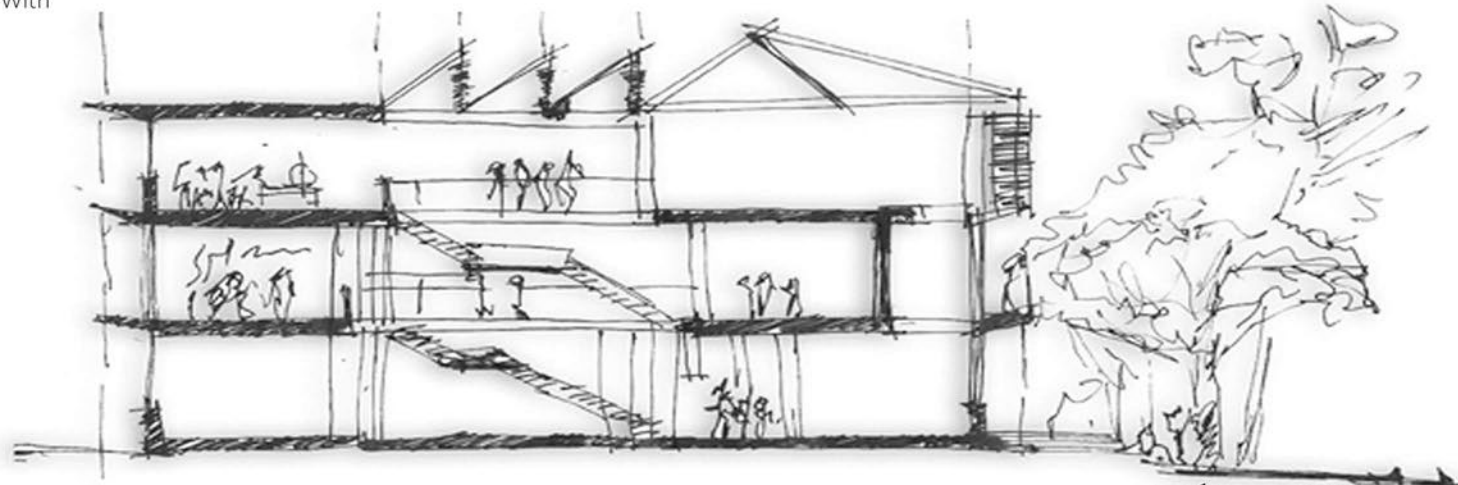


No Eternal Response To The Community- Poor Place-Making

Strong Connectivity With The Private And Semi-Private Spaces Such As The Studios And Courtyards, But There Is A Lack Of Engagement With The Community And The Street



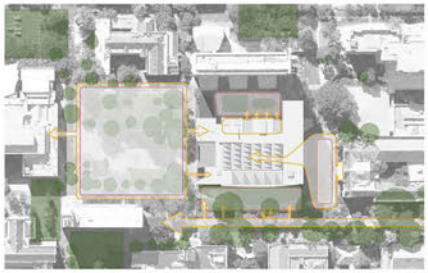
Effective Triple Volume Space, Informal And Circulation Spaces



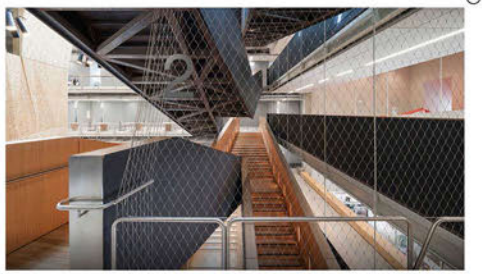
# Melbourne School Of Design University Of Melbourne

The School Of Design At The University Of Melbourne Celebrates New Levels Of Student-Centered Design, Showcasing The Successful Combination Of Creative Design, Technology And Sustainability. The Key To Creating A Living, Learning Environment Was To Design The Msd As An Evolving Teaching Tool. To Achieve This, Pedagogical Features Were Incorporated To Create A Transparent Learning Environment Where-by Students And Staff Can Observe And Interact With The Building's Functionality.

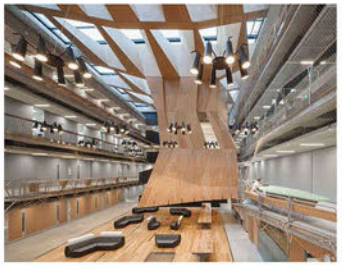
Location



Connectivity And Walkability



No Flexibility Of Classrooms Because Of floor Plated Stacked Ontop Of Each Other

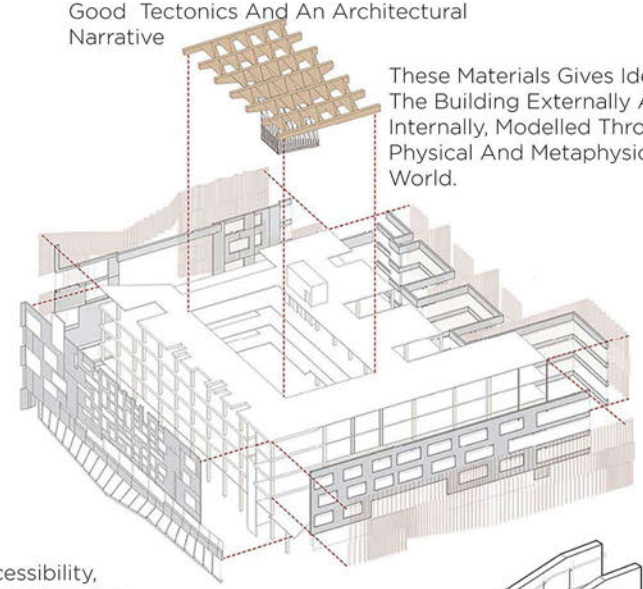


Tectonic Expression

Places For Collaboration

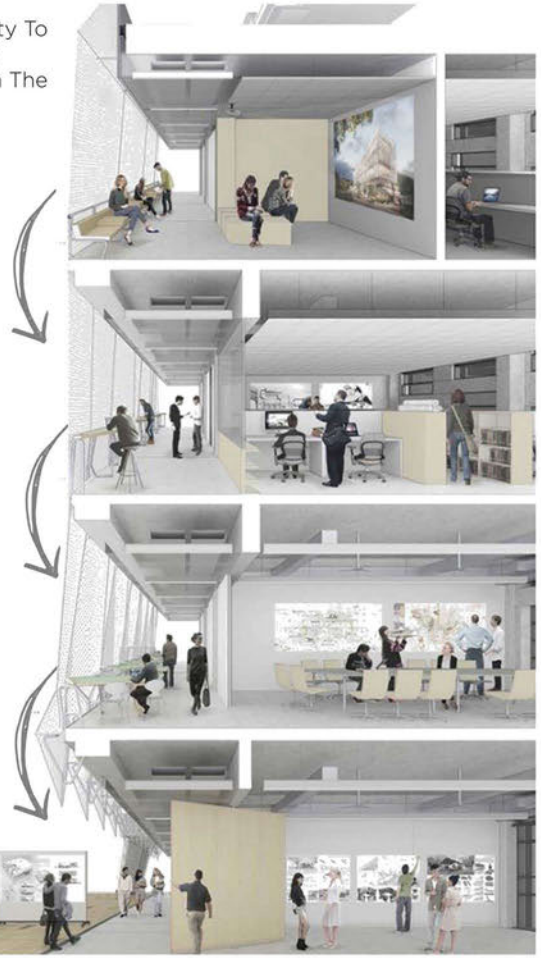
These overlapping and interconnected spaces with materials, volumes, light and meaning provide a sense of belonging.

Good Tectonics And An Architectural Narrative



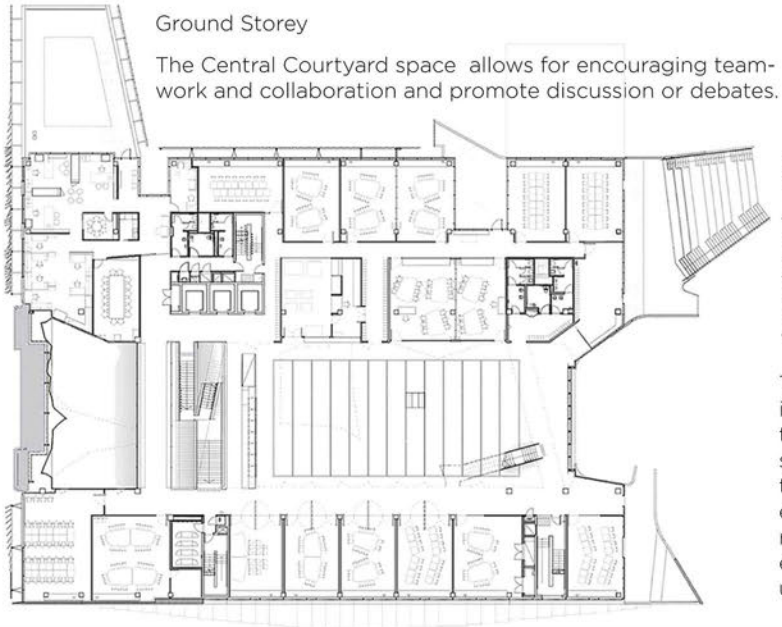
These Materials Gives Identity To The Building Externally And Internally, Modelled Through The Physical And Metaphysical World.

There Is A Disconnection Of Clasrooms



Ground Storey

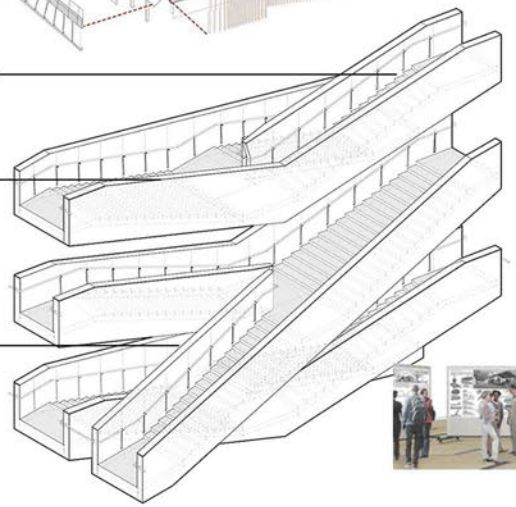
The Central Courtyard space allows for encouraging team-work and collaboration and promote discussion or debates.



Connectivity, Accessibility, Safety/Security And Comfort

These Ramps Creates Engagement That Increase Collaboration And Commu-nication, Visual Interest And Aesthetics In The Area,

The encouragement and implementation of walkable transport into a 21st-century school of design maximizes the community's health, economic satisfaction, and reduces pollution and expenses within the university.



# Local Case Study: Durban University Of Technology

The Department of Architecture is located in Steve Biko Campus Musgrave Berea within a building that accommodates all the Engineering and Built-Environment departments through the many allied disciplines are on different there is little or even no interaction and communication with each other, as these disciplines are treated in separation with no collaboration, which is not what 21st-century pedagogy in architecture calls for, but the building accommodates many of the applied sciences which there is potential for collaboration as similar to the selected, Ørestad College collaborates with.

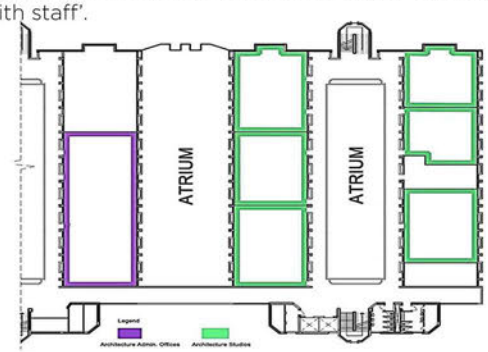
Location


Studio Floor Layout

These studios are linked via narrow walkways with no possibility of breakaway spaces for collaboration and interconnectivity.

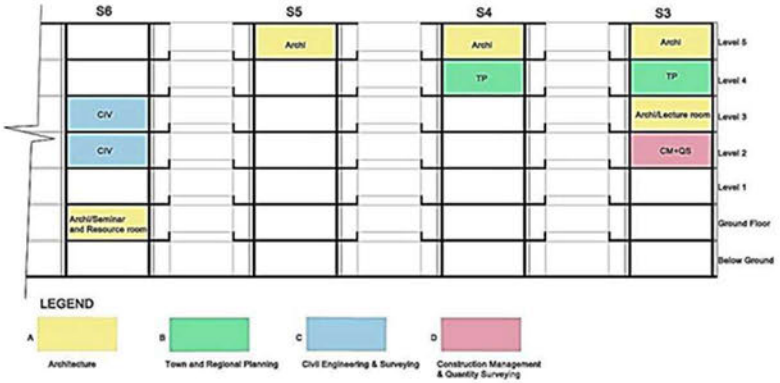

Relationship between Admin and Learning spaces

-Admin offices which accommodates the academic staff, is disconnected from the studio spaces leading to 'incidental interaction with staff'.



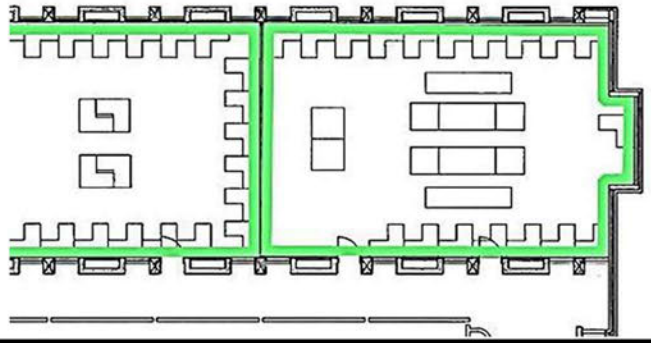

Multimedia Lecture Room Space with fixed and defined furniture layout

A lack of connectivity because the level is stacked on top of each other with no layers of connectivity




Multimedia lecture room plan

-Studios are arranged in a cellular configuration, individually accessed from an external walkway hindering inter-level connectivity



Studio and lecture room lacking collaboration amongst allied departments through poor accessibility

Architectural Department has no link to the external environment and community thus lacking community interest and involvement

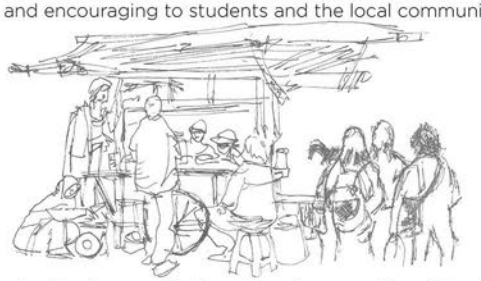
No architectural narritive the eternal facade is a mere concrete box with no sense of experience, culture, and history as well as most importantly innovationivity

Through Evidence And Research, The Researcher Suggested Recommendations For The Universities And Other Institutions Offering Architectural Design Learning To Advance Their Design Learning Spaces Towards The 21st-Century And Beyond. The Recommendations Also Suggested How Universities Can Use The Architectural Principals Of Design To Transform Such Learning Spaces From Confined Disjointed Physical Spaces To Collaborative Learning Environments. With These Recommendations, Most South African Design Schools Can Bridge The Gap Internationally And Most Importantly, Within The Design Environment Linking The Various Allied Disciplines To Align The Real-World Environment To Local Design Schools.

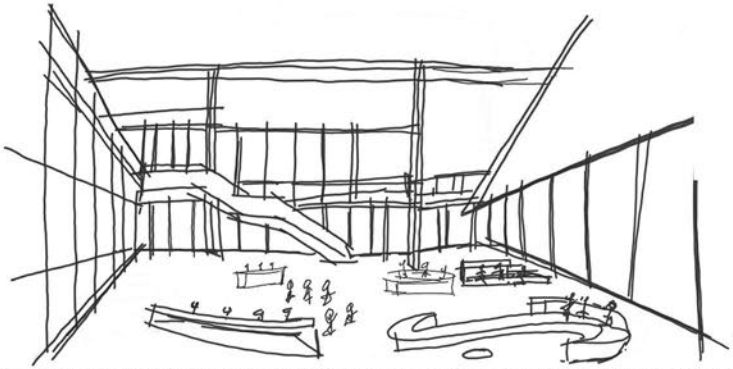
**Diurnal and Nocturnal Revitalization of Place-**The current universities under research and its architectural design studios are not accessible during the night. with the advancement of tehcnoloy theses dead spaces at nght can be activated


**Interactive Dynamic Space** Physical and Virtual-Most learning spaces in universities are confined whilst vi, **Digitally Enhanced Experiencertual space**, on the other hand, is not, and students will be able to access the world at their fingertips.

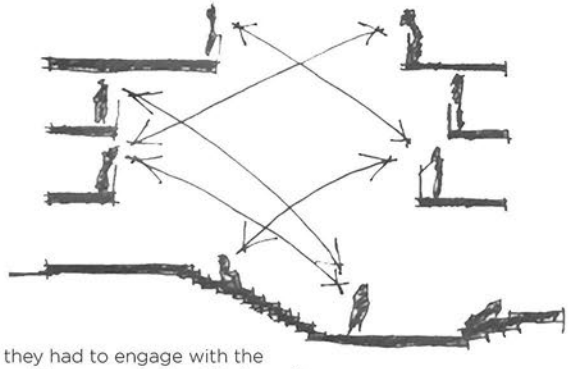
**Community-based Learning**-Concrete landscapes and unimaginative buildings such as most design universities in South Africa have caused higher stress levels and demotivation and are not inspiring and encouraging to students and the local community.



**Tectonic Design-**Poor tectonics such as the lack of architectural narrative within and on the actual design school is recognized in this research and various design universities that use conventional and traditional pedagogy.

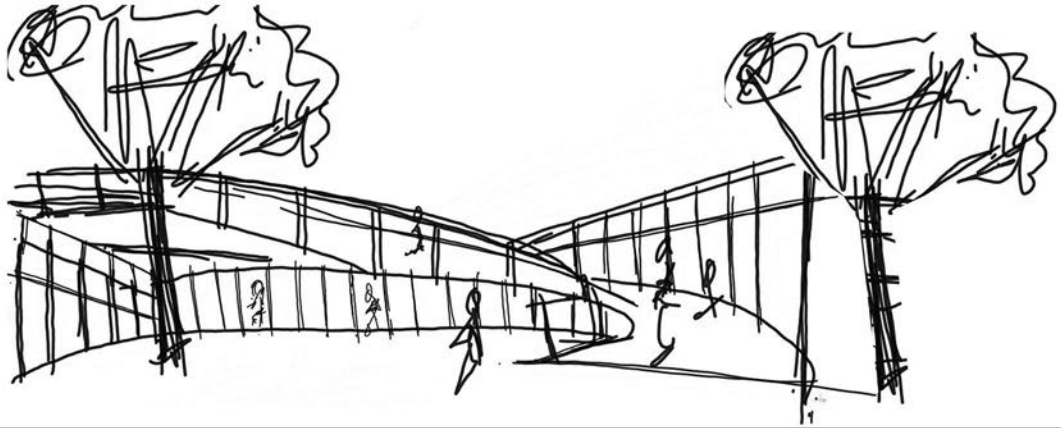


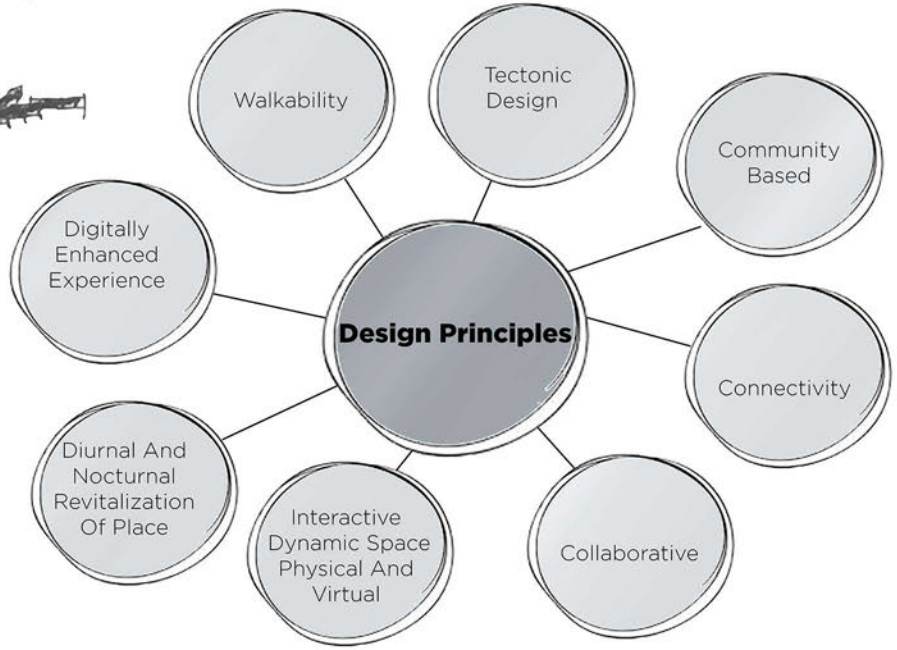
**Connectivity** -through technology and spaces that should be linked to architectural studios such as interdisciplinary connectivity, visual connectivity and connectivity to the public is of importance.



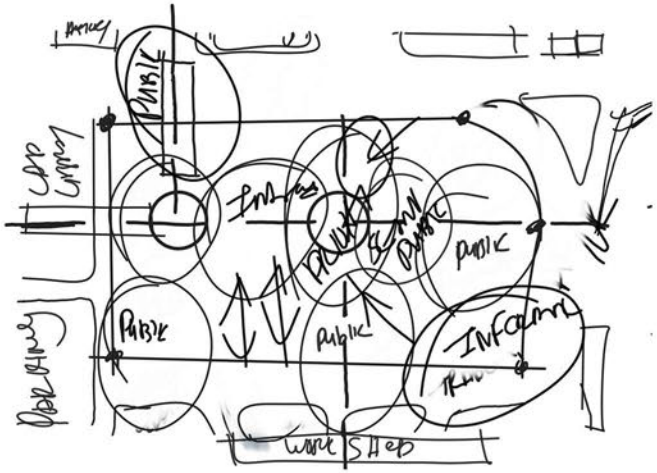
**Collaborative Learning Environments-**There is a disconnection of design students from the real working world. Therefore, students need to have a multidisciplinary **collaborative** cross-curricular connection through collaboration with other allied disciplines.

**Walkability-**architectural and design studios are secluded from the world, and if they had to engage with the community, the ease of access is not visible.These walkable universities should have interconnected subtle flow of movement levels connected by sight and breakaway spaces of engagement that increase collaboration and communication, visual interest and aesthetics in the area, access to the commercial, retail areas from across campus,

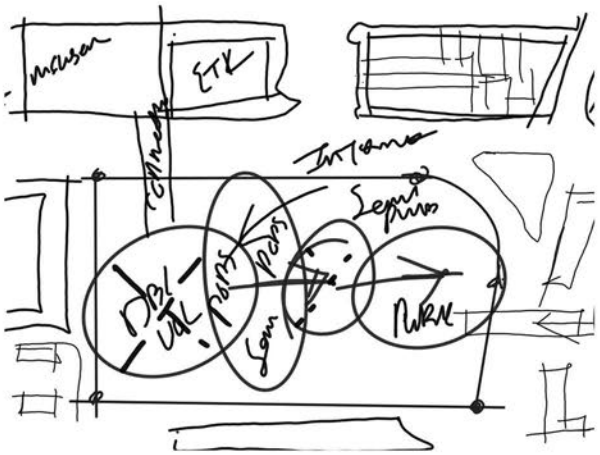




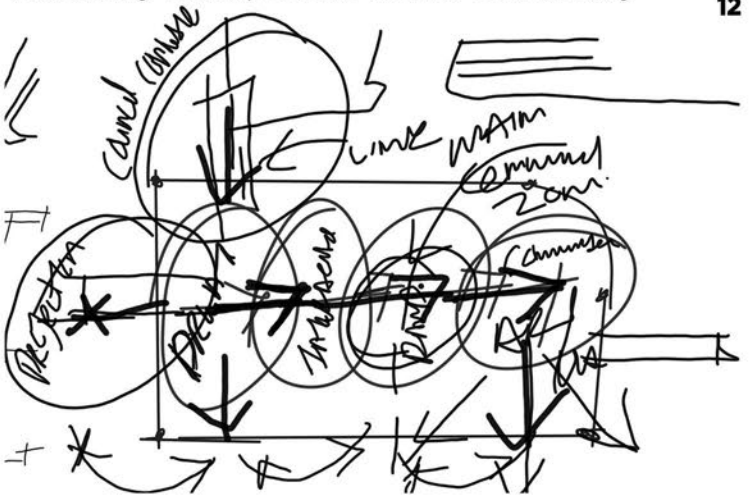
Ground Storey Development To The Community



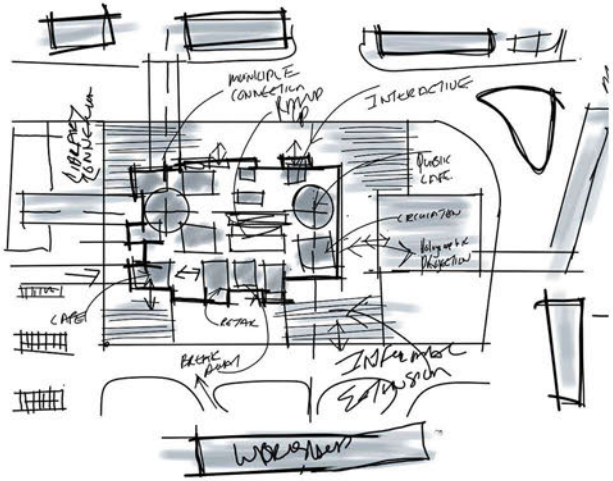

1st Storey Interdisciplinary Collaboration



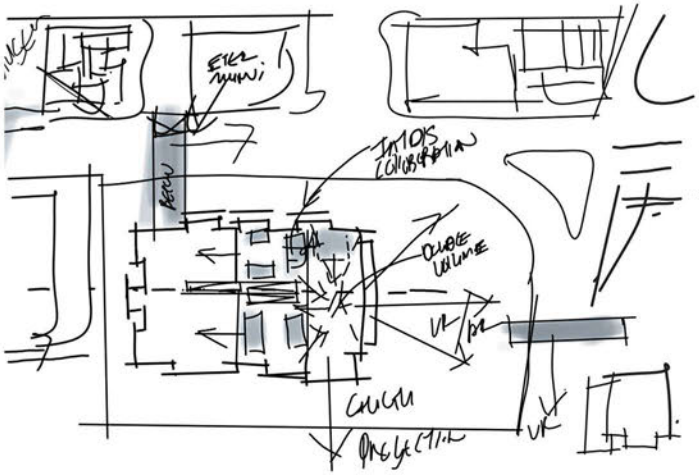

2nd Storey Municiple and Museum Connectivity




Ground Storey Development To The Community




1st Storey Interdisciplinary Collaboration

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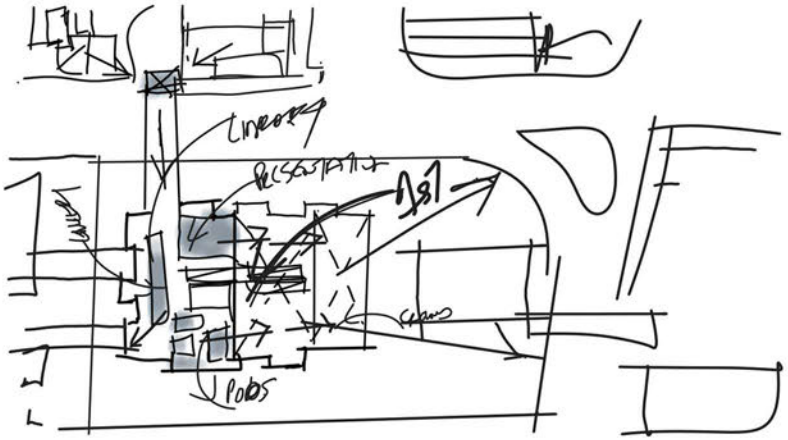
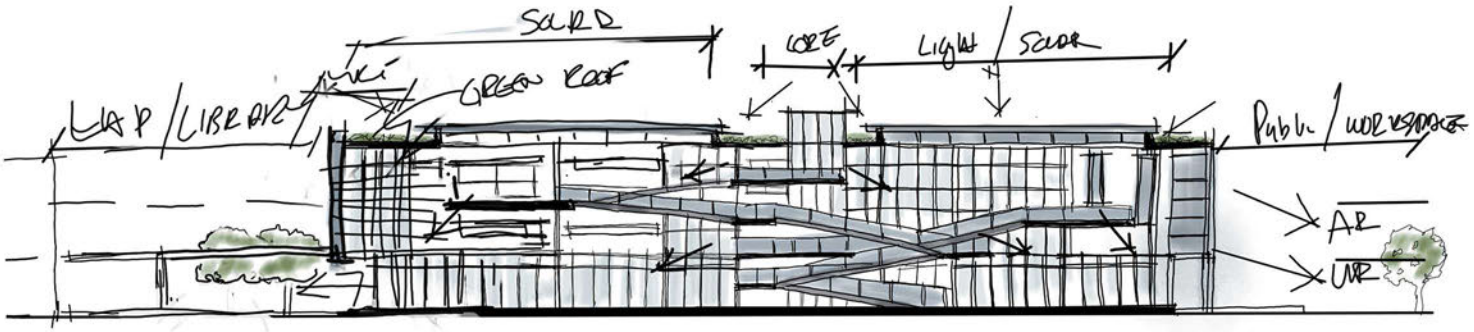
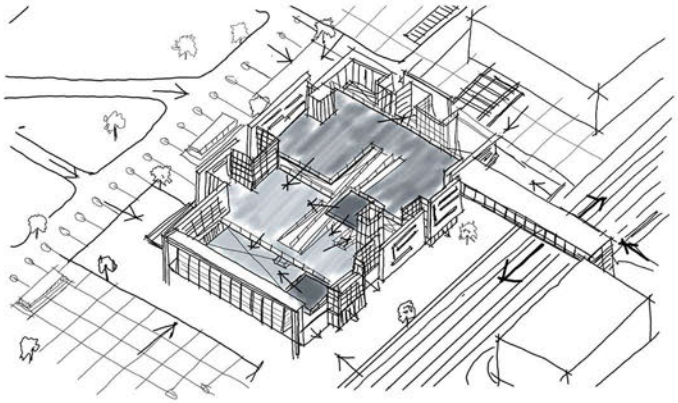
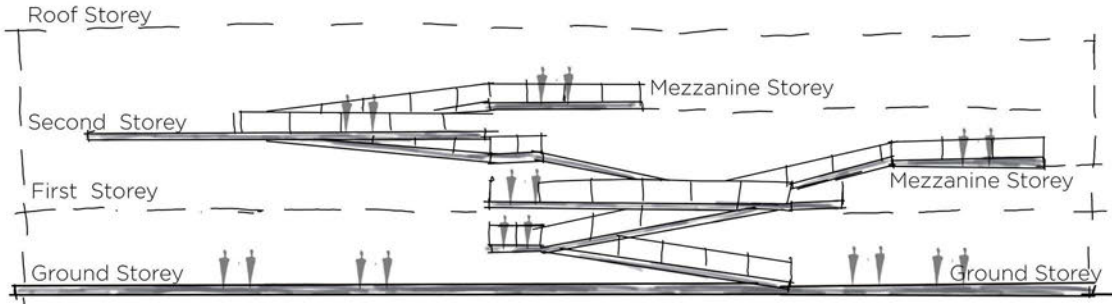


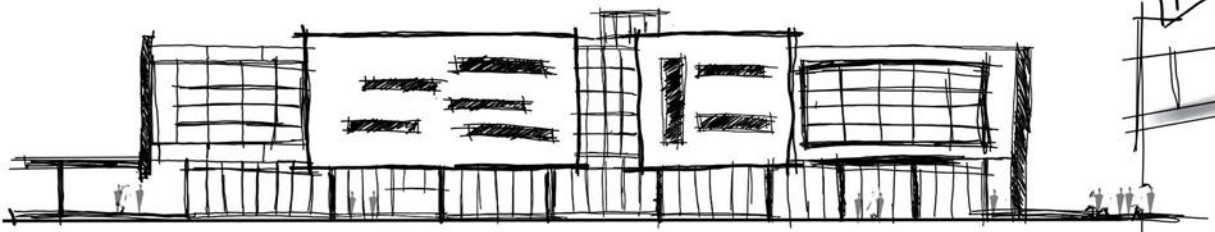

Volume Development



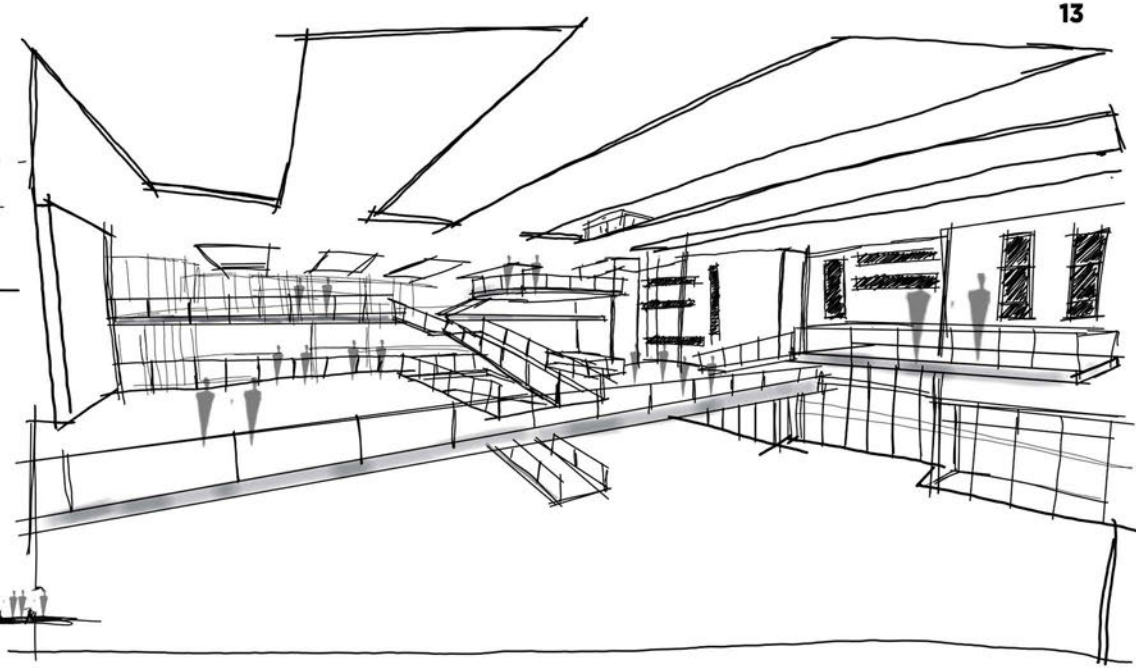






Volume Development



Form Development



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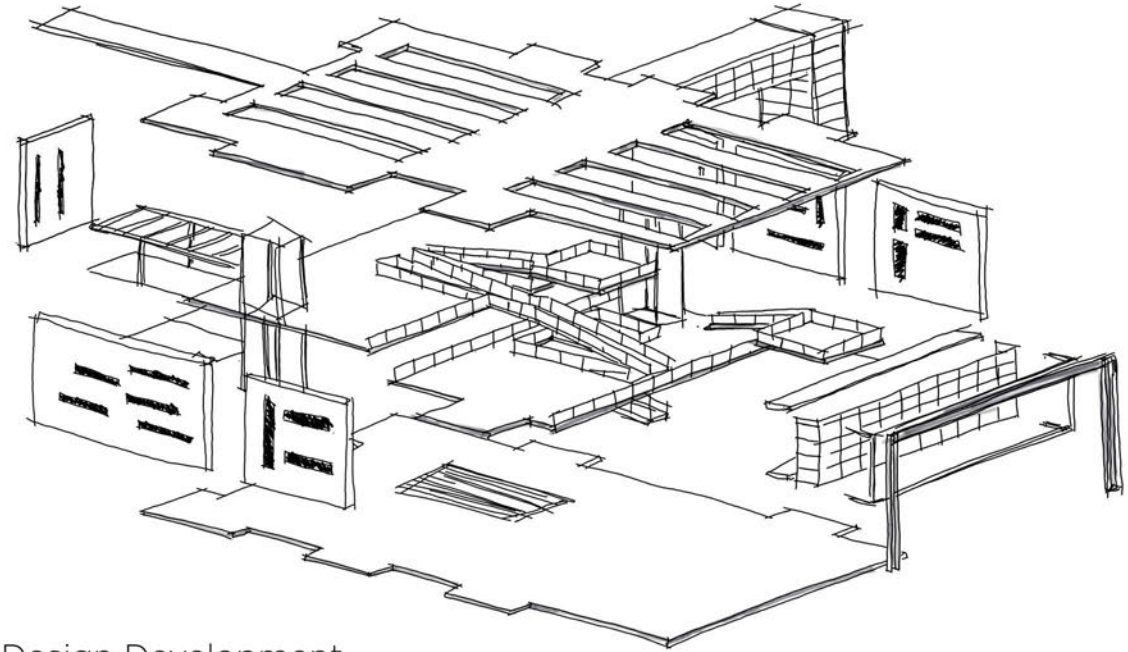
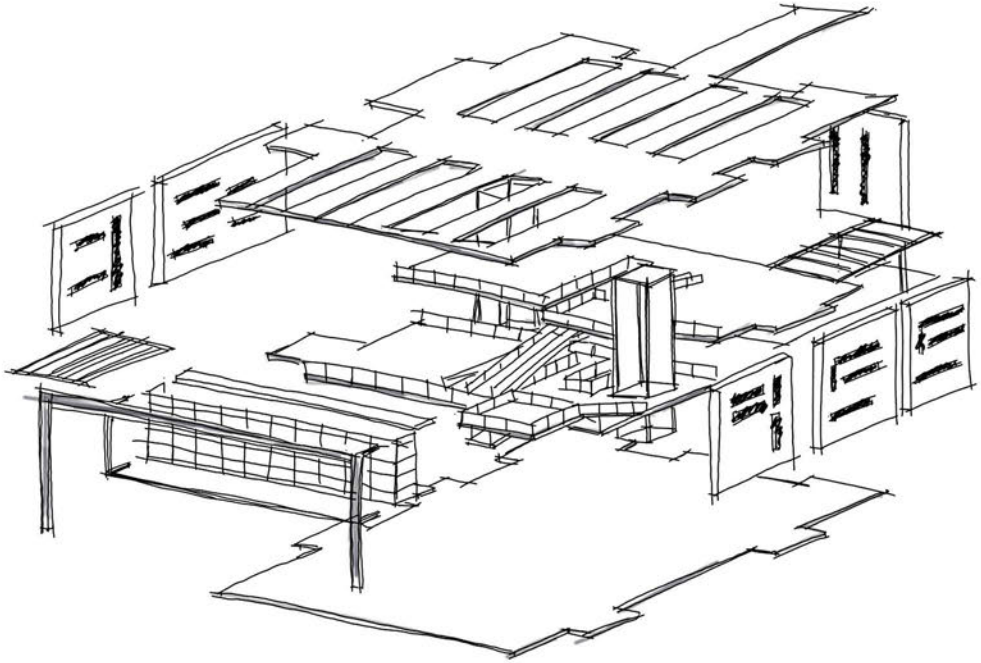
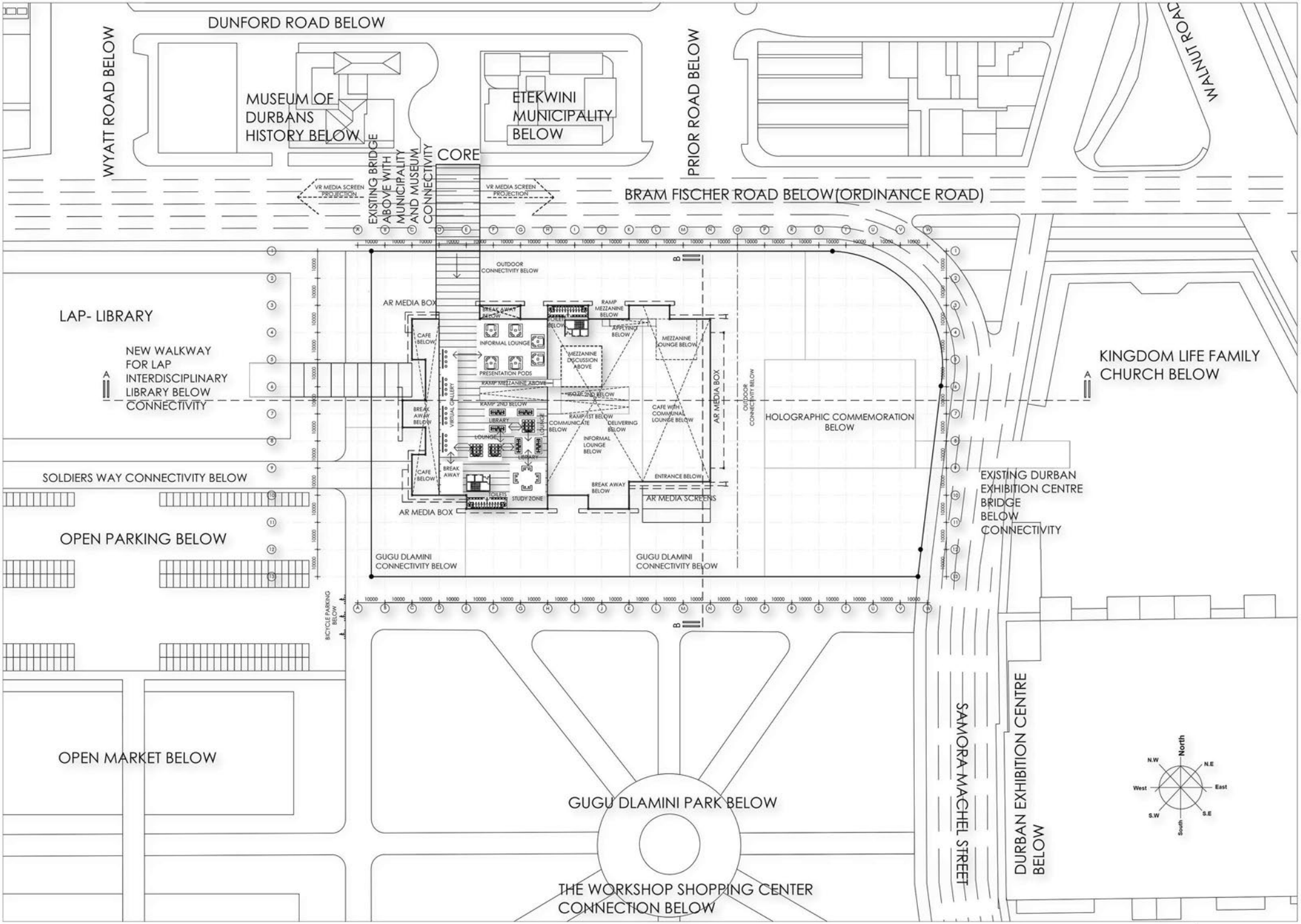


Design Development



Design Development


DUNFORD ROAD BELOW
WYATT ROAD BELOW
MUSEUM OF DURBANS HISTORY BELOW
ETEKWINI MUNICIPALITY BELOW
PRIOR ROAD BELOW
WALNUT ROAD
EXISTING BRIDGE ABOVE WITH MUNICIPALITY AND MUSEUM CONNECTIVITY
CORE
VR MEDIA SCREEN PROJECTION
VR MEDIA SCREEN PROJECTION
BRAM FISCHER ROAD BELOW(ORDINANCE ROAD)
OUTDOOR CONNECTIVITY BELOW
AR MEDIA BOX
LAP- LIBRARY
NEW WALKWAY FOR LAP INTERDISCIPLINARY LIBRARY BELOW CONNECTIVITY
CAFE BELOW
INFORMAL LOUNGE
PRESENTATION PODS
RAMP MEZZANINE ABOVE
RAMP 2ND BELOW
BREAK AWAY BELOW
VIRTUAL GALLERY
LIBRARY
LOUNGE
CAFE BELOW
BREAK AWAY
TOILETS
STUDY ZONE
AR MEDIA BOX
RAMP MEZZANINE BELOW
MEZZANINE DISCUSSION ABOVE
RAMP 2ND BELOW
RAMP 1ST BELOW COMMUNICATE
DELIVERING BELOW
INFORMAL LOUNGE BELOW
BREAK AWAY BELOW
MEZZANINE LOUNGE BELOW
CAFE WITH COMMUNAL LOUNGE BELOW
ENTRANCE BELOW
AR MEDIA SCREENS
AR MEDIA BOX
OUTDOOR CONNECTIVITY BELOW
HOLOGRAPHIC COMMEMORATION BELOW
KINGDOM LIFE FAMILY CHURCH BELOW
EXISTING DURBAN EXHIBITION CENTRE BRIDGE BELOW CONNECTIVITY
SOLDIERS WAY CONNECTIVITY BELOW
OPEN PARKING BELOW
BICYCLE PARKING BELOW
GUGU DLAMINI CONNECTIVITY BELOW
GUGU DLAMINI CONNECTIVITY BELOW
OPEN MARKET BELOW
GUGU DLAMINI PARK BELOW
THE WORKSHOP SHOPPING CENTER CONNECTION BELOW
SAMORA MACHEL STREET
DURBAN EXHIBITION CENTRE BELOW
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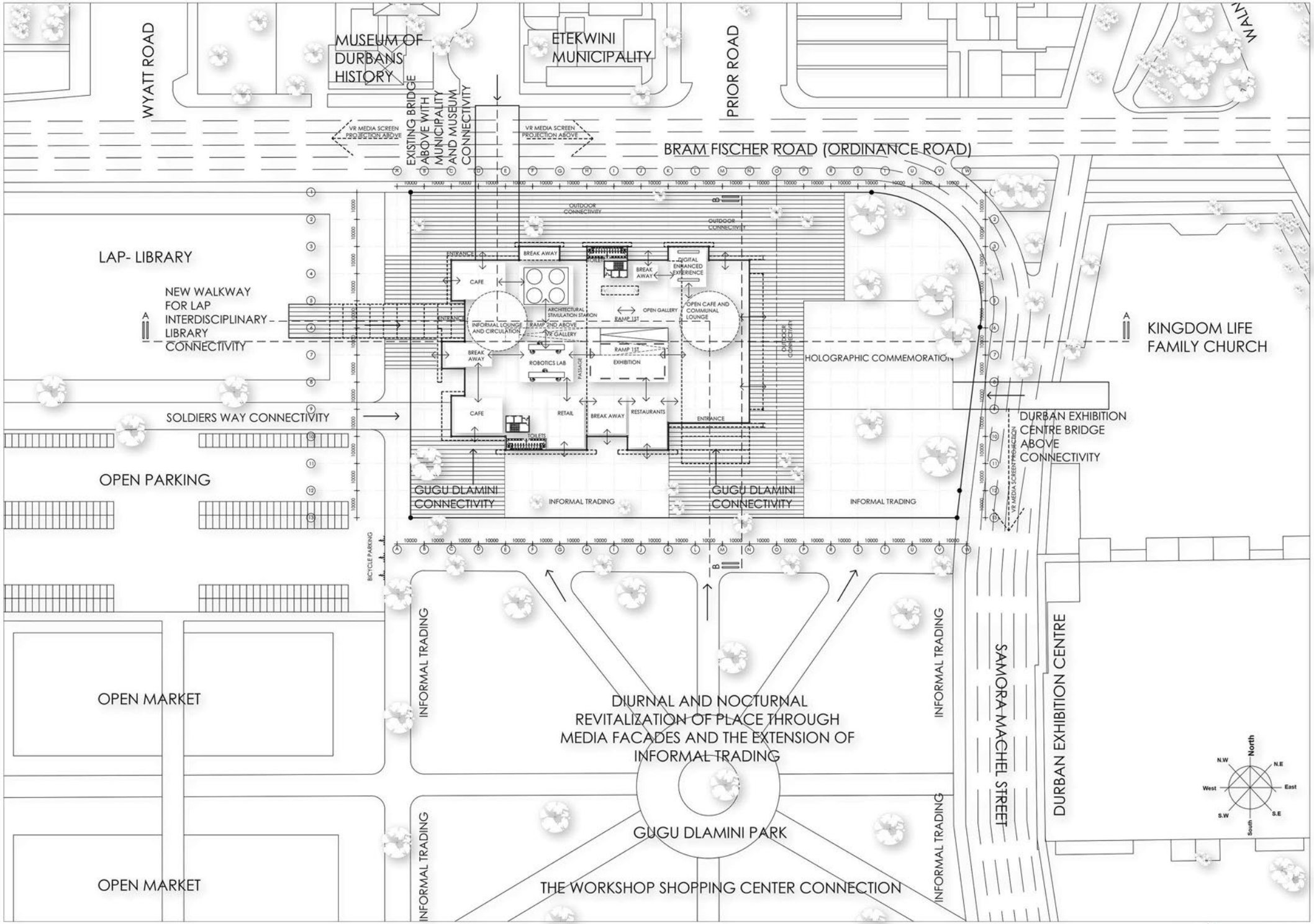
WYATT ROAD
MUSEUM OF DURBANS HISTORY
ETEKWINI MUNICIPALITY
PRIOR ROAD
EXISTING BRIDGE ABOVE WITH MUNICIPALITY AND MUSEUM CONNECTIVITY
VR MEDIA SCREEN PROJECTION ABOVE
VR MEDIA SCREEN PROJECTION ABOVE
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LAP- LIBRARY
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SOLDIERS WAY CONNECTIVITY
OPEN PARKING
OPEN MARKET
OPEN MARKET
BICYCLE PARKING
OUTDOOR CONNECTIVITY
OUTDOOR CONNECTIVITY
ENTRANCE
CAFE
BREAK AWAY
ARCHITECTURAL STIMULATION STATION
DIGITAL ENHANCED EXPERIENCE
BREAK AWAY
OPEN GALLERY
RAMP 1ST
OPEN CAFE AND COMMUNAL LOUNGE
ENTRANCE
INFORMAL LOUNGE AND CIRCULATION
RAMP 2ND ABOVE
VR GALLERY
BREAK AWAY
ROBOTICS LAB
PASSAGE
RAMP 1ST
EXHIBITION
CAFE
RETAIL
BREAK AWAY
RESTAURANTS
ENTRANCE
TOILETS
GUGU DLAMINI CONNECTIVITY
INFORMAL TRADING
GUGU DLAMINI CONNECTIVITY
INFORMAL TRADING
OUTDOOR CONNECTION
HOLOGRAPHIC COMMEMORATION
KINGDOM LIFE FAMILY CHURCH
DURBAN EXHIBITION CENTRE BRIDGE ABOVE CONNECTIVITY
VR MEDIA SCREEN PROJECTION
INFORMAL TRADING
INFORMAL TRADING
SAMORA MACHEL STREET
DURBAN EXHIBITION CENTRE
DIURNAL AND NOCTURNAL REVITALIZATION OF PLACE THROUGH MEDIA FACADES AND THE EXTENSION OF INFORMAL TRADING
GUGU DLAMINI PARK
THE WORKSHOP SHOPPING CENTER CONNECTION
INFORMAL TRADING
INFORMAL TRADING
North
N.E
East
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South
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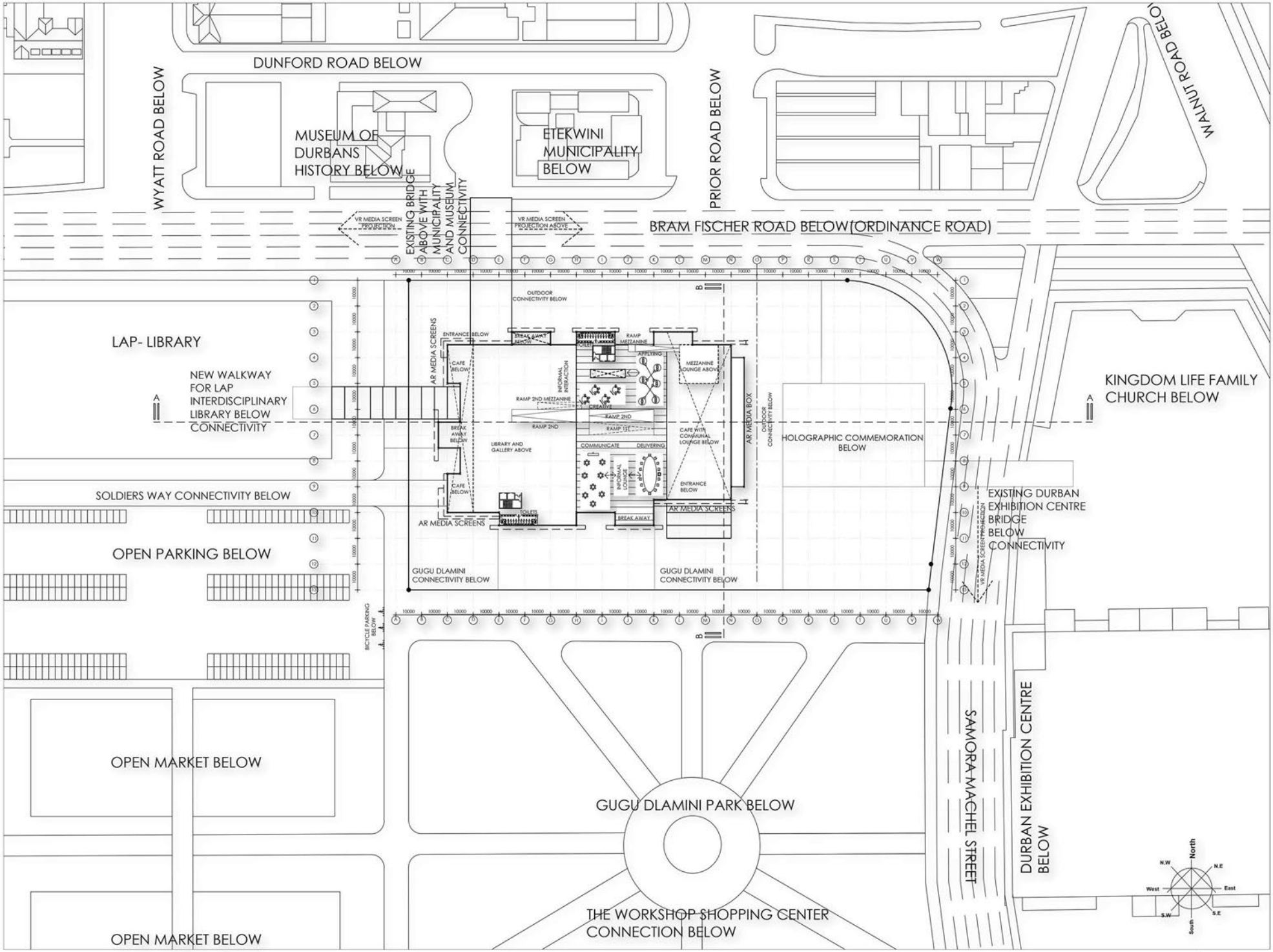
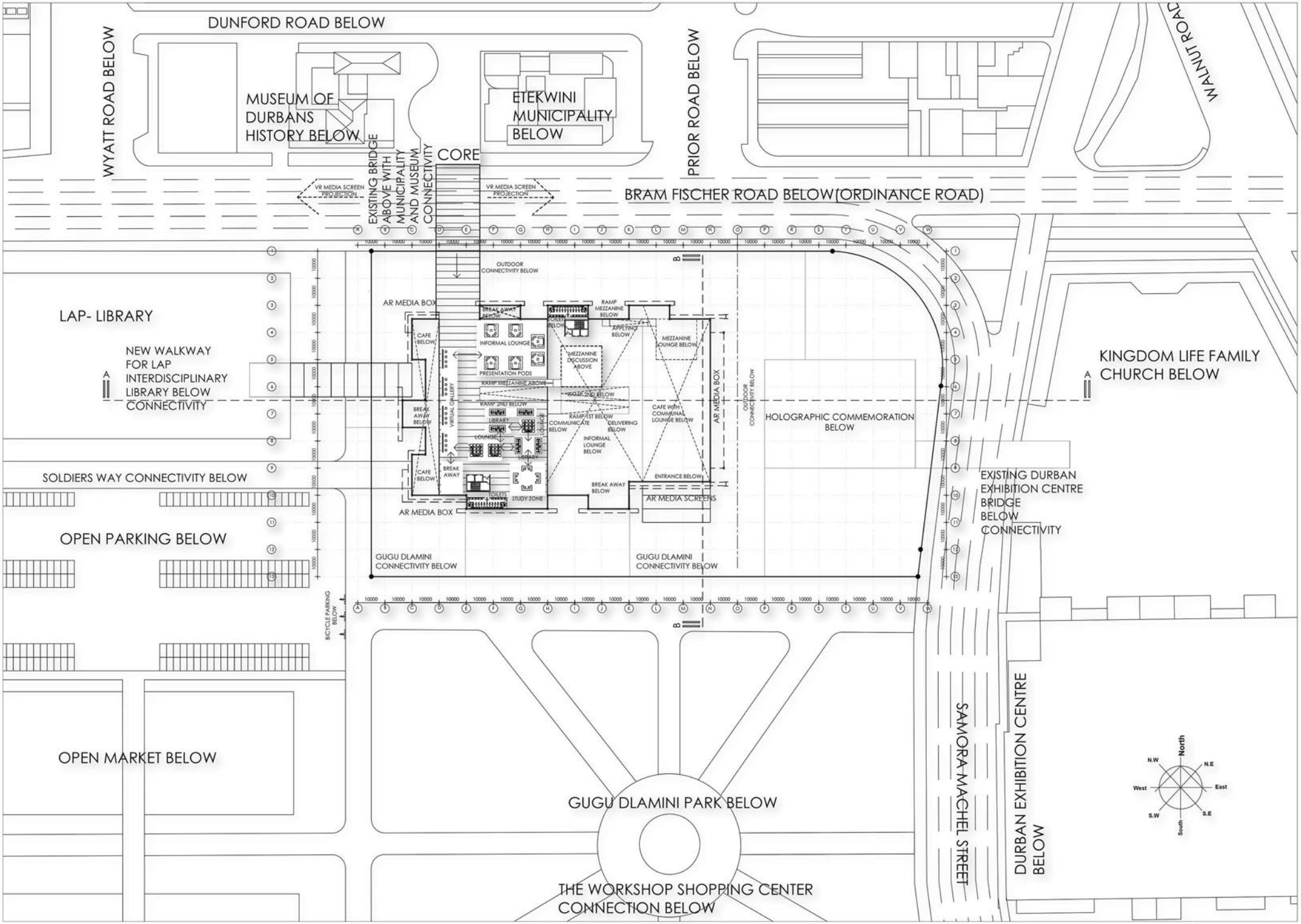
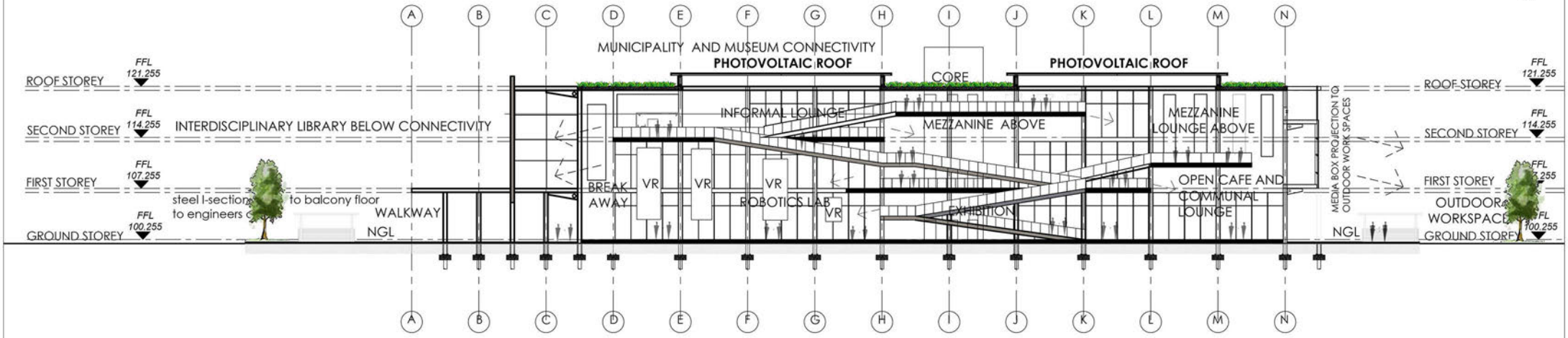
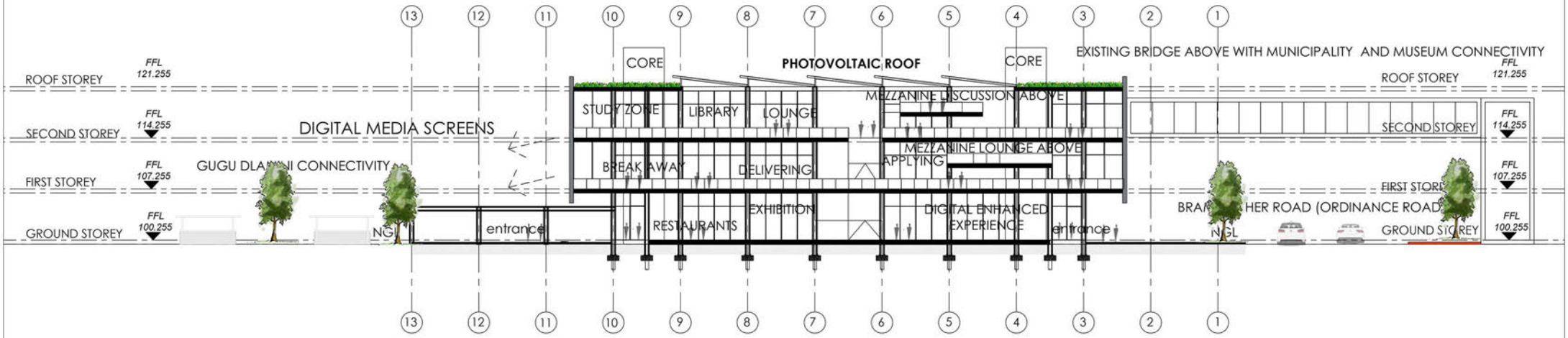
West
N.W


DUNFORD ROAD BELOW
WYATT ROAD BELOW
MUSEUM OF DURBANS HISTORY BELOW
ETEKWINI MUNICIPALITY BELOW
PRIOR ROAD BELOW
WALNUT ROAD BELOW
EXISTING BRIDGE ABOVE WITH MUNICIPALITY AND MUSEUM CONNECTIVITY
VR MEDIA SCREEN PROJECTION
VR MEDIA SCREEN PROJECTION ABOVE
BRAM FISCHER ROAD BELOW(ORDINANCE ROAD)
LAP- LIBRARY
NEW WALKWAY FOR LAP INTERDISCIPLINARY LIBRARY BELOW CONNECTIVITY
SOLDIERS WAY CONNECTIVITY BELOW
OPEN PARKING BELOW
OPEN MARKET BELOW
OPEN MARKET BELOW
BICYCLE PARKING BELOW
OUTDOOR CONNECTIVITY BELOW
ENTRANCE BELOW
BREAK AWAY BELOW
RAMP MEZZANINE
AR MEDIA SCREENS
CAFE BELOW
INFORMAL INTERACTION
APPLYING
MEZZANINE LOUNGE ABOVE
RAMP 2ND MEZZANINE
CREATIVE
RAMP 2ND
RAMP 1ST
AR MEDIA BOX
OUTDOOR CONNECTIVITY BELOW
LIBRARY AND GALLERY ABOVE
COMMUNICATE
DELIVERING
CAFE WITH COMMUNAL LOUNGE BELOW
ENTRANCE BELOW
TOILETS BELOW
BREAK AWAY
AR MEDIA SCREENS
GUGU DLAMINI CONNECTIVITY BELOW
GUGU DLAMINI CONNECTIVITY BELOW
HOLOGRAPHIC COMMEMORATION BELOW
KINGDOM LIFE FAMILY CHURCH BELOW
EXISTING DURBAN EXHIBITION CENTRE BRIDGE BELOW CONNECTIVITY
VR MEDIA SCREEN PROJECTION
GUGU DLAMINI PARK BELOW
THE WORKSHOP SHOPPING CENTER CONNECTION BELOW
SAMORA MACHEL STREET
DURBAN EXHIBITION CENTRE BELOW
North
N.E
East
S.E
South
S.W
West
N.W

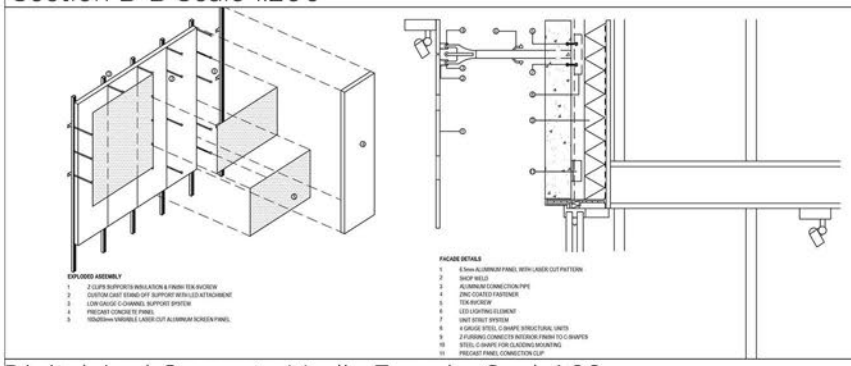

DUNFORD ROAD BELOW
WYATT ROAD BELOW
MUSEUM OF DURBANS HISTORY BELOW
ETEKWINI MUNICIPALITY BELOW
PRIOR ROAD BELOW
WALNUT ROAD
EXISTING BRIDGE ABOVE WITH MUNICIPALITY AND MUSEUM CONNECTIVITY
CORE
VR MEDIA SCREEN PROJECTION
VR MEDIA SCREEN PROJECTION
BRAM FISCHER ROAD BELOW(ORDINANCE ROAD)
OUTDOOR CONNECTIVITY BELOW
AR MEDIA BOX
LAP- LIBRARY
NEW WALKWAY FOR LAP INTERDISCIPLINARY LIBRARY BELOW CONNECTIVITY
CAFE BELOW
INFORMAL LOUNGE
PRESENTATION PODS
RAMP MEZZANINE ABOVE
RAMP 2ND BELOW
BREAK AWAY BELOW
VIRTUAL GALLERY
LIBRARY
LOUNGE
CAFE BELOW
BREAK AWAY
TOILETS
STUDY ZONE
AR MEDIA BOX
RAMP MEZZANINE BELOW
MEZZANINE DISCUSSION ABOVE
RAMP 2ND BELOW
RAMP 1ST BELOW COMMUNICATE
DELIVERING BELOW
INFORMAL LOUNGE BELOW
BREAK AWAY BELOW
MEZZANINE LOUNGE BELOW
CAFE WITH COMMUNAL LOUNGE BELOW
ENTRANCE BELOW
AR MEDIA SCREENS
AR MEDIA BOX
OUTDOOR CONNECTIVITY BELOW
HOLOGRAPHIC COMMEMORATION BELOW
KINGDOM LIFE FAMILY CHURCH BELOW
EXISTING DURBAN EXHIBITION CENTRE BRIDGE BELOW CONNECTIVITY
SOLDIERS WAY CONNECTIVITY BELOW
OPEN PARKING BELOW
BICYCLE PARKING BELOW
GUGU DLAMINI CONNECTIVITY BELOW
GUGU DLAMINI CONNECTIVITY BELOW
OPEN MARKET BELOW
GUGU DLAMINI PARK BELOW
THE WORKSHOP SHOPPING CENTER CONNECTION BELOW
SAMORA MACHEL STREET
DURBAN EXHIBITION CENTRE BELOW
North
N.W
N.E
West
East
S.W
S.E
South



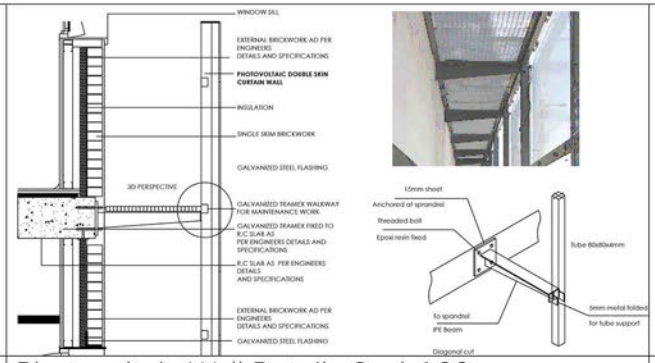

Section A-A Scale 1:200



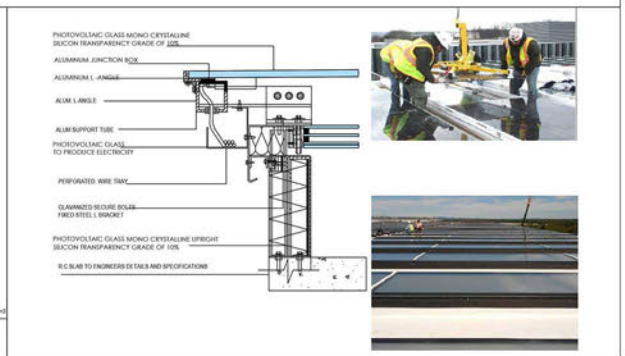

Section B-B Scale 1:200



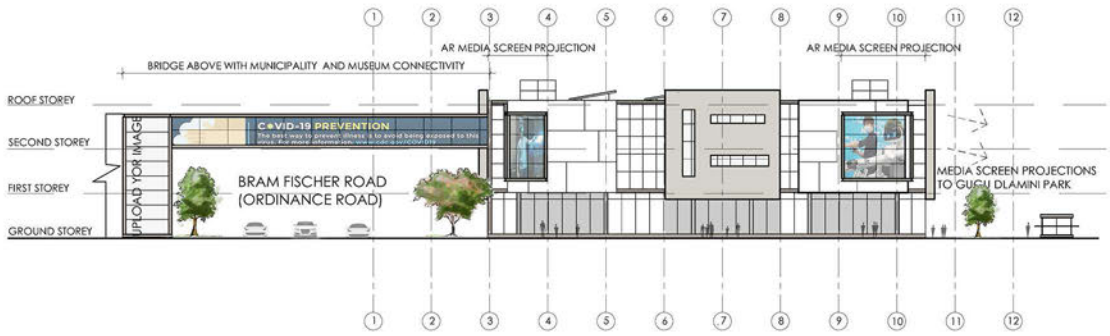
Digital And Concrete Media Facade Scale1:20




Photovoltaic Wall Detail Scale1:20

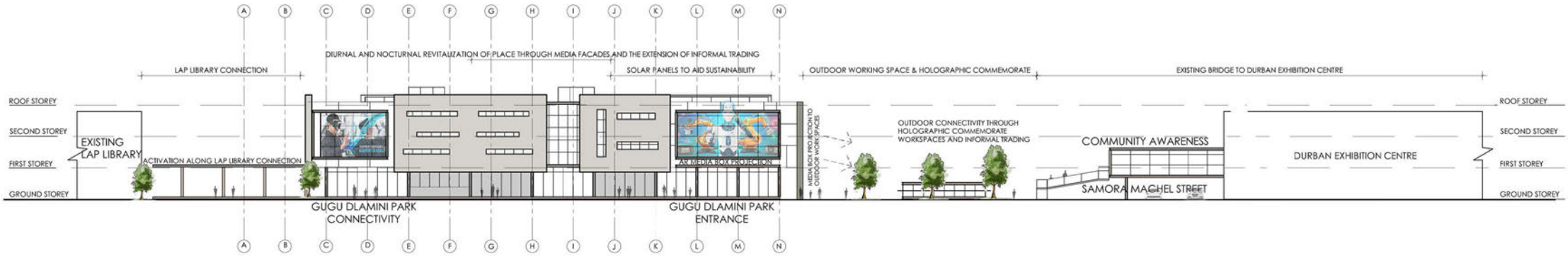



Photovoltaic Roof Detail Scale1:20

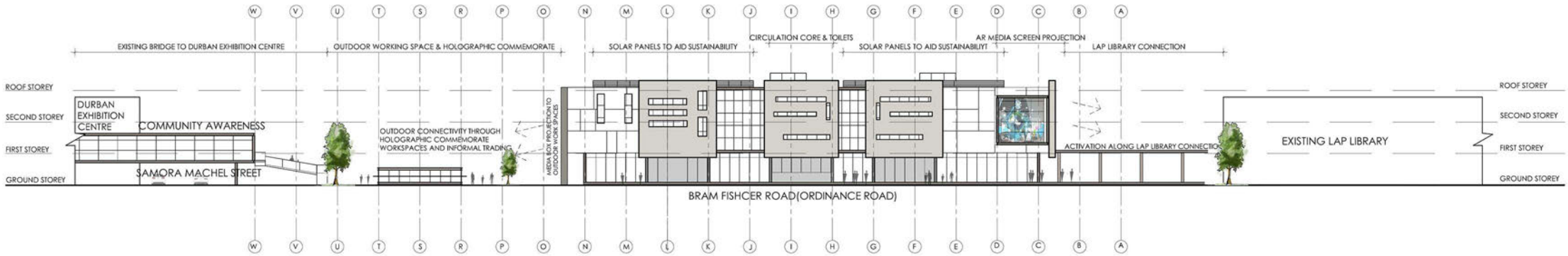



West Elevation


East Elevation



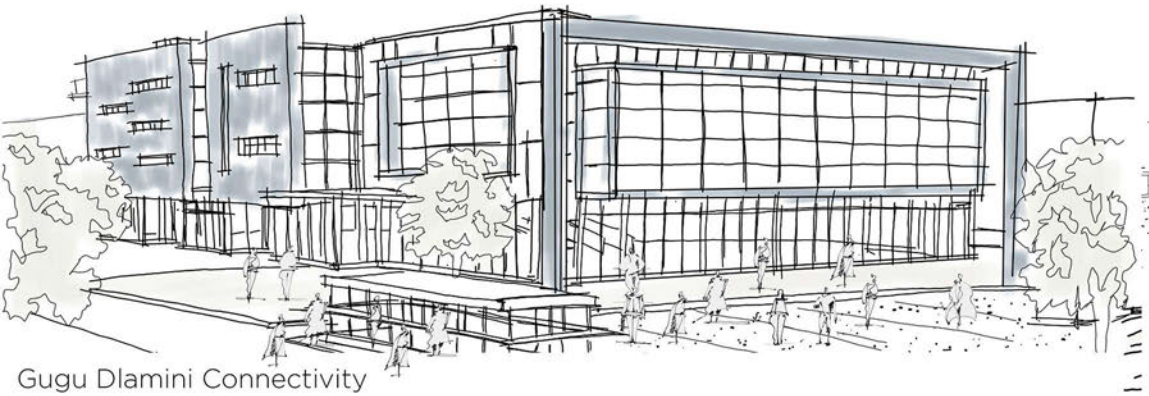

South Elevation Gugu Dlamini Revitalization




North Elevation Municipality and Museum Connectivity

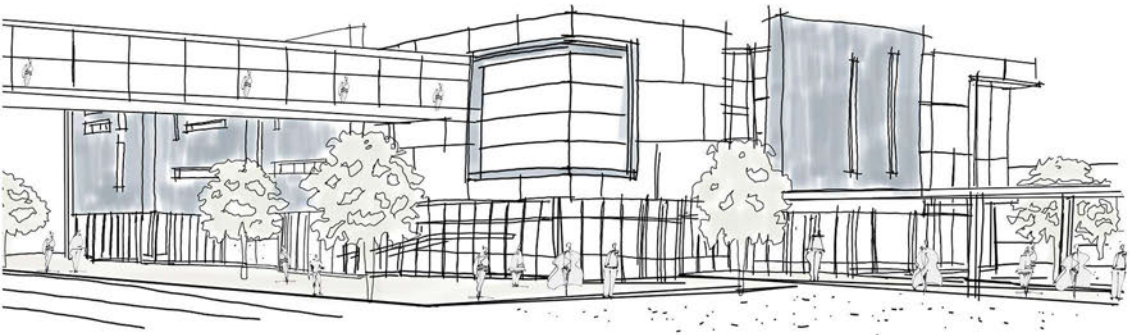
Diurnal And Nocturnal Revitalization Of Place

LAP Interdisciplinary Library Connectivity

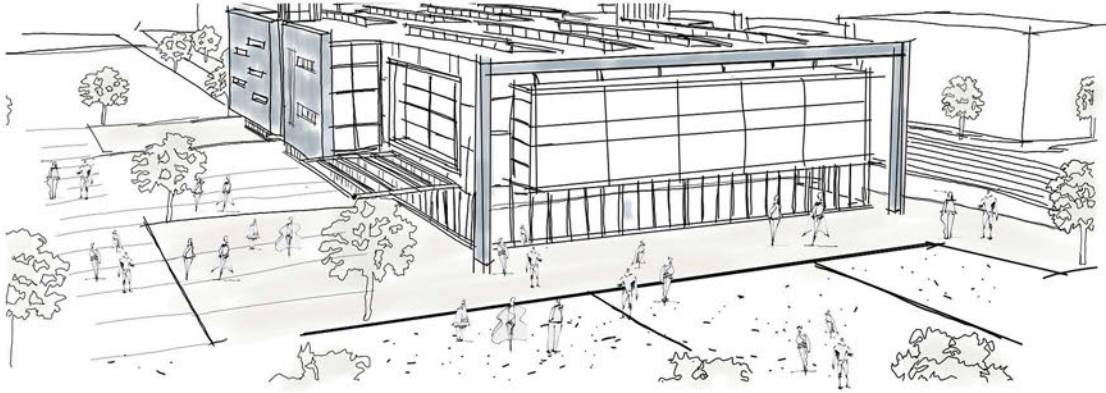


Gugu Dlamini Connectivity

Edge Activation Of The Corner Of Bram fischer road



Existing Inaccessible Activation Of Bridge Above With Municipality And Museum Connectivity



Outdoor Workspace With Holographic Commemoration

Perspective 1

Perspective 2

Perspective 3

Perspective 4