UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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Teacher engagement with the process in Design: policies, problems and visions

by

Anriët van Deventer

Submitted in fulfilment of the requirements for the degree

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in the

Department of Humanities Education

FACULTY OF EDUCATION

at the

UNIVERSITY OF PRETORIA

Supervisor: Dr Raïta Steyn

November 2021

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DECLARATION

"I declare that **Teacher engagement with the process in Design: policies, problems and visions,** which I hereby submit for the degree **Philosophiae Doctor** at the **University of Pretoria** is *my own work* and has not previously been submitted by me for a degree at this or any other tertiary institution".

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DEDICATION

THIS STUDY IS DEDICATED TO MY PARENTS, BEN AND MARIE

In loving memory of my late father, LJB van Deventer

07/10/1941 – 04/08/1994



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ACKNOWLEDGEMENTS

To my **Creator, God Almighty**, who has blessed me with curiosity, resilience, passion for life, ideas, creativity, love for children and animals, education, museology, freedom of psyche, opportunities for life-long learning and encouraging kindness, all to fill my world with bliss!

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To you **ALL,** *I say,* **Thank you!**[1] (English), **Dankie** (Afrikaans),  (sign language), **Ngiyathokoza** (IsiNdebele), **Ke a leboha** (Sesotho), **Ke a leboga** (Northern Sotho), **Ke a leboga** (Setswana), **Siyabonga** (SiSwati), **Inkomu** (Xitsonga), **Ro livhuwa** (Tshivenda), **Enkosi** (IsiXhosa), and **Ngiyabonga** (IsiZulu).

[1] The list reflects the 11 official languages of South Africa, plus South African Sign Language as the 12th (currently considered by the South African Parliamentary Constitutional Review Committee), (Businesstech, 2020).

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"… the '*thinking*' is a lot more than sitting like Rodin's 'Thinker', with your chin in your hand. A '*design thinker'* is intensely collaborative, empathetic, able to craft things in the real world".

Tim Brown (1962 - present*)*
British Designer, Design Thinker, Executive Chair of IDEO

"If we can really understand the problem, the answer will come out of it because the answer is not separate from the problem".

Jiddu Krishnamurti (1895 - 1986)
Indian Philosopher, Writer and Educator

"We spend a lot of time designing the bridge, but not enough time thinking about the people who are crossing it".

Dr Prabhjot Singh (1983 - present)
American Professor and Physician

"The ability to think has lent us the competence to design".

Mehran Hashemi (1972 - present)
Iranian Industrial Designer, Manufacturer, Lecturer and Writer



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ABSTRACT

The South African Department of Basic Education promotes problem-solving as a key skill while acknowledging the *design process* from Grade R to 12 as the means to acquire such. There have been reforms and revisions in the South African curriculum since the advent of Design education, e.g., Curriculum 2005 changed to *Revised National Curriculum Statement* (RNCS), and currently functions as *National Senior Certificate NSC-CAPS*. In the CAPS Design policy, there has been a (re)focus on the *design process* from a linear or non-linear perspective through the taxonomies of Bloom and Williams as guidelines. During provincial moderation sessions by the *Gauteng Department of Education* (GDE), it was found that the quality of the Design products ranged from good, mediocre to poor. Similar results were seen during the national external marking process.

The success of a good design or product lies heavily on the design process as it allows for problem-solving activation of quick and decisive thinking in terms of creativity and critical assessment. This study investigates how Design teachers interpret the *design process*, the reasons for their chosen approach, the way they apply their conceptual views and the way their subjective interpretation influence their *design process* teaching. In a *Design Thinking Framework* (DTF), the study explores Grade 11 Design teachers' views and their impact on teaching the *design process* at large. The research has taken place in Gauteng, South Africa (RSA), with selected schools offering Design as a subject. The selection was based on the past five years Grade 12 Design NSC results. Learners who participated were identified by the Design teacher based on their Grade 10 Design marks. A qualitative case study approach was used with purposeful sampling to obtain the participants for this study.

The objective of the collected data was explored with semi-structured interviews (Part 1) with the participation of eight Design teachers, data taken with digital photographs and assessment (Part 2 - Rubric A & B) of the *Design Process* (Topic 1) - Sourcebooks and the *Design Products* (Topic 2) of 42 Design learners. Eight Design teachers and 42 Design learners participated in the study. As a contribution to this study, a new model for the *design process* was developed through this study as South African specific for the Design classroom and for implementation from Grade R to Grade 12 in all aspects of the teaching and learning curricula of different subjects. The Van Deventer D+NQ Model serves as a South African *Design Thinking* model of the *design process* to assist learners across the board in acquiring effective problem-solving skills. The Model accompanying this thesis and study is a prototype of the Model. The study concludes that the

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design process approach enables teachers to focus on the various parts of the problem-solving process, giving learners more freedom and acquiring problem-solving skills to experiment proficiency. It would require that teachers develop a deeper understanding of the *design process* approach to teaching Design advocated by CAPS.

According to the findings, Grade 11 Design teachers have two main viewpoints of the *design process*: (a) a step-by-step approach that offers learners comfort throughout the problem-solving phase, and (b) the iterative method that provides learners with the freedom to explore endlessly. The findings have also revealed that teachers' perspectives on the *design process* are a composite of their related art qualifications in Visual Arts and Design education, pedagogical subject knowledge, and prior teaching experience, mainly in Visual Arts. As a result, Design teachers' interpretations and understanding of the *design process* have an unquestionable impact on their instruction approaches and how they teach it to their learners. The study has demonstrated how this fully assimilated, rich pedagogical experience of the South African arts teachers can be enhanced and better invested through adjustments, innovative teaching and learning approaches in the context of the Fourth Industrial Revolution.

Keywords: South African education, Design education, CAPS Design, PAT guidelines for Design, practical, problem-solving, Design thinking, Designerly thinking, Grade 11 Design learners, Design teachers, innovation, new Model, Van Deventer D+NQ Model, design process, Fourth Industrial Revolution, 21st century skills, taxonomies, creativity, thinking, multi-faceted, creative thinking, critical thinking, Bloom's taxonomy, Williams' taxonomy, skills of teaching and learning, competence, case study, interpretivism, COVID-19.

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OPSOMMING

Die Suid-Afrikaanse Departement van Basiese Onderwys bevorder probleemoplossing as ‘n sleutelvaardigheid, terwyl die *ontwerpproses* van Graad R tot 12 erken word as die middel om dit te bekom. Sedert die bekendstelling van Ontwerp-onderwys in die Suid-Afrikaanse kurrikulum, was daar hervormings en hersienings, bv. Kurrikulum 2005 wat verander het na *Hersiende Nasionale Kurrikulumverklaring (HNKV),* en funksioneer tans as die *Nasionale Senior Sertifikaat* (NSS-KABV). In die KBA Design-beleid was daar ‘n (her)fokus op die *ontwerpproses* vanuit ‘n lineêre of nie-lineêre perspektief deur die taksonomieë van Bloom en Williams as riglyne. Tydens provinsiale modereringsessies deur die Gautengse Onderwysdepartement (GDE) is bevind dat die gehalte van die Ontwerpprodukte gewissel het van goed, middelmatig tot swak. Soortgelyke resultate is tydens die nasionale eksterne nasienproses gesien.

Die sukses van ‘n goeie ontwerp of produk leun swaar op die *ontwerpproses*, aangesien dit voorsiening maak vir probleemoplossingsaktivering van vinnige en beslissende denke in terme van kreatiwiteit en kritiese assessering. Hierdie studie ondersoek hoe Ontwerponderwysers *ontwerpproses* interpreteer, die redes vir hul gekose benadering, die manier waarop hulle hul konseptuele sienings toepas en die manier waarop hul subjektiewe interpretasie, hul *ontwerpproses-onderrig* beïnvloed. In ‘n *Ontwerpdenkeraamwerk* ondersoek die studie Graad 11-Ontwerponderwysers se sienings en die impak daarvan op die onderrig van die *ontwerpproses* in die algemeen. Die navorsing het in Gauteng, Suid-Afrika (RSA) plaasgevind, met geselekteerde skole wat Ontwerp as vak aanbied. Die seleksie is gebaseer op die afgelope vyf jaar se Graad 12 Ontwerp NSS resultate. Leerders wat deelgeneem het, is deur die Ontwerponderwyser geïdentifiseer op grond van hul Graad 10-Ontwerppunte. ‘n Kwalitatiewe gevallestudiebenadering is met doelgerigte steekproefneming gebruik om die deelnemers vir hierdie studie te bekom.

Die doelstelling en benadering van data wat ingesamel is, is ondersoek met semi-gestruktureerde onderhoude (Deel 1) met sewe Ontwerponderwysers, en data geneem met digitale foto’s en assessering (Deel 2 – Rubriek A & B) van die *Ontwerpproses* (Tema 1) – Bronboeke en die *Ontwerprodukte* (Tema 2) van 42 Ontwerpleerders. Agt Ontwerponderwysers en 42 Ontwerpleerders het aan die studie deelgeneem. As ‘n bydrae tot hierdie studie is ‘n nuwe Model vir die *ontwerpproses* ontwikkel. Die studie het gelei na ‘n unieke Suid-Afrikaanse ontwerp-spesifiek vir die Ontwerp-klaskamer. Die ontwikkeling van hierdie Model stel ten doen om goedkeuring vir implementering van Graad R tot Graad 12 in alle aspekte van die onderrig- en

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leerkurrikulums van verskillende vakke. Die Van Deventer D+NQ Model dien as ‘n Suid-Afrikaanse Ontwerpdenkemodel van die *ontwerpproses* om leerders van ooral oor te help om effektiewe probleemoplossingsvaardighede aan te leer. Die Model wat hierdie tesis en studie vergesel, is ‘n prototipe van die nuwe ontwikkelde Model. Die studie kom tot die gevolgtrekking dat die *ontwerpprosesbenadering* Ontwerponderwysers in staat stel om op die verskillende dele van die probleemoplossingsproses te fokus. Hierdie benadeing bied aan leerders meer vryheid, om sodoende probleemoplossingsvaardighede aan te leer om met nuwe vaardigheid te eksperimenteer. Dit sal vereis dat onderwysers ‘n dieper begrip ontwikkel van die *ontwerpprosesbenadering* tot onderrigsbenadering wat deur KBA voorgestaan word.

Volgens die bevindinge het Graad 11 Ontwerponderwysers twee hoofstandpunte van die *ontwerpproses*: (a) ‘n stap-vir-stap-benadering wat leerders gerief deur die probleemoplossingsfase bied, en (b) die iteraktiewe metode wat aan leerders die vryheid bied om eindeloos te verken. Die bevindinge het ook aan die lig gebring dat onderwysers se perspektiewe van die *ontwerpproses* ‘n samestelling is van hul verwante kunskwalifikasies in Visuele Kunste en Ontwerp-onderwys, pedagogiese vakkennis en vorige onderrigervaring, hoofsaaklik in Visuele Kunste. Gevolglik het Ontwerponderwysers se interpretasies en begrip van die *ontwerpproses* ‘n onbetwisbare impak op hul onderrigbenaderings hoe hulle dit aan hul leerders leer. Die studie het getoon hoe hierdie ten volle geassimileerde, ryk pedagogiese ervaring van die Suid-Afrikaanse kunsopvoeders verbeter en beter belê kan word deur aanpassings, innoverende onderrig- en leerbenaderings in die konteks van die Vierde Industriële Revolusie.

Sleutelwoorde: Suid-Afrikaanse onderwys, Ontwerponderwys, KABV-ontwerp, PAT-riglyne vir Ontwerp, prakties, probleemoplossing, Ontwerpdenke, Ontwerperlike denke, Graad 11 Ontwerpleerders, Ontwerponderwysers, innovasie, nuwe Model, Van Deventer D+NQ-model, ontwerp proses, Vierde Industriële Revolusie, 21ste eeuse vaardighede, taksonomieë, kreatiwiteit, denke, veelsydige, kreatiewe denke, kritiese denke, Bloom se taksonomie, Williams se taksonomie, vaardighede van onderrig en leer, bevoegdheid, gevallestudie, interpretivisme, COVID-19.

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LANGUAGE EDITOR'S DISCLAIMER

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13 November 2021

CERTIFICATE OF EDITING

To whom it may concern,

This letter confirms that the thesis title *Teacher engagement with the process of Design: policies, problems and visions* by Anriët van Deventer was proofread by All-done Editing Services.

The document was edited (technical editing excluded) for grammar, punctuation, spelling, overall style and consistent use of South African English spelling conventions. All amendments were tracked using Microsoft Word's "Track Changes" feature, and consequently, the author had the option to accept or reject each change. A complete edited copy was provided, but the final decisions as to which changes to implement, rested with the author. The list of references was not edited.

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LIST OF ABBREVIATIONS

4Cs	Collaboration, Creativity, Critical thinking, and Communication
4IR	Fourth Industrial Revolution
5IR	Fifth Industrial Revolution
CAPS	Curriculum and Assessment Policy Statements
CAPS Design	Curriculum and Assessment Policy Statement Grade 10-12 Design
C2005	Curriculum 2005
CD	Compact disc is a portable digital optical disc data storage format
COVID-19	Corona virus disease
DBC	Design in a Business Context
DBE	Department of Basic Education
DHE	Department of Higher Education
DCES	FET Curriculum coordination, Deputy Chief Education Specialist [DCES]: FET Visual Arts and Design, Gauteng Department of Education
DoE	Department of Education
d.school	Hasso Plattner Institute of Design, Stanford University
DTF	Design Thinking Framework
FET	Further Education and Training
GDE	Gauteng Department of Education
GET	General Education and Training
IDEO	Innovation Design Engineering Organisation
IDEA Collective	South African Innovative Design Education Africa Collective
IEB	Independent Education Board
Illinois CITL	Illinois Center for Innovation in Teaching & Learning
ITEA	International Technology Education Association
KBA	Kurrikulum- en assesseringsbeleidsverklaring
L1 to L42	Learner 1, Learner 2, Learner 3 up to Learner 42
NCS	National Curriculum Statement
NGO	Non-governmental organisation
NSC	National Senior Certificate
PAT	Practical Assessment Task Guidelines
RBT	Revised Bloom's Taxonomy
RNCS	Revised National Curriculum Statement
RS1	Reference School 1
RST1	Reference School Teacher 1
S2, S3, S4, S5, S6, S7	School 2, School 3, School 4, School 5, School 6, School 7
T2, T3, T4, T5, T6A, T6B, T7	Teacher 2, Teacher 3, Teacher 4, Teacher 5, Teacher 6A, Teacher 6B, Teacher 7
S5L5	The participant code includes both the school and learner (in that order)
RSA	Republic of South Africa
STEM	Science, Technology, Engineering and Mathematics
STEAM	Science, Technology, Engineering, Art and Mathematics
Umalusi	Council for quality assurance in general and further education and training
VAN DEVENTER D+NQ MODEL	An 8-step interactive, easy-to-use, user-centric mind-set problem-solving Model. See *Chapter 3* for an explanation of the label

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CLARIFICATION OF SELECTED TERMS AND PHRASES

CAPS	Curriculum Assessment Policy Statement (CAPS) for each NSC subject; contains an outline of the content to be presented per term per year.
CAPS Design	An outline of the content of Design Theory and Practical, to be presented on a termly basis over a year.
COVID-19 Pandemic	COVID-19 (Corona) virus spread in the form of human-to-human transmission and is transmitted through respiratory droplets that human beings sneeze, cough or exhale. Pandemic refers to an international spread of a virus.
Design (upper case) vs. design (lower case)	In this study, **Design** refers to the subject while **design** refers to an act of creativity.
Design	Design is defined as a problem-solving process.
Design brief	Document that outlines the problem, the deliverables and the scope of the project.
Design in a Business Context	DBC – Research project to be completed each term with the process phase. Focus on 1. Research skills: observation, interviews, and data analysis. 2. Research layout: introduction; content/body; conclusion; and bibliography.
Design classroom	Space where relevant Design instruction is provided to learners regardless of their prior design experience.
Design curriculum	Synonym for Curriculum Assessment Policy Statement (CAPS) for Design. In this study, it refers to the same document.
Design education	In this study, Design education refers to general Design education, ie. Design education for all learners in a class/group context.
Design process	Iterative approach used to break down a large project into manageable chunks.
Design thinking	Mind-set and tactic used to learn, collaborate and solve problems. Step-by-step process.
Designerly thinking	Philosophical approach that examines the process and methods viewed by designers from a human-centred perspective. Endless/ongoing process.
DoE vs. DBE	Previously, the South African Department of Education was known as the Department of Education (DoE). This department has now been divided into a *Department of Basic Education (DBE) and the Department of Higher Education (DHE),* each with its own minister and curriculum. For the purposes of this study, I shall focus on the DBE.
Educator or teacher	Trained person who coaches learners to develop into adults who are fully adjusted, contribute to society and can solve problems and challenges. A teacher instructs learners in specific skills and content in accordance with a curriculum, and at a specific developmental level. Teacher is the preferred terminology to use in this study.
Exposed design curriculum	A teacher uses his or her field of expertise as the framework to guide learners in producing the final product.
Further Education and Training (Phase)	Grades 10 to 12 in a South African high school (FET), Department of Basic Education.
General Education and Training	Grades 8 and 9 in a South African high school (GET) These two grades also form part of the senior phase in the South African education system.

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IDEA Collective	Innovative Design Education Africa (IDEA) Collective believes Design's core purpose is to improve the quality of life for all. Need to produce citizens who are proactive problem-solvers and who create appropriate solutions that take cognisance of social, cultural, environmental and economic factors.
IDEO	An award-winning global British design firm that takes a human-centred approach to help organisations in the public and private sectors innovate and grow.
Illinois CITL	American Illinois Center for Innovation in Teaching & Learning (CITL), which explores and promotes innovative teaching to support transformative learning experiences in all modalities.
Government Gazette	A periodical publication that publishes public or legal notices on behalf of government.
Grade 11 learner	16 to 17-year-old adolescents in South Africa high schools.
KABV	Terminology for CAPS in Afrikaans.
Learners	The DBE refers to Grades R to 12 school children as learners.
Problem-solving	The process or act of finding a solution to a problem.
Problem solver	An individual who uses an imaginative and innovative way to redefine problems and come up with new, innovative responses and solutions, and then act on these.
Process	A series of actions or steps taken to reach a particular end or result.
Proficiency	The development of an increasing degree of expertise and experience.
Skill	An ability that is either innate or developed through knowledge and practice.
Specialist Design teacher	A specialist Design teacher has a university degree or diploma in Design Education.
Stanford d.school	Refers to the American Hasso Plattner Institute of Design at the Stanford University.
Topic 1	CAPS: Design practical – The sourcebook/planning of the design namely the *Design Process*.
Topic 2	CAPS: Design practical – The *Design Product*.
Topic 3	CAPS: Design theory – History of Design.
Sourcebook	Also referred to as Portfolio File or Workbook (synonyms).
Use of 'researcher' or first person ('I')	The first person – 'I' will be used to refer to the candidate who undertook this study.
Use of male and female pronouns	Male and female pronouns (he/she and his/her) will be used interchangeably throughout the study and will indicate both genders. This excludes reference to the researcher, who is female.
Visual Arts	Creative art that is made to express an opinion or emotion based on vision alone.

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CHAPTER 1

BACKGROUND AND EDUCATIONAL CONTEXT

1.1 INTRODUCTION

In Chapter 1, I give an overview of my study in the South African historical educational context, including the rationale, purpose and relevance of my study, concept clarification, my chosen paradigm, qualitative assumptions, a short overview of data collection and analysis, a touch on ethics and I also address possible limitations of my study. Finally, the Chapter highlights the focus, significance, and critical questions of the research.

The 21st century, particularly in the time of the COVID-19 Pandemic[2], has brought to the fore a plethora of challenges in education: content delivery, assessment, and teacher-centred focus are no longer the standard for teaching and learning (Alismail & McGuire, 2015:151; Geisinger, 2016:245, Trilling, & Fadel, 2009). (See *APPENDIX H: Infogram | COVID-19*). In respect of educational achievement, Spaull (2015:37) believes that poverty is the biggest hurdle.

In South Africa, we face yet another crisis: our educational system is inadequate, despite the attempts made by the *Department of Basic Education* (DBE) and *Non-governmental organisations* (NGOs) to equip learners with the problem-solving abilities and skills they need to solve current and future challenges.

The imperative intention for introducing Design education in the South African national curriculum in 2014 recognised the need to produce a new generation of problem-solvers and thinkers *"with crucial life skills such as visual literacy, critical and creative thinking, self-discipline, and leadership. It also encourages learners to be resourceful and entrepreneurial, to strategise and to be team players"* (*Curriculum and Assessment Policy Statement* [CAPS] (2011:8). To develop the skills that learners need to engage with the 21st century successfully and its challenges, creative engagement with Design as a subject in the Further Education and Training (FET) Phase will enable a shift from a STEM (Science, Technology, Engineering and Mathematics) approach to a STEAM approach that incorporates *Art.* Notably, Art is an integrated and transformative component of the concept of STEAM, in transdisciplinary STEAM learning structures with significant cultural ingraining and social impact, not just a means for STEM learning (Fenyvesi & Lähdesmäki, 2017:23).

[2] Human-to-human transmission is how the COVID-19 (SARS-CoV-2) virus spreads, and it is distributed through respiratory driblets that humanoids sneeze, cough, or breathe out (Sansa, 2020). The term 'pandemic' refers to a virus that has spread globally.

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In view of South Africa's socio-cultural complexities, teachers must be aware of the limitations of the current educational system in preparing learners for the future. To enable future generations to develop suitable solutions to the problems arising in our constantly changing world (Rabie, 2015:1), South African educationalists must acquire relevant and essential thinking skills that are underpinned by the Fourth Industrial Revolution (4IR)[3]. Furthermore, scholarly data supports the idea that empathy and affective domains are essential characteristics for a better human existence. Thus, soft skills are based on empathy (Ratka, 2018:1140). Children, as global citizens, must be given equal opportunities to participate in and add value to life, both individually and collectively (Booyse, 2018:12-13; Kek & Huijser, 2015:408). This ability will contribute to them finding fulfilment in life (Bowman, 2012:37).

According to Ambrose and Sternberg (2016:11), as well as Betts, Kapushion and Carey (2016:201), our current approach to education does not allow for a blend of problem-finding, problem-solving and creative solutions. Therefore, learner-centred education became the main focus, by the implementation of CAPS, which was adopted in 2012 (DBE, 2011:4):

> *"The National Curriculum Statement Grades R–12 gives expression to the knowledge, skills and values worth learning in South African schools. This curriculum aims to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives".*

Hence, in theory, the learner-centred approach is predicated on the credence that the learner is the most important participant in the classroom and, ideally, can constructively share his/her knowledge.

I regard this research topic worthy of investigation in the context of the existing learning plan for Design education in South Africa, and the skills required in the 21st century workplace and beyond, namely that learners must be well trained in solving different problems by utilising problem-solving *[design] processes*. I, therefore, identified existing problems in the current curriculum, propose solutions, highlight strong points, and suggest ways for improvement, in light of my findings, especially regarding my two proposed approaches, namely *Designerly thinking* and *Design thinking*.

In the framework of Design education in South Africa, for the subject Design, I used CAPS and *Practical Assessment Task* 2018 (PAT) documents as the basic requirements and as the set goals by the DBE. Interviews with Design teachers and the digital photographs of research data from the sourcebooks (the *Design Process* (Topic 1) and the *Design Product* (Topic 2)) of Grade 11 Design learners afforded me with the opportunity to critically analyse the ways in which teachers engage with the ***design process*** in the FET phase. In this study, Design refers to the subject while design refers to an act of creativity. *Design* is defined as a problem-solving process, whereby the *process* is described as a series of actions or steps taken to reach a particular end or result. CAPS (DBE,

[3] The Fourth Industrial Revolution (4IR) we are currently experiencing, is characterised by a blend of technologies and trends such as digital media, robotics, virtual reality, and artificial intelligence – all of which influence the way we live.

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2011:8) outlines the *design process* about understanding the problem, to plan, do research, apply originality in inventing anew, realise the idea, scrutinising the new ideas, and lastly, critically reflect on the solutions found by merging *design* and *process*. Thus, an iterative approach is used to break down a sizeable project into convenient pieces.

In terms of the implementation of the Design curriculum, as prescribed by CAPS, the research investigated problems related to educational policies and their relevance to teaching and learning issues with particular focus on the practical CAPS tasks: namely, the *Design Process* (Topic 1*)*, which includes the sourcebook and *Design in a Business Context* (DBC), and the *Design Product* (Topic 2) referring to the final design work. The terminology, the *Product* and the *Process* are also used interchangeably in this study.

My research was guided by the following queries: I wanted to understand how Design teachers interpret CAPS in their classrooms and if their interpretation influences their teaching of the *design process*. In addition, I conferred two methods – *Designerly thinking* and *Design thinking* – as problem-solving tools and methods teachers will be able to use at the FET level (Eriksson, Gibbons, Tabane, Steyn & Visser, 2019:20). Lastly, I identified gaps that I believe should be addressed to facilitate progress, and I suggest ways that might improve, benefit, and provide solutions in this uncharted, relatively young subject.

In addition, I am familiar with the requirements of a formal academic thesis. Nonetheless, because of my study field and topic (creative), I took the liberty to approach and present my thesis in a more *'creative manner'* by adding selective delicate elements to the document. My aim is to complement the visual appearance as well as the visual aesthetics of the document. First, the Van Deventer D+NQ Model was created (inadvertently, as it was not the goal at the start of my research). The development of the Van Deventer D+NQ Model in Chapter 3 necessitated the addition of a chapter to my thesis. The usage of red represents one of the University of Pretoria's corporate colours. Furthermore, I made use of a design principle known as repetition, by underling the titles of each chapter in red, and repeating it throughout the thesis. Then, the red page numbers, my dedication, acknowledgements, and quotes include a personal touch by adding a red decorative footer. QR codes, URL-links and a website are used in my thesis to provide access to 1400 digital photographs in an image carousel that form part of the data collected. The URLs offer better quality images. Both the website and the QR codes will be available until they are eventually superseded by cutting-edge technology in future.

Finally, after each participating Design teachers' participant codes, I included a tiny avatar to indicate imitation and their *'design process-persona'*.

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1.2 BACKGROUND AND CONTEXT

1.2.1 Background

Design education was introduced in both the government and the *Independent Education Board* (IEB) schools in 2014. Since then, employing qualified teachers in Design is not considered a priority. Hence, any qualified teacher may teach Design as a FET subject (for example, teachers specialising in Mathematics, Technology or Visual Arts) (Eriksson *et al.*, 2019:9, 39). I, in this case, have a postgraduate qualification in Visual Arts education and am currently teaching Design. However, for the needs of my teaching, I rely on my own practical interpretation of CAPS principles, especially in respect of the Design practical, which is moderated or marked by external examiners as well.

Furthermore, I believe that most Design learners focus on the topic and do not have the freedom to experiment with the problem given in the Design brief. For example, for a Design brief, the PAT Guidelines (DBE, 2018:7) instruct as follows: "*… a problem/need/opportunity should be identified that gives the learner the opportunity to create an aesthetically pleasing functional design solution".* By focussing, therefore, on the '*creation*', I confidently believe that in practice, the problem-solving process either is not applied correctly or, even worse, entirely skipped since learners are instructed to focus initially on creating the final product and then work *backwards* to complete the problem-solving process. This could indicate a lack of proper planning or poor time management on the part of the teacher or, more importantly, a misinterpretation of the CAPS document for the *Design Process* (Topic 1) & the *Design Product* (Topic 2). In addition, the Design task (Design brief) includes DBC, which refers to a research project that must be completed each semester along with the *process* stage (Topic 1).

Noteworthy is the items produced by learners during Design practical often clearly reflect the teacher's own field of expertise, since this is used as a framework to guide learners in producing the final item referred to as an *exposed Design curriculum*. Thus, for example, learners whose teacher specialises in graphic design will produce mainly two-dimensional products or even two-dimensional drawings as final products for examination (Eriksson *et al.*, 2019:17). This phenomenon motivated me to examine the degree of attention paid throughout each stage of the *design process*, using creative and critical thinking solutions in terms of *Designerly thinking* and *Design thinking.*

1.2.2 Context

The context of the proposed study is the current educational system in South Africa with specific reference to the FET Design classroom. Schäfer and Wilmot (2012:42) argue that most of the current instability and uncertainty around education results from the government's implementation of different teaching and learning guidelines. Since 1994, the South African curriculum has continuously transformed to create a *relevant curriculum* for post-apartheid South Africa. To satisfy the needs of

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change, *Curriculum 2005* (C2005) adopted a drastic approach to education to encourage social change (Chisholm, 2005:193). The most recent change was the 2011 amendment of the *National Curriculum Statements* (NCS). The adaptation of the NCS came about because of the findings of a Ministerial Task Team appointed in 2009 by the Minister of Basic Education, Angie Motshekga. The team had to review the implementation of the NCS. In its report released in October 2009 (DoE, 2009:11), the team specified that one of the NCS' *General Aims* was to –

> *"encompass principles such as the Critical and Developmental Outcomes in the NCS".*

In 2014, with the implementation of CAPS, Visual Arts and Design were split into two independent subjects. Before 2014, Design fell under Art II, while Art I comprised Visual Arts. (Eriksson *et al.*, 2019:9). Although Visual Arts already had designated status for admission to a bachelor's degree programme at a tertiary institution, Design – a *relatively new* subject[4] – did not enjoy such status. Design received designated status from the Minister of Higher Education and Training *only* [my emphasis] as of 1 October 2018 (DBE, 2018:213). A learner who achieves a final mark averaging 50% or more in Grade 12 qualifies for admission to a bachelor's degree programme at a tertiary institution. It is assumed that learners who achieve an average of 50% or more are taught by teachers qualified in at least one of the Design categories, namely *Visual Communication Design/Digital Design*, *Surface Design*, *Product Design* and *Environmental Design* (CAPS, 2011:13). In this context, apart from the teaching dexterity offered by Design as a subject, it also gains momentum because it creates an environment for learners to develop creative and critical thinking and to test their initiative by identifying practical problems and finding suitable solutions (Eriksson *et al.*, 2019:5, 17). At present, 54 schools in South Africa offer Design as a subject from Grade 10 to Grade 12. However, recent statistics show that schools offering Design are on the decline, and Design learner numbers are rapidly diminishing, as conferred by Mmutle Tabane (FET Curriculum coordination, Deputy Chief Education Specialist [DCES]: FET Visual Arts and Design, Gauteng Department of Education) at the Design Roadshow presented at Tshwane University of Technology (15 February 2020).

CAPS (DBE, 2011:8) states that –

> *"Design is a creative problem-solving process and includes the study of both Design practice and Design theory. The Design process involves problem identification, planning, research, innovation, conceptualisation, experimentation and critical reflection".*

This step-by-step procedure from CAPS (DBE, 2011:8) above, as understood by Design teachers and Design learners, is collectively referred to as the *Design Process*. Consequently, it has become essential for learners to acquire problem-solving abilities at school (Kay & Greenhill, 2011:46-47). Learners should be taught to apply originality, planning and imagination to arrive at a productive thinking stage that traces the logical relationship between ideas and creative solutions to problems. The Design Curriculums' (DBE, 2011:4, 8) general and particular goals provide learners with the

[4] CAPS Design was introduced in selected South African schools in 2014.

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opportunity to be all-embracing able and ready to advance in life (regardless of socio-economic status, race, gender, or impediment) by providing them with:

- *"Knowledge, abilities, opinions and values required for self-realisation, and significant involvement in society as conscientious and involved people;*
- *Offering them admission to higher education; and*
- *Assisting the shift of learners from educational institutions to places of work".*

These broad objectives serve as a guide and should be used in conjunction with the *particular Design aims*, which compose learners to –

- *"Recognise that Design may be used to effect social shifts through increasing one's quality of life by giving answers to individual and societal issues;*
- *Identify Design's social and historical significance in terms of economic development, entrepreneurship, and sustainability;*
- *Develop an understanding of design career opportunities;*
- *Successfully handle their own working manner and time;*
- *Build presentation-and-communication proficiencies to communicate design concepts appropriately; and*
- *Accept and consider the design, art, and workmanship of native and foreign cultures, both past and present"* (DBE, 2011:4, 8).

This official map of educational decisions, policies, strategies, and guidelines of the Design curriculum ideally stresses the importance of their practical implementation. I believe the fundamental problem that resulted in my primary research questions is that the theory and what is being done in practice (in the classroom) do not come together. Based on my experience as a provincial marker, Design teaching is seemingly product-driven, as opposed to CAPS, which is prescribed as a problem-solving process. With this apparent focus, the most crucial part of the creative process is set aside. However, reality proves far from successful implementation for reasons known or assumed and unknown factors. Therefore, my research focused on teaching and learning Design and the practical implementation of the relevant policies. I also investigated the consequent problems of teachers' engagement with the *design process* in class. Steyn (2019:157) states that concerned educationalists need further training to better understand the literacies of both dynamics, namely theory (creative thinking) and its practical application (technical means).

As mentioned before, the problem-solving process is not applied to the extent that it should be or may even be omitted entirely. Instead, the work is done following the teacher's instructions and with the sole purpose of producing a final product for which a mark can be allocated. During the past years, I have observed that the Design briefs given in the examination papers for Grade 10 to 12 focus on a specific topic or theme without providing a clear design problem statement and yet they present a solution to the problem (DBE, 2011:15). I validate this statement by employing my proposed analysis of the learners' Design sourcebooks in the data analysis and findings stage. I

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assume that part of the hindrance in teaching Design is that most learners are not given the freedom in class to experiment with the problem contained in the Design brief.

According to the Design Curriculum (DBE, 2011:16), *"open-ended briefs'* are offered *'where learners choose the materials, tools, techniques, themes, and processes best suited to their individual interests*", which ideally allows for '*freedom*' to explore various solutions to complex problems in the Design briefs. However, I believe that this cannot be applied in the classroom if learners are conveniently driven by teachers towards the *correct* answer (product-driven) to the problem in the same way as Hmelo-Silver and Barrows (2006:24) argue that the teacher still leads the way in teaching and learning in class.

Furthermore, there is little emphasis on developing creative and critical thinking (*design process*) offered by the *Design Thinking Framework* (DTF) in the problem-solving stage. Pontious (2013:1) states that the process of creating innovative design is often demonstrated but not explained. Defined guidelines will ensure that both the quality of learners' work and their creativity improve as they work through a process that they have learned, assimilated, and practised (Pontious, 2013:1). The PAT document (DBE, 2018:21) stipulates that, on completion of this component, learners should be able to demonstrate their understanding of the industry because of their knowledge, skills, values and reasoning, and their ability to address real-world challenges would have been enhanced. With more emphasis on and practise and training in the crucial stages of the *design process*, I believe that these desired outcomes can be achieved with much more success.

Moreover, as I stated before, I believe that teachers use their own field of expertise as a framework to guide learners in producing the final product. CAPS (DBE, 2011:13) provides for differences among schools by promoting teachers' specialist skills and learners' talents to encourage creativity and diversity. In this context, to *"ensure progression and development"* (DBE, 2011:13), learners in Grade 11 can choose from four fields of expertise (Visual Communication Design/Digital Design, Surface Design, Product Design and Environmental Design) (CAPS, 2011:13) and specialise in one of them. In fact, it is *recommended* that learners specialise in one of the named *"fields of focus".* The pitfall is that the statement for learners *to specialise in* a focus field is only a *"recommendation".*

In contrast, the curriculum is flexible enough *"...to accommodate differences between schools [and] teachers' specialist skills"* (DBE, 2011:13). Thus, while this apparent contradiction promotes the teacher's specialist field, at the same time, it emphasises its detrimental role in the learner's *specialist skills and abilities*. As a result, teachers can teach only through their own specialisation or personal field of interest. The CAPS document (DBE, 2011:48) highlights an important note:

> *"Teachers should use their own collection of project briefs, class notes, reference books, catalogues and magazines, photographs, slides, videos, etc., to provide valuable teaching*

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and learning support material for the theory content and practical skills required by the new Design curriculum".

The statement above demonstrates the policy in favour of teachers' authoritative freedom of choice. Coe, Aloisi, Higgins and Major (2014:3), Hmelo-Silver and Barrows (2006:22) and Schoenfeld (1998:2) state that a teachers' values and beliefs underpin professional practice. To understand the process to be followed in creating innovative designs, I shall continue by defining the *design process*. I looked at the theories of the Revised Bloom's Taxonomy (RBT) (Adams, 2015; Bloom, 1956, Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) and Williams' Taxonomy (Williams, 1969) in more detail, as both of these serve as the basis in the PAT document for Design. Romiszowski (2010), as an Instructional-design theorist, classifies skills in terms of their intricacy or erudition. Romiszowski (2010:202) refers to reproductive skills versus productive skills. I looked more closely at how he differentiates between repetitive and mainly instinctive activities versus activities that involve planning a procedure appropriate for the specific condition. In addition, Maslow's Taxonomy and De Bono's Six Thinking Hats Theory are briefly discussed.

The purview of my research is centred around Design education and the praxis part as prescribed in CAPS Design. This means that my focus stayed within the playing-field thereof, the documents prescribed, the Design teachers, Design learners, and the *design process.* Therefore, I kept close proximity to the abovementioned aspects to '*keep my eye on the ball'*.

Lastly, **the *Design Thinking Framework* and *Design thinking*** refer to the ***design process***, and the preferred term in this study. In this framework, the *design thinking process* and the *problem-solving process* are both synonymous with higher-order thinking, iterative, nonlinear, step-by-step, and human-centred design, which involve users throughout the *design process*. Human-centred design places the user at the core of all design processes, since it starts and ends with the persons the design is being created for (Vezzoli, Ceschin, Osanjo, Mugendi, M'Rithaa, Moalosi, Nakazibwe & Diehl, 2018:111). The *process* first defines the user's experience issues, then gains insight into the problem, develops possible solutions, tests them, and finally reflects on the results (Carlgren, Rauth & Elmquist, 2016; Liedtka & Ogilvie, 2011).

1.3 CONCEPT CLARIFICATION

The following terms that need clarification in the study are noted in no particular order. Firstly, referring to my title, ***Teacher engagement with the process of Design: policies, problems and visions***, it engages the official map of educational decisions, policies, strategies and guidelines of the Design curriculum, which ideally stresses the importance of their practical implementation. I deem the fundamental problem that resulted in my research question and three sub-questions is that

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the theory and what is being done in practice (in the classroom) do not come together, hence, averring to my title.

CAPS Design (DBE, 2011:44) clearly defines *assessment* as follows:

> *"Assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of learners, using various forms of assessment. It involves four steps: generating and collecting evidence of achievement; evaluating this evidence; recording the findings; and using this information to understand and thereby assist the learners' development in order to improve the process of learning and teaching".*

The definition above guides and supports my study on *assessment,* whereby *evaluation* is described as a higher-order cognitive level, together with analysis and synthesis (DBE, 2011:47). Evaluation is not clearly defined in CAPS Design, but for my study, I outline the term as follows: evaluation is applied as an opportunity to discuss the development (*process*) of a design and final (art) work. Furthermore, it creates an understanding for others of the aims and explains successes and weaknesses to demonstrate knowledge and understanding gained. In my opinion, applying both terms refer back to teachers' and learners' growth.

According to Mawson (2003:118, 125), the concepts of design (*design process*) and problem-solving are similar as they both have the same order or structure: *"(1) the beginning/birth of an idea, (2) the reflection stage and (3) evaluation of the success of the outcome*". As a result, permitting learners to engage in design pursuits provides them with the chance to tackle challenging design issues in an appropriate learning environment (Kangas, Seitamaa-Hakkarainen & Hakkarainen, 2013:161-178). The beforementioned is undoubtedly in line with the definition provided by CAPS on the *design process*, which is '*creative*' and in the '*problem-solving process*' involves the steps of *"problem identification, planning, research, innovation, conceptualisation, experimentation and critical reflection"* (CAPS, 2011:8).

For more terminology clarification, see *Clarification of selected terms and phrases (page xiv)* and *List of abbreviations (page xiii).* I shall now define the *design process* to achieve clarity in implementing the DTF as a guided process for problem-solving.

1.3.1 Defining the design process

Referring to the *International Technology Education Association* (ITEA) (2000, 2002), Burghardt and Hacker (2004:6-8), stress the importance of Design *"as the core problem-solving process of technological development"* and as *"fundamental to technology, as inquiry is to science and reading is to language*".

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Ohemeng-Appiah (2014:7-8), citing Mawson (2003), and Jones, Buntting and De Vries (2013), considers the *design process* as the framework that supports Design, as well as the use of technology in education (Eriksson *et al.*, 2019:8). Ohemeng-Appiah (2014) cites Mawson (2003), who claims that the *design process* is at the heart of the South African Design education curriculum and the curricula of many other nations. Furthermore, according to Ohemeng-Appiah (2014:7-8), some academics propose that the *design process* is a prototypical model covering several activities or stages that must be completed to generate resolutions to fulfil the final goals of Design.

In addition to stating that Design is a *creative problem-solving process*, the CAPS (2011:8) document furthermore states that –

> *"This process typically results in new environments, systems, services, and products, which may be unique or intended for mass production, or which may be constructed by hand or produced by mechanical and/or electronic means*".

In this definition, the *design process* is well-defined as a structured approach to problem-solving in Design. It is used to generate and deliver goods, amenities, and practices that meet people's wants and needs (Eriksson *et al*., 2019:5, 10). Lastly, the spectrum of this part of the study did not cover the entire scope of current literature on *design thinking* or *higher-order thinking theories*. But the scope was narrowed through purposeful selection, which intended to provide a functional platform and approach to the rest of the study.

1.4 RATIONALE AND MOTIVATION

In the context of the skills required in the 21st century, and particularly higher-order thinking skills, my personal interest lies in contributing to the best of my ability. This holistic learning approach will accommodate and develop the necessary skills to solve problems effectively (Gardner, 2012). I am ardent about Design education with specific reference to the ***Design Thinking Framework*** mentioned above, **referred to as the *design process* in this study.**

My undertaking of this study not only benefitted and expedited my personal growth but also transformed my teaching career by opening up new opportunities and extending personal networks. Furthermore, by means of my study, I wish to leave my footprint on the science of Pedagogy and bring about change in the *status quo* of Design education in South Africa. Based on my research, in my opinion, learners need to be taught how to engage in the format of a problem-solving framework. In addition, borrowed from anthropology, social and behavioural sciences, I applied a dual field-work viewpoint, (a) the '*emic*', which defines '*from within the social group'* and from the perspective of the subject, in my case, as a practising Design teacher and an examiner as Gauteng Provincial Marker, and (b) the '*etic*', meaning from the outsider, '*the researcher's viewpoint, the perspective of the observer'*. Both these perspectives used in my study refer to my empirical knowledge in Design education (Mostowlansky & Rota, 2020).

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Subsequently, the approaches and models used by Design teachers are important to me, and I greatly value the freedom Design affords learners; to explore, experiment and come up with their own design solution, mainly using the problem-solving process, long before reaching the final product solution.

As a practising Design teacher and marker of national examinations, I have noticed that most Design teachers generally lack the expertise, experience and ability to teach Design. According to Coe *et al*. (2014), several studies have found a link between measurements of a teacher's knowledge of the content they teach, and the benefits derived from their learners. As a result, teachers cannot guide children to learn what they themselves do not understand (Ball & Hill, 2009). During moderation sessions by the *Gauteng Department of Education* (GDE), I observed that the quality of products ranged from good to mediocre or poor. Many products were either aesthetically-pleasing-and-functional or functional but less aesthetically impressive. Yet, both kinds are acceptable in terms of the *Curriculum and Assessment Policy Statement Grade 10-12 Design* (CAPS Design) requirements (DBE, 2011). However, products that are purely aesthetically attractive but not functional are not acceptable in terms of the CAPS Design criteria. These criteria are described as follows (DBE, 2011:8): *"Design adds value to life by creating products that have a purpose, are functional, and have an aesthetic value"* [my emphasis]. It also states that *"design products can shape the social, cultural and physical environment for the benefit of the nation".* Therefore, learners can contribute to changing their future.

Finally, in respect of my focus and topic of this study, the abovementioned CAPS requirement led me to follow the role of the Design teacher in his/her interpretation of the *design process* that I investigated in this study. Thus, through this study, I hope to enhance teaching and learning approaches in respect of problem-solving by utilising creative and critical thinking from a different pedagogical perspective.

1.5 MAIN AND SUB-QUESTIONS OF THESIS

The information above alerted me to how proper Design education can expose learners to a rich diversity of ways to communicate, interact socially and culturally, and apply their creative and critical capabilities. This led to the main question and focus of this study, namely:

a. How do Design teachers interpret the *design process*?

The main question inevitably gives rise to the following three sub-questions:

b. Why do Design teachers interpret the *design process* the way they do?
c. How does teachers' interpretation influence their teaching of the *design process*?
d. How can Design teachers enhance diversity in creative and critical thinking by an innovative and easily applicable Design teaching model?

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1.6 PURPOSE OF THE STUDY

With this study, I sought to *understand* how Design teachers engage with the CAPS document with specific exploration towards the *design process*. Secondly, How Design teachers *interpret* their understanding of the *design process*, and I seek to *understand* why they interpret the *design process* they do. This, in effect, will give a clear indication of how their '*own*' interpretation impacts how they *teach* the *design process* in the Design classroom. Furthermore, I intended to explore two educational approaches with Design teachers, namely:

- *Designerly thinking*; and
- *Design thinking*.

These approaches are underpinned by the literature review, which showed prominent stakeholders in the industry to refer to both approaches in the *design process*. In addition, the importance of these stages have been discussed by many scholars such as Andrews (2015); Brown (2009); Buchanan (1992); Cassim (2013); Cross (1982, 2004, 2011); Dam and Siang (2018); Gyabak, Ottenbreit-Leftwich and Ray (2015); Johansson-Sköldberg, Woodilla and Çetinkaya (2013); Lawson (2005); Plattner, Meinel and Leifer (2012); Rabie (2015); Schön (1983, 1992); and Simon (1969).

1.7 PARADIGM – INTERPRETIVISM

1.7.1 Ontology and Epistemology

While ontology is concerned with the essence of reality, Hudson and Ozanne (1988) believe that epistemology is concerned with the researchers' connection with reality, or how this reality is recorded and experienced (Carson *et al*., 2001). In other words, ontology is concerned with determining the general nature of a phenomenon's existence. In my instance, it is socially created (through the assimilated knowledge and acquired cultural experiences of both teachers and learners) in a classroom environment. My ontological assumption is that the existence of an idea in the mind tells us nothing about the entity's existence in reality. For example, a three-dimensional product of a unicorn does not prove the existence of unicorns (Pigliucci, 2001). Nonetheless, I understand when I seek answers (reality) to my research questions, as I am referring to a certain sort of knowledge that exists outside of myself, as there is no such a thing as one single reality, especially in the context of the interpretivist approach.

However, due to the complexity, diversity, and unpredictability of what is considered as reality, the interpretivist researcher enters the field with prior knowledge of the study setting. Yet, I am warned, that this might be insufficient for building a strong research strategy, as no one can obtain previous knowledge of social facts that are *time* and *context* constrained (Hudson & Ozanne, 1988).

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In my chosen paradigm, epistemologically I refer to the view of *prior* knowledge in terms of *time*, *context, culture* and *value*, therefore presenting *a truth,* not *the truth*. Furthermore, it is about how I approach the uncovering of this knowledge (external to me) and learn about reality as perceived from different points of view. Equally important is utilising pre-understanding knowledge with a distinction made between facts and less clear value judgements. In respect of my notion of reality, I believe that the ontological nature of my interpretivist approach forms a solid basis for the integrity of my viewpoints and evaluation of the gathered data. Finally, the study's aim can be achieved successfully through the interactive, cooperative, and participative relationship between the selected participants and myself in this case.

The research plan indicates how the research will be conducted (Mouton, 2001:55). An overarching theory, namely social constructivism, associated with my paradigm is an interpretative framework in which entities seek to understand the world and develop their own precise meanings that correspond with their experiences (Creswell, 2011). This theory assumes that understanding, meaning and importance have been developed in coordination with other people (Amineh & Asl, 2015:13). According to Willis, Jost and Nilakanta (2007:4), interpretivism usually seeks to understand a particular context, and the underlying belief of the interpretative paradigm is that reality is socially constructed. As far as my paradigm is concerned, I decided on *interpretivism* because the study engages both the researcher and the human subject. Design teachers and learners are the essential instruments used to measure phenomena relevant to this study. Interpretivists, according to Babbie and Mouton (2008:28), seek to comprehend people and the world as it is grounded on personal experiences of individuals, which are prone to prejudice (Pizam & Mansfeld, 2009:1), rather than to simplify, anticipate causes and consequences (Neuman, 2000; Hudson & Ozanne, 1988). Therefore, the interpretative paradigm has embraced a more personal and pliable investigation framework (Carson, Gilmore, Perry, & Gronhaug, 2001), which is open to securing connotations in the human interface (Black, 2006) and makes a good judgment of what is viewed as authentic (Carson *et al*., 2001). Interpretivism typically involves observation and interviews as research tools; only interviews (Design teachers) are used in this study.

1.8 PHILOSOPHICAL ASSUMPTIONS UNDERPINNING THIS STUDY

1.8.1 Why this study involves qualitative data

This study is an inductive inquiry that followed a logical reasoning process of analysing data based on a predetermined structure. Multiple corroborations were considered, accurately assessed, and combined, leading to a specific and valid conclusion. With an idea of the likely responses of the Design teachers, this approach was a quick and easy method as I used my research questions as a guide for grouping and analysing the data collected.

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Therefore, this research emanates within the interpretative paradigm and employs a qualitative methodology (Trochim, 2006). As Punch (1998:4) indicates, qualitative research is empirical (verifiable by experience rather than theory) with data based on standards, not on numbers. It is a multi-focus method that takes realistic, interpretative conduct to the topic (Denzin & Lincoln, 1994:2). Concerning the study field in the Design classroom setting, it attempts to understand the phenomena researched in this study. I assumed Design teachers could use this research opportunity to voice their interpretation, experience and pitfalls of teaching the *design process* to Design learners.

1.8.2 Reasons for using a case study approach for the study

Aforementioned, my study's research paradigm, interpretivism, allows the use of a qualitative method that builds its principles on inductive reasoning. My research strategy involved a case study to investigate the phenomena in the context of real life. Case studies are frequently used to collect in-depth data in actual and real-life contexts when the researcher has slight or no command over occurrences. In my case study, the sample group comprised Design teachers and Grade 11 learners. They were studied in a real-life context, namely their Design classrooms. My research did not include any experimentation (Patten & Newhart, 2018:13) but involved interviews with Design teachers. The interviews, digital photographs taken of research data from learners' Design sourcebooks, and data from the case study were analysed regarding the samples collected from selected schools in Gauteng, South Africa, that offer Design as a subject. The three tools for data collection were document analysis, interviews and the use of research data captured by digital photos. In addition, I photographed the *Design Process* (Topic 1) and the *Design Product* (Topic 2) (CAPS) of learners' Design work produced for this study. To emphasise, by following the interpretive paradigm, I want to investigate how teachers engage in the *design process* and analyse the aspects that influence their interpretation of CAPS, which impacts how they teach the *design process*.

Regarding *Table 1.2 (see below, page 18)*, I used the Design brief (see *Appendix I*), DBC (see *Appendix J*) and Rubric A (peer assessed) (see *Appendix K*) provided by the *Reference School 1* (RS1). Peer teachers first evaluated my assessment tool, Rubric B (see *Appendix L*) created for measurement in this study. Participating schools then received the same Design brief, DBC and Rubric A to be used and implemented by Design teachers. I used the same instruments, but instead of Rubric A, I utilised my detailed rubric based on Rubric A, that is, Rubric B, to assess learner participant products in the corresponding case study. This case study, I believe, to have played a crucial role for my data collection and classification by maintaining its process firmly focussed on its relevant context, namely the South African contemporary Design classroom.

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1.8.3 Location of this study

The location of this study consists of seven schools in Gauteng, South Africa, that offer Design as a subject. The selection of these schools was based on their performance in Design over the last five years. The key advantage of purposeful sampling methods is that they ensure that the sample selected represents the population (Fox & Bayat, 2014:55). In this context, '*population*' can be interpreted as a representative sample of all schools offering Design (CAPS) as a subject. My selection of schools represents two of high, two of middle and two of low performance which I have considered as indicative paradigms of all schools in South Africa. The small sample of 50 participants was a purposeful sample: 42 Grade 11 Design learners and 8 Design teachers. The Design teacher continued teaching Design to his/her learners as usual. This took place at each individual school in the space or classroom where Design teaching and learning usually takes place.

I have selected the location for this study, the Design classroom (without my direct involvement) for each participating school, which is the natural environment for both teachers and learners where Design education usually takes place. Despite the importance of interviewing within the studio space, some interviews were conducted online due to the COVID-19 pandemic. This non-intrusive approach for my study allowed *freedom to the Design teacher and learners to interpret CAPS-supplied* Design brief, DBC, and Rubric A. The output (that is, the Design work of the Design learner) formed part of the data collection for this study because it was important for the conclusions to be drawn.

1.8.4 The researcher

Not to be taken for granted is my passion and vision for Design education. Engaging with this '*young*'[5] subject, I lean on my interpretation of CAPS Design for my teaching and learning requirements. I am a middle-aged Caucasian female Design teacher with a postgraduate qualification in Visual Arts education. For five years, my life journey took me on a '*new*' road to have taught Design at an all-inclusive multi-racial, co-gender government high school in a middle-class city suburb of Gauteng, South Africa. Therefore, curiosity, determination, and a desire to learn more about the possibilities of Design education served as motivation to stimulate my interest even further.

1.9 DATA COLLECTION, SAMPLE GROUP AND ANALYSIS

In my case study, the sample group comprised Design teachers and Grade 11 learners. They were studied in a real-life context, namely their Design classrooms, where interviews were conducted with Design teachers and digital photographs were taken of data from Design learners' sourcebooks. I investigated how teachers interacted with the *design process* using the interpretative paradigm, including the factors that impact their interpretation of CAPS and their teaching of the *design process*.

[5] CAPS Design was introduced in schools in 2014.

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The three tools for data collection were document analysis, interviews, and the use of photos. The interviews, digital photographs of data taken from the learners' Design sourcebooks and case study data were analysed concerning the samples collected from selected schools in Gauteng, South Africa, that offer Design as a subject. In addition, the *Design Process* (Topic 1) and the *Design Product* (Topic 2) (CAPS) of the learners' Design work produced was photographed for this study.

Regarding *Table 1.1: Summary – Data Collection* below, the Design brief, DBC and Rubric A (peer assessment) provided by Reference School 1 were used. As mentioned before, my measurement assessment tool, Rubric B is peer-assessed. The participating schools received the same Design brief for Grade 11 Design, DBC and Rubric A for the Design teacher, which were implemented in Term 1 of 2020. The case study used the same tools to evaluate each participants' design work.

Table 1.1: Summary – Data collection

	DOCUMENT ANALYSIS	INTERVIEWS	PHOTOGRAPHS
Type	1. DBE CAPS FET (curriculum) 2. DBE PAT Guidelines for Design Grade 12 3. Road Show reports & publications	Traditional semi-structured	Digital
Who?	Myself	Design teachers	Myself – Design Learners' sourcebooks: The *Design Process* (Topic 1) and the *Design Product* (Topic 2)
How?	Reference – stipulate outcomes for Design practical	One-on-one (Teacher & myself)	Digital camera
Why?	1. Less time consuming and more efficient 2. Learner's benefit 3. Insight	Participation presenting their reality	Documentation & illustrative
Where?	Online & hard copy	Teachers' classrooms and online Zoom platform	Participants' schools
When?	Start and during the research	By appointment at schools and online	After completion of Design brief & DBC (study) – End March 2020

Source: Anriët van Deventer

In conclusion, the primary data generated cannot be generalised. Data collected using my document analysis, interviews and data captured in photographs were influenced by my personal perspective as a Design teacher (Pizam & Mansfeld, 2009:1).

1.9.1 Data collection instruments

My data collection was conducted per the qualitative method case study design. As suggested by Yin (2009), researchers use case studies to focus on how and why research supports a thorough

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study of actual phenomena in their true context. My multiplex data collection process was conducted on three levels, namely document analysis, interviews, and photographs of learners' products (Sourcebooks: The *Design Process* (Topic 1) and the *Design Product* (Topic 2)).

1.9.1.1 Document analysis

The two most relevant prescribed documents that were analysed to collect data are the DBE CAPS FET document and the DBE PAT Guidelines for Grade 12, 2018-version. These documents are available online. In addition to the CAPS document, I wanted to see what else was out there regarding the instructional matter. These two documents served as a reference for the entire study. This analysis has provided a theoretical basis of what is supposed to form the practical part of CAPS in this study. These formal documents indicate what DBE expects regarding teaching and learning the subject Design to benefit the learners too. I used a hard copy to describe the stipulated outcomes for the FET Design practical tasks.

1.9.1.2 Interviews

Interviews with Design teachers were conducted in a traditional, semi-structured way that was organised at each participant's school – unilaterally (teacher and myself) and following a pre-structured document containing all the interview questions (peer assessed). According to their NSC school results, the involved eight Design teachers came from different schools categorised as high, middle, or low-performing schools. Hence, no learners were participating in the relevant interviews. The semi-structured modus allowed for a discussion with the interviewee rather than a straightforward question-and-answer format. The interviews were necessary to engage directly with the Design teachers to share their own interpretation of the CAPS Design practical component. This allowed me to critically engage with the primary research question: *"How do teachers interpret the design process?".* Semi-structured interviews, according to McLeod (2017:2), allow participants to speak freely while using their own syntax in the interview. Thus, it allowed me to understand the teachers' knowledge of the CAPS Design better. These interviews answered my sub-questions from the perspective of the Design teacher and their perceived reality: *"Why do teachers interpret the design process the way they do?" and "How does their interpretation influence their teaching of the design process?".* As to "How can Design teachers enhance diversity in creative and critical thinking by an easily applicable Design teaching model?", in Chapter 3, I propose my own, practical model, which is based on my empirical knowledge and researched information.

1.9.1.3 Digital photographs

I took digital photographs of the research data produced of participating learners' sourcebooks, the *Design Process* (Topic 1) and the *Design Product* (Topic 2) at each participating school for

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documentation and illustration. To draw meaning from the photographed products, the images are used as illustrations to support the answers to my research questions.

In the framework of the interpretivism paradigm, I cannot claim absolute objectivity neither for my interviewers nor myself. Yet, I believe that the well-substantiated qualitative design case study and my interpretation of the detailed and multifaceted data collection might provide truthful enough recommendations and information to enhance the CAPS document or offer new insights that incorporate the reality of the South African Design classroom.

1.9.2 Sample Group

This study used purposeful sampling, in which individuals were identified and chosen based on their knowledge and experience in the phenomena under investigation (Creswell & Plano Clark, 2011). In purposeful sampling, my participating sampling was done prior to the research. Thus, it refers to the stage in which the participants were selected. In addition to participants having knowledge and experience, Bernard (2002) notes the importance of accessibility and willingness to participate and the ability to convey experiences and opinions in an articulate, expressive, and reflective way.

The schools were selected based on their performance in Design over the last five years. The key advantage of purposeful sampling methods is that they ensure that the sample selected represents the population (Fox & Bayat, 2014:55). Therefore, the small sample of 50 participants was a purposeful sample.

Table 1.2: Case study – Grade 11 Design learners

1 **2**	**Category A: Participant codes: School 1: Reference School (RS1)** **Six learners participating: High-Performers, Middle-Performers and Low-Performers**		
3	**Category B** **High-performance Schools** **Participant codes:** **School 2 (S2) and School 3 (S3)**	**Category C** **Middle-performance Schools** **Participant codes:** **School 4 (S4) and School 5 (S5)**	**Category D** **Low-performance Schools** **Participant codes:** **School 6 (S6) and School 7 (S7)**
	School 2 (S2)	**School 4 (S4)**	**School 6 (S6)**
	School 3 (S3)	**School 5 (S5)**	**School 7 (S7)**
	*Four schools were approached	*Four schools were approached	*Four schools were approached
4	**Six learners participated: *High-Performers, Middle-Performers and Low-Performers***	**Six learners participated: *High-Performers, Middle-Performers and Low-Performers***	**Six learners participated: *High-Performers, Middle - Performers and Low-Performers***

**Subject to voluntary participation*
Source: Anriët van Deventer

(See *APPENDIX C: Detailed summary of the structure and participant codes & Summary of participants* | *Total* for more detail.)

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In *Table 1.2: Case study – Grade 11 Design learners* depicts the sample group of participants for this case study: 7 schools consisting of 8 Design teachers and 42 learners; in total, there were 50 participants. School 1 served as the Reference school in Category A. Category B represents high-performance schools, Category C represents middle-performance schools, and Category D represents low-performance schools. Each school had six learners representing different learning standards (two learners per standard), i.e., high, middle, and low. Each category had a Design teacher participating in the sampling group. The note to Table 1.2 above, *'Subject to voluntary participation',* refers to schools taking part in this study. By approaching four schools in Categories B, C and D (12 in total), I was afforded a broader spectrum of schools in those categories. Schools that responded positively to my request for voluntary participation in my research guided me in selecting the final two schools under each category. According to a category, each school had a total number of six learners, based on their performance in the previous year (Grade 10) and sub-divided into high, middle, or low performers.

1.9.3 Data Analysis

According to Burns and Grove (2009), data analysis is a means to abate and arrange data to create conclusions that the researcher must interpret. My interpretation focused more on *extracting meaning or usefulness from my data* findings. I acknowledge that in the natural setting of the Design classroom, nothing is predefined or taken for granted. As I intended to form an integral part of the data collection for the sake of objectivity in analysing and assessing the multiple viewpoints of *reality*, my research process was flexible in terms of direction, progression, and development.

As noted by Corbin and Strauss (2008), and Patton (1990), qualitative evaluation poses certain challenges. Most researchers feel overwhelmed when they start analysing the data they have obtained (Vaterlaus & Higginbotham, 2011). A high level of expertise is required to complete qualitative interpretation successfully (Vaterlaus & Higginbotham, 2011). However, to analyse my data collected, I will mainly use manual methods.

Throughout the data analysis, I accessed documentation and reports, such as the Road Show reports[6], relevant policies and publications, correspondence, and photos that were appropriate for this study. Qualitative research, according to McLeod (2017:2), is infinitely creative and interpretative. It is devised to allow a variety of data analysis approaches such as content analysis (Glaser & Strauss, 1967), theme analysis (Braun & Clarke, 2006), and discourse analysis (Fairclough, 2013:9). My chosen model was qualitative content analysis, which Hsieh and Shannon (2005:1278) define as *"a research method for subjective interpretation of text data content through a systematic coding process and identification of themes or patterns". "To make valid inferences*

[6] Annual DBE Gauteng Provincial Departmental meeting: discussion and feedback on the previous years' results of the final National School Certificate (NSC) Grade 12 examination.

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from the text, it is important that the classification procedure be reliable in the sense of being consistent", states Weber (1990). I consider this method suitable for the analysis of qualitative information, as it provides deep insight into and understanding of the participants and accurate classification and comparison of information before the data is summarised. The original data set had to be converted into usable evidence through a data reduction method based on explicit coding rules (Stemler, 2001:5). The data analysis focused on the actual content (primary data), as I applied it to determine the use of certain words, themes, phrases, and sentences in the sets of texts.

Lastly, Stemler (2001:7) explains that the richness and meaningfulness of the content analysis technique lie in its reliance on coding and categorising the data. Before I began with the analysis, the data was transcribed, which simply means that text from my interview notes, recordings or other memos was entered into word documents (Smit, 2002:66). I mainly used manual paper data analysis. It assisted me to generate codes and themes from the data derived from my interviews. I found manual analysis using Microsoft Word and sticky colour notes most suitable for the data collected for my study. Smit (2002:67) confirms that data analysis is broken down into pieces and re-joined in new ways in labelled themes. In this study, I grouped my loose data see *Chapter 4,* section *4.2 Part One: Design teachers' interviews* into three themes: Cognitive, Affective, and Empathic.

To continue, my data analysis was bundled into three parts. Part One the Design teachers interview analyses were guided by my research question and three sub-questions. The data was then further unpacked onto two levels [1] Descriptive presenting the data. [2] Interpretive looking at what was meant by the data. To serve as an analytical tool for Part Two and Part Three, I used the Van Deventer D+NQ Model to analyse the digital photographic data. The *Design Process* (Topic 1) was analysed using the Models' four stages and eight steps. Part Three, the *Design Product* (Topic 2), applied the Models' last stage, one step and five criteria to analyse the digital photographs from the D+NQ Model. These tasks have their roots in CAPS Design and PAT Guidelines for assessment. Also, see *Chapter 3: Design Thinking: Van Deventer D+NQ Model* for detail.

The type of encoding process I have chosen – open coding – highlighted the nature of the data provided by respondents. Open coding refers to naming, categorising, and placing phenomena through careful examination of the data collected. First, data is apportioned into unconnected parts, which are compared and interrogated using *what, where, how,* and *when* questions (Saldaña, 2013). The data is then compared, after which similar measures or patterns are clustered together and given the same conceptual marker (Smit, 2002:69).

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Finally, with open encoding, I segmented my data into meaningful parts to be able to describe them in single words or short words to identify them for final analysis. See *APPENDIX D: Qualitative data analysing process and phases* for more detail.

1.10 ETHICS

Ethics concerns confidentiality, how the research will be conducted, and how participants will be protected from both physical and psychological harm (Patten & Newhart, 2018:35). For the sake of confidentiality, I facilitated my research and protected the right to privacy of the participating schools, teachers, and learners' Design work, all of whom are identified by participant codes and avatars[7] and categorised accordingly – see *APPENDIX C: Detailed summary of the structure and participant codes*. Furthermore, I obtained approval and ethical clearance from the Research Ethics Committee of the Faculty of Education at the University of Pretoria (See *page iii*) to conduct this research. Permission was also granted from the Gauteng Department of Education (see *APPENDIX A*), to interview Design teachers and photograph learners' work to participate, and these were granted (see *APPENDICES N, O, P & Q* for approval letters). The level of sensitivity/intrusiveness was medium, although participation required divulging of personal information that was not regarded as sensitive/intimate (a direct reference to the Research Ethics Committee approval).

1.11 POSSIBLE LIMITATIONS OF THE STUDY

The study had certain limitations; not all the teachers who had been initially selected for the study participated. A total of 13 schools (ranking high-, middle- and low-performing schools) were contacted who DBE rank in categories of their NSC Design Class 12 results over the last five years. A final selection of 7 schools in total was concluded after all consent forms had been returned. This might also have put a limitation on the response time of the principals to approve or not.

Another limitation may be a prior impediment to exposure and exploration of Design and might be barriers for a Grade 11 learner because these learners had just completed Grade 10. Grade 10 CAPS Design mainly focuses on the four Design categories laying a solid Design foundation. The potential limited exposure to which I am referring is related to the *design process*, which requires a clear problem resolution from the Design brief (included see *APPENDIX I: Design brief | English and Afrikaans)* in this study. Besides, a factor that can negatively impact the availability of technology, data, and a stable Internet connection by Design teachers. Suppose the only access to technology is available in an office that is not secluded. In that case, the Design teachers might be more hesitant and calculated in answering the interview questions.

[7] **Source**: Avatars (a graphical persona depiction) of which 60% of the original designs have been changed for us in this thesis (Vectors, 2020).

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COVID-19 had its challenges: some interviews were performed on the Zoom online platform for the convenience and safety of both the Design teacher and me. In this regard, the interview through a laptop or even a cell phone proved to be the best option. The availability thereof determined the privacy of the interview taking place.

Other obstacles included delivering the Design learners' sourcebooks to the moderation centre – set as a collection point for my research data. Delivery of such work took place at different times as the Design teachers set their own schedules. Ideally, I had hoped to be present to receive the six Design learners' works per participating school. After that, I conducted, firstly photographing the sourcebooks, afterwards assessing (marking) *Design Process* (Topic 1) and *Design Product* (Topic 2) with my customised research tool Rubric B (peer-assessed) – see *APPENDIX S: The Design Process (Topic 1) – Sourcebooks and the Design Product (Topic 2) | RS1-S7: Graphic representation Design teachers' assessment marks (Rubric A) vs. Researcher assessment marks (Rubric B)* indicates differences in marks related to the teachers' subjective approach to a more objective view when I reviewed the *Design Process* and *Design Product.* Furthermore, as Rubric A offers more detail in each section, Rubric B was customised accordingly.

Finally, various government officials (DBE, Principals and Design teachers) were approached to allow access for the first stage, and possible limitations were not encountered, everything went smoothly.

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1.12 OUTLINE OF THE CHAPTERS

This research is presented in six chapters as illustrated here below:

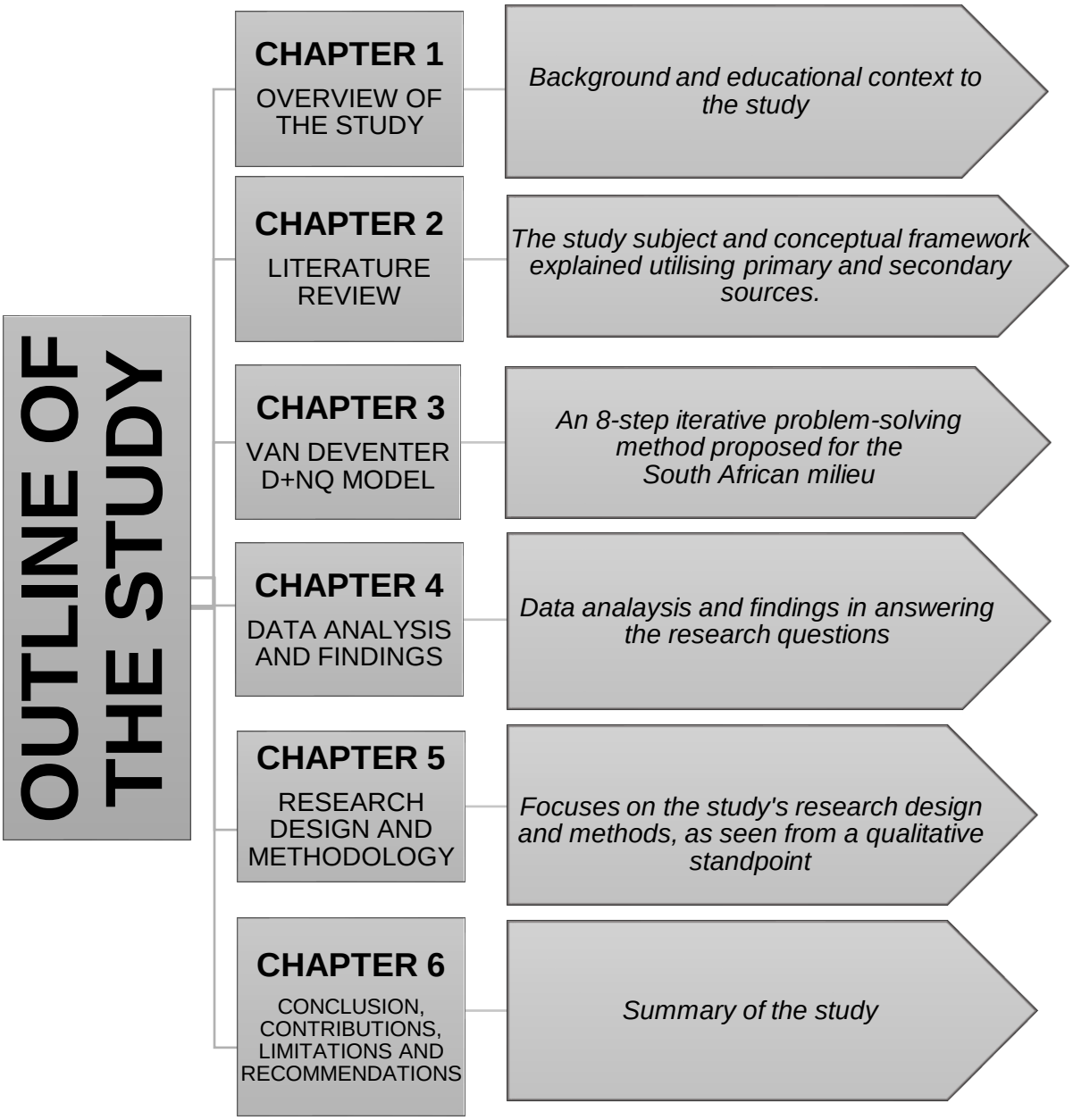


Figure 1.1: Diagram illustrating the outline of the study
Source: Anriët van Deventer

CHAPTER 1

The first Chapter provides South Africa's historical background context to the study and the research problem. The study's purpose is also stated in Chapter 1. The investigation, concept definition, and reasoning are guided by the crucial questions, which are important for the study's emphasis. It also acts as a primer on the research design, the research paradigm and the philosophical assumptions that underpin this study, a short overview of data collection and analysis, and all ethical

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considerations are provided. The Chapter concludes with a brief description of possible limitations of the research, followed by a conclusion.

CHAPTER 2

Chapter 2 presents the literature review for the research and explains the criteria for selecting available literature. This Chapter first explains what a literature review is, the aim of a literature search in the study, and how I conducted my literature quest. The literature review is thematically structured in the following order: what are;(a) different ways of thinking, (b) different creative taxonomies, (c) problem-solving, (d) the *design process*, (e) *Design Thinking,* and (f) *Designerly Thinking*. The different taxonomies of Bloom, Williams, Romiszowski, and the theory of Maslow and the theory of the six thinking hats by De Bono, are examined, which essentially include both creative and critical thinking (Krathwohl, Bloom, & Masia, 1964). Next, the context and place of Design education with the *design process* focus are described: NCS for Grades R-12 and CAPS Design FET Grade 10-12. More detail follows, with the focus on Practical Assessment Task 2018 (PAT) and its focus areas, i.e., *Design Process* (Topic 1) and the *Design Product* (Topic 2). This Chapter also presents the Conceptual Framework. Finally, Chapter 2 looks at visual thinking and briefly discusses the comparison between product versus process.

CHAPTER 3

The third Chapter presents a new design process as a problem-solving model for use in South African schools and beyond if possible. Explaining its use, the aim of this Model is intended for the expansion of the Design educational praxis starting as early as possible, from Grade R to Grade 12. In addition, this proposed innovative approach has a generic use too as it allows application in business, engineering, and any other sector. Hence, I present the Van Deventer D+NQ Model in an attempt to answer the third sub-question, "*How can Design teachers enhance diversity in creative and critical thinking by an innovative and easily applicable Design teaching model?*".

CHAPTER 4

Chapter 4 aims to present a discussion of the results, findings, and data analysis to answer the main question and focus of this study, namely, *"How do teachers interpret the design process?"* The two sub-questions, *"Why do teachers interpret the design process the way they do?"* and *"How does their interpretation influence their teaching of the design process?"* are discussed and answered. There are three parts to this Chapter. Part One seeks to address the primary research question and the two sub-questions, while Parts Two and Three employ the Van Deventer D+NQ Model as a tool for analysis. Associated with Part One, three themes emerged in response to the research questions: the teachers' viewpoint on the *design process*, their interpretation of the *design process*, and why they maintain this perspective. The semi-structured interviews with the Design teachers were used to answer the primary research question and the two sub-research questions. Part Two is the *Design*

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Process (Topic 1), and Part Three, the *Design Product* (Topic 2): digital photographs research data is presented and analysed, and at the same time, the D+NQ Model is tested. Finally, data collected with assessments conducted by the Design teacher, using Rubric A and myself, using Rubric B were used to make comparative graphs.

CHAPTER 5

The research design and methods route to this study are discussed in Chapter 5. This Chapter delves into the philosophical assumptions that drive my research and discusses why I chose a qualitative and a case study approach. To continue, further exploration of the What, Where and Why is broken up into sub-sections. Then, in this segment, I will discuss the research location and data collection methods that I used in my study. Following that, the data instruments, sampling procedure, and data analysis method are explained. The data collecting technique and data analysis methods are then described. Finally, the Chapter concludes with a description of the study's ethics and the instruments' trustworthiness.

CHAPTER 6

The recommendations related to the findings and reflections are provided in Chapter 6. Furthermore, the Chapter highlights the study's limitations, potential contributions, implications, and proposed topics for further research before concluding with a synopsis of the study.

1.13 SUMMARY

In this chapter, I set out to give an overview of my study. It summarised how the research is conducted by outlining the background of the research, as well as the educational context within which the study has been directed. The chapter highlights the focus, significance and critical questions of the study. In the next chapter, I establish the presentation of my literature review and conceptual framework used in this research.

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CHAPTER 2

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

In this chapter, I will describe what a literature review is, its function in the study, and how I conducted my literature search, emphasise the purpose of my research, unpack important concepts, and the significance of each component in the study. As for my conceptual framework, theories by scholars regarding Design thinking, creative thinking, critical thinking, and problem-solving are closely looked at, in particular, Williams' and Bloom's taxonomies as they are referred to in the *Curriculum and Assessment Policy Statement* (CAPS) *Further Education and Training Phase* (FET) *Design Grade 10-12* (2011). In addition, critical and visual thinking and other thinking models are unpacked. The two documents, CAPS and *Practical Assessment Task (PAT) (2018)* are highlighted. They further serve my argument in the discussion of my proposed approaches, *Designerly Thinking* and *Design Thinking*, which I introduce in Chapter 3 with the *Van Deventer D+NQ Model*.

A literature review is a critical evaluation and synthesis of historical and current literature in a specific field of study (Fox & Bayat, 2014:35). According to Fox and Bayat (2014:49), a literature search serves many purposes, including broadening horizons, preventing repetitive research, placing contextual research work that has already been performed, providing a framework for further research, and determining the need for research. Furthermore, a literature review requires good planning and rewriting because the research goal, purpose and objectives are kept in mind. What I have read has been questioned and evaluated, it took time to develop the reading skill critically (Fox & Bayat, 2014:49). Furthermore, my literature study is presented as different topics. Lastly, the spectrum of this part of the study covers the most relevant literature on *Design thinking* or higher-order thinking theories, purposefully selected to provide a well-substantiated conceptual framework that supports and guides my arguments and approaches and assessments to the rest of my work.

2.2 LITERATURE REVIEW

2.2.1 Design Teaching

The least achievable objectives and standards, the methods, and procedures for measuring learner performance, are regulated and relevant to public and independent schools under

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section 6(a) of the South African Schools Act, 84 of 1996 (RSA, 1996). The generic outcomes and aims for learners are described in section 1.3(d) of all CAPS documents (DBE, 2011:5). To analyse which of the generic outcomes have been achieved by learners, evidence from the Design CAPS itself is obtained as the subject ascribes to the generic outcomes and aims (DBE, 2011:4). Furthermore, the Design CAPS provides and addresses principles of knowledge, skills and values worth learning in the South African and international school context. Moreover, the *PAT Assessment Guidelines* (DBE, 2018) gives guidance for assessing Design PATs from Grades 10 to12.

In this context, I use the CAPS (DBE, 2011) and PAT (DBE, 2018) documents relevant to Design studies significantly as guidelines to analyse Design teachers' engagement with and their interpretation of the Design CAPS document. Primarily, I focus on the practical part: the *Design Process* (Topic 1) and the *Design Product* (Topic 2). In addition, I also discuss literature related to the teaching of the *design process* and its pedagogic content.

Concerning CAPS minimum outcomes and standards of learners' performance, Reigeluth (1999:19) points out that there are many diverse kinds of thinking and learning (Gardner, 2012), most theorists (Bloom, 1956; Briggs & Wager, 1992; Gagné, 1985, 1992) classify kinds of learning in three areas: cognitive, affective (emotional), and motor skills. Having previously observed how Design teachers interpret the CAPS document, I set out to discover more to serve as background knowledge. Then, I turned to the writings of Eisner (2004) with specific reference to curriculum design. Continue, Sternbergs' (1999, 2016) scientific work on creativity and creative thinking is remarkable and continues to be explored by scholars. Furthermore, relevant publications pointed at the necessity for creative and critical thinking skills in the 21st century. For example, according to Schwab (*Council for Scientific and Industrial Research* [CSIR], 2018):

> *"Previous industrial revolutions liberated humankind from animal power, made mass production possible and brought digital capabilities to billions of people. However, the fourth industrial revolution is different, and it is characterised by a range of new technologies that are fusing the physical, digital and biological worlds"*.

Regarding the clarification as mentioned above, the 4IR is characterised by technological integration, which blurs the borderlines between the human, physical, digital, and biological fields. Although we are considered to be in the 4IR, scholars like Gauri (2019:1) already describe our presence in the *Fifth Industrial Revolution* (5IR). Gauri writes the 5IR re-directs receptiveness to 21st century needs to *"re-connection of innovation to flourishing humanity"* (Gauri, 2019:1). Therefore, it is desirable to use 4IR technology to save the earth and make humans and technologies tap collectively into the 5IR. Taking the above into account whilst

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considering my research questions, I placed my study in the experiences of the 4IR to reach the aims of this research. Aforesaid, creative, and critical thinking skills are essentials in the 21st century. Webster (2002:11) notes that *creative thinking* is a term based on creativity, in other words to give concrete, tangible form to one's inspiration. Finke, Ward, and Smith (1996), offer another view on creativity in a cognitive framework, including themes like perception, problem-solving, recollection, and enlargement.[8]

As for critical thinking, an affirmation by Ennis (1985:45), Norris (1985:43), Ragins and Cotton (1999), and Tosuncuoglu (2018:26) refers to thinking creatively. For example, according to Ennis (1985:45), critical thinking is rational since reflective thinking is concerned with determining what to believe or do. On the other hand, Norris (1985:43) refers to critical thinking as support to learners to apply everything they already know and feel to evaluate their own thinking and, in particular, to change their behaviour. In his book, Ware (2010:3) addresses the scientific foundations of design work. He argues that visual thinking brings perceptual science, an active process involving selection, inference, and interpretation, to the art of design. Oxman (2004:65) repeatedly emphasises that developing thinking skills is crucial to Design education. Besides, Austin (2015:2) proposes *"design as a creative act that incorporates thinking, and therefore knowledge, and includes important contemporary distinctions about design (designing), design knowledge, design praxis and design thinking".* I believe that all these thinking skills contribute to the successful development of novel solutions to problems in the end. Relevant knowledge and a well-structured theoretical basis will obviously result in mastering *design thinking*. To consolidate their similarities and differences, concepts such as analytical thinking, rational thinking, lateral thinking, and visual thinking will be referred to.

In the setting of Design education, which accentuates the development of thinking skills, *Design thinking*s' basis is grounded in understanding people and their needs, and in doing this, we try to create products, services, or experiences suitable for them, therefore, motivated by sentiments of *empathy*. For example, Hill (1998), Mawson (2003), Potgieter (2013), Rowel (2004), Williams (2000), and Wong and Siu (2012) propose a procedure that first defines user-experience issues, then drills down into questions, followed by creating possible solutions, testing them, and finally reflecting the results. Besides, when it comes to tackling current issues, Cassim (2013:1) sees design as a legitimate and beneficial method of thinking.

[8] For further information on creativity, see Webster (2002:5) who refers to two volumes published in the past decade as excellent compilations of creative topics. The second mentioned volume, is edited by Sternberg (1999) and published by Cambridge University Press. According to Lin (2011:149), this volume may well be the most comprehensive and authoritative in the creative field since it contains 22 chapters written by numerous eminent current scholars.

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Furthermore, Cassim (2013:190-201) flouts South African traditional Design education and emboldens greater commitment to the country's current social, economic, and environmental problems through a more human-centred design mindset[9].

Design broadens the range of problem-solving abilities in this way. Consequently, changes in Design praxis and an improved appreciation of the design process as a strategic tool have become indispensable incentives for the broad, continued growth, acceptance, and appreciation of Design. Notably, facilitation for unceasing development through the *design process* or *Design thinking* has been discussed for more than 30 years in academic dialogue by authors such as Lawson (2005), Schön (1983), and Wrigley and Straker (2017). Therefore, they describe and reflect on the way designers as *problem solvers* [my emphasis] think. In addition, some researchers (Flowers, 2010; Jones, Buntting & De Vries, 2013; Lawson, 2005; Potgieter, 2013; Pudi, 2007; Williams, 2000) describe the conceptualisation stage in the DTF as a *problem-solving process*. All the researchers mentioned here uphold the significance of the *design process*. In my study, I will unpack the differences and similarities of the *design process* within the DTF.

Nonetheless, the disjuncture between a scientific method (CAPS descriptive) and the *design process* (practical application in class) urged Lawson (2005:81-82) to place a warning on the argument if a solution carries merit or not:

> *"However, we must not expect the design process to be as clear, logical and open a process as the scientific method. Design is a messy kind of business that involves making value judgments between alternatives that may each offer some advantages and disadvantages. There is unlikely to be a correct or even optimal answer in the design process, and we are not all likely to agree about the relative merits of the alternative solutions".*

Yet, Vande Zande, Warnock, Nikoomanesh and Van Dexter (2014) affirm that Design teachers can have a lasting impact on learners' lives and professional skills by teaching them the *design process*. Although the PAT Guidelines document is very descriptive in outlining practical tasks, especially in Grade 12, I firmly believe there is a need to examine how the teachers engage with its content. Then, to collate these expectations, as indicated in the document Design PAT (DBE, 2018:13), I too discuss the two cognitive level descriptors for practical projects, namely the taxonomies of Bloom (Adams, 2015; Bloom, 1956) and Williams (1969), and also unpack the models following the aims of the CAPS document in the next section of this chapter. Furthermore, as stated in my context, critical and creative theories, visual thinking, and other

[9] Human-centeredness is based on the concept that human knowledge and behaviour are intricately linked; what relics are closely connected to how their users see them, imaginatively engaging with them, utilise them, and express their interest in them to others (Krippendorff, 2004:48).

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related creative taxonomies and theories, such as *De Bono's six thinking hats theory* (De Bono, 1987; Kivunja, 2015:380–391), will be considered. Therefore, I use the DTF as guidelines for solving problems encountered in the practical teaching of Design.

Through the development of my literature review, I encountered scholars' various perspectives on how the *design process* should unfold (Lawson, 2005; Wong & Siu, 2012). According to Mawson (2003) and Williams (2000), some researchers apprehend the *design process* as being *linear*. Steyn (2020:345) reiterates that teachers generally understand the design process as a single linear process, meaning that learners "*are expected to follow these steps 'sequentially and diligently' in their projects*". However, Williams (2000) argues that the ideology behind this systematic process can be taught. Notwithstanding the rigid process approach, it is inviting to teachers because the CAPS document provides a basic structure for Design teaching. Yet, most of the teachers do not necessarily apply this rigid process but instead make use of it as a '*check-list*' and often work backwards to fill in the missing ticks. In contrast to the rigid process approach, Brown (2009) and Lawson (2005) view the *design process* as an *iterative* procedure, defining it as a repeated process that generates a sequence of relevant outcomes (Hill, 1998:203). Hence, Brown (2009:86) believes that Thomas Edison's (1847-1931) approach, an early example of Design thinking, reflects the full range of innovations with a people-oriented design philosophy (De Freitas, 2016:21; Giacomin, 2014). Thus, whatever the Design teacher does in class depends on the extent of his or her knowledge of the design process and the pedagogy used in learners' practical training. The literature on the teaching of the design process and pedagogic content knowledge is reviewed to weigh the argument that teachers' views of the design process influence their involvement with and implementation of the design process (Shulman, 1986:4-14).

Conversely, *design process* skills are not exclusively applicable to the subject Design. Mioduser and Dagan (2007:155, 156, 159-160) maintain that to develop capabilities and skills in Technology, learners must engage with the *design process*. Similarly, in Design teaching, it is essential to examine what the *design process* entails. According to the Department of Basic Education (DBE, 2011:8), for the Design learner, this process consists of the following main activities by which (1) a problem or need is identified; (2) the problem is investigated; (3) a solution is suggested; (4) a product or prototype is created, or a service is proposed; (5) the evaluation of the outcome of the *process* by accessing the product or the service; and finally by (6) communicating the results. Likewise, Jones, Buntting and De Vries (2013) hold that the *design process* is fundamental to the South African Design education curriculum. According to Pudi (2007), the *design process* describes all that should take place from the birth of an idea, through its development, and until the end (the outcome). Therefore, it is essential to

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know how the *design process* is structured to be used to address and solve problems or unmet needs in the design context. By making the *design process* the focus, my reading was extended to international studies with the *Design Thinking* process as their research objective, including the writings of Tambunan and Napitupuluand (2016), who propose an interactive multimedia-based learning model. Ohemeng-Appiah (2014) focuses on teaching the *design process* in the Technology class and contends that the relevance to critical engagement with this source lies in the fact that the *design process* is also the basis of the learning plan, including in Technology education. Significant works by Brown (2009), Cassim (2013:190-201) and Giacomin (2014) present a human-centred approach to creative problem-solving. And Eisner (2004:4) argues that a curriculum that includes music, dance and art is essential to developing thinking skills in learners.

Following through, Johansson-Sköldberg, Woodilla and Çetinkaya (2013:121) advise Design teachers to apply the two most important and applicable educational approaches to motivate creativity among their learners. These approaches are –

- *Designerly thinking*; and
- *Design thinking*.

The succeeding learned approaches also have a significant academic following (Johansson-Sköldberg *et al*., 2013:124). Their scientific work is easily accessible and has been featured in many sources I reviewed. They are presented hereafter in a summative format, highlighting the focus area of the scholar. I will be starting with Simon's (1969) approach – *Design and Designerly thinking* as the *production of elements*, as I highly regard his scholarly work, which is very relevant and insightful in the field of my investigation*;* Schön's (1983) – *Design and Designerly thinking* as an *activity that is reflective;* Buchanan's (1992) – *Design and Designerly thinking* as an *activity to solve problems;* and Lawson's (2005), Owen's (2007), and Cross' (2011) – approach *Design and Designerly thinking* as a method of *deducing/making meaning of events* – as important sources of identifying, exploring, and supporting selected concepts in my study. Given the above, the two proposed approaches need to be examined more closely.

Cross (1982:221) introduced the ***Designerly thinking approach***, and Nelson and Stolterman (2012:21) explain that the notion is based on ***"a philosophical approach that examines the process and methods used by designers from a human-centred perspective"***. To continue, Baynes (2010:17) states that placing *'Designerly thinking*' at the core of Design education will contribute enormously to learners' ability to deal creatively with economic,

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environmental and social problems. During the *design process*, judgement is affected by both theoretical knowledge and practical experience (Gyabak *et al.,* 2015:256). In this context [*Designerly thinking*], the problem-solving process comprises a synthesis, specifically, a combination of theoretical and practical components to form a meaningful whole (Gyabak *et al*., 2015:256).

Design thinking**,** on the other hand, refers to *a* ***mindset and process used for learning*****,** ***collaboration and problem-solving.*** Notably, the design problem outlines the outcomes and scope of the project. In practice, *the design process* is a structured framework that identifies challenges, gathers information, generates potential solutions, refines ideas, and tests solutions. Importantly Brown (2009:10) succinctly states that *Design thinking* involves creating solutions and then making choices.

In this research, the link between *Design thinking* and *Designerly thinking* is central and is accurately analysed. I am committed to exploring the *design process* in its various forms to have a wide array of reference areas for different existing models and studies (Buchanan, 1992; Cross, 2004; 2011; Krippendorff, 2006; Lawson, 2005; Schön, 1983; Schön & Wiggins, 1992; Simon, 1969). Various theoretical approaches have been utilised in investigating *designerly thinking*, according to Johansson-Sköldberg *et al*. (2013:127). Some researchers examined protocol analysis research to gain an understanding about designers' interpretation of their own work processes (Galle & Kovács, 1996; Ho, 2001). Another technique teaches learners *Designerly thinking* using prescriptive judgment procedures (Leong & Clark, 2003; Oxman, 2004). Finally, Johansson-Sköldberg *et al*. (2013:131) argue for both *Designerly thinking* and *Design thinking* as unending design practices, a reality that is not an isolated and lucid practice and is by no means standardised but remains the foundation for generalisations, descriptions, and theories in both discourses.

To summarise, my critical engagement with the literature remains based on the *problem-solving process*, as discussed in the publications of Cross (1982) and Brown (2009). Most notable are the five stages-approach in the DTF by the Hasso Plattner Institute of Design at Stanford University's d.school and *collaborative design in practice* by Lawson (2005). According to Lombard and Grosser (2008:572), learners need to become considerably more conscious of their own learning and think independently of their teachers.

However, learners generate their own patterns of thinking and meaning from the material provided to them as they learn to think critically, go beyond the Design brief's content, and reflect and interpret their knowledge by taking risks in the learning process. These findings

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underline the importance of the planned study. As Kwek (2011) and Owen (2007:25) state, the new challenges and context confronting our learners require new 21st century competencies and skills. According to Mtshali (2014), employers worldwide cannot find the talents they require in the workplace. The 21st century's *super skills* are defined by Kivunja (2015:225) as shorthand for all the skills needed for a successful career and life, namely the 4Cs – collaboration, creativity, critical thinking, and communication. Finally, authors such as Burmeister (2013 cited in Rabie, 2015), Carroll, Goldman, Britos, Koh, Royalty & Hornstein, (2010), and Faust and Howland (2013) promote research that investigates the implementation of *Design thinking* in the classroom.

2.3 THE CURRICULUM AND ASSESSMENT STATEMENT POLICY (CAPS) DESIGN FET GRADE 10-12

In terms of implementing the Design curriculum, as prescribed by the Curriculum and Assessment Policy Statement (CAPS), the research investigated problems related to educational policies and their relevance to teaching and learning issues in the Design classroom. I focused on CAPS' practical part, namely the *Design Process* (Topic 1) and the *Design Product* (Topic 2). I regard this research topic as worthy of investigation in the context of the existing learning plan for Design education in South Africa, and in the context of the skills required in the 21st century, specifically that learners must be well-trained in solving different problems by utilising problem-solving [*design* – my emphasis] *processes*. Therefore, I aim to identify any existing problems in the current curriculum, propose solutions, highlight strong points, and given my findings, suggest ways for improvement, especially concerning my two proposed approaches, namely *Design thinking and Designerly thinking*.

2.4 PRACTICAL ASSESSMENT TASK 2018 (PAT)

The Practical Assessment Task Guidelines (PAT) (DBE, 2018:7) document contains guidelines for a Design brief, for example: *"…a problem/need/opportunity should be identified that gives the learner the opportunity to create an aesthetically pleasing functional design solution".* In practice, however, I believe that the problem-solving process is not applied correctly or may even be skipped since learners are instructed to initially focus on creating the final product and then work *backwards* to complete the process. This could indicate a lack of proper planning or poor time management on the part of the teacher or, more importantly, a misinterpretation of the CAPS document for Design (Topic 1 & Topic 2). In addition, the design task (Design brief) includes Design in a Business Context (DBC), which refers to a research

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project that must be completed each semester along with the process phase (Topic 1). See *Table 2.1: PAT | Summary of activities* below.

Table 2.1: PAT | Summary of activities

SUMMARY OF ACTIVITIES	
LEARNERS	**TEACHER**
Investigate approaches	Presents brief
Experiment with materials	Provides source material where needed
Generate original ideas	Provides a stimulating environment
Produce designs	Guides learners in making choices
Work in groups	Shows PowerPoint presentations
Employ safe working practice	Shows YouTube videos
Reflect on process and practice	Uses the Internet on a projection screen
Use correct terminology	Explains processes, material, methods, techniques
Compile findings systematically	Relates practical project towards theoretical concepts Design Theory
Present brief professionally	Assesses the outcomes of lessons
Exhibit in an interesting and professional manner	
Take responsibility for one's own actions	

Source: PAT Guidelines (DBE, 2018:3-4)

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2.5 CONCEPTUAL FRAMEWORK

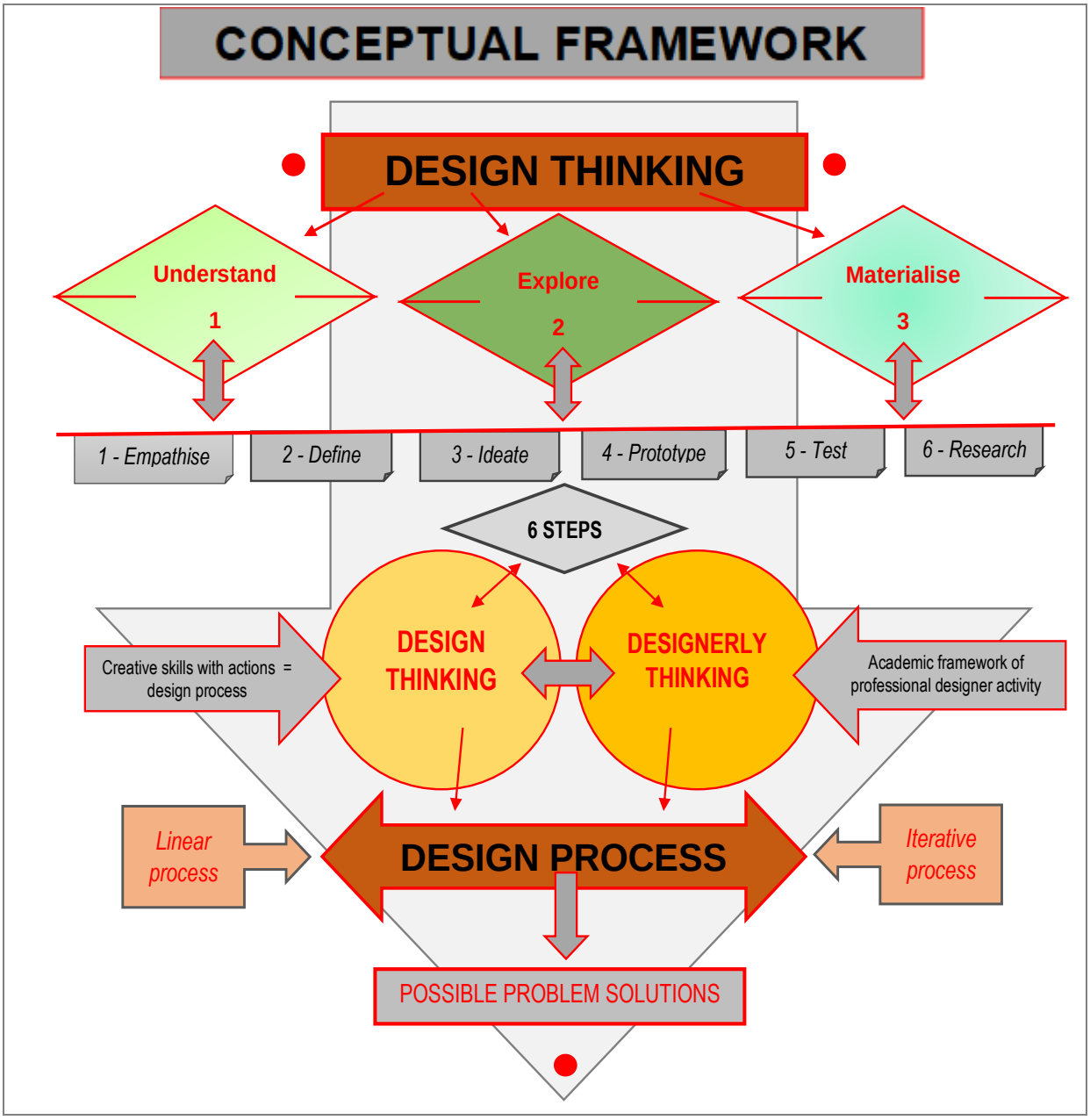


Figure 2.1: Conceptual Framework
Source: Anriët van Deventer

2.5.1 Interpretivism

As for my paradigm, as discussed in Chapter 1, *1.7 PARADIGM – INTERPRETIVISM*, I decided on *Interpretivism* because the study engages both the researcher and the human subject. Therefore, Design teachers and learners are the essential instruments used to measure phenomena relevant to this study.

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According to Babbie and Mouton (2008:28), interpretivists seek understanding of people and their world, as they are focused on biased individuals' subjective experiences (Pizam & Mansfeld, 2009:1) rather than generalising and predicting cause and effect (Hudson & Ozanne, 1988; Neuman, 2000). The interpretative paradigm is based on a more flexible and individualised research approach (Carson, Gilmore, Perry, & Gronhaug, 2001), which is open to the nuances of human contact (Black, 2006) and a focus on what is thought to be true (Carson *et al*., 2001). Although Interpretivism typically involves observation and interviews (Design teachers) as research tools, only interviews are used in this study. My approach is semi-structured interview questions (55 questions) embroiled in four parts.

My study is an inductive inquiry that follows a logical reasoning process by which multiple pieces of evidence are considered, adequately assessed, and combined, leading to a specific and valid conclusion. Therefore, this work falls in the interpretivist paradigm (to confirm as stated above) and adopts a qualitative approach as a methodology. As Punch (1998:4) indicates, qualitative research is empirical (verifiable by experience rather than theory) with data based on standards, not numbers. Finally, qualitative research employs a multi-pronged strategy that follows an interpretative, realistic approach to the topic (Denzin & Lincoln, 1994:2). My decision to set the study field in the Design classroom is an attempt to make sense of the phenomena researched in this study. Next, I will unpack my conceptual framework. See *Figure 2.1: Conceptual Framework* above.

2.5.2 Design Thinking

In my study, I provide a conceptual framework based on model integration in *Design thinking*. The term *Design thinking* dates from the 1960s and is now globally applied in numerous sectors. Furthermore, in secondary education, *Design thinking* refers to unlocking the creative potential of learners. It aims to generate, embrace, and execute new ideas and find a new way of doing and finding solutions. *Design thinking* can also be applied to resolve broader issues, for example, in business and society. Moreover, according to Puccio, Cabra, Fox and Cahen (2010:155), *Design thinking* is based on visual and empathetic thinking.

To continue, unlike analytical thinking, which analyses how current resources and expertise may be utilised to address *an issue*, *Design thinking* focuses on the *end objective and design process* rather than the present situation or design challenge. *Thus, Design thinking* is all about learning by doing (Melles, Anderson, Barret & Thompson-Whiteside, 2015:205; Oxman, 2004:72). Noticeably, the Hasso Plattner Institute of Design at Stanford University has identified the following five stages in the DTF:

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1. Empathise: be mindful to the individuals you are creating for and learn more about them.
2. Define: form an opinion based on user wants and knowledge.
3. Ideate: generate ideas and come up with unique solutions.
4. Prototype: develop a model of one or more of your concepts to exhibit to others.
5. Test: return to your user group and get their feedback on your thoughts and recommendations.

In addition to the above institute's model of the five crucial stages of the *Design Thinking* process, per the CAPS requirements, I propose research as a sixth, equally important phase. Besides, I firmly believe that adding *research* to the model will increase the understanding of the problem in question:

6. Research: study the background, other design solutions and concepts (DBE, 2011:8).

Essentially, these six phases are noteworthy in that they are not sequential (that is, they do not occur in a certain sequence); they frequently occur in tandem and are repeated continually. Therefore, the DTF is not to be understood as a step-by-step or hierarchal process; it is an overview of the stages that contribute to an innovative project (Dam & Siang, 2018:14, 15). Michl (2002:9, 15) also posited that a sixth step, namely *Redesign,* could be added to the institute's model if required. *Design thinking*, therefore, involves deliberately seeking people with different perspectives, knowledge, skills and experience to create practical solutions to real-world problems. It is a framework for solving problems systematically and encouraging innovation. Therefore, it encompasses multiple dimensions of the creative process and requires creative and critical thinking.

The DTF follows an overall flow of (1) understand, (2) explore, and (3) materialise. These broad categories include the five steps: empathise, define, ideate, prototype and test (Brown, 2009; Stanford University, 2020), see *Figure 2.2: The Design Thinking process*. In addition, CAPS (DBE, 2011:8) requires a research phase as part of the problem-solving goal, as shown in *Figure 2.3: Graphic representation of the non-linear Design Thinking process*.

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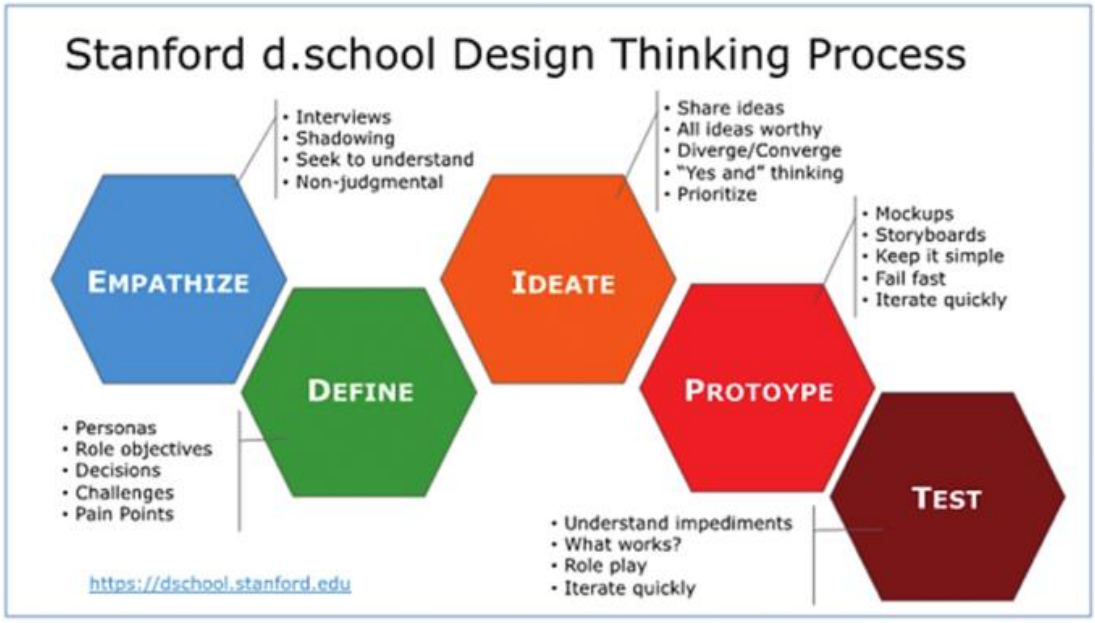


Figure 2.2: The Design Thinking process
Source: Stanford University – d.school

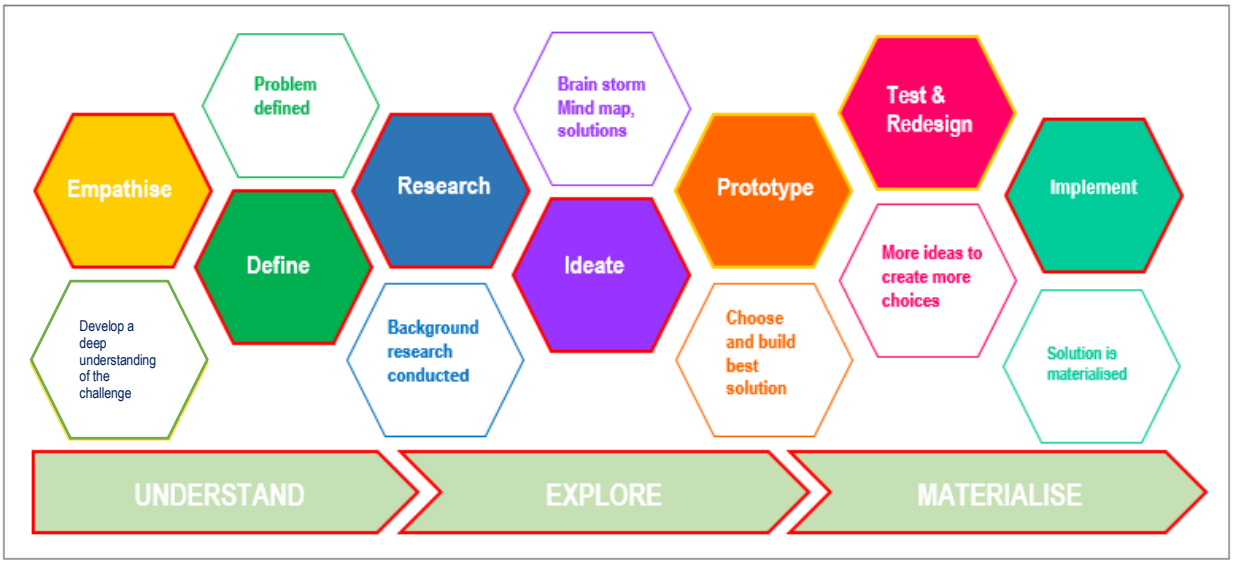


Figure 2.3: Graphic representation of the non-linear Design Thinking process
Source: Adapted from Gibbons (2016) and Illinois Center for Innovation in Teaching & Learning (2018)

The *design process* is a practical and creative approach to solve challenges in the classroom. To continue, I emphasise *Design thinking* as solution-based thinking, and it starts with a goal or what is to be achieved, instead of a relative problem, thereby helping to enhance creativity and capability to innovate. Buchanan (1992) was an early adopter of a *designerly view to design thinking* (Johansson-Sköldberg *et al.*, 2013:125). He built on the *wicked problem approach* of Rittel and Webber (1973) as an accepted step-by-step approach. Johansson-Sköldberg *et al*. (2013:125) elaborate on the *design process* as being divided into two stages:

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first, the problem definition's analysis part, and second, the synthetic sequence of solving the problem.

According to Rancourt (2016), the emphasis is on future targets rather than current limits, *"challenges the status quo and forces you out of your comfort zone".* When using *creative design processes*,

> *"…you often end up completely discounting existing problems, instead uncovering an unexpected approach that could ultimately lead to an entirely new business model [problem or design solution]".*

Rancourt (2016) adds that *the process* must tolerate and even embrace ambiguity and failure.

Noticeably, influential mainstream international *Design thinking* entities include the Hasso Plattner Institute of Design, d.school at Stanford University, and IDEO (a global design company founded in 1991). In South Africa, the Greenside Design Center in Johannesburg, and The IDEA Collective, South Africa, an initiative started by Des Laubscher (Director of the Greenside Design Center), are taking the lead in training implementation and practice regarding concepts and approaches in education. To elaborate further, the *Design thinking* model 2019 used by The IDEA Collective is based on the core iterative model applied by designers across the globe. Furthermore, the hallmark of the IDEA model is the focus on embedding creative thinking and complex problem-solving in all aspects of life. Lastly, the model takes the individual through four different phases (engaging, explaining, exploring, and expanding) and, thus, achieves a complete exploration investigation cycle (Eriksson, 2019:2).

Furthermore, *Design thinking* is utilised in the IDEO approach as a tool for teacher innovation and to improve the relevance of the classroom experience. *Design Thinking for Educators Toolkit 2012* from IDEO is a useful online resource. Hence, teachers follow the steps to discover, interpret, conceive, experiment, and evolve. Carroll *et al*. (2010:39) point out that *"design thinking requires learners to identify problems themselves".* Therefore, keeping in mind the challenges of our multicultural environment and the developmental challenges learners face, innovative thinking is essential in South African schools (Rabie, 2015:24-25).

The Hasso Plattner Institute of Design at Stanford University (d.school) builds on methods from all areas of design to create learning experiences that help people unleash their creative potential and apply it to the world. Whereas Stanford's educational approach is to equip learners with *design thinking* skills that will help them solve challenges more originally and comprehensively.

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I use the DTF adopted from the two main *Design thinking* entities, namely IDEO and Stanford University, and refer to these frameworks as the *design process*. Moreover, by way of explaining my choice of DTF, I would like to point out that Johansson-Sköldberg *et al.* (2013:125) examines the *Design thinking* discourse, which takes on diverse connotations varying on the situation.

In conclusion, separating the two discourses appears to be an organised approach to explaining *Design thinking* in this study. *Designerly thinking* refers to the theoretical thinking and academic foundation manifesting in a professional designer's work as shown by his/her practical abilities and talents and of understanding and characterising the designers' non-verbal skills. Furthermore, *Designerly thinking,* because its linkup theory and practice from a design viewpoint, is grounded in the academic discipline of design. Therefore*, Design thinking* is the second discourse of discussion. Besides, this phrase is appropriate when design practice and expertise are used outside of the design environment. Lastly, Johansson-Sköldberg *et al*. (2013) define *Design thinking* as a streamlined form of *Designerly thinking* that describes designers' approaches used in an academic or practical conduct context.

2.6 THE DESIGN THINKING FRAMEWORK – DESIGN PROCESS

2.6.1 Introduction

In this study, *Design thinking* is viewed in the context of the skills essential in the 21st century, namely that learners must be able to solve various problems using problem-solving processes. Cassim (2013:192) and Potgieter (2013:954) have shown that the curriculum for schools in South Africa considers the *design process* applicable in various subjects. Furthermore, according to Cassim (2013), the *design process* is seen as the backbone in the outcomes of practical processes and learning areas. This prominence given to the *design process* in the South African school environment led to this research project.

Lastly, the term *Design* has also been defined as a psychological process of *making and shaping text* by creating expressive marks [and symbols] (Janks, Dixon, Ferreira, Granville & Newfield, 2014:8; Steyn 2019:157). Cross (2011:78) and Lawson (2005:289-301) seem to be pursuing the traditional approach of *Design thinking* initiated by Schön (1992:3).

2.6.2 Design Process

In proposing a model of the *design* process, Lawson (2005:234) describes the complex process of the design strategy in a series of process-driven stages, whereby Cross (2011:78),

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through repetition, outlines the *design process* used by designers. Yet, Johansson-Sköldberg *et al*. (2013:121) refer to these two proposed *approaches* as *discourses* in the *design process*. They examine the debate over *Design thinking*, which takes on multiple meanings depending on the situation. Botella, Zenasni and Lubart, (2018) describe the *design process* as a *creative process* to be more related to physical production and literature writing alike. Additionally, they refer to the Wallas Four-stage Creativity model in this regard. Wallas (1926) wrote *The Art of Thought* – an astute theory that outlines the four stages of the creative process, based on his empirical observations of poets, artists, famous inventors and polymaths (Cropley & Cropley, 2012). Notably, creativity as a process is described as preparation, incubation, illumination, and verification, which are four steps in the *Wallas Model of Creativity* (Botella *et al*., 2018).

Within the management area, *Design thinking* is regarded as the most acceptable method to be creative and inventive. In contrast, *Design thinking* in the design ambit can be partly neglected and considered as standard, regardless of a long history of scholarly debate and development (Johansson-Sköldberg *et al.,* 2013:121). In the design field, there are various discussion on *Design thinking* or various epistemic underpinning for characterising what designers practically do. These techniques do not compete with each other but should rather be regarded as equivalents of each other. *Design thinking* management discourse, according to Johansson-Sköldberg *et al.* (2013:121), has three separate roots but has a more artificial and general nature and is less academically anchored than the *designerly* approach. Furthermore, *Design thinking* seldom refers to *Designerly thinking*, impeding the development of a proficiency structure. Further research to link the approaches is being anticipated by Johansson-Sköldberg *et al*. (2013:121). Contrary to Simon (1969), one may well express that Krippendorff (2006:23-24) effectively reversed the connection between the design idea and its aim.

The *Design Product* (Topic 2) is the core for Simon (1969), and he is likely to claim that 'meaning' is an element, methodical, but 'meaning' is at the centre of the *design process* for Krippendorff (2006:24), and the creation/design/solution becomes a way of expressing these '*meanings*'. Furthermore, Steyn (2019:166) believes that the current problem in *design classrooms* in South Africa is that, although several qualified teachers have an outlook of a *designing mind*, the problem-solving mentality is pedagogically obligatory with the design classroom's teaching requirements under the CAPS document.

However, *designing* is different from *design*: designing itself is a process, in its own right, as part of making. At present, in most cases, schools do not adopt a process-based design approach. As a result, in addition to the work that most teachers allow their learners to do in

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the current school system, especially in the FET Phase, conceptual thinking is not fulfilled (Steyn, 2019:166).

Clearly, both *Designerly thinking* and *Design thinking* signify to be persisting design practices. This reality is not an isolated and straightforward practice and is far from standardised, but it serves as the basis for generalisation, analogies and theories, in all methods (Johansson-Sköldberg *et al*., 2013:131). Johansson-Sköldberg *et al*. (2013:131) further recap that they belong to different categories of literature. The *Designerly thinking* approach is a more scientific debate in which the diverse authors refer to and cite each other, either as cohorts or in disagreement as options. Hence, *Design thinking* can be seen as an adaptation of *Designerly thinking* into a popularised, manageable representation. Whereby, *Design thinking* can be seen as a conversion of *Designerly thinking* into a generalised controlled interpretation (Johansson-Sköldberg *et al*., 2013:131).

Lastly, Sylvester (2019:43) emphasises that brainstorming (one of the *Design thinking* steps) is essential to generate creative ideas for visual manifestation, for initiation of topics and content in design pedagogy, practice and theory. Therefore, designers and other creative professions should be familiar with the pragmatic brainstorming applied to novel ideas and products that meet users' needs (both aesthetic and functional as per CAPS).

2.6.2.1 Design Thinking

Thinking is an important factor in schools since learners are goaded on to think anytime and anywhere (Gholam, 2019:53). Sousa (2011:250) has confidence in that thinking is effortless to describe but not to define because: *"its characteristics include the daily routine of reasoning where one is at the moment, where one's destination is, and how to get there".* Along with these researchers, Orlich, Harder, Callahan, Trevisan, and Brown (2012) emphasised that thinking is a multidimensional undertaking that consists of outlooks, information and abilities, making it possible for an individual to effectively describe his or her situation. Arends (2014), on the other hand, characterises thinking as a psychological process including a broad spectrum of processes such as induction, deduction, categorisation, and discernment. *"Thinking skills are the mental processes we use to do things like solve problems, make decisions, ask questions, make plans, pass judgments, organise information, and create new ideas. Often we're not aware of our thinking – it just happens automatically"* (Moore, 2014:376). These different explanations indicate that thinking is focused on and comprises specific cognitive processes. Over against that, researchers in creativity, Xu and Andersen (2017:662), deliberate *Design thinking* to be one of the numerous creativity techniques or ways

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of thinking and do not regard it as revolutionary. Due to their understanding, the history of creativity research, and the realisation that new ways of creative thinking will be developed in the future. But when a phenomenon becomes so prominent, verification is needed (Xu & Andersen, 2017:662).

Moving on to *Design thinking*, which is viewed by Johansson-Sköldberg *et al.* (2013:123) as an inverted term for this approach in which the skills and practice related to design are used in fields other than the design environment for and with people who do not have the academic context of Design especially in management. *Design thinking* then becomes a shortened form of *Designerly thinking* or a way of describing a designers' approaches as they are used in academic or practical management situations. For the corporate community *Design thinking* appears to be a novel concept for our era, but since the 1960s the features of designers' work and practice have been discussed in Design research (Johansson-Sköldberg *et al*., 2013:124).

Watson (2015:16) argues that *Design thinking* generates an informal process that is already part of the arts. Whereby Zande (2011:27) explains that we all make design decisions naturally when we decide how to personalise our living spaces, what to wear, or create our fashion style and appearance. Furthermore, Watson (2015:13) reiterates that *Design thinking* was always part of creative skills, *"before we introduced all the names for Design thinking, it was a thing you did in the back of your head". "We make designs",* says Zande (2011:28), and the cognitive actions used to create them are referred to as *Design thinking*. Paramount to these actions is the *design process*.

The designer is portrayed by Schön and Wiggins (1992:70) through a practice-based epicentre on the correlation between creation and reflection in design, allowing for constantly developed competence and re-design. As Schön and Wiggins (1992:71) discovered in the work of both architects and psychoanalysts, such contemplation was believed to be at the heart of design work.

Therefore, an important part of *Design thinking* is understanding the problem as a challenge. This first step is imperative because challenges are issues that can be solved. *Design thinking* begins with empathy – rooted in deep human-centredness, progress into development of understanding, where new and unexplored ways of '*looking*' [thinking] can be discovered. In a way, a human-centred focus is reframing a challenge or a problem.

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To summarise, the *design process* is effective as a problem-solving approach, but I want to agree to a reasonable thinking attitude while dealing with complicated problems. Therefore, *Design thinking* should be taught as a concept in the classroom. Permitting to Puccio *et al*. (2010:156), a certain mindset is required for effective involvement in *Design thinking*, which includes taking a human-centred approach, utilising visual thinking and prototyping, using tales and storytelling, and harnessing the power of collaboration.

2.6.2 2 Designerly Thinking

Designerly thinking is defined by Johansson-Sköldberg *et al*. (2013:123) as follows: It is the academic framework of professional designer activity (practical skills and capabilities) and theoretical thoughts on how to understand and characterise the designers' nonverbal know-how. Therefore, *Design thinking* is integrated into the academic area of Design because it combines theory and practice from a design perspective. However, *Designerly*, according to Cross (2004:3), refers to certain design practices. Therefore, the discourse's *designerly* approach creates an academic motion including designers' and professionals in relevant disciplines' contributions (design history, planning and architecture). The objective has been solely educational, either in terms of understanding or providing learners with such knowledge (Johansson-Sköldberg *et al*., 2013:124). To continue, Buchanan (1992:14) is leading to rightly think about design concepts from the designers' point of view [a designerly perspective on *design thinking*], which refers to the formation of a poorly defined problem or challenge or the problem might not be defined at all – therefore, the designer must find and solve the problem in a unique and functional-creative way. Buchanan's *Design thinking* concepts are based on the wicked problem[10] approach of Rittel and Webber (1973) (Buchanan, 1992:15). Lastly, Buchanan's *Design thinking* principles replace the traditional step-by-step *design process* model with two separate stages: analysis and issue description, followed by an artificial framework of problem solutions, resulting in a well-defined problem to be addressed. *Design thinking* is the more common term referred to as the *design process* used in different industries and the *general walk-of-life*.

[10] Wicked problems are a *"class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing".* The first published report of Rittels' concept of wicked problems was presented by C.W. Churchman, "Wicked Problems", Management Science, (December 1967), 4(14):141-142.

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2.6.3 Critical Thinking and Creative Thinking

Creativity forms part of the 21st century required abilities, in conjunction with critical thinking, communication, and collaborative skills and includes meta-cognition to the general *Cs*'[11] (Greiff, Niepel, & Wüstenberg, 2015:2). Robinson (2019) defines creativity as the *"process of having original ideas that have value*". However, any essential notion of thinking or problem-solving that involves the formation of a new suggestion or meaning, according to Runco (2003:318), is creative. Numerous connections, concern for the environment and others, levelheadedness, practical thinking, and reaching multiple conclusions are all hallmarks of creativity. Interestingly, critical thinking is also referred to as *"critico-creative"* thinking (Tosuncuoglu, 2018:26).

Therefore, creativity models support the process of making or producing the criticality of evaluation or assessment. When thought is activated, the mind must simultaneously produce and evaluate the outcomes it builds (Elder & Paul, 2014:13). Hence, *intelligent thinking* requires both imagination and intellectual discipline. Thus, we create and evaluate; we evaluate what we make; we assess as we develop. In other words, we think critically and creatively at the same time.

2.6.3.1 Critical Thinking

Critical thinking is a type of discovering what should be deemed relevant or put into action. Critical thinking includes logical reasoning and the capability to detach evidence from ideas. Before information is accepted or rejected, information is strictly separated by evidence (Winarso, Winarso, & Widya 2017:4). Therefore, it is important to let learners continue to question issues, perform analyses, present new ideas and provide solutions to problems (Winarso *et al*., 2017:4).

As far as critical thinking is concerned, the method of inquiry involves revised Bloom's taxonomy, which confers great importance to the development of advanced thinking skills. To continue, Snyder and Snyder (2008:90) describe critical thinking as a learned skill that involves direction and reiteration. Whereby, Tosuncuoglu (2018:26) paints a picture of how critical thinking may be developed as a crucial component of authentic, meaningful teaching and learning. Thus, we use critical thinking to solve issues, make decisions, and achieve our objectives. Thinking is an active process, not a passive one.

[11] The 21st century's *super skills* are defined by Kivunja (2015:225) as shorthand for all the skills needed for a successful career and life, namely the 4Cs – collaboration, creativity, critical thinking and communication.

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"Critical thinking is related to making decisions, and it is desirable behaviour", says Tosuncuoglu (2018:26). According to Ennis (1985:45), the ability to think critically leads to insightfulness and this coherent way of thinking is dedicated to decision-making to solve problems effectively. Norris (1985) continues and refers to critical thinking as an optional, non-educational skill, therefore learners need to be master critical thinking skills in a holistic manner.

Furthermore, Kek and Huijer (2015:406) refer to problem-based learning as an effective unequivocally pedagogical approach. They keenly involve learners in a learning-and-teaching structure defined by repetitive and thoughtful learning cycles, subject-specific knowledge, and independent learning thinking. Substantially, Ulger (2018:1) claims that the nature of both creative thinking and critical thinking are problem sensitive. According to Bloom and Doss (2019:71), creativity, innovation, and critical thinking form a collective entity. Encouraging this kind of interactive thinking involves creative and critical thinking by considering the teaching environment and learner motivation. Lastly, it has been indicated by Elder and Paul (2014:13) that there is a close interrelatedness of critical thought in everyday reasoning.

Several barriers can impede critical thinking learning, such as limited resources, predetermination and time constraints, which may negate learning environments that should encourage critical thinking. Yet, actively engaging learners in project-based or collaborative activities can buoy-up learners' critical thinking growth if teachers demonstrate the thinking process, use effective questioning techniques, and steer learners' critical thinking processes in the right direction (Snyder & Snyder, 2008:90). Therefore, teachers are encouraged to see learners as information (source) users rather than recipients of information (Snyder & Snyder, 2008:90). However, even with a professed value of critical thinking rooted in the minds of teachers, and its distinction among the objectives of school curricula across sectors, there is a gap of research that precisely concentrates on how critical thinking is perceived and developed in Secondary School classrooms (Shafer, 2019). Therefore, McPeck (2016:6) says critical thinking always manifests itself in connection with some identifiable activity or subject.

To continue, by providing a safe environment and targeted tasks, learners can get involved in the creative process and use critical thinking to produce original thoughts (Bloom & Doss, 2019:71). Robinson (2019) identifies creativity as the combined use of ingenuity and critical thinking. Particularly in Jean Piaget's scientific work, many examples of personally meaningful construction originate (Runco, 2003:318). Notably, Piaget did not use the term *creativity* when describing new interpretations, despite defining them as *constructs and structures* (Runco,

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2003:318). Finally, according to Runco (2003:318), Piaget sought the brainchild as a *personal and authentic understanding*.

2.6.3.2 Creative Thinking

Creativity is a complex and multifaceted phenomenon (Puccio *et al*., 2010:157). Webster (2002:26) defines creativity as, *"the engagement of the mind in the active, structured process of thinking in sound for the purpose of producing some product that is new for the creator".* Therefore, creativity is the essence of being human: we can all use our imagination to generate new ideas (Puccio *et al*., 2010:157). According to the definition of creativity in terms of the integration process, creativity may be encouraged in two ways. They can even collaborate to increase efficacy in a two-step process.

Furthermore, the first stage is based on the idea that people only assimilate when they have a personal stake in doing so (Runco, 2003:320). Much has been written on intrinsic motivation in the literature, and the theory of personal creativity would likewise place a high value on intrinsic motivation. Only when the issue is something that the individual cares about will he or she attempt to assimilate (Runco, 2003:320). This may imply, according to Runco (2003:322), that teachers should enable learners to work on "*idiosyncratic themes*". Alternatively, teachers should search for truly fascinating components in every assignment or Design brief; find out what each learner enjoys in history, mathematics, languages, and the arts, among other disciplines. The second element of this progression effort, according to Runco (2003:322), derives from the fact that people only adapt to knowledge that is somewhat ahead of their present functioning. Meaningly, individuals should be intellectually stimulated, according to Piaget's theory. Still, just as you cannot work below a particular level of functioning because learners would grow bored, you should not challenge them with too advanced issues for their current operational level (Runco, 2003:322).

To continue, Finke, Ward and Smith (1996) highlight that what we can create or how we can create could play a productive role in the creative process. Henceforth, creativity is a diverse thinking ability to produce suitable, original, and flexible answers through varied situational contexts (Sternberg, 1999).

According to Lin (2011:149), the progress of creativity in education can be promoted in three ways: by (1) providing teaching of creativity and innovative practices; (2) creating an environment that supports learners' creativity; and by (3) maintaining a teacher attitude that is open to learners' innovative ideas and behaviours. However, Robinson (2019) contends that

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while some scholars, such as Sondheim (2018:71) and Sylvester (2019:35), think that creative thinking mainly refers to the free flow of ideas, creativity is essentially a more complex process, which is thoughtful, allows for imagination, the implementation of new ideas, as well as assessing and refining these ideas (Robinson, 2019). Although Runco's (2003:318) approach appears to contradict theories of creativity that emphasise originality and efficacy, there is no difference because personal construction is likely to be distinctive and suited for that individual. He continues, Piaget felt that without innovation, a person merely recalls knowledge but does not comprehend it (Runco, 2003:318). To add, as a way of thinking and communicating, Ahmadi and Besançon (2017:7) considered creativity, critical thinking, and cooperation to work.

Hence, Cropley and Cropley (2012:35) continue to outline nine situations in which teachers might help their learners improve their creativity. They encourage teachers, for example, to place learners under their judgment and assess their creative output, allowing them more time to reflect on their own work. The primary reason for this is that learners will have more time to conceive, formulate, and change their ideas autonomously, which is necessary for developing creativity (Ahmadi & Besançon, 2017:8). In reality, autonomously, learners construct their ideas of what they want and do and are more easy-going of uncertainties without strict rules that can lead to blocked noncreative productions (Ahmadi & Besançon, 2017:8). Personal creativity theory is linked to various perspectives on creativity and development (Runco, 2003:320). Then, the inquiry learning approach offers significant opportunities for creative thinking that includes all aspects of creativity outlined in Williams' taxonomy, see *Figure 2.4: Williams' Taxonomy for Creative thinking below*. Furthermore, De Bono's six thinking hats theory includes both critical and creative thinking.

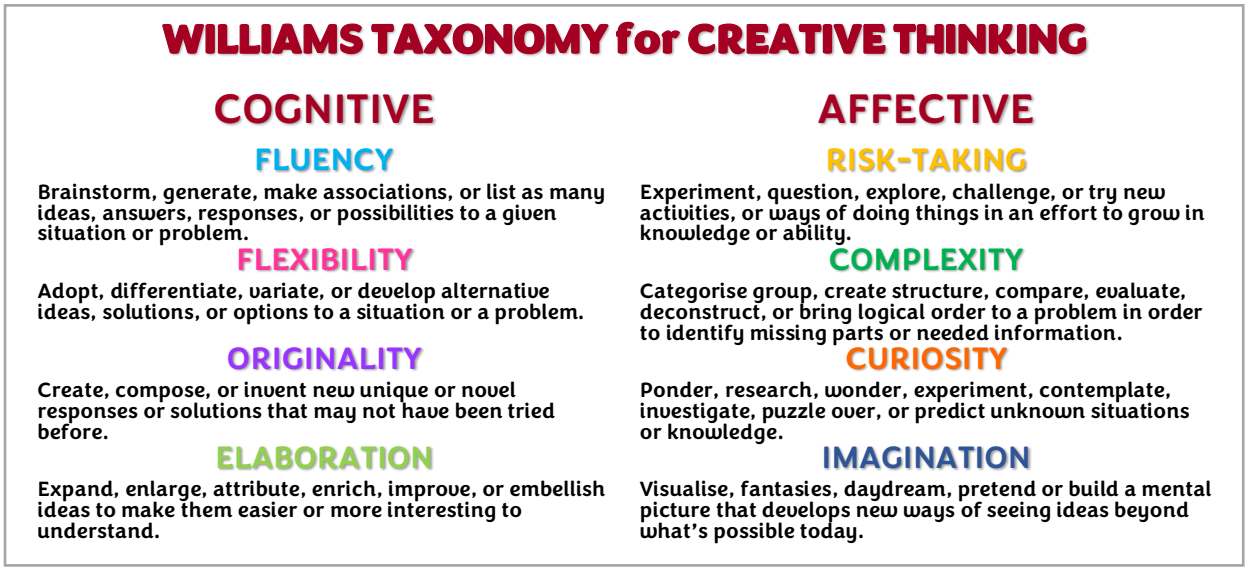


Figure 2.4: Williams' Taxonomy for creative thinking
Source: Alessa (2018)

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To start, Cachia, Ferrari, Ala-Mutka, and Punie (2010) focused their research on teachers' perspectives on creativity and teaching methods on how to foster creativity and innovation in the classroom. The findings demonstrate that just because creativity is mentioned in many nations' school curricula does not guarantee that schools foster innovative activities (Cachia *et al*., 2010). They also point out that teachers are unsure how creativity should be defined or how it may be introduced into classrooms (as learning or assessment). Yet, on the other hand, teachers have recognised the need to teach creativity and have appealed to do so.

Creativity can be learnt, according to Henriksen, Mishra, and Fisser (2016:33), but because it is a cognitive skill, it is only viable to be "*learned by doing*" or be acquired by "*learning in action*". This implies, however, that the educational system and teachers must recognise and encourage continuous stimulation of creativity as a mental habit and agree on what it is and how to engage it. Nevertheless, this also means that the Department of Education and teachers must identify and maintain the continuous advancement of creativity, making it a practice of thinking, and elaborate on its meaning and use (Henriksen *et al.,* 2016:33). Thus, this can vary significantly in contexts and cultures. According to Puccio *et al*. (2010:157), who claim that creative thinking and problem-solving are essential life skills, schools should educate creative processes and concepts. To conclude, according to Henriksen *et al*., (2016:33), *"essential challenges [and changes] involve convincing policymakers, who often prefer clear answers and objectivity that it is important to infuse curricula with creativity, an area that does not have one 'right' answer".*

2.6.3.3 Visual Thinking

We believe we see the world beautifully, wholly, and in complexity when we are awake, and our eyes are open. Ware (2010:1) says this impression is wrong. Through scientific research, the same answer appears again and again about what is stored in the brain of the visual world (Ware, 2010:1). We only absorb a small portion of the information in our environment, but it is generally the proper knowledge to get us through the task at hand (Ware, 2010:2). Furthermore, Ware (2010:12) indicates that pattern creation is the true authority of visual thinking. Seeing a pattern, he feels, is the key to solving a problem. It is frequently simpler to re-do a cognitive process than to recall it, which is a hallmark of visual thinking. Therefore, to be clear, seeing is a skillful process that requires intentional participation (Ware, 2010:17). Nonetheless, visual thinking is an alternative to verbal thinking (Puccio *et al.,* 2010:156). McKin (1972) calls it a "*meta-strategy*", as visualising ideas and sketches can help generate new understandings.

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To continue, Gholam (2019:53) defines visual thinking routines as principles based on a variety of ideas, methods, and tactics. He says routine classroom activities enhance thinking skills, encourage cooperation and sharing ideas, and, most importantly, make reasoning and learning evident (Gholam, 2019:53). Furthermore, Gholam (2019:55) observes that thinking is often imperceptible. However, according to Tishman and Palmer (2005), visual thinking is a visual representation that chronicles an individual's or group's thinking progress, inspection and contemplations. In their view, learners can use tools or visual thinking aids, such as mind maps, diagrams and lists, charts and worksheets to make their thinking visible.

Lastly, Ritchhart and Perkins (2008) provide a set of qualities that serve as a foundation for visual thinking. These qualities include learning because of thinking, thinking growth is a communal endeavour, and growing thinking involves making thinking visible. Thus, visual thinking is a versatile framework that incorporates various techniques for making learners' thinking evident to (Dajani, 2016).

2.7 PROBLEM-SOLVING

Finding alternatives and implementing the best answer is the process of problem-solving. It is a difficulty or challenge is a problematic issue that must be resolved. Alternatives are available options for resolving the issue. According to Ware (2010:18), solutions are the greatest option for solving a problem. A suitable way to describe how the brain solves problems is through a series of nested loops (Ware, 2010:18). The outer circles deal with the big picture, while the inner loops deal with the specifics. The brain establishes and then applies a series of problem-solving processes in the outer loop (Ware, 2010:18). Innovative problem-solving is also known as *thinking outside the box,* but I prefer referring to the saying as ***thinking without any box*****.** Steyn (2019:169) contemplates the problematic aspect of developing critical and creative thinking and problem-solving skills as a long-term challenge.

By providing theoretical knowledge of how humans perceive to guide the *design process*, Ware (2010:19) provides an intriguing and informative layout in his book. Solving a problem is the process of defining the problem, determining the cause of the problem; prioritising and selecting solutions; and implementing a resolution (Ware, 2010:19). Design problems are often presented as arranged information with detailed limitations and necessities that suggest a fixed solution. However, designers' previous protocol studies have shown that problems in developing solutions can *'develop together'* during the *design process*.

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Finke *et al*., (1996) states that higher-order thinking is known by various terms, like reasoning, problem-solving and decision-making, and is defined as an important conversation process that uses knowledge and intellectual skills to achieve specific goals. In the classroom, learners could be encouraged to solve issues (Runco & Nemiro, 1994). Laurillard (1997:127) suggests that the difficulties are hypothetical with purely educational value; it is not the thought-provoking solution but the *process* of finding a solution. She continuous to define a problem-solving task as one that *"engages the students [learners] in thinking about the subject matter in ways designed to improve their understanding of it"* (Laurillard, 1997:127).

Back in 1964, Christopher Alexander argued that, due to the absence of problem-solving, contemporary methods do not produce products that meet the real needs of individuals and society and do not meet the actual needs of users, but ultimately fail because of the basic premise that design and technology do improve the human condition (Lawson, 2005:75). Lawson (2005:75) states that the famous design method of Christopher Alexander may exemplify the first generation of ideas around the *design process*. Alexander's method starts by listing all the criteria for a given design challenge, then looking for collaboration between them (Alexander, 1964). Furthermore, Alexander (1964:76) refers to the *centre* as a pattern that heightens the context in the *design process*.

Lui and Chen (2018:1710) clarification of concepts and meanings are made possible, when learners demonstrate advanced problem-solving skills. Subsequently, by integrating knowledge in various fields, the knowledge combination will develop value and cognition, thereby assembling different elements into complete functional integrity (Lui & Chen, 2018:1710).

2.7.1 Process vs. Product

Numerous existing theories tend to be product-oriented (Runco, 2003:319-320). On the contrary, the theory of personal creativity is attentive to the *creative process,* and the mechanism is the basis of creative behaviour. Therefore, there are considerable distinctions between the theory of personal creativity and other prevalent ideas, but they are especially important for our purposes since it has direct pedagogical implications (Runco, 2003:321). For example, Runco (2003:320) goes on to say that we will never be able to discover learners' potential until we recognised learner innovation and criticise adult standards. This difference is the importance of the teachers' focus in the classroom, where the teacher can concentrate on encouraging creative solutions, which can lead to effective production of creative activity (Henriksen *et al*., 2016:33).

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Importantly, the process versus the product marks the transfer in focus (Runco, 2003:320), emphasising the learners' steps to create the product [*process*] instead of completing the final product. Setting forth to encourage learners to prioritise the *design process* over the product inspires creativity and risk-taking without fear of performance assessment consequences, especially for high school learners (Runco, 2003:320). Henriksen *et al*. (2016:33) go on to explain that the product is more palpable and hence more easily evaluated. Nonetheless, the procedure may be more essential for teachers because it considers the entire learner (the process can be distinctive and playful, bringing another challenge). In contrast to the Design teacher who cares about the *design process*, the *technology approach* tends to focus on the finished result. Then, concerning evaluation in both technological dexterity and creative ability, one must consider how to move between the product and the process and how to consider them for effective creative use in terms of functionality (Henriksen *et al.,* 2016:33).

According to Xu and Wang (2018:407), the user constantly interacts with the product, and then contact behaviour occurs. This process first meets the users' needs, and secondly, it takes care of the psychological requirements of the users. The product form is inseparable from the psychology of the user (Xu & Wang, 2018:407), especially as the development of the *design process* is evolving. It is understood that with different material techniques, visual shapes and colour combinations, users will have different psychological emotions. In addition, the original design must fully express the psychological desires of the user and make the innovation clear in terms of structure, function and production. Consequently, the result or solution is taken care of for the specific needs of the user. Therefore, the nature of the design will be understood by users.

To conclude, the solution to the problem is to find alternatives and finally select the best solution. The problem can be difficult to solve, but *the answer usually lies in the problem since the answer is not separate from the problem* (Krishnamurti, 2018:2; McLeod, 2016:6). After all, alternatives are the options available to solve the problem. I emphasise what Runco (2003:320) says, the process versus the product marks the transfer in focus where the emphasis is on the steps the learner takes to create the product [*process*], as opposed to the completion of the final product. Lastly, reassuring learners to focus on the *design process* over the product encourages creativity and risk-taking without fear of the consequences of performance evaluation after completing the task.

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2.8 FRAMEWORKS FOR THINKING: TAXONOMIES

2.8.1 Introduction

The process of developing a systematic classification scheme for the educational setting is a crucial step toward creating a new education theory that takes a holistic perspective. A taxonomy is a set of consistent generating principles, methods, and rules-driven by a functional logic that reflects the (assumed) instrument categorisation object (Bauer & Baumgartner, 2010:16). Despite its relevance, according to Bauer and Baumgartner (2010:6), pedagogy has failed to create a coherent taxonomy of educational contexts. Although the emergent education taxonomy is primarily a theoretical invention, it does not imply that the outcome is exclusive of interest to theorists. Like Lewin (1951:169) said, *"There is nothing more practical than a good theory".* Therefore, a good taxonomy should be a practical and helpful instrument to assist and enhance the educational process as a whole.

The PAT document (2018:13) refers to Williams' taxonomy; hence, this section looks at this taxonomy and explains its relevance. Furthermore, a teacher using Bloom's taxonomy aims to incite higher-order thoughts in their learners by building from lower-level cognitive skills to higher conceptual levels. Therefore, behavioural and cognitive learning mechanisms goals are provided to highlight how Bloom's taxonomy can be incorporated into major educational goals, strategies or guidelines. Lastly, Rominoszwski's taxonomy on reproductive versus productive skills as an Instructional-Design theory is also valid and accordingly explored.

2.8.2 Benjamin Bloom's Taxonomy

For a long time, educational transformations have focused on curriculum, assessments, teaching, and lately, on standards and data. However, these efforts have only penetrated fleetingly into how learners think (O'Neill & Murphy, 2010). This means that the focus of limited teacher and school resources is not to promote thinking and understanding but on the types of things learners will think about and prove that they understand them. Though, this stands in disparity to the characteristics of the early 21st century, including determining connectivity, dynamic media formats, information-rich (digital and non-digital) environments, and a focus on the visibility of almost all content (Ahmadi & Besançon, 2017:8).

In the context of such needs, already in 1956, a classification system of ideas was designed by Benjamin Bloom, which, divided into three parts, became known as Bloom's taxonomy model (O'Neill & Murphy, 2010):

1. Cognitive domain (intellectual capability, namely, knowledge or think).

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2. Affective domain (feelings, emotions, and behaviour, namely, attitude or feel).
3. Psychomotor domain (manual and physical skills, namely. skills, or do).

Bloom's taxonomy is a multi-layer model that categorises thinking based on six complex degrees of cognition. Commendably, many teachers have encouraged their learners to ascend to a higher level of comprehension by depicting levels as ladders over the years (Ahmadi & Besançon, 2017:8). Furthermore, Bloom's cognitive field poses mental activity into six levels: *knowledge, comprehension, application, analysis, synthesis,* and *evaluation* (Bloom, 1956). In the 1990s, Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths & Wittrock (2001) revised the field and proposed slightly different terms to identify levels: *remembering, understanding, applying, analysing, evaluating,* and *creating* (Anderson *et al*., 2001). See *Figure 2.5: Revised Bloom's Taxonomy (RBT)* below.

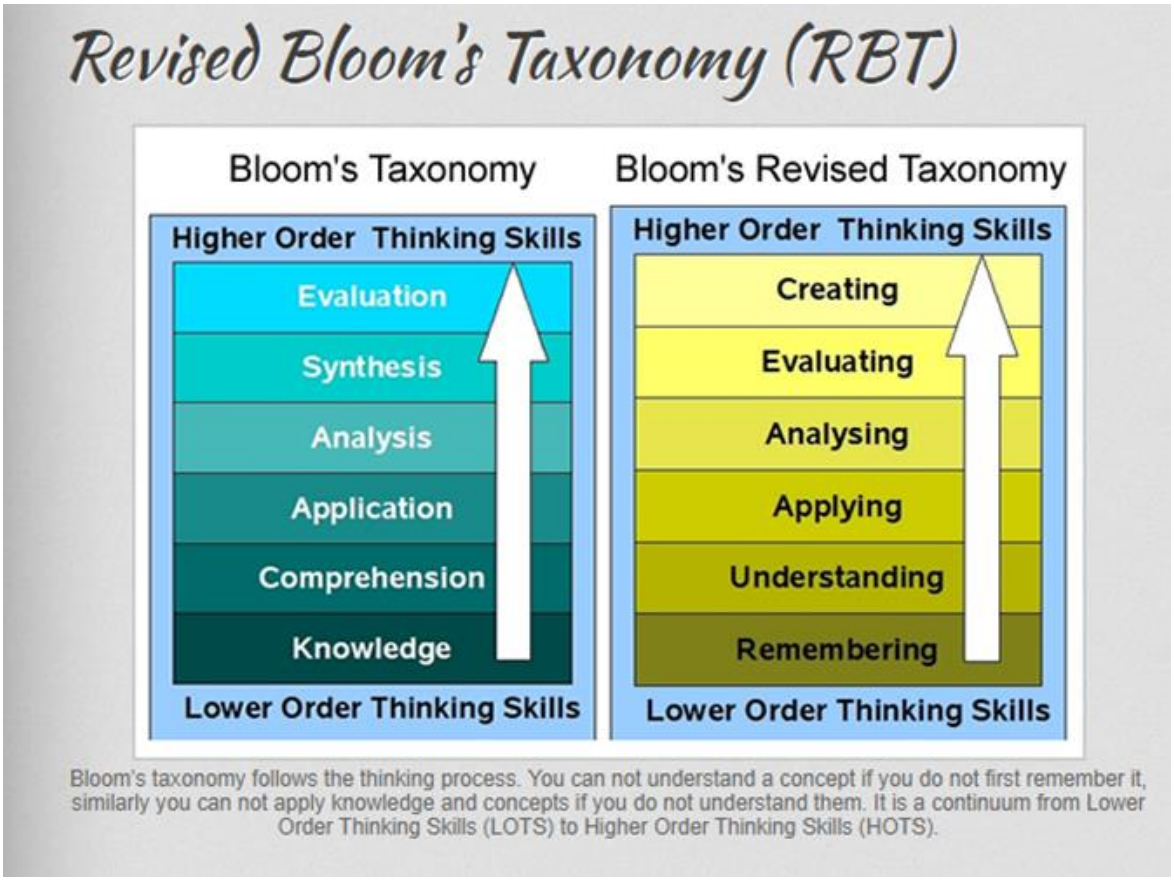


Figure 2.5: Revised Bloom's Taxonomy (RBT)
Source: Anderson *et al*. (2001)

The taxonomy aims to classify the education system's goals, especially to help teachers, administrators, professional experts, and researchers discuss the curriculum and evaluation issues more accurately (Bloom, 1994:10). The revised Bloom's taxonomy on the cognitive

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domain has a *hierarchical structure*, namely capturing the learning process, from simply remembering information to creating new information, knowledge, and understanding.

Anderson *et al.* (2001) believes that although the lower level of Bloom's taxonomy is still applicable, the need to adjust to meet the requirements of the 21st century must be emphasised. In short, the more learners have *direct access* to information, the more logically they can apply the information to a higher level of thinking and initiate such endeavours themselves, identify their own connections, and establish them. Furthermore, allowing learners this freedom empowers them to correct misunderstood (or misinterpreted) information and transfer their understanding more smoothly to new, unfamiliar situations (Ahmadi & Besançon, 2017:8). Moreover, in this method, all learners start at a similar point – recognising and defining – and then *move up* Bloom's Taxonomy, along with the *Creating level* that helps provide a flexible maximum that can be stretched to meet the needs of even the most forward-thinking understanding, while still acting as a goal for learners who may struggle. Finally, as the highest level of Bloom's revised taxonomy, *creating* requires learners to use innovative ideas, or at least creative ideas or inventive thinking.

Ahmadi and Besançon (2017:8) encourage teachers to enhance the designing learning experience in class, which means providing each learner with space for cognitive and creative awareness. Furthermore, Ahmadi and Besançon (2017:8) also recommend digital technology and social media to achieve asynchronous cooperation. By these applications, digital communities allow learners to access different sources to complete certain parts of their assignments at their own pace. This method will allow learners to add their ideas and enable them to observe according to their level of preparation, background knowledge, and skilled proficiency.

However, Coleman and Cramer (2015:6-13) as well as Kwakye and Ghartey (2019:163-164) state that many teachers are unwilling to adopt computer technology into their creative lessons as they (the teachers) are of the opinion that it will decrease learner's creativity expression whereas Ahmadi and Besançon (2017:8), believe this approach to be specifically effective when teaching creative introverts. Besides this, combining Bloom's taxonomy with a learning sequence based on planned projects means that learners can analyse the causes/impacts of many of these factors and challenges, evaluate the effectiveness of what exists, and finally develop new strategies to implement.

Pahl (1995:156) concludes that Bloom's levels of thinking skills is often only located in a curriculum on the bookshelf or included in a question at the end of the final teaching method;

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it is rarely implemented consciously in the classroom. Today's thinking is no different than a hundred years ago, therefore, using the revised taxonomy of Bloom in the 21st century is more complicated than the strategies mentioned above admit Ahmadi & Besançon (2017:8). However, I find the idea too prototypical as an intent for the learning experience used by learners.

2.8.3 Frank Williams' Taxonomy

Frank Williams, an educational psychology researcher, created, developed, and analysed the Williams taxonomy, which is a hierarchical framework comprising eight creative thinking skills (Williams, 1969:7). The taxonomy aims to educate creative thinking skills, stimulate lateral thinking and initiative, nurture creativity, and cultivate learners' creative talents, which may be converted into ever-changing everyday challenges (Williams, 1993:464).

At present, the Design CAPS provides conditions for the teaching process, requiring learners to carry out some *plan/preparation/survey/research* to solve the problems or tasks found and allows some *innovation and creativity* (DBE, 2011:46). These activities form part of daily teaching-learning and link up with Williams' skill development taxonomy. The eight levels of Williams' taxonomy are *fluency*, *flexibility*, *originality*, *elaboration*, *adventure*, *complexity*, *curiosity*, and *imagination*. To elaborate, the first four levels of skill development are classified according to their nature as cognitive (thinking) levels, and the last four levels are categorised as emotional (feeling) levels (Williams, 1993:461). Specifically, the PAT Guidelines document (DBE, 2018:13) refers to Williams' taxonomy and indicates how the taxonomy should be used in conjunction with the assessment criteria for PAT 1 (Term 1) and PAT 2 (Term 2). These cognitive level descriptors are used for practical projects. See *Figure 2.6: Williams' Taxonomy* below.

WILLIAMS' TAXONOMY: COGNITIVE (THINKING)				**WILLIAMS' TAXONOMY: AFFECTIVE (FEELING)**			
Fluency (the generation of ideas, answers, responses, possibilities to a given situation/ problem)	Flexibility (the generation of alternatives and variations, adaptations, different ideas/ solutions/ options)	Originality (the generation of new, unique and novel responses/ solutions)	Elaboration (the expansion, enlargement, enrichment or embellishment of ideas to make it easier for others to understand or make it more interesting)	Risk-taking (experimenting, trying new challenges)	Complexity (the ability to create structure out of chaos, to bring logical order to a given situation and/or to see the missing parts)	Curiosity (the ability to wonder, ponder, contemplate or puzzle)	Imagination (the ability to build mental pictures, visualise possibilities and new things or reach beyond practical limits)
The learner generated many ideas and many possible solutions to the problem/brief	The learner was able to adapt and consider alternative solutions or options	The learner generated creative solutions	The learner took the idea(s) much further, adding enough detail for other people to understand it	The learner tried new ideas through risky experimentation	The learner was able to fill in the missing parts to make up a complete solution	The learner looked at various options and put in a lot of thought	The learner was able to visualise possible solutions, even if not practically implementable

Figure 2.6: Williams' Taxonomy
Source: PAT Guidelines (DBE, 2018:13)

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The Williams model has been widely utilised for brilliant and talented learners as a planning framework for curricular customisation. However, there is a lot of room in the classroom to encourage all learners to be creative. As a result, the question is how to include it into one's curricular design. The Design CAPS (DBE, 2011), in conjunction with the PAT (DBE, 2018) guidelines, recommend using Williams' taxonomy during the practical tasks. This taxonomy also serves as a higher cognitive level assessment criteria for practical assignments, although not directly mentioned in the CAPS or the *Examination Guidelines* (Department of Basic Education, 2017). Therefore, it is essential to include this taxonomy in the said guidelines, as it will assist teachers in guiding learners with their creative output.

2.8.4 Abraham Maslow's Theory

Humanists reject the idea that humans are convulsed by external powers, such as impetus and reinforcements (behaviourism) or unconscious, instinctive urges (psychoanalysis), according to Simons, Donald, Irwin, and Drinnien (1987:221). Instead, humanists are interested in possibilities. Thus, humans strive to attain the limits of creativity, as well as the pinnacles of consciousness and knowledge. Subsequently, it has been dubbed a *fully functional person, a healthy personality*, or, as Maslow puts it, "*self-actualising of the individual"* (Simons *et al.,* 1987:221).

Abraham Maslow, who was a humanistic psychologist, developed a personality theory that had an influence on a variety of professions, including education. This widespread effect can be attributed in part to Maslow's theory's great practicality. Moreover, this idea accurately describes many personal experiences. As a result, countless people can understand what Maslow is saying. However, they can name some of their real and recognisable qualities, experiences, or behaviours, but they cannot put them into words (Simons *et al*., 1987:221).

Maslow's hierarchical theory is typically represented as a pyramid, demonstrating five tiered levels; the level one shows basic psychological needs, and the upper point, level five, representing the ultimate need for self-actualisation. See *Figure 2.7: Maslow's Hierarchy of Needs* below.

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Figure 2.7: Maslow's Hierarchy of Needs
Source: Adopted from Maslow (1943)

To continue, Maslow's hierarchy is based on five levels of fundamental requirements. Higher-level requirements exist in addition to these. Understanding, artistic appreciation, and essentially spiritual demands are among them (Simons *et al*., 1987:222). To explain, on the five fundamental wants level, a person does not perceive the second need until the first is satisfied, the third until the second, and so on. Maslow's fundamental requirements are thus:

1. Level 1: Physiological needs - Basic biological needs: oxygen, shelter, food, and water. When a learner is deprived of all needs, this is the first need they will seek to satisfy. It controls thoughts and behaviours (Simons *et al*., 1987:222). If this level is not attained, learners may be unable to concentrate properly on their studies.
2. Level 2: Safety needs - Adults are unaware, yet youngsters frequently display symptoms of insecurity and a need to feel protected. Safety needs refer to physical, emotional, and psychological essentials. For example, a setting must be created where learners may ask questions and express ideas without being laughed at or criticised by their peers or the teacher (Desmet & Fokkinga, 2020). When this need is not met, learners will not respond, be fearful, experience anxiety and stress.
3. Level 3: Love, Affection and Belongingness need - According to Maslow, humans strive to alleviate emotions of loneliness and alienation (Simons *et al.,* 1987:222). This includes to give and receive love, affection and rapport. At this stage, learners must be able to identify with their peers and feel like they belong. As an individual and as part of a group, the learner must feel valued. This may be accomplished in the classroom by establishing reasonable ground rules for everyone's respect and employing participatory learning approaches such as group work (Desmet & Fokkinga,

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2020). When this need is not met, learners feel unwanted, lonely and not accepted (Simons *et al.,* 1987:222).

4. Level 4: Self-esteem and esteem from others - Involves a desire for both self-esteem and regard from others. At this stage, the learner is most open to new information and desires to boost his or her self-esteem through success and acknowledgement. Learners are confident in their capacity to learn and are willing to take charge of their own education. Engage learners in activities that are focused on them, such as peer teaching and peer evaluation (Desmet & Fokkinga, 2020). When these requirements are not satisfied, the individual feels mediocre, disappointed, vulnerable, and insignificant.
5. Level 5: Needs for Self-Actualisation - Self-actualisation requirements are triggered only when all the preceding needs have been met. Self-actualisation, according to Maslow, is a person's desire to be and accomplish what they were created to do. This level is the motivating factor where learners proactively seek ways to realise their learning potential and seek realisation in pursuing higher learning goals and strive to achieve them (Neto, 2015). Individuals can become irritated, tense or unsatisfied if this desire is not fulfilled.

In summary, if a person is starving, unsafe, unloved, rejected/unaccepted, or low in self-esteem, it is uncomplicated to determine what makes them uneasy. Although Simons *et al*. (1987:222) point out that it is not always apparent what a person desires when there is a need for self-actualisation, Maslow argues that the only thing preventing individuals from achieving self-realisation is the barriers presented by society. According to Maslow (in Simons *et al*., 1987:222), education is one of these barriers, therefore, teachers should respond to a learners' potential to become a unique self-fulfilling person. The directive, for teachers to address and establish a learner's self-fulfilment, Maslow listed the following ten points:

- Teach learners to be sincere, understand their inner self, and listen to their inner voice.
- Teach learners to excel in their cultural environments and become citizens of the world.
- Aid learners to discover their lives, calling, ability or purpose. This mainly focuses looking for a suitable occupation and a suitable partner.
- Teach learners that life is precious and to experience happiness in life. If people are willing to see goodness and joy in various situations, then life is worth living for.
- Accept the learner, without reservation, and guide them in understanding their own temperament and mind-set. Teachers will then understand what foundation to build on and the potential that exists with a well-grounded awareness of skills and limitations.

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Ascertain that the learner's fundamental requirements are met. This encompasses the demands for protection, respect, belonging, and esteem.

- Teachers should have new appreciation too and teach learners to appreciate the splendour and other beautiful things in nature and life.
- Teach learners that control is sensible and giving up completely is awful. However, control is needed to advance all situations.
- Teach learners how to deal with real difficulties in life rather than minor issues. Injustice, anguish, suffering, and death are among these issues.
- Learners need to be taught how to make informed decision. (Simons *et al*., 1987:222). See *Figure 2.8: Maslow's Hierarchy of needs for learners*.

Finally, considering all the above motivating factors, it goes without saying that Maslow's hierarchy can encourage learning through constructive creativity. By meeting all levels of Maslow's needs, learners can demonstrate their abilities and enthusiasm for learning. Therefore, the higher the learner's level, the stronger the motivation to experience more effective learning. Teaching someone to know better one's deeper inner self contributes to enhancing one's empathy and developing humanity in terms of compassion, kindness and sensitivity, all necessary factors for 'Me' to design for the 'Others'. See *Figure 2.8: Maslow's Hierarchy of needs for learners* below.

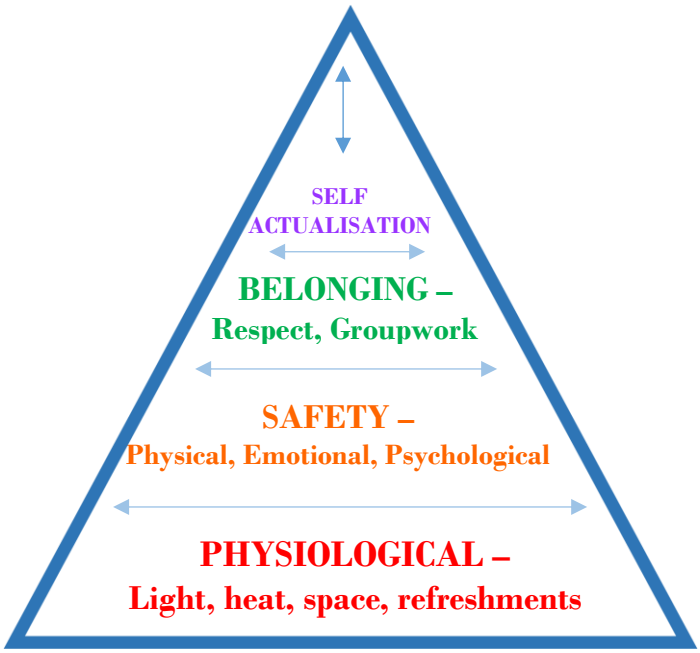


Figure 2.8: Maslow's hierarchy of needs for learners
Source: Adopted from Zoya (2018)

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2.8.5 Alexander Romiszowski's Taxonomy

Alexander Romiszowski's taxonomy focuses on acquiring skills and knowledge (Romiszowski, 1982). The terms 'knowledge' and 'skills' are used interchangeably (Bekkering, 1992). Let me elucidate, knowledge is divided into facts and concepts, whereas facts are detailed information about specific events, situations, people, or matters. On the other hand, concepts are abstract definitions such as freedom, intellect, or groupings of visible things or substances. Therefore, the content of a lesson (or a part) can be concentrated on factual knowledge or demonstration. Romiszowski's taxonomy illustrates that teachers' significance in transferring information is a complex matter. However, teaching must lead learners to expand facts and other forms of knowledge transfer (Romiszowski, 1999:457-462).

To continue, according to Bekkering (1992), knowledge is further defined as an example of a tangible goal, by which learners should be able to accurately explain the timeline of Design movements (Design History [CAPS Design, Topic 3]). Besides, the knowledge procedures composed of step-by-step planning can be followed in an assignment. Agreeing with Bekkering (1992), one must learn these steps and perform them correctly to solve a problem or take action. Therefore, one of the learning goals may be to teach learners procedures to support them to solve problems independently (Standaert & Troch, 1987). Then moving on from *facts to concepts,* concepts should be explained as a learning goal to learners. An example of learning of a concept is when a learner can name the characteristics of Art Nouveau in Design History (Topic 3) and will be able to conceptualise and write an essay on the characteristics thereof or apply the knowledge of these concepts in the *Design Process* (Topic 1) and the *Design Product* (Topic 2).

To continue, Romiszowski (1999) emphasises that learners can learn to master these skills in reproductive and productive ways. Mastering reproductive skills mean performing a skill as per the previously mentioned set out procedures. Both these refer to cognitive, interactive, psychomotor, and reactive skills (Romiszowski, 2010:202). However, according to Standaert and Troch (1987), skills transmission is much more important to Romiszowski than just the transfer of knowledge. Therefore, the information obtained must be put into practice effectively (Standaert & Troch, 1987). To put it differently, information has to be expressed in terms of abilities. Unfortunately, many teachers do not consider this factor and are limited only to the transmission of knowledge (Standaert & Troch, 1987).

Romiszowski (2010:202) sub-divides reproductive and productive skills into:

- Cognitive skills, such as decision-making, problem-solving, logical thinking;

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- Psychomotor skills, such as the performance of actions and techniques;
- Reactive skills, such as being conscious of and acting by a value system; and
- Interactive skills in the fields of social interaction, communication and leadership.

An example of the reproduction of psychomotor skills is that learners can mix secondary colours according to the rules provided in the instruction manual. As for the reproduction of cognitive skills, the learner can mix 12 colours to complete the colour wheel.

Lastly, a learner may create a new t-shirt pattern — this is a sample of a productive psychomotor skill. A learner understands how to evaluate the elements that contribute to the effective manufacture of t-shirts. This is an example of a cognitive talent that is useful in the workplace. Finally, in collaboration with his or her customer (teacher/target group), a learner might design a construction plan, such as a new entertainment auditorium. On a practical level, this is an example of an interactive talent.

2.8.6 Edward de Bono's Six Thinking Hats Theory

With the surge in brain-based learning, there has never better time learn, fewer teachers teach worthless thinking clichés. Instead, they direct learners to practical thinking tools like De Bono's six thinking hats theory (Pahl, 1995:156). This approach, developed by Edward de Bono in 1985, describes problem-solving activities and includes group discussions and personal thinking tools or modes with six coloured hats. Regardless, Edward de Bono's *Six Thinking Hats Theory* is playful, uncomplicated and can be implemented on almost all cognitive levels.

Moreover, learners are encouraged to think about the situation and possible solutions from different angles to become empathetic and look at problems and solutions in different ways to equip learners with complex decision-making methods (Patterson, 2006:11). De Bono's six thinking hats theory, according to Pahl (1995:156), are a highly authoritative instrument that encourages critical thinking, cooperation, communication, and creativity. Furthermore, it promotes the learner's point of view, causing learners to think more critically while making informed decisions. In addition, studying essential problem-solving strategies in a multi-sensory learning environment dominated by youngsters improves listening and conversational skills and boosts confidence. From a development perspective, the six-hat approach offers a simple steppingstone to formal levels of thought with the possibility of very little individual trauma with the prospect of analysing a potentially tricky problem on its own (Pahl, 1995:156).

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To continue, the Six Thinking Hat method can be used to solve almost any problem-solving activities found in the classroom (De Bono, 1987). By assigning colours to each '*way of thinking'* can be used as a visual prompt to assist learners in recognising the thinking skills they use (De Bono, 1987). First, divide the class into five groups, each wearing a real or imagined coloured hat. Next, the teacher puts on the sixth (blue) hat, which symbolises the teacher's control and guidance of the thinking process of the six hats (Patterson, 2006:11). The subtlety of De Bono's six thinking hat-strategy is that it forces learners to limit thinking to one analytical method and spreads the analysis of the complete problem to the entire classroom collaboratively (De Bono, 1987). See *Figure 2.9: De Bono's Six Thinking Hats Theory* below.

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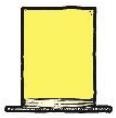
The following is a quick rundown of the six different types of hats learners might wear and the various ways of thinking they represent:		FOCUS	ACTIONS
	**WHITE HAT** The Facts *Facts*	What are the facts?	Discuss what you already know about the situation and what you still need to know.
	**RED HAT** The Feelings *Feelings*	What do I feel about the problem?	Express your thoughts and feelings about the issue.
	**BLACK HAT** The Problems *Cautions*	What could be wrong with the problem?	Describe the situation's undesirable elements or catastrophe scenarios. Judgment -- the devil's advocate or why something may not work.
	**YELLOW HAT** The Positives *Benefits*	What are the good points?	Consider the pros and cons of the situation.
	**GREEN HAT** The New Ideas *Creativity*	What new ideas are possible?	Consider creative ideas and optimism that come from looking at the problem in a new way.
	**BLUE HAT** The Thinking *Process*	What thinking and planning are needed?	Recap what you have learnt. Manage the thinking process.

Figure 2.9: De Bono's Six Thinking Hats Theory
Source: Sarah (2012)

Furthermore, the six thinking hats can be utilised in conjunction with parallel thinking (or lateral thinking), allowing learners to simultaneously focus on a specific type of thinking. The parallel thinking technique offers a structure for learners to discover six different perspectives of

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complex problems or scenarios. For example, let each learner in the group wears the same '*thinking hat'* and collectively share thoughts and ideas, and then everyone alternates to a new thought hat. Usefully, parallel thinking is an exceptional strategy used to try to simplify discussions, and it is also a method to assist learners in mastering and developing different thinking skills (De Bono, 1987).

Lastly, with the implementation of the thinking hats approach, Pahl (1995:156) points out some disadvantages: The technique can be time-consuming, defining a preference for a solution can be difficult, there may be a reluctance to implement judgments made, and there may be a tendency to shift the responsibility for final decision errors.

2.9 CHAPTER SUMMARY

This chapter provided an overview of the literature of the *design process*, the different perspectives among researchers about how the *design process* should take place, and how the teaching of the *design process* should transpire. The chapter also included examples of how *Design thinking* has been worthily applied to education challenges to promote problem-solving skills and creative certainty. Then the two approaches, *Designerly thinking and Design thinking, were unpacked.* I concluded that the latter is the popular terminology to make the *design process* more understandable to non-designers of other industries, beyond the *design studios and academics*. On the other hand, *Designerly thinking*, as used by designers in the industry, for example, fashion designers, brand developers, etcetera, is the same *design process* also applied in education. The Design CAPS document and PAT guidelines (2018) were used to guide and highlight the expectations of these policies to Design education. *Design thinking* is a modern-day solution to make thinking more real, same as Bloom's, Williams', and Maslow's taxonomies in their day.

Moreover, *critical and creative thinking* were highlighted as part of thinking and creativity. A transitory explanation was given for the study that embraced an interpretivist approach while revising the idea of pedagogical content knowledge to support my argument that teachers' views, interpretation and teaching of the *design process* influence their involvement and execution thereof. Furthermore, the variety and important approaches by scholars to higher-order thinking were defined and discussed with CAPS. The conceptual framework was used here to discover and comprehend the relationship between Grade 11 Design teachers' understandings of the *design process*, their practical application of theory in class and the awareness of their interpretation of the *design process* in terms of their subjective knowledge.

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In conclusion, my literature overview has illustrated the need for a more significant scholarly effort to widen and enhance the existing educational system in the South African multicultural context.

In the next chapter, my proposed approaches, presented under my name, Van Deventer D+NQ Model as an eight-step iterative problem-solving method, based and developed to contribute to further research, will be discussed and analysed.

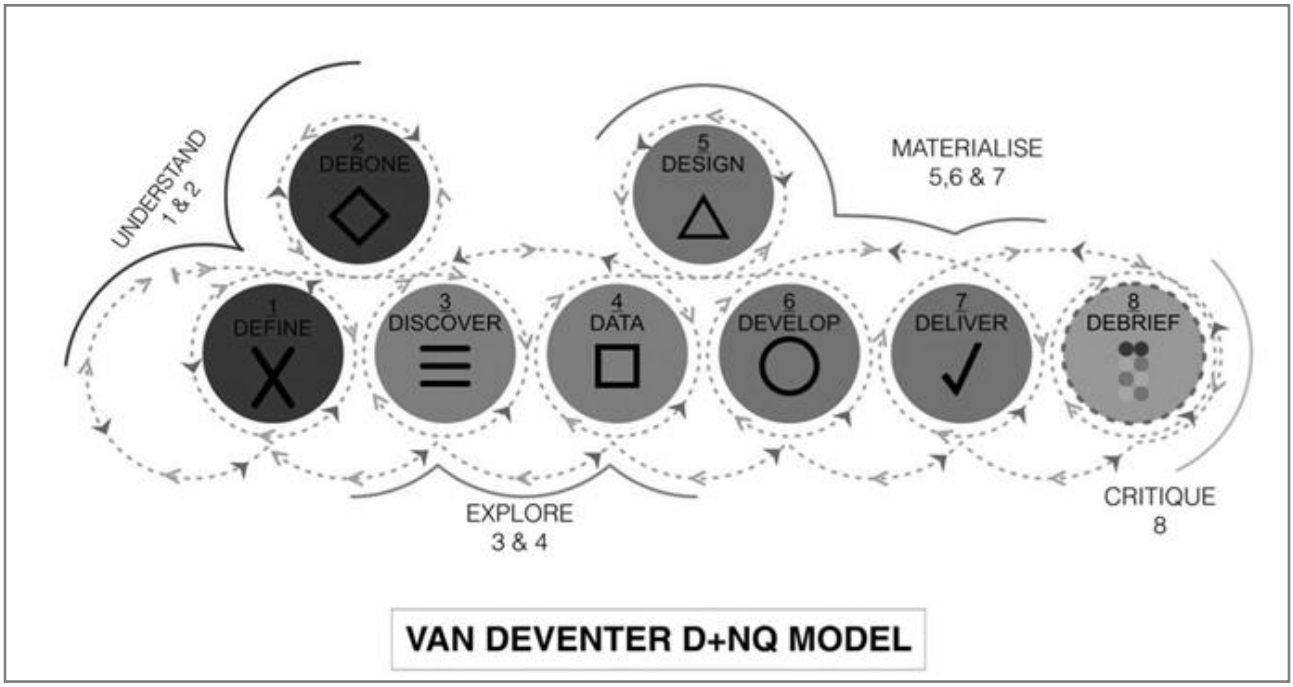
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CHAPTER 3

DESIGN THINKING: VAN DEVENTER D+NQ MODEL[12]

3.1 INTRODUCTION

In continuation of the previous chapter on the reviewed research literature, in this chapter, I define and analyse my proposed model under my name, the Van Deventer D+NQ Model which, as framework, refers to the current *design process* but as a problem-solving means, it offers the possibility to be introduced to DBE for implementation in South African schools. Furthermore, as an answer to the third sub-question set in my introductory chapter: "*How can Design teachers enhance diversity in creative and critical thinking by an easily applicable Design teaching model?",* the Van Deventer D+NQ Model is proposed as an *innovative contribution* to the *Design teaching learning* pedagogical system in South Africa.



Copy of Figure 3.2: Van Deventer D+NQ Model. The Design process: 8-Steps in transforming the existing way of solving problems
Source: Anriët van Deventer

[12] The D+NQ Model is based on the five-step classic model of *Design Thinking*: Emphasise, Define, Ideate, Prototype and Test. With reference to *Figure 2.2: The Design Thinking process.*

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Design Thinking is a *process* that addresses many aspects of innovative thinking in terms of processes, products, services, ways of communicating and even personal life changes (Brown, 2008:86). The DBE aims to include *Design Thinking* in curricula from Grade R to Grade 12 in the near future (Eriksson *et al*., 2019:13, 31). This study has allowed me to develop and propose a *design process* model applicable to South African education. The Model (*Figure 3.2: Van Deventer D+NQ Model The Design process: 8-Steps (Monotone)*) above, aims at transforming the existing way of solving problems. It also demonstrates its generic usage beyond education, such as in business or corporate environments, after having been suitably adapted, hopefully and if needed, for the four different phases currently applied in the school structure: 1) Foundation Phase, 2) Intermediate Phase, 3) Senior Phase, and 4) Further Education and Training Phase. For its successful application, teachers should be introduced and effectively trained with this Model. Yet, in the final analysis, the uniqueness of this *design process* depends on how teachers will interpret it in the context of comprehensible instruction, simplification, and suitable teaching guidance in each one of its stages.

To continue*, Design thinking* ultimately centres on the *final goal and design process*. Although a surfeit of *Design Thinking* models is available and easily accessible online, like the free downloadable IDEO's *Design Thinking* for Educators Toolkit 2012, yet I have not found another available model specifically created for the South African Design education milieu. Therefore, as indicated in *Chapter 1,* section *1.1 Introduction,* I intend to identify any relevant existing problems, challenges, and gaps that I believe should be addressed to facilitate progress in this field. This analytical discussion will justify my suggestions on how to improve, benefit, and hopefully approve my proposed solutions in this fairly young subject[13]*.* It seems that at present, there is a product-driven approach employed by Design teachers, which, I believe, has resulted in a severe gap between the intended pedagogically positive outcomes in Design education and the reality. In other words, by focusing on the end results (summative assessment), Design teachers do not bring the CAPS Design pedagogical aims (formative assessment) enough into praxis in class.

In answer to this observation, the D+NQ Model (*Figure 3.2: Van Deventer D+NQ Model. The Design process: 8-Steps (Monotone)*) is applied in transforming the existing way of solving problems has been designed to fill such a gap and assist teachers in understanding and using the *design process* more intentionally. The concept and development of my D+NQ *design process*

[13] CAPS Design was introduced in schools in 2014, see *1.2.2 Context and 1.8.4 The researcher*.

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model (problem-solving) rely on two motivating factors: its theoretical basis, derived from the literature overview, as discussed in *Chapter 2*, and its practical factor, which will be duly examined in *Chapter 4 Data Analysis*.

Concerning the two documents (CAPS and PAT), I have indicated in Chapter 1 that, according to the DBE (2011:8), *"...for the design learner, this process consists of the following main activities by which (1) a problem or need is identified, (2) the problem is investigated, (3) a solution is suggested, (4) a product or prototype is created, or a service is proposed, (5) the evaluation of the outcome of the process by accessing the product or the service, and finally by (6) communicating the results".*

With these stipulations set out by the DBE above, the D+NQ Model is wholly designed to assist [my emphasis] in the *design process* for a better application and meaningful completion of these focal set-out actions. To this end, the D+NQ Model's importance lies in the interactive, easy-to-use, creative, colourful, and fun tool teachers and learners can use in approaching problem-solving with a hands-on, user-centric mindset that can lead to real problem-solving and innovation creation at an early age. As the D+NQ Model flows logically and simplistically, it is specifically designed in an uncomplicated and understandable way to ease the fear of problem-solving engagement at different levels. It can eventually assist the Design teacher in connecting CAPS more effectively with the learners' practical application and outcomes. The Model's core is placed on inserting creative thinking [*design process*] and complex problem-solving in all aspects of life. I envisage the effective contribution the D+NQ Model can make and ultimately have an impact in equipping and preparing our learners as holistic, balanced individuals in all facets of life. The Model brings forth a uniquely designed South African product and resembles the magnitude of diversity in the country.

To reiterate, I momentously value the freedom Design affords learners to understand, explore, experiment, and materialise their own design solutions primarily using the problem-solving process, long before reaching the final product solution. This marks the importance and contribution of the educational blueprint of my D+NQ Model.

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3.2 CHARACTERISTICS OF THE D+NQ MODEL

Unlike the step-by-step, single linear process, my D+NQ Model suggests an iterative problem-solving process, which helps Design teachers and learners to generally interpret the *design process*. The proposed model is a framework for solving problems systematically and encouraging innovation, *going back-and-forth through the steps* (my emphasis). It encompasses multiple dimensions of the creative process and requires creative and critical thinking. Users are encouraged to follow the clear guidelines on each card in the eight-step process to reach a suitable, user-centred solution for the problem at stake. My aim is for South African schools, in general, to apply it, hoping for the further use of the process beyond the classroom and the development of skills in the informal sector. This Model has a generic use and is pertinent in the corporate, business, training, entrepreneurial and education sectors. Lastly, I intend to reach as many users as possible to gain the skill of *problem-solving* effectively.

3.2.1 Origin of the D+NQ Label

Concerning the label D+NQ, Afrikaans being one of the eleven official languages of South Africa, I have used the Afrikaans term *DINK* (=think) [=D+NQ] in a combined linguistic interplay between Afrikaans and English terms and concepts. The combined new word, D+NQ, has put creative thinking in a play of multiple meanings: indirectly, the letter 'D' for Design implies also the cyclical recurring characteristic of my proposed *Design Thinking process*. The letter 'I' in '*dink*' was left out purposefully, indicating that there is no room for 'I' in the D+NQ Model. Instead, it has been replaced by the symbol '+' (plus), which defines *Design thinking* as an empathetic, human-centred approach that understands community needs and refers to the 21st century's *super skills*, namely the 4Cs – *Collaboration, Creativity, Critical thinking, and Communication* (Kivunja, 2015:225). Besides, the use of the *plus* '+' symbolises that there is ***'more to thinking'*** and ***'more to come from unexplored ventures'.*** The letter 'Q' is used instead of the 'K', referring to a continuous *quest* through *questioning* and *critiquing* during the *design process*.

The D+NQ Model was inspired and conceptually developed through interviews with Design teachers at the participating schools in my study. Relevant questions were posed, and responses/suggestions on the use of symbols, colours, and practicality have been meticulously analysed and assessed in the context of a child who grows up in the South African multi-cultural society.

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3.2.2 Colours and Meanings

We exist in a world of colour, a kaleidoscope of meanings we take for granted. Colour illumes, inspires, and guides us to express ourselves by colouring our thoughts, ideas, feelings, and linguistics (McLeod, 2016:2). Colour reaches us on a subconscious level. I believe colour is as complicated as one wishes to make it. However, with no understanding of colour properties, choosing the wrong set of colours in a specific project will probably cause one to fail before one has even started. According to McLeod (2016), the way colour developed throughout history has evolved internationally. The country, culture and religion all play a part in colour acceptance, meaning and understanding. Colour provides non-verbal but effective communication, probably the most underused but utmost operative to use. Colour affects children and adults' human behaviour, and each colour initiates an emotional, physical and psychological response. Colour psychology asserts knowledge from popular culture, claiming that colour elicits various human responses (McLeod, 2016:6).

The three colours used for the distinct colour zones in the D+NQ Model, Red, Orange and Green, are deliberately chosen for qualities identified in colour psychology applicable to my Model: *Red* – energy, alertness, boldness and excitement; *Orange* – confidence, motivation, creativity, and bravery; and *Green* – quality, clarity, living and freshness [meaning something *new*] (McLeod, 2016; Won & Westland, 2017). Vibrant and intense, Red makes an instant impact implying a prompt start. Orange is an opinion of choice, collaboration, and flow of energy. Green is balancing and pacifying (Won & Westland, 2017). However, according to O'Connor (2011:229), empirical substantiation of colour characteristics is seldom referenced, and when it is, it is usually in the context of results that are inappropriately deduced or obsolete. Therefore, the colour choice of the D+NQ Model will ease identification for users of the different *Stages and Steps* in the Model. Furthermore, learners will only have to remember the three colour-set and as mentioned before, they are related to our traffic lights (robots). The rules and function of traffic lights are taught at an early age; hence the symbolic use of Red, Orange and Green are known, and therefore inoffensive towards any South African cultural group. While the colour choice is grounded on the universal traffic light system the selected geometric shapes have been inspired by Ndebele, isiXhosa, isiZulu and VhaVenda communicative colours and shapes. As a stronger justification, these symbols are also used at the *Constitution Hill* manifesting the seven pillars of Human Rights Policy in South Africa (Naidu, 2003, Parliament of the Republic of South Africa, 1996), (see *Figure 3.1: Constitutional Hill transport vehicle),* illustrated as follows:

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DEMOCRACY = DIGNITY = JUSTICE = RESPECT = FREEDOM = EQUALITY = DIVERSITY =



Figure 3.1: Constitutional Hill transport vehicle
Source: Photograph taken by Steyn (2022)

The application of the same colour-set and its identification with my D+NQ Model, will support the flow of the teaching-learning interaction and strengthen the use of the iterative *design process* for both the Design teachers and learners. The Red Zone, which for a driver represents STOP, WAIT, PREPARING TO START, in the *design process,* symbolises the conceptualisation of an idea and preparation for its application. The Orange Zone, which prepares the driver for the pending stop or go, in my creative thinking process means the time before motion, before carrying on or critically reassessing the concept. Finally, the Green Zone, indicating motion, symbolises the open road for the creation, meaning an anticipated solution to the related problem or creating a user-friendly product. For the last stage, the Grey Zone was selected. This stage represents the '*crit*'-stage (critique), where the problem or solution is being Debriefed according to five criteria. My selection of the grey colour expresses a neutral and balanced colour, often referred to as emotionless and timeless. In my Model, further than timelessness, the grey colour emphasises and supports the

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'crit' stage where Debriefing must take place on a neutral, a non-threatening platform where questions can be asked, and decisions can be taken. In conclusion, I view my four-colour choice: red, orange, green, and grey for the D+NQ Model fit for its purpose.

Dating back to classical Greece, *Rhetoric* is the earliest term, which defines *communication* today and is concerned with studying the use of symbols to communicate (Foss, 2005:141). According to Foss (2005:143), human experiences that are spatially orientated, non-linear, multi-dimensional, and dynamic can usually be communicated only through symbols (or visual imagery). In its subtle form, a sign communicates when it is connected to another object. Clements (2004:13), who conducted several studies on a large number of children, ages 3 to 6 years, in his first, co-authored study (Clements, Swaminathan, Hannibal & Sarama, 1999), and cited in Clements (2004:8), states that for comparison purposes, the same equivalent offline geometric depictions were used as before with elementary learners. According to Clements (2004:8), children accurately identified all geometric-shaped figures (Clements, 2004:8). As a result of this study states that prototypes in forming geometric shapes have already been conceptually formed reminiscent of *geometric thinking* (Clements, 2004:13).

With locus to the above, symbols in the D+NQ Model were wisely chosen and will be easily recognised by younger learners (see *3.2.2 Colours and Meaning*). The symbols and colour-set effort aims to achieve the learning goal of mastering the *design process* in much younger learners or learners that prefer visual learning. My aim for learners is to apply shape recognition, remember the symbol, especially for younger learners who cannot read yet but can learn the *design process* using the D+NQ Model. Identifying and remembering each symbol in the D+NQ Model will aid them to continue the process by crossing from stage-to-step, knowing what is expecting within that specific step. The choice of the geometric shapes, as mentioned above, were inspired by the South African communicative symbols. Thus, it has reference to my holistic goal, in terms of easy recognition and understanding the process while developing this Model. I have placed considerable effort in choosing the '*correct*' shape complimenting the specific Stage and step.

Empirical evidence by Chen, Kasof, Himsel, Greenberger, Dong and Xue, (2002:173) emphasises that creativity is involved in a wide range of activities. Other researchers have studied prime creative activities, such as producing innovatory scientific ideas (for example, the theory of relativity), producing noteworthy artworks, architectural structures, writing novels and poems, as well as trivial shapes and forms of creativity that occur in circadian life (Richards, Kinney, Benet

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& Merzel, 1988 cited in Chen *et al.,* 2002:173). Choosing the insignificant shapes that surround us in everyday life for my Model, a circle is exceedingly interactive, sharing structure for systematising flow and the regulation of the *process*. The D+NQ Model consists of three clusters of circles: two at the bottom and one above. The last two rings, next to each other, is standalone. The objective is to acquire, exchange, and convey knowledge via an undeveloped dialogue and deep thought process focused on a typical result around topics or difficulties. All of these circles are linked, forming a sequence and pattern with a 'golden thread' enforcing an iterative process, going 'back-and-forth' when engaging with the Model. The arrows on the 'golden line' are facing forward (right) and backward (left) with a drive for users to go back to a previous step at any time before progressing to the next step.

Based on an eight-step iterative *problem-solving method*, my D+NQ Model has further worked on the established *Hasso Plattner Institute of Design at Stanford University's* (d.school) and the *Innovation Design Engineering Organisation's* (IDEO) *Design thinking* models. The proposed D+NQ Model is a prototype designed with the latest state-of-the-art design trends in mind and consists of 22 cards. What follows is a short explanation of how the D+NQ Model works.

The D+NQ Model has been mapped out and is accompanied by 'step-and-stage cards' but is to be used iteratively, explaining each step within the different stages of the *Design thinking process* that both teachers and learners need to follow. An A3-size Road Map accompanies the model. The map is used for each step-and-stage card, placed onto the relevant block, indicating which step the learner/user is. The first card gives an overview of the D+NQ Model and explains how to use the other cards for successful guidance throughout the *design process*. Each step has a highlighted question and focuses on the main point of the next step. In addition, specific questions are listed, including 'To Do' pointers as guidance to assist the learner with sufficient information to answer all the given questions in that step.

I hope to present my new proposed model to the DBE for consideration. Furthermore, due to developments from my literature review, and not stated in Chapter 1, my Model was tested in this study as I analysed the collected data against this context (see *Chapter 4, 4.3 PART TWO: DESIGN LEARNERS' OUTCOMES OF THE DESIGN PROCESS (TOPIC 1) – SOURCEBOOKS and PART THREE: DESIGN LEARNER OUTCOMES OF THE DESIGN PRODUCT (TOPIC 2)).* Therefore, for the full development of the Model and its advancement, further testing will be suggested aimed at its completion and the successful crafting of the designed product.

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3.3 FOUR STAGES OF THE MODEL AND EIGHT STEPS OF THE PROCESS

As mentioned above, my D+NQ Model is based on an eight-step iterative problem-solving method developed from the prominent perspectives in educational terms, namely Stanford University d.school's and IDEO's Design Thinking models. I have also looked at other models – South African Innovative Design Education Africa (IDEA) Collective and Illinois Center for Innovation in Teaching &and Learning (CITL) – that were created from the standard *Design Thinking* model, which I used as reference, inspiration and guidance in designing and mapping my D+NQ Model (see *Figure 2.2: The Design Thinking process* and *Figure 2.3: Graphic representation of the non-linear Design Thinking process*). The model has three developmental stages, namely: (A) Understand, (B) Explore and (C) Materialise (see *Figure 3.6: Summary of the Van Deventer D+NQ Model: STAGE A, Figure 3.7: Summary of the Van Deventer D+NQ Model: STAGE B* and *Figure 3.8: Summary of the Van Deventer D+NQ Model: STAGE C*) and one evaluation or critique stage (D) Critique (See *Figure 3.9: Summary of the Van Deventer D+NQ Model: STAGE D*). Similarly, Brown (2008:88) refers to these three '*overflow*' buckets as: Inspiration, Ideation and Implementation. Regarding the problem-solving part of the Design**+** *process*, (=D**+**N), the development of these stages consists of eight steps in the following order:

A) Stage A – *Understand*: 2 steps: Define and Debone (= Red Zone);
B) Stage B – *Explore*: 2 steps: Discover and Data collection/analysing (= Orange Zone);
C) Stage C – *Materialise:* 3 steps: Design, Develop and Deliver (= Green Zone) and
D) Stage D – *Critique*: 1 step, 5 criteria: Debrief (= Grey Zone).

As for the critical-thinking part of the *design process*, *Quest and Questioning* (=Q) will be at play after each step (Crit) to allow the teacher and learners to assess their progress. Finally, the last Stage, Stage D, involves evaluation and critique of the solution or product. An opening between each of the above eight steps secure objective critique, referring to the iterative (repeated cycles) progression process in finding creative answers to your problem.

The iteration cycles could be used to expand the number of options that might serve for viable solutions. In other cases, iteration is used to omit details and ensure that all requirements and constraints have been considered for the chosen option. See *Figure 3.2: Van Deventer D+NQ Model.* The *Design process: 8-Steps in transforming the existing way of solving problems* (Full colour) for a graphic of the Model. *Figure 3.3* illustrates the *package design and format* of the suggested D+NQ Model prototype.

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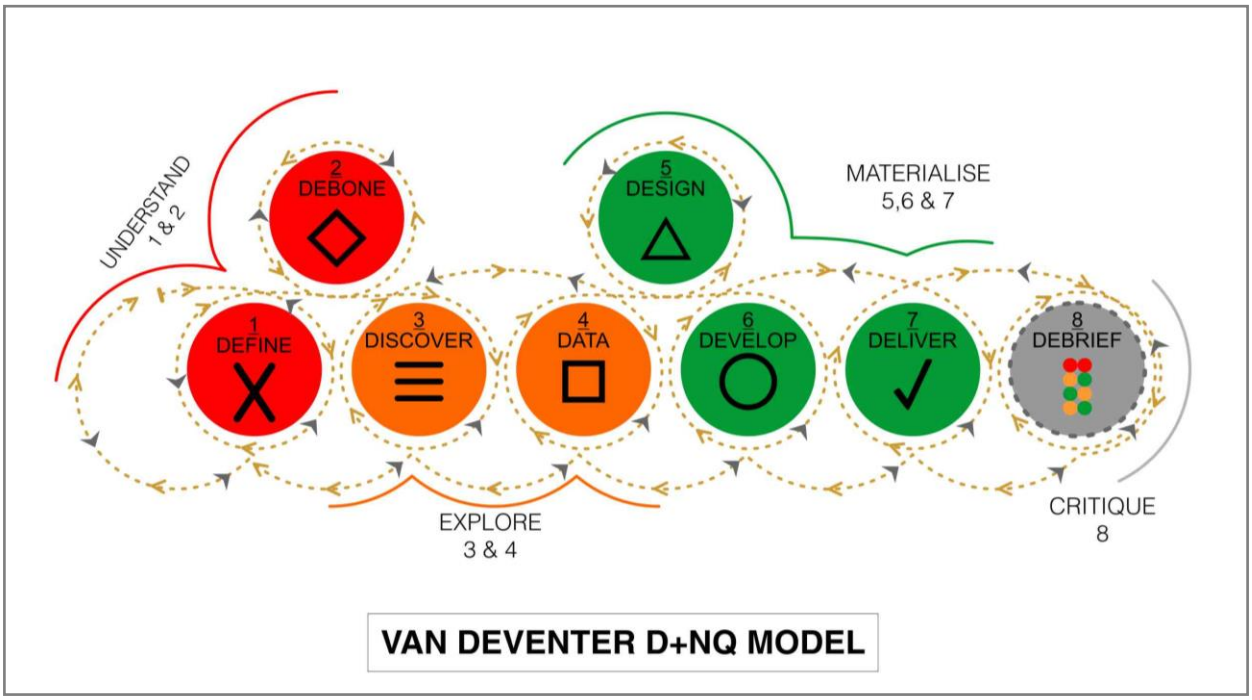


Figure 3.2: Van Deventer D+NQ Model. The Design process: 8-Steps in transforming the existing way of solving problems
Source: Anriët van Deventer

3.3.1 Infographic of Figure 3.2: Van Deventer D+NQ Model

Figure 3.2 is a visual representation of the D+NQ Model.

A) Stage A – Understand: 2 steps: Define and Debone (= Red Zone);
B) Stage B – Explore: 2 steps: Discover and Data collection/analysing (= Orange Zone);
C) Stage C – Materialise: 3 steps: Design, Develop and Deliver (= Green Zone) and
D) Stage D – Critique: Debrief - 5 criteria (= Grey Zone).

The golden line represents the continuous flow identified by the '*closed grey arrow-heads*', all facing right. The '*open golden left-facing arrow-heads*' illustrates the iterating steps of the Model. See *APPENDIX R: Card layout of the Van Deventer D+NQ Model.*

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3.3.2 Product | Van Deventer D+NQ Model – Photographs of the printed prototype

Figure 3.3: Product photographs | Van Deventer D+NQ Model below shows two photographs illustrating the printed format of the Model. The prototypes' front and back are shown on the left, while the content cards are shown in the photograph on the right.



Figure 3.3: Product photographs | Van Deventer D+NQ Model
Source: Anriët van Deventer

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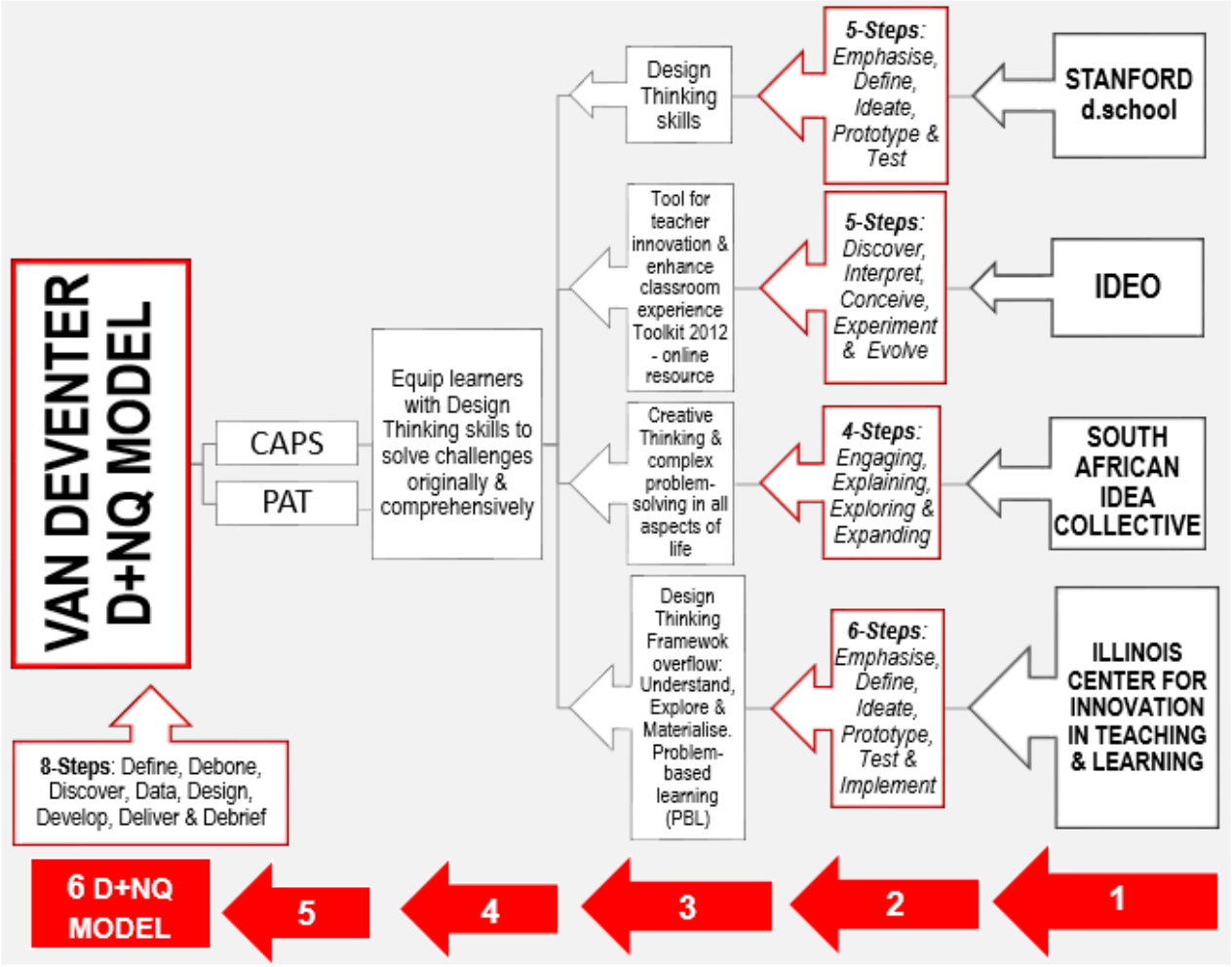


Figure 3.4: Organogram: Van Deventer D+NQ Model links to CAPS, PAT and other *Design Thinking* theories
Source: Anriët van Deventer

3.3.3 Discussion of Figure 3.4: Organogram: Van Deventer D+NQ Model links to CAPS, PAT and other Design Thinking theories

In *Table 3.1: Figure 3.4 arrows discussed,* each arrow and what it represents are described in detail below.

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Table 3.1: Figure 3.4 arrows discussed

1	Stanford University d.school, IDEO, IDEA Collective and Illinois CITL are the different *Design Thinking Models* and *design process* theories I have selected. I have used aspects from these models to develop my D+NQ Model.
2	Here is a layout of the steps in each model. This might be a good way for comparison to take note of the similarities and differences I took cognisance of.
3	This indicates each model's distinctive aim and contribution. I appropriated d.school and IDEO models as guidelines for my Model, namely *Design Thinking* skills and the latter, the useful Teacher Toolkit 2021. From the South African IDEA Collective, I took *"problem-solving in all aspects of life".* I decided on the letter 'D' for my model and incorporated the first letter as the repetitive letter in each of the D+NQ Model's steps. Lastly, Illinois CITL contributed to my chosen three Stages A, B and C in the D+NQ Model that act as an ampule; these have reference to any standard DTF referred to as an 'overflow' contained in three buckets, namely: "*Understand, Explore and Materialise*". As a result, this links/homogenises my Model to any other *Design thinking* model.
4	This is a combination of all four models' aims and distinct features, which link to the D+NQ Model's main aim.
5	Here I indicate the CAPS and PAT documents' guidelines regarding the *design process (Design thinking).* CAPS – Plan, prepare, survey, research; Innovation & creativity (DBE, 2011:46). PAT – The PAT Guidelines (DBE, 2018:13) document refers to William's taxonomy and indicates how it should be used in conjunction with the assessment criteria for PAT 1 (Term 1) and PAT 2 (Term 2). These cognitive level descriptors are used for practical projects. Stage D of the Van Deventer D+NQ Model lashes back onto the PAT Guidelines (DBE, 2018:5, 6 & 14).
6 VAN DEVENTER D+NQ MODEL	I have arrived at the final prototype: The Van Deventer D+NQ as an iterative user-centred problem-solving framework/method, which has four Stages: A, B, and D, and 8-Steps with each step uniquely named starting with the letter 'D'.

Source: Anriët van Deventer

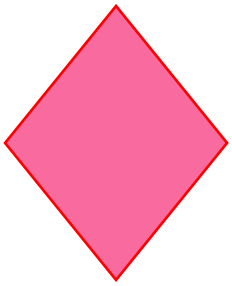
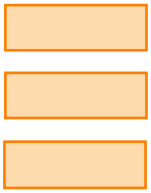
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Table 3.2 – Four stages of the Model and eight steps of the process below provides a complete description of the stages and steps used in the Model. The first column indicates the stages, column two specifies the steps of the Model with the main *focus* in each and includes the signposts – symbol. Under the heading '*Description*', a clear indication is given '*what to do'* in each step to accomplish the goals set in each *step-and-stage*. See *Table 3.3: Full questions for STAGE D | Critique | Step 8 | Debrief | Design below* indicates the questions under each criterion in the Critique Stage. Then, *Figure 3.5: Criteria 2: A list of Elements of Art and Principles of Design* lists the Elements and the Principles as a reference under Criteria 2 (see below).

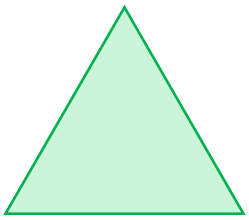
Table 3.2: Four stages of the Van Deventer D+NQ Model and 8-steps of the process

D+NQ MODEL		*Understanding – Exploring – Materialising – Critiquing (design process)*			
		STAGES	**STEPS**		**DESCRIPTION**
A	Red Zone	*Understand*	**1st**	**DEFINE** Define the Problem/Challenge	This process outlines the issue or challenge that you need to address: • Define the problem/challenge. • Understand/investigate the brief • Develop a deep understanding of the problem or challenge. • Develop a concept demonstrating creative and critical thinking • What pain points do you face in the context? • Formulate a problem statement and/or a point of view.

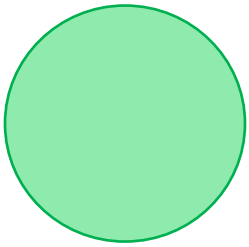
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D+NQ MODEL		*Understanding – Exploring – Materialising – Critiquing (design process)*			
		STAGES	**STEPS**		**DESCRIPTION**
A	Red Zone	*Understand*	**2nd**	**DEBONE** Seek to understand. 	Unpack real user problems and start building empathy: • What do I need? • What do I need to know? • What common themes and patterns do I observe between *Me and the Other*? • What needs of the user (the Other) and challenges consistently are coming up? • What do I see, hear, feel and think in connection with what I am referring to? • Continuous reflection on the process must be evident = critical thinking
B	Orange Zone	*Explore*	**3rd**	**DISCOVER** Research Identify your facts. 	Explore different avenues without a specific route or direction: • Do research, get more facts. • Brainstorm and/or create a mind map. • Continue with paste-ups and a mood board. • Allow space for freedom to explore.

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D+NQ MODEL		*Understanding – Exploring – Materialising – Critiquing (design process)*		
		STAGES	**STEPS**	**DESCRIPTION**
B	Orange Zone	*Explore*	**4th** **DATA** Build on different ideas alternative options. Think with No box! 	Organise your thoughts rationally and present them in a structured way. • Combine different ideas and build different options around a proposed solution to the relevant problem. • Based on the findings from the DEBONE and DISCOVER steps, start piecing them together. • You are encouraged to deviate from the usual, look at things from other perspectives, and think *'beyond the box'*. • ***Think with NO box!***
C	Green Zone	*Materialise*	**5th** **DESIGN** Choose the best solution and expand on it. 	Transform your concepts into something concrete that can be tested (on real users). • This is essential for keeping a user-centric approach and gathering input before building the entire product. • Among the different options put to the table, choose the best solution and build on it. This guarantees that the final design or solution answers your problem while also being enjoyable to use!

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D+NQ MODEL	*Understanding – Exploring – Materialising – Critiquing (design process)*			
	STAGES	**STEPS**		**DESCRIPTION**
C Green Zone	*Materialise*	**6th**	**DEVELOP** Test your design through user-testing and improve if needed. 	The testing phase: add detail to your solution. • Increase the number of options by coming up with new ideas. Testing can immediately reveal any design faults or solutions that are not appropriate for solving your issue. • You will make the required modifications and enhancements based on what you learn through user-testing. Therefore, the findings of the testing phase may continually need a return to the DEFINE and DEBONE phases, as well as a few additional DATA and DESIGN sessions.
C Green Zone	*Materialise*	**7th**	**DELIVER** Produce/present your solution. 	• The drawn-up plan is materialised. A suitable solution is found. • The way forward: Reiterate the *design process*.

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D+NQ MODEL		*Understanding – Exploring – Materialising – Critiquing (design process)*			
		STAGES	**STEPS**		**DESCRIPTION**
D	Grey Zone	*Critique*	**8th**	**DEBRIEF** Evaluate and critique your solution/product 	• Ask reflective questions • Use 5-Criteria to look at your solution/product and evaluate • ***Criteria* 1** Plagiarism Interpretation of Brief Relevant solution of Brief • ***Criteria 2*** Art Elements Principles of Design • ***Criteria 3*** Techniques Methods Craftsmanship • ***Criteria 4*** Creativity Originality • ***Criteria 5*** Functionality of solution Professional presentation

Source: Anriët van Deventer

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Table 3.3: Full questions for STAGE D | Critique | Step 8 | Debrief | Design

Full Questions for STAGE D | Critique | **Step 8 | Debrief** | DESIGN
Criteria 1 1. Have I plagiarised any existing Idea/Concept? 2. Have I copied the Idea as is? 3. Have I changed 60% of the Idea/Concept/Solution? 4. Is my interpretation relevant to the brief or scope? 5. Is my solution relevant to the brief or scope?
Criteria 2 1. Have I taken the Art Elements in account? 2. Does my Solution/Design/Product reflect effective consideration of the Principles of Design?
Criteria 3 1. What is quality of my craftmanship? 2. Are my techniques applicable? Have I tried something new/else? 3. Do my methods reflect innovation? 4. Have I applied Thinking with NO box?
Criteria 4 1. Have I applied creativity? 2. Have I created/suggested an Idea/Concept/Product/Solution that never existed before? 3. To what extent is my Idea/Concept/Product/Solution original?
Criteria 5 1. How practically functional is my design Product/Solution? 2. Is the presentation of my Idea/Concept/Product/Solution professional, aesthetic and appealing?

Source: Anriët van Deventer

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Art Elements	Design Principles
1. Line 2. Texture 3. Colour 4. Shape 5. Form 6. Value 7. Space	1. Unity 2. Repetition 3. Variety 4. Proportion 5. Balance 6. Harmony 7. Emphasis 8. Rhythm 9. Contrast 10. Movement

Figure 3.5: Criteria 2: A list of Elements of Art and Principles of Design
Source: Anriët van Deventer

As a transitory overview of the D+NQ Model, I have plotted my Model in its different stages and included each step that accompanies it. It reflects the colour-set as discussed above, together with the different symbols and focus of each step. These are included in the prototype set of cards for easy referral and effective use. See *Figures 3.6, 3.7, 3.8, 3.9 & 3.10* below.

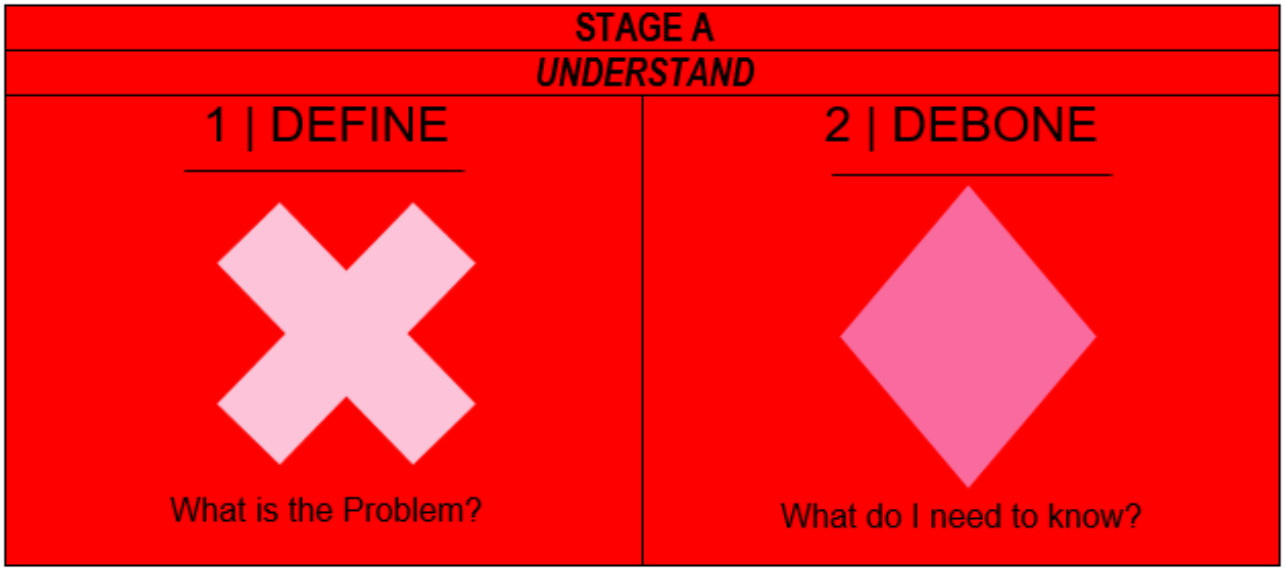


Figure 3.6: Summary of the Van Deventer D+NQ Model: STAGE A
Source: Anriët van Deventer

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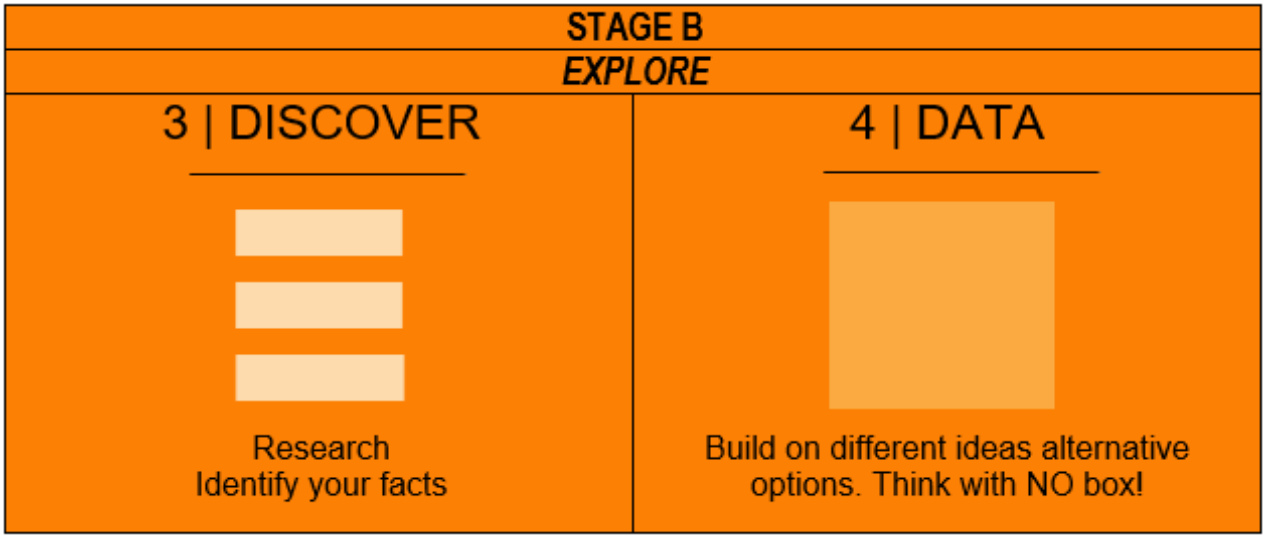


Figure 3.7: Summary of the Van Deventer D+NQ Model: STAGE B
Source: Anriët van Deventer

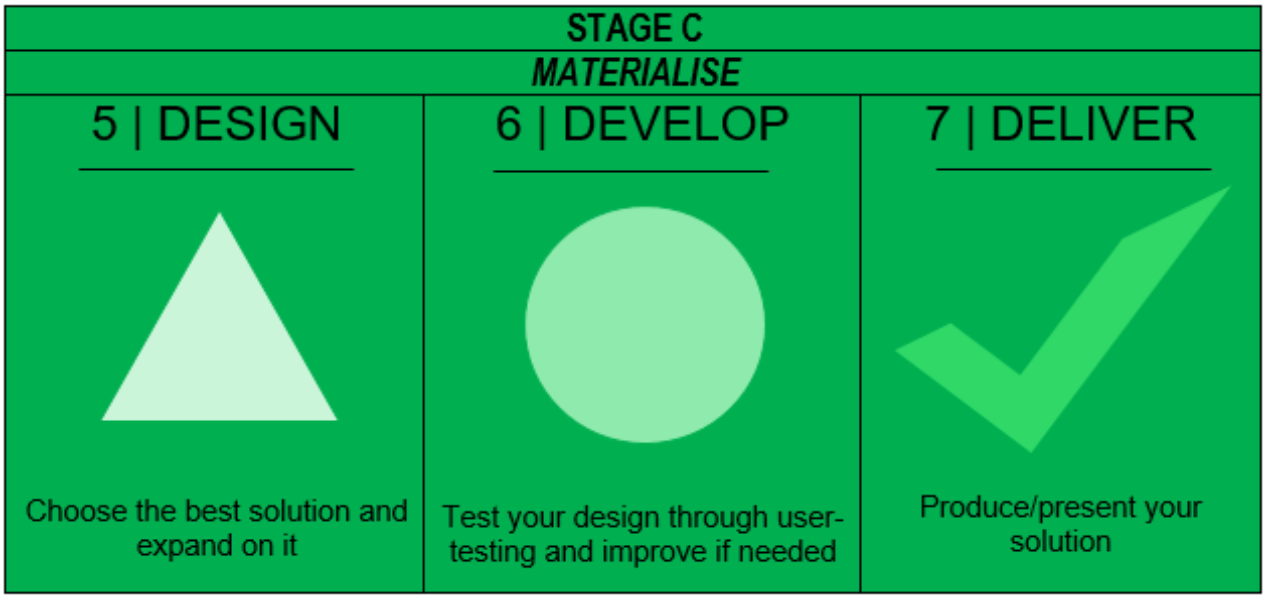


Figure 3.8: Summary of the Van Deventer D+NQ Model: STAGE C
Source: Anriët van Deventer

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STAGE D	
CRITIQUE	
DEBRIEF	
THE DESIGN PRODUCT	
8 | Five Criteria |	
Criteria 1 Plagiarism Interpretation of Brief Relevant solution to Brief	***Criteria 2*** Art Elements Principles of Design
Criteria 3 Techniques Methods Craftsmanship	***Criteria 4*** Creativity Originality
Criteria 5 Functionality of solution Professional presentation	

Figure 3.9: Summary of the Van Deventer D+NQ Model: STAGE D
Source: Anriët van Deventer

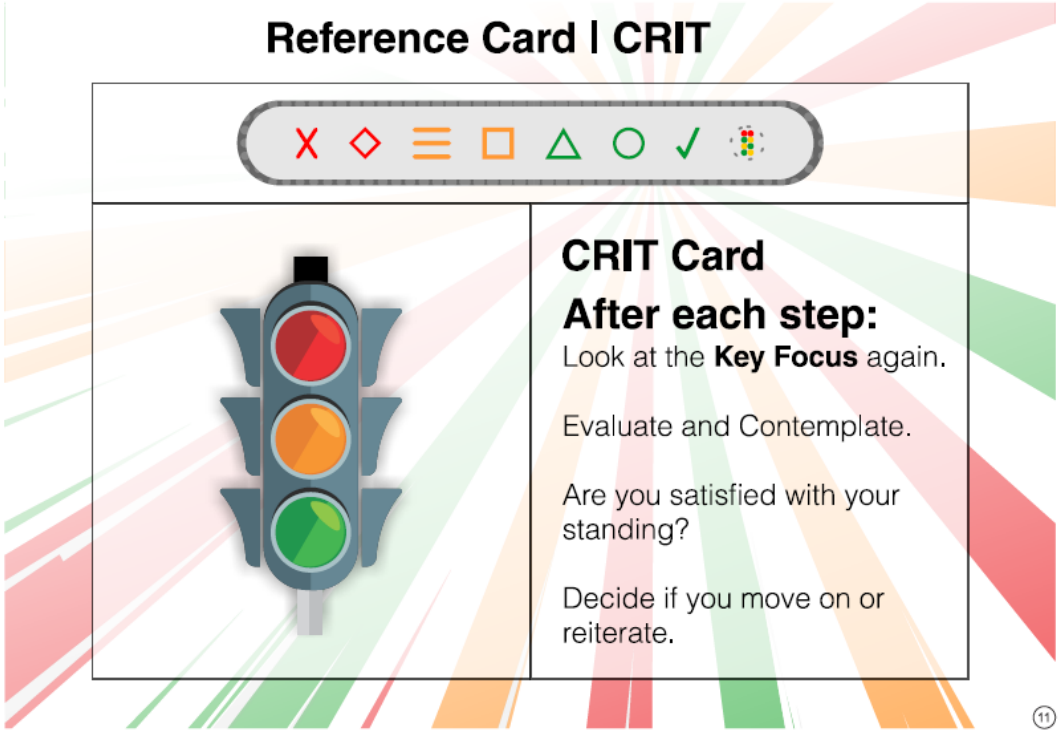


Figure 3.10: Summary of the Van Deventer D+NQ Model: CRIT Card
Source: Anriët van Deventer

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3.4 VAN DEVENTER D+NQ MODEL AS ANALYTICAL TOOL

3.4.1 Testing the Model

Data analysis is employed to evaluate data using tools to find useful information and the interpretation thereof. Different methods can be utilised to assist with the process of dismantling the data collected. With the development of the D+NQ Model, which resulted from the research I conducted, I decided to test the Model in its application as a problem-solving tool. In *Chapter 1, 1.9.3 Data Analysis* it is stated that I will use the *Design Process* (Topic 1) with six tasks and the *Design Product* (Topic 2) with the four stages of the Van Deventer D+NQ Model to analyse the data from the digital photographs. See *Chapter 4*, section *4.6 DATA STRUCTURE* for detail. However, considering that the D+NQ Model is a problem-solving tool, its testing in this study is favourable. Hence, the progression of using the D+NQ Model as an analytical tool rather than CAPS Design tasks. I tested the D+NQ Model in *Chapter 5, 5.3 Part Two: Design learners' outcomes of the Design Process (Topic 1) – sourcebook* and *Part Three: Design learners' outcomes of the Design Product (Topic 2).*

3.5 VAN DEVENTER D+NQ MODEL: QR CODE[14] AND URL-LINK

A printed version is available of the Model. Following the instruction of the University of Pretoria, this thesis will be made available electronically to reviewers. Therefore, the Model is presented as an overview with a selection of steps form can be viewed by using this QR code. Scanning the QR Code with your smartphone will lead to my PhD student homepage. Then, click on the Van Deventer D+NQ Model-tab. A selection of cards is offered as an overview in *APPENDIX R: Card layout overview of the Van Deventer D+NQ Model*. See *Figure 3.11: QR Code and URL-link: Van Deventer D+NQ Model* for the QR-code and URL-link below.

[14] Quick Response Code is abbreviated as QR. A machine-readable code with an array of black and white squares is commonly used to store URLs or other information that can be read by scanning with a smartphone. The address of a web page is the URL (Uniform Resource Locator).

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It is advisable to access the landing page on a laptop which gives a better visual experience of the visual show, here is the link: https://rb.gy/mebibz

Click URL-link https://rb.gy/mebibz or

Scan QR code

Figure 3.11: QR Code and URL-link: Van Deventer D+NQ Model
Source: Anriët van Deventer

3.6 CHAPTER SUMMARY

This chapter has presented a detailed analysis of my *Design thinking* D+NQ Model which has been conceptualised, applied, and tested on various occasions in my Design classes and, as impartially as possible, empirically assessed. Encouraged by successful teaching outcomes and positive learning responses, I believe that the analytical presentation of this Model carries enough merit to be recognised and duly evaluated for its pedagogical significance. Depending on its acceptance, this study aims at presenting the D+NQ Model as an innovative *Design Thinking* model to the DBE in the context of having been created and developed for the South African multi-cultural social needs. The application of the D+NQ Model as my analytical tool in this study can serve as first-hand feedback on the effectiveness and functionality of its intention. In the next chapter, I set forth my research design and methodology applied in this study.

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CHAPTER 4

RESEARCH DESIGN PROCESS, THINKING PROCESS AND METHODOLOGY

4.1 INTRODUCTION

In the previous chapter, in the context of *Design thinking* education, I introduced my own Design thinking tool based on my empirical knowledge and relevant scholarly information. As presented in the Van Deventer D+NQ Model, my pattern was conceptualised and is intended for South African schools and learners of diverse cultural backgrounds.

This chapter outlines my research design and discusses why I chose a qualitative and case study approach for this project (Stake,1995). In addition, it describes the research setting as well as the data collection methods used. The chapter also accounts for each data collection stage (this research has two parts) and how the directly concerned parties were approached for their approval to conduct the study and gain access to information. It justifies the obstacles I have encountered during the data collection phase of the research, as I discuss what impact the COVID-19 pandemic (See *4.9.3 Pandemic | Corona Virus – COVID-19*) had on my progression. The instruments, sampling details, and process utilised in this study are explained. Followed by the data collecting procedure and data analysis method are described. In conclusion, the chapter confers the study's data collection's reliability, ethics, limits, and strengths.

4.2 RESEARCH DESIGN

I relied on the theory of social constructivism in the framework of interpretivism to analyse my research paradigm. Willis, Jost and Nilakanta (2007:4) explain interpretivism as an approach that usually seeks to understand a particular context and that *reality* is socially constructed. From his viewpoint, Creswell (2011) argues that individuals seek to understand the world and develop their own precise meanings that correspond with their experiences. The social constructivism theory considers collective understanding, purpose and importance generated per other people's ideas and cognitive perceptions (Amineh & Asl, 2015:13).

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Guided by Mouton (2001:55), my research design indicates the direction to follow and the method to apply. In *Figure 4.1*, I present a diagram that summarises my research thinking process.

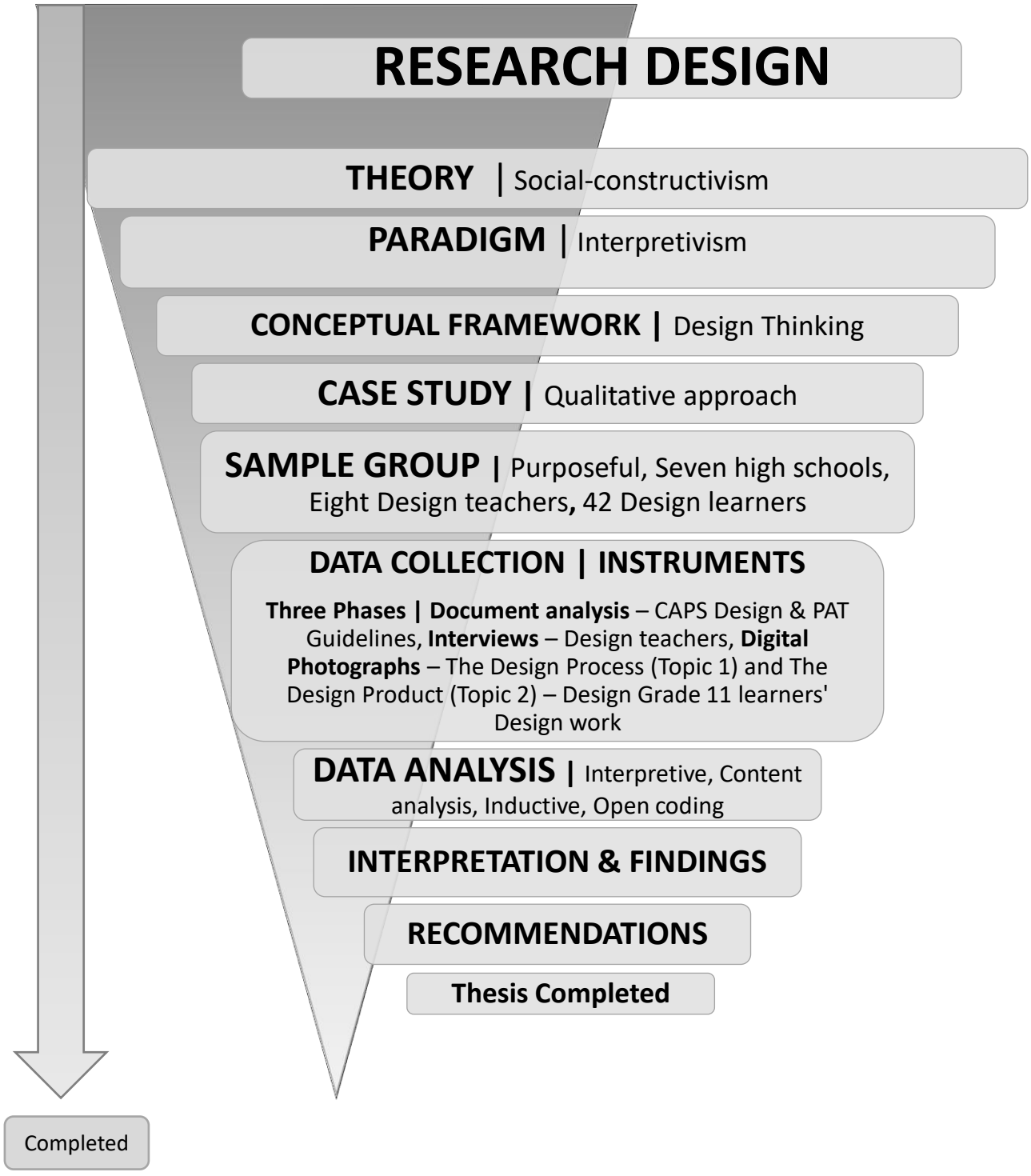


Figure 4.1: Diagram: Concise research process
Source: Anriët van Deventer

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4.3 RESEARCH METHODOLOGY

My study's research paradigm, interpretivism, allows using a qualitative method that builds its principles on inductive reasoning. The researcher's paradigm fully comprehends, explains, and interprets the study participants' life experiences (Cohen, Manion & Morrison, 2011). According to this paradigm, the teacher is viewed as a social being who exists in a certain social environment. Thus, contextual variables such as resources and types of training impact the social setting in which the teacher works (Ohemeng-Appiah, 2014:28). These elements, such as resources and forms of training, are termed teaching practices in my study and are meticulously investigated in terms of the *design process*. Henceforth, the study explores the Grade 11 Design teachers' perspectives on the *design process* and its pedagogical impact on the teaching-learning interaction activity, based on the assumptions of the interpretivist paradigm.

My research strategy involves a case study that investigates the focused phenomenon in its real-life context. Case studies usually collect comprehensive data in a natural environment and in a standing context where the researcher has little or no command over the factors that play a role in the particular environment. My case study addresses an expanded view on the variable human behaviour by revealing participants' views and choices in a well-defined context and discussing the answers to the *how* and *why* questions in my relevant investigation (Anderson & Arsenault, 1998). My sample group, Design teachers and Grade 11 Design learners were studied in a real-life context, namely their Design classrooms. My research involves interviews with Design teachers but does not include any experimentation (Patten & Newhart, 2018:13). To understand their real-life circumstances, the data collection, which includes interviews and data captured by digital photographs, was taken from selected learners' sourcebooks in designated schools that offer Design as a subject in Gauteng, South Africa, and was later analysed. Thus, the three main tools for data collection and interpretation were document analysis, interviews and the use of data captured by digital photos. I photographed the *Design Process* (Topic 1) and the *Design Product* (Topic 2) (CAPS) of learners' Design work produced for this study as a primary source. Under the interpretivist paradigm, I also explored how teachers engaged in the *design process* and analysed the factors that influence their interpretation of CAPS, which affects their way of teaching the *design process*.

Cohen *et al*., (2011:291) identified three types of case studies based on their outcomes, and I utilised one of them. Furthermore, I considered my research questions, *"How do teachers interpret*

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the design process"; "Why do teachers interpret the design process the way they do?" and *"How does teachers' interpretation influence their teaching of the design process?"* to strengthen my descriptive case study. An explanatory case study deals with testing a hypothesis. The goal was to understand the teaching methods of the *design process* rather than to judge teacher practice. Thus, the case study featured real people in real situations and provides a thorough comparative examination of the participants' unique and usual qualities in a short amount of time (Bell, 1993; Cohen, Manion & Morrison, 2011; Denscombe, 2003; Kumar, 2005).

Regarding my qualitative approach, McMillan and Schumacher (2010) collate the goals of qualitative research, which I followed *to explore, describe and explain the phenomenon.* The distinction, according to Ohemeng-Appiah (2014:29), is in the case study methodology approach, which allows for extensive descriptions of participants' experiences, ideas, and feelings regarding a specific occurrence within a particular setting utilising various data sources. The purpose of collecting qualitative data for the study was to understand better how Grade 11 Design teachers' perceptions of the *design process* impact their teaching (Bertram, 2003; Kumar, 2005). Therefore, flexibility was required at all phases of the investigation to approach such viewpoints. This approach was chosen because it recorded a wide variety of replies, implying that the participants' perspectives were rich, appreciated, and respected.

4.4 LOCATION OF THIS STUDY

As location-focus for my study, I conducted my research in the Gauteng Province, South Africa, for practical reasons. I live in Gauteng and am familiar with the structure and procedure of the GDE. The border on the west is the Northwest Province, Limpopo Province to the north, and Mpumalanga Province to the east. Gauteng's southern border is the Vaal River, which parts it from the Free State Province.

In the FET phase, 54 public Gauteng high schools offer Design as a selective subject. Therefore, I focused on seven high schools offering Design as a subject in Johannesburg and Pretoria as the financial and administrative centres of South Africa. The participating seven schools are from different districts, namely Tshwane South (TS) - *2 schools,* Johannesburg South (JS) - *1 school,* Johannesburg North (JN) - *1 school,* Ekurhuleni North (EN) - *2 schools and* Ekurhuleni South (ES) - *1 school.*

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4.5. DATA COLLECTION METHODS

4.5.1 Introduction

Empirical studies are founded on natural settings; therefore, the empirical research approach is demarcated where conclusions of the study are accurately drawn from concrete empirical evidence, and as an outcome, *verifiable* evidence. Failure to identify suitable data collection tools can undesirably impact research results. This is only because the study of such data may yield relevant knowledge, such as phenomena, patterns, acts, and behaviours. As a result, researchers using ineffective data collection methods may be unable to access information (Ohemeng-Appiah, 2014:32).

There are two approaches to gather research data, the indirect and direct collection. For starters, it might come from previously unseen data, such as school records, census data, or other previously unreleased publications. This indirect approach is referred to as secondary data (Kumar, 2005). The direct approach, primary data, is obtained from a *tête-à-tête* source, such as interviewing or seeing people, or getting direct responses through face-to-face questionnaires (Bertram, 2003; Cohen *et al*., 2011; Denscombe, 2003). For my research, the data collection resulted from a primary source as illustrated in *Table 4.2: Phases of data collection* below.

In *Chapter 4*, section *4.9.3 Pandemic | Corona Virus – COVID-19/Government*, I elaborate on the effect and impact of the virus on education and indirectly the timeframe of my research. At this point, I wish to note that only the question *When?* – as indicated in *Table 4.2: Phases of data collection* – was affected, as I could not proceed with my plan set out at the end of March 2020. As a result of the lockdown and the closure of schools, my data collection phase was completed at the end of September 2020, which extended the completion of my study to 2021.

4.5.2 Permissions to conduct research

Attaining access in each research phase requires a set plan. The Gauteng Department of Education gave me formal permission to conduct my research in Gauteng high schools. This came with a prescribed guideline when research could be done, either Term 1 or Term 3, and it was clearly stated that it should take place *after hours*. Before this approval, I had to present my research proposal to an academic panel within the Humanities Education Department at the University of Pretoria. Hereafter, consent was sought with the Faculty of Humanities Research

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Ethics Committee, where strict guidelines had to be adhered to. After receiving approval for all of the aforementioned, permission was requested from the principals of the schools in Gauteng Province to conduct the research at their respective schools. Thirteen High School Principals were approached to make a final selection. Two schools per category: High Performing Schools, Middle Performing Schools and Low Performing Schools form part of my study. All correspondence was conducted via email. Although I had some difficulties obtaining responses to my initial email request to the principals of certain schools, official authorisation was obtained for my study to be performed at the seven schools that agreed to participate. Once I had secured the consent of the principals to conduct research at their schools, I pursued permission from Grade 11 Design teachers and Design learners to participate in this study. All participants were informed about the study's history and objectives via email and letters. Therefore, prior to the start of the study, the Principals, Design teachers, Design learners, and Parents of the learners all signed consent forms. Participants were informed that they may opt-out of the research at any moment and that their privacy and identities would be protected.

4.5.3 Instruments

My data collection was conducted per the qualitative method case study design. Yin (2009) suggests that case study researchers focus on how and why research has supported a thorough study of actual phenomena in their true context. Therefore, my multiplex data collection process was conducted in three phases, namely document analysis, interviews and data procured by digital photographs of learners' products (sourcebooks: the *Design Process* (Topic 1) and the *Design Product* (Topic 2)). The purpose of using the instruments mentioned above was to be considered the most ideal and appropriate tools for collecting qualitative data for my study.

4.5.3.1 Document analysis

This section reports on the two most relevant prescribed documents analysed to collect data: the DBE CAPS FET Curriculum (Grade 11) and the DBE PAT Guidelines for Grade 12. I conducted an online analysis of the documents: DBE CAPS FET and an analysis of the Grade 12 2018-version PAT Guidelines. Furthermore, I looked at significant aspects that I could use for my research framework. In addition, I explored what is currently available in terms of instructional material and used this collected information in addition to the CAPS document. Since it is easily accessible, I used a hard copy to describe the stipulated outcomes for the FET Design practical. These two documents served as a reference for the entire study. As extended assistance, I have

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found the analysis of these two documents resourceful. This analysis has provided a theoretical basis of what is supposed to form the practical part of CAPS in this study. These formal documents indicate what DBE expects regarding teaching and learning the subject Design to benefit the learners.

4.5.3.2 Interviews

Semi-structured interviews were performed online and videotaped on Zoom as the second data collecting instrument, allowing me to explore the participants' replies to interview questions in real-time. Krueger and Casey's (2000:xi) statement that interviewing is about talking to define a semi-structured interview, often known as casual, interactive, or soft interviews. Still, it is also *"...about listening. It is about paying attention. It is about being open to hear what people have to say. It is about being non-judgmental. It is about creating a comfortable environment for people to share".* The goal of the interviews was to sample the replies of the Design teachers by asking them the same questions in the same order, improving the comparability of their responses (Cohen *et al*., 2011).

Design teachers' perspectives on the *design process*, methods used to teach the *design process*, and motives for adopting the approaches were all examined through semi-structured interviews. In addition, the semi-structured interviews were utilised to determine the sample for Phase Two of my data collecting strategy (see *APPENDIX P: Semi-structured interview questions for Design instructors*).

The interviews with design teachers were steered in a traditional, semi-structured way, not conducted at a participant's school as it was proposed at first (due to COVID-19). Still, for the convenience of the Design teachers, it was agreed upon instead to conduct interviews online, as explained. However, three Design teachers were interviewed (after teaching hours) at their respected schools. The interviews occurred unilaterally (teacher and I) and under a pre-structured document containing all the interview questions (peer-assessed). The semi-structured modus allowed for a discussion with the interviewee rather than a straightforward question-and-answer format. The interviews were necessary to engage directly with the Design teachers to share their interpretation of the CAPS Design practical component. This allowed me to critically engage with the primary research question: *"How do teachers interpret the design process?"* According to McLeod (2017:2), semi-structured interviews allow participants to talk in some depth. Using their

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own words in the interview helped me develop a real sense of the teachers' understanding of CAPS. I anticipated that these interviews would answer my sub-questions from the perspective of the Design teacher and their perceived reality: *"Why do teachers interpret the design process the way they do?"* and *"How do teachers' interpretation influence their teaching of the design process?".*

4.5.3.3 Data obtained by digital photographs

Within the social sciences, visual research is a disjointed and ill-defined field. Despite increased interest in employing visuals in research, Pauwel (2010:545) contends that efforts toward a more coherent conceptual and methodological framework for dealing vigilantly with the details of this (relatively) new form of academic thought remain scant and restricted in scope. Furthermore, Pauwel (2010:545) offers the *"Integrated Framework",* a more comprehensive and improved analytical framework for visual research methodologies. I refer to the Integrated Framework because it could allow scholars to expand on this framework in another study. To continue, subsequently, Bolton, Pole and Mizen (2001) point out that visual techniques, such as photography, are under-used in the active sociological research process.

To continue, Pain (2012:309) emphasises that visual methods may aid richer data than when verbal data alone is collected. Nonetheless, he cautions that bigger data brings new problems in terms of presentation. Images, according to Barthes (1967) cited in Shyamala & Betsy (2019), are too polysemic (meaningful in numerous ways) to be understood without a verbal explanation. He considers pictures to be text dependent. Others believe that the visuals confirm the text (Reiger, as stated in Bolton *et al.,* 2001), while Latham (2003) believes that if textual data is the primary emphasis, the richness of social activity would be insufficiently portrayed. Such remarks encourage using images and text in combination to generate an interaction, which is best illustrated in picture books (Sipe, 1998). As Johnson (1997) defines the phenomena, words and visuals might work together to deepen meaning or stimulate contemplation if they communicate different messages. This characteristic of visual pictures may be one reason why they enable reflection. Pictures make one pause and look to take in additional parts of the image, whereas language directs one (Steiner, as cited in Sipe, 1998), and this property of visual images may be one reason why they encourage reflection.

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With the above as background, I made use of the generation of primary visual data sources in my study. I took digital photographs of the research data produced by participating learners' sourcebooks, the *Design Process* and the *Design Product* (Topic 1 & Topic 2), at each participating school for the purposes of documentation and illustration. The visuals serve as a complementary illustration of the data gathered for this study. The data was analysed and described, and findings were written in text (documents and interviews) and used in supplementing the visual images (photographs) of the sourcebooks and products by the Design learners. The data captured by digital photographs informed my research questions. The meanings drawn from the photographed products were used as illustrations to support the answers to my research questions. Accepting the collection of visual data as a form of knowledge per se, I value using digital photographs fully applicable to capture research data produced in my study (Pain, 2012:313). I am convinced that the well-confirmed results of qualitative case study design based on detailed and multifaceted data collection can provide relevant recommendations and information important enough to enhance the CAPS document or deliver new insights to understand and deal with the reality of the South African Design classroom.

In conclusion, the primary data generated cannot be generalised. However, my interpretation of the data collected using document analysis, interviews, and digital photographs was probably influenced by my personal perspective as a Design teacher (Pizam & Mansfeld, 2009:1).

4.5.4 Sampling

Purposeful sampling was used in this study, which involved people who were identified and chosen specifically for their knowledge of and experience with the phenomena under investigation (Creswell & Plano Clark, 2011). The participants' selected stage was done before my research started and referred to as my participating sample, which is classified as purposeful sampling. In addition to participants' having knowledge and experience, Bernard (2002) emphasises the significance of accessibility and desire to engage and the capacity to communicate skills and ideas in a clear, expressive, and thoughtful manner. The key advantage of purposeful sampling methods is that they ensure that the sample selected represents the population (Fox & Bayat, 2014:55).

The schools were selected based on their Design National School Certificate (NSC) Grade 12 final examination performance from 2014 to 2018. After receiving ethical clearance and GDE

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permission to commence with my research, I embarked on requesting the principals of these schools to conduct research in their schools. At first, thirteen schools offering Design were approached. Four school principals did not respond in any manner, and one principal declined, one had internal power struggle issues, and it was a battle to get approval, but approval was granted. In the end, seven schools, as planned, were ready to embark on the study – January 2020. Seven Design teachers initially formed part of the sample group, but one school (S6) had two Design teachers, to deal with the large numbers of Design learners. Therefore, bringing the total number of Design teachers to eight. They are identified as teachers 6A  and 6B  in the study. The sample of 50 participants presented a purposeful sample (see *APPENDIX C | Detailed summary of structure and participant codes below*). See *APPENDIX B: Structure of participant codes and avatars* for more detail on the identification and presentation of the graphic avatars below.

Copy of APPENDIX B: Structure of participant codes and avatars

CATEGORY	SCHOOL	PARTICIPANT CODES
Category A	Reference school 1	RS1
Category B	School 2	S2
Category B	School 3	S3
Category C	School 4	S4
Category C	School 5	S5
Category D	School 6	S6
Category D	School 7	S7

Category	Teacher	Participant codes & Avatar
Category A	Teacher 1	RST1 
Category B	Teacher 2	T2 
Category B	Teacher 3	T3 
Category C	Teacher 4	T4 

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Category C	Teacher 5	 T5
Category D	Teacher 6A	 T6A
Category D	Teacher 6B	 T6B
Category D	Teacher 7	 T7

Source: Anriët van Deventer

Continued APPENDIX B: Structure of participant codes and avatars

Category	School	Learners
Category A	Reference school 1	RL1, RL2, RL3, RL4, RL5 & RL6
Category B	School 2	L7-1, L8-2, L9-3, L10-4, L11-5 & L12-6
Category B	School 3	L13-1, L14-2, L15-3, L16-4, L17-5 & L18-6
Category C	School 4	L19-1, L20-2, L21-3, L22-4, L23-5 & L24-6
Category C	School 5	L25-1, L26-2, L27-3, L28-4, L29-5 & L30-6
Category D	School 6A	L31-1, L32-2, L33-3, L34-4, L35-5 & L36-6
Category D	School 6B	L31-1, L32-2, L33-3, L34-4, L35-5 & L36-6
Category D	School 7	L37-1, L38-2, L39-3, L40-4, L41-5 & L42-6

Source: Anriët van Deventer

Table 4.1: Sampling | Case study: Grade 11 Design learners

1 **2**	**Category A: Participant codes: School 1: Reference School** **Six learners participating: High Performers, Middle Performers and Low Performers**		
3	**Category B** **High-performance Schools** **Participant codes:** **School 2 and School 3**	**Category C** **Middle-performance Schools** **Participant codes:** **School 4 and School 5**	**Category D** **Low-performance Schools** **Participant codes:** **School 6 and School 7**
	School 2	**School 4**	**School 6**
	School 3	**School 5**	**School 7**
	*Four schools were approached	*Four schools were approached	*Four schools were approached
4	**Six learners to participate:** ***High Performers, Middle Performers and Low Performers***	**Six learners to participate:** ***High Performers, Middle Performers and Low Performers***	**Six learners to participate;** ***High Performers, Middle Performers and Low Performers***

**Participation was voluntary. Four schools were approached and two accepted.*

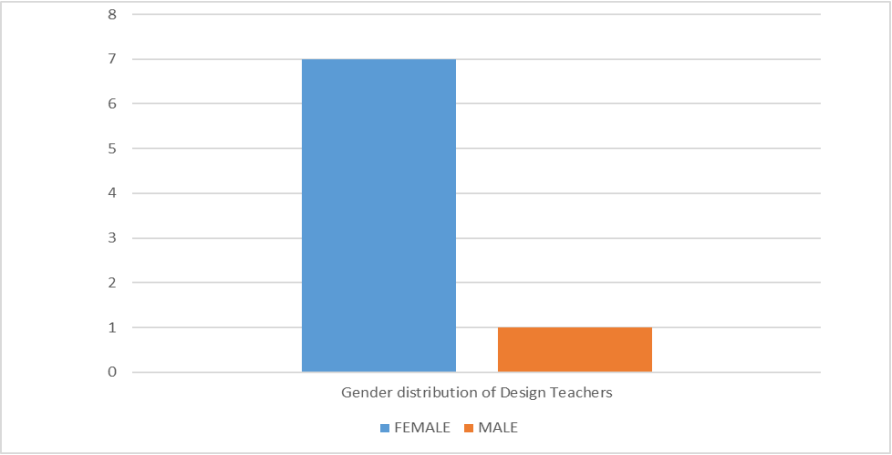
Source: Anriët van Deventer

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Table 4.1 above portrays the sample group of participants for this case study: 7 schools, 8 Design teachers, and 42 learners; in total, 50 participants. School 1 served as the Reference school in Category A. Category B represented high-performance schools, Category C represented middle performance schools, and Category D represented low-performance schools. Each school had six learners representing different learning standards (two learners per standard), namely high, middle and low performers. Each category had a Design teacher participating in the sampling group. The note to *Table 4.1* above, *Participation was voluntary. Four schools were approached and two accepted,* refers to schools that took part in this study. By approaching four schools in categories B, C and D afforded me a broader spectrum of schools in those categories. Schools that responded positively to my request for voluntary participation in my research guided me in selecting the final two schools for each category. Each school in each category had a total number of six learners, sub-categorised based on their performance in the previous year (Grade 10) as high, middle or low performers. The demography is as follows: 7 Female and 1 Male Design teacher/s, Design learners: 30 Female and 12 Male.

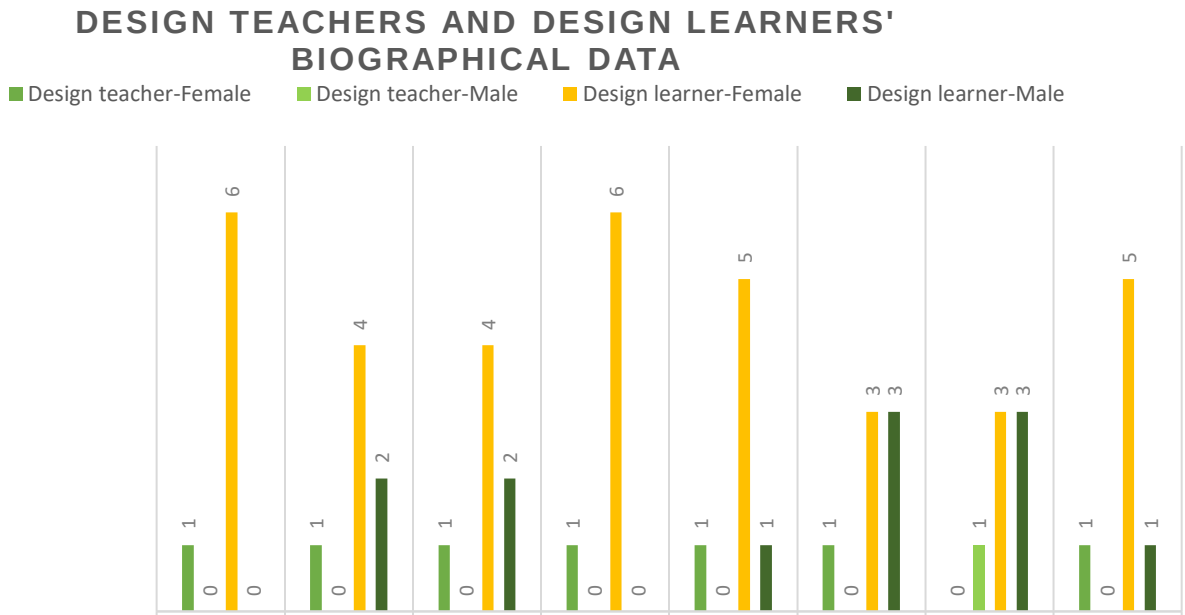
See *APPENDIX E: Graph | Data collection - Design teachers and Design learners' biographical data* below, which exemplifies the female dominance in Design education. As my study is not a quantitative or mixed-methods approach, the information is used as a visual reference. In addition, the reader might be interested in the actualities, similarities and differences displayed in *APPENDIX E: Graph | Data collection - Design teachers and Design learners' biographical data* below.

Copy of APPENDIX E: Graph | Data collection – Design teachers and Design learners' biographical data



Source: Anriët van Deventer

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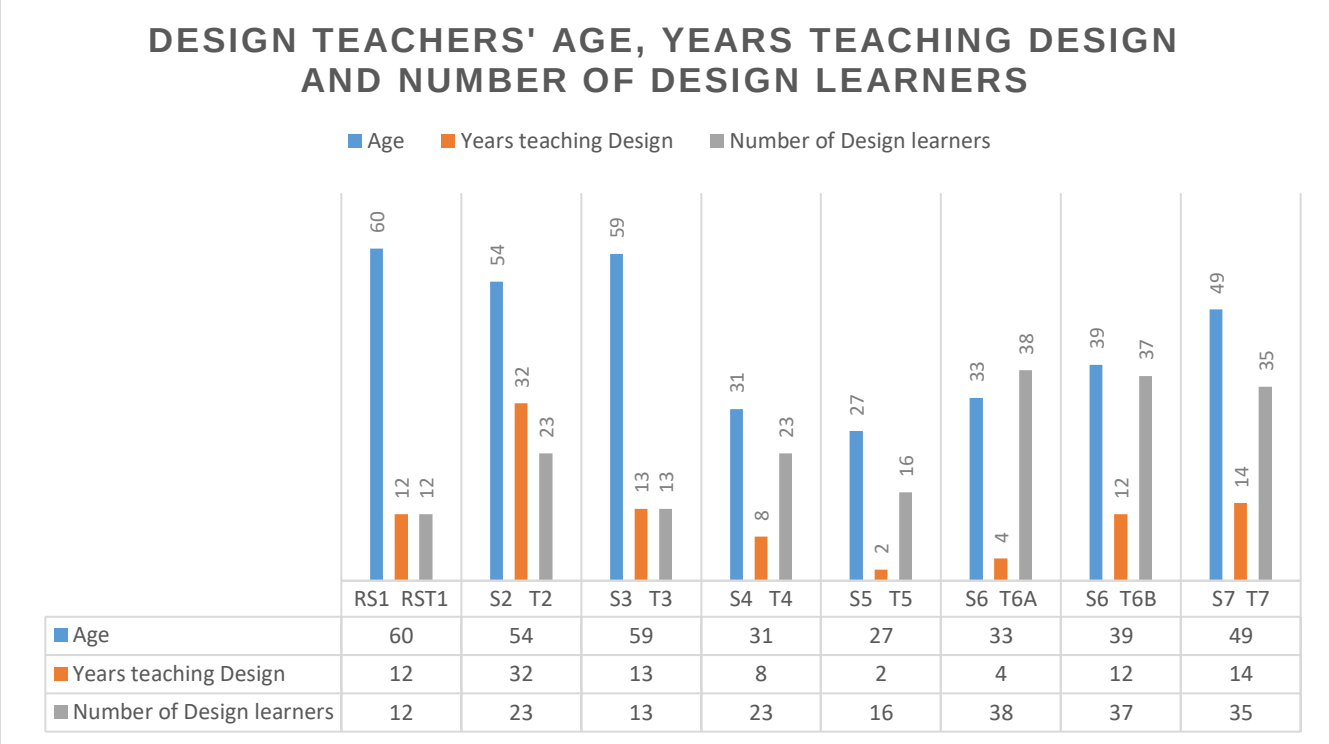
	RS1 RST1	S2 T2	S3 T3	S4 T4	S5 T5	S6 T6A	S6 T6B	S7 T7
Design teacher-Female	1	1	1	1	1	1	0	1
Design teacher-Male	0	0	0	0	0	0	1	0
Design learner-Female	6	4	4	6	5	3	3	5
Design learner-Male	0	2	2	0	1	3	3	1

Source: Anriët van Deventer

With *APPENDIX F*, I attempt at a glance to show the age, years of teaching Design, and the number of Design learners that must be taught. See *APPENDIX F: Graph | Design teachers' age, years teaching Design and number of Design learners* below. More detail is to be explored. The information gathered from the questionnaire's biographical part was used to build profiles in context for the participating Design teachers. This questionnaire component inquired about the teacher's qualifications, age, gender, teaching experience, years teaching Design education, and whether they had attended any specific training to implement the *design process. See APPENDICES E, F and G.*

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Copy of APPENDIX F: Graph | Design teachers' age, years teaching



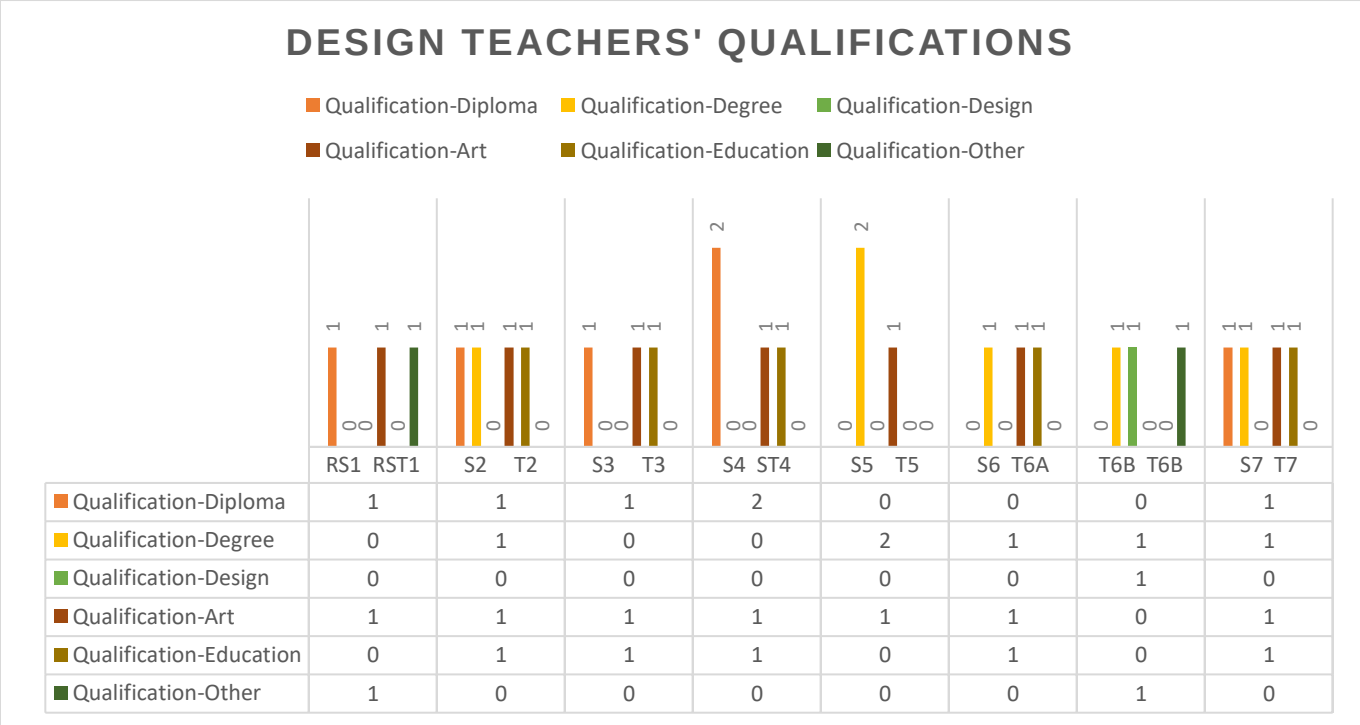
	RS1 RST1	S2 T2	S3 T3	S4 T4	S5 T5	S6 T6A	S6 T6B	S7 T7
Age	60	54	59	31	27	33	39	49
Years teaching Design	12	32	13	8	2	4	12	14
Number of Design learners	12	23	13	23	16	38	37	35

Source: Anriët van Deventer

It is noteworthy that only T6B  (male) has a Design qualification accompanied by other complementary technical subjects. Five teachers have a related Arts degree, and three teachers have an Arts Diploma as a qualification. T4  and T5  both have post-graduate Arts or education qualifications.

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Copy of APPENDIX G: Graph | Design teachers' qualifications



	RS1	RST1	S2	T2	S3	T3	S4	ST4	S5	T5	S6	T6A	T6B	T6B	S7	T7
Qualification-Diploma	1		1		1		2		0		0		0		1	
Qualification-Degree	0		1		0		0		2		1		1		1	
Qualification-Design	0		0		0		0		0		0		1		0	
Qualification-Art	1		1		1		1		1		1		0		1	
Qualification-Education	0		1		1		1		0		1		0		1	
Qualification-Other	1		0		0		0		0		0		1		0	

Source: Anriët van Deventer

4.5.5 Data Collection Plan

Data generation was conducted in three phases as represented in *Table 4.2: Phases of data collection* below:

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Table 4.2: Phases of data collection

THREE PHASES	PHASE 1 DOCUMENT ANALYSIS	PHASE 2 INTERVIEWS	PHASE 3 PHOTOGRAPHS
Type Instruments	1. DBE CAPS FET (curriculum) 2. DBE PAT guidelines for Design Grade 12 3. Road Show reports & publications	Traditional semi-structured interviews	Digital photographs
Who? Data source	Myself	Design teachers	Myself – Design Learner sourcebooks: The *Design Process* & The *Design Product* (Topic 1 & Topic 2)
How?	Reference – stipulate outcomes for Design practical	One-on-one (Teacher & myself)	Digital camera
How?	1. Less time consuming and more efficient 2. Learners' benefit 3. Insight	Participation presenting their reality	Documentation & Illustrative
Where?	Online & hard copy	Teacher's classroom Online via Zoom	Participants' schools
When?	Start and during the research	By appointment at schools	After completion of Design brief & DBC (study) – End March 2020. Due to the impact of COVID-19, my data capturing was postponed. This step was completed in September 2020.
What? Research question targeted	1. How do teachers interpret the *design process*?	1. How do Design teachers interpret the *design process*? 2. Why do Design teachers interpret the *design process* the way they do? 3. How does Design teachers' interpretation influence their teaching of the *design process*?	3. How does Design teachers' interpretation influence their teaching of the *design process*?

Source: Anriët van Deventer

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Phase 1: For this study, the official policies established by DBE were used, namely CAPS FET (curriculum) and DBE PAT guidelines for Design Grade 12. Roadshow reports and other publications were used as a reference and, in some cases, as a primary source of new information, such as the Roadshow (Tabane, 2020) presented on 15 February 2020, where changes to the CAPS Design were presented. Using these sources initially and during the research guided me and kept me focused on the expected outcomes for Design practice. In addition, the online and hard copy versions of the CAPS Design and PAT guidelines for Design Grade 12 were consulted. The benefit was that it was less time consuming and more effective in gaining insight and keeping my focus.

Phase 2: The semi-structured interviews were conducted and recorded by appointment online via the Zoom platform. Participation was individual (teacher and myself) as interviews were conducted one-on-one, allowing the Design teachers to present their reality truthfully. As stated above, the selection criteria of participating schools were based on the results of the Grade 12 NSC final examinations for the last five years. The schools are identified as RS1, S2, S3, S4, S5, S6 and S7. Teachers and learners who participated in the study were given participant codes, and Design teachers are referred to in my study as RST1  , T2  , T3  , T4  , T5  , T6A  & T6B  and T7  accompanied by an avatar as a creative touch reflecting each teacher's '*design process persona*': Learners' participant codes begin with L1 and end with L42. They do not have an avatar complementary to their participant codes. (See *APPENDIX B: Structure of participant codes and avatars*).

It was agreed with the participants that the interview schedules coincided with non-teaching times. Being online made it convenient for participants to conduct the interviews after hours. However, there were some difficulties with the internet connection due to unannounced electricity load-shedding during some of the interviews. Therefore, five semi-structured interviews conducted and recorded online, and three interviews were conducted face-to-face.

The online Zoom platform was used to record and document interviews. I was able to explore participants' responses during the interviews, and individuals could clarify and clarify their responses. Probing questions were occasionally used to elicit more information from interviewees. Each interview lasted an average of 90 minutes, during which respondents answered questions on their perspectives on planning and how they teach the *design process*.

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Phase 3: The third and final phase was taking digital photographs of the *Design Process* (Topic1) and the *Design Product* (Topic 2) scheduled for April 2020, when Term 2 began. But due to the COVID-19 pandemic, South Africa was placed in lockdown level 5 on 23 March 2020. Various DBE attempts to return to normal education were based on the gradual introduction of learners of different grades to return to school, but due to the severe cases of COVID-19 of teachers and learners, it was decided to close schools again for one month. DBE decided that learners should return to school and allowed them to arrive in stages. Grade 12 returned on 3 August 2020. Grade 11 returned on 4 August 2020 [my resource group]. The work of School 1 was recorded and evaluated in March 2020. I was allowed to enter schools in late June, early July 2020, and at the end of September 2020 to collect my research data.

By the beginning of September, data from one school, S6, was still outstanding as collaboration with the Design teachers were very difficult throughout the study. Various attempts were made to get access to the learners' Design work at school, but the reason supplied by T6A  was that learners took their Design work home and have not returned to school. Finally, a date was secured at the end of September 2020 to collect data successfully from School 6.

4.5.6 Data analysis method

Hatch (2002:148) explains data analysis as:
"…a systematic search for meaning. It is a way to process qualitative data so that what has been learned can be communicated to others. Analysis means organising and interrogating data in ways that allow researchers to see and find patterns, identify themes, discover relationships, develop explanations, make interpretations, mount critiques, or generate theories".

Inductive data analysis approaches were employed in each of my study's three phases. For me, this method entailed a thorough examination of raw data to build themes as I drew conclusions from the data. According to Thomas (2006:237), the goal of adopting the inductive technique is to *"(a) condense raw textual data into a brief, summary format; (b) establish clear links between the evaluation or research objectives and the summary findings derived from the raw data; and (c) develop a framework of the underlying structure of experiences or processes that are evident in the raw data".*

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4.5.6.1 Data analysis

To continue, Burns and Grove (2009) state that data analysis is a tool for reducing and organising data to produce findings requiring the researcher's interpretation. My interpretation focuses more on '*extracting meaning or usefulness*' from my data findings. I acknowledge that nothing is predefined or taken for granted in the natural setting of the Design classroom. My initially proposed research process was flexible in terms of direction, progression and development, as I intended to form an integral part of the data collection for objectivity in analysing and assessing the multiple viewpoints of *reality.*

4.5.6.2 Data analysis qualitative approach

Corbin and Strauss (2008) and Patton (1990) noted that qualitative evaluation poses particular challenges. Most researchers feel overwhelmed when analysing the data they obtained (Vaterlaus & Higginbotham, 2011). A high level of expertise is required to complete qualitative interpretation successfully (Vaterlaus & Higginbotham, 2011). With the above in mind, I have utilised support tools, the expertise of local scientists, and software as aids in my analysis. I found that analysing data manually served my purpose best. Throughout the data analysis, I accessed documentation and reports, such as the Road Show report[15], relevant policies and publications, correspondence, and photos that were appropriate for this study. Qualitative research, according to McLeod (2017:2), is endlessly creative and interpretative. It is designed to allow a variety of data analysis approaches such as content analysis (Glaser & Strauss, 1967), theme analysis (Braun & Clarke, 2006), and discourse analysis (Fairclough, 2013:9). My chosen process was qualitative content analysis. *"To make valid inferences from the text, it is important that the classification procedure be reliable in the sense of being consistent"* (Weber, 1990). I consider this method of arrangement suitable for the analysis of qualitative information. The approach provides deep insight into the participants and accurate classification and comparison of information before the data are summarised.

4.5.6.3 Data reduction

The original data set was converted into usable evidence using a data reduction method based on explicit coding rules (Stemler, 2001:5). The data analysis focused on the actual content, as I

[15] Annual GDE Provincial Departmental meeting: discussion and feedback on the previous years' results of the final NSC Grade 12 examination.

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applied it to determine the use of certain words, themes, phrases and sentences in the sets of texts. To continue, Stemler (2001:7) explains that the richness and meaningfulness of the content analysis technique lie in its reliance on coding and categorising the data.

4.5.6.4 Process of analysis

Before I began with the analysis, the data were transcribed, which simply means that text from my interview notes or other notes were entered into word processing documents (Smit, 2002:66). I approached my analysis with manual methods using the features within Microsoft Word. For the analysis of the photographic data, I used Microsoft Word documents that I prepared with the data capture on an original photo and a description of the photo. As Smit (2002:67) confirms, data analysis is a process during which data are broken down into pieces and combined together in new ways in so-called categories.

4.5.6.5 Process of encoding

For the encoding process my *open coding* approach has highlighted the nature of the data provided by respondents. '*Open coding*' refers to naming, categorising, and placing phenomena through careful examination of the data collected. Its importance lies on having two separate researchers agreeing on how to code the same content, known as intercoder reliability. To this end, to ensure consistency and the validity of the analysis, I have asked my supervisor to fulfil the role of my intercoder as commonly applied in content analysis. Initially, data are apportioned into loose parts, which are compared and questioned using *what, where, how, when* and *how*. This process is followed a comparative approach, after which similar measures are clustered together and given the same conceptual marker (Smit, 2002:69).

4.5.6.6 Research questions

The analysis was organised around the primary research question and sub-research questions: *"How do teachers interpret the design process", "Why do teachers interpret the design process the way they do?"* and *"How does their interpretation influence their teaching of the design process?"* All relevant data from data sources (policy, questionnaires, and interviews) was gathered in this method to offer a consolidated answer to each study question. This was in line with Cohen *et al*. (2011) statement that qualitative data entails the organisation, accounting, and explanation of participants' views of the phenomena under investigation, identifying patterns,

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themes, categories, and regularities. As a result, the analytical component of this study was produced by Design teachers' perspectives on the *design process*.

4.6 DATA STRUCTURE

4.6.1 Documents: CAPS and PAT

CAPS' focus in this study is on the practical section of the subject Design: the *Design Process*. (Topic 1) and the *Design Product* (Topic 2). CAPS Design Studies (2011:10, 12, 14-19) and PAT (2018:3-14).

4.6.2 Semi-structured interviews

My semi-structured interview questions, which totalled 55, were organised into four sections, as stated in Chapter 2.

Part A (Q1-9) evoked biographical and teaching and learning replies from participants;
Part B (Q10-35) contained questions related to Design education in general, CAPS and PAT;
Part C (Q36-45) referred to the *design process* and the primary research question, and sub-research questions and
Part D (Q46-55) focused on resources and the conclusion of the interviews.

Part A (Q 1-9): To create a context for Grade 11 Design education at various districts within Gauteng Province, the interview questions, 1-5, focused on information about teachers' gender, age, qualifications, teaching experience, number of years they been teaching the Design subject, as well as a summative description of the school/s they had previously taught at, the nature of the discipline and the general background of learners they experienced in their teaching career. Questions 6 to 9 referred to the Design teachers' interpretation of quality and other factors of influence in teaching and learning, available technical equipment in relationship to the increasing need in the 21st century for skills.

Part B (Q10-37): Data collected from questions 10 to 25 featured established aspects of Design education as currently applied, while Questions 26 to 37 focused on CAPS and PAT Design.

Part C (Q38-45): Continuing, question 38 targeted research question 1 *(How do you interpret the design process?)* and the next two questions, 39 and 40 focused on research question 2

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(Why do you interpret the design process the way you do?) and question 3 *(How does your interpretation influence your teaching of the design process?).* Questions 41 to 44 attained data on how Design teachers further use the *design process* in their teaching in class. In establishing an ideal of a new *Design Thinking* Model made more understandable and simplistic for all teachers, questions 44 and 45 were applied. The outcome of some of these suggestions and opinions were incorporated in the development of the Van Deventer D+NQ Model presented in Chapter 3.

Part D: (Q46-54): Concluding, the interview questions were related to teaching resources and the use of textbooks in Design education. To mark the end of the interview, Design teachers were thanked with a concluding statement of acknowledgement. See *APPENDIX P: Semi-structured interview questions for Design teachers*.

4.6.3 Data captured by digital photographs

Data was captured and analysed in two Parts. As for the Design learners, the *Design Process* and the *Design Product* (Topic 1 & Topic 2) consist of 1635 digital photographs of the Design work produced, which are explicitly analysed for evidence of the course and development of the *design process* with the use of my chosen analysis tool, the Van Deventer D+NQ Model.

4.6.3.1 PART A: The Design Process (Topic 1)

PART A: D+NQ Model, Four Stages A, B, C & D, Steps 1-8

- Steps 1 & 2: *Understand*: Define & Debone
- Step 3: *Explore*: Discover
- Step 4: *Explore*: Data
- Steps 5 & 6: *Materialise*: Design & Develop
- Step 7: *Materialise*: Deliver
- Step 8: Critique: Debrief forms part of Part B – see *Section 4.6.3.2 PART B: The Design Product* (*Topic 2*)

4.6.3.2 PART B: The Design Product (Topic 2)

PART B: D+NQ Model, One Stage D, Step 8

Debrief: Ask a question about the solution/product (=evaluation), 5 Criteria asked.

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- Step 8: *Critique*: Debrief
- Criteria 1: Critique
- Criteria 2: Critique
- Criteria 3: Critique
- Criteria 4: Critique
- Criteria 5: Critique

Finally, with open encoding, my data was segmented into meaningful parts to facilitate identification, description and interpretation for final analysis (for more detail, see *APPENDIX D: Qualitative data analysing process and phases).*

4.7 VALIDITY AND TRUSTWORTHINESS

Johnson (1997) and Morse, Barrett, Mayan, Olson, and Spiers (2002) argue that standard quantitative criteria for reliability and validity do not apply to qualitative research. Therefore, when I speak of validity in my study, I refer to credibility, transferability, dependability and subsequently, conformability (Johnson, 1997:282). Yet, by definition, the qualitative method is considered as "*a research method for subjective interpretation of text data content*" (Hsieh & Shannon, 2005:1278). Being aware that absolute objectivity is almost impossible for any researcher, I have directed my abilities and efforts towards the most significant possible impartiality. To maximise validity, I utilised peer reviews and discussions on my topic to gain new insights and challenges. To collect data relevant to this research, I used tools that are trustworthy and valid. The appropriateness, utility, and meaning of the assessment processes, methodologies, tools, and materials are referred to as validity (Ary, Jacobs & Razavieh, 2002; Cohen, Manion & Morrison, 2011). For this study, the interview questions, Design brief & DBC, Rubric A and B, were tested with peers and experts in the Design field.

Trustworthiness refers to qualitative research's methodological accuracy and appropriateness (Holloway & Wheeler, 2002:224). The availability of rich, relevant, and well-saturated data determines the trustworthiness of content analysis findings. As a result, data gathering, processing, and reporting are all intertwined (Elo, Kääriäinen, Kanste, Pölkki, Utriainen & Kyngäs, 2014:6). Therefore, trustworthiness and its four constructs, credibility, transferability, dependability, and conformability, have been closely guarded and respectfully applied in my qualitative study.

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a) If the research has established trust in the truth of the results, and how the research outcomes in the study environment are in accordance with reality, it is said to be credible (De Vos, 2005:351). Elo *et al*. (2014:8) state that credibility can be achieved through tenacious data triangulation. Two Design assessment rubrics were used. The standard CAPS rubric (Rubric A) is the DBE's assessment tool. My customised rubric (Rubric B) is adopted from the standard structure within the parameters of the Design teaching reality. This served as an objective opinion reflected by assessment/marks. (See *APPENDIX S: Comparison | The Design Process (Topic 1) – Sourcebooks and The Design Product (Topic 2) | RS1- S7 - Graphic representation Design teachers' assessment marks (Rubric A) vs. Researcher assessment marks (Rubric B).*

b) *The capacity to apply the findings to different situations or people is referred to as Transferability* (Babbie & Mouton, 2008:277; De Vos, 2005:352). I have already provided a detailed description of the setting and context in which the research was conducted to give readers enough information to judge the applicability of the results to other settings (Elo *et al.,* 2014:8). All Design teachers should have used rubric A for the assessment of PATs in the FET phase. Rubric B's criteria were broken down into more detail for assessment. Both rubrics were transferable in respect of context and participants.

c) *Dependability* describes the idea of reliability as applied in quantitative research, but whereas reliability can be verified in quantitative research, this is not the case with qualitative research (Elo *et al*., 2014). According to Thomas and Magilvy (2011), a study's dependability is high if another researcher can easily follow the original researcher's decision-making route. As a qualitative researcher, I have ensured reliability by properly documenting data and methods and making appropriate research decisions. I have demonstrated that the results are comparable when the study is repeated (Babbie & Mouton, 2008:278; Klopper, 1995:27). Both rubrics depend on expert peer review as this served as a guide and allows another researcher to track my decisions easily. The primary data gleaned from interview questions is also available.

d) *Conformability* is defined as the objectivity of research during data collection and data analysis (Elo *et al*., 2014:7). Two or more persons must agree independently on the data's accuracy, relevance or importance (Polit & Beck, 2012). I used my supervisor and other Design experts to verify data to present the participants' information independently. Furthermore, the data's referenced impartiality suggests that it

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accurately reflects the information supplied by the participants. As a result, my interpretations are solely based on and drawn from the information supplied. Techniques, such as triangulation (data, researchers and context) can be useful tools in obtaining conformability (Elo *et al.,* 2014:6). Kennedy (2009) indicates that the triangulation method minimises distortion – a problem that occurs when a single research method is used. Therefore, as represented in the generated primary data, reliability can be associated with a high degree of validity since the data is oriented towards individual trustworthiness and honesty. Table 4.3 below shows the four strategies with actions and application criteria.

Table 4.3: Strategies to ensure trustworthiness

STRATEGY	ACTIONS	APPLICATION CRITERIA
CREDIBILITY *Internal validity = Truth value*	Continue engagement	Researcher's profile: 1. Actively involved in Design teaching. 2. FET Design teacher for five years. 3. Design teacher & provincial marker.
	Tenacious interviews	1. Consistently pursued interpretations in different ways. 2. Following a process of constant and tentative analysis.
	Referential adequacy	1. Using set questions for interviews & audiotapes. 2. Digital photographs. 3. Using Rubric A & B as assessment tools.
	Triangulation methods a. data b. participants c. context	Triangulation of data 1. Document analysis. 2. Interviews. 3. Digital photographs.
	Purposeful sampling	Sampling was purposeful: Design teachers (trained teachers).
TRANSFERABILITY *External validity = Applicability*	Dense description	A detailed description of setting and context Design teachers working in the FET phase in South Africa. Data about participants, research context and setting, were sufficiently provided.
DEPENDABILITY *Reliability = Consistency*	Dependability occurs with credibility	
	Dependability audit	Keeping personal field notes. Clear display of decision path.

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STRATEGY	ACTIONS	APPLICATION CRITERIA
	Compact description	Describing research methodology comprehensively.
	Peer examination	1. Using experts in the Design field. 2. Using an expert supervisor.
CONFORMABILITY *Objectivity = Neutrality*	Conformability occurs with: a. credibility b. transferability c. dependability	1. Using experts in the Design field. 2. Using an expert supervisor. 3. The study pinpoints rigour with the decision-making process and established its compliance through credibility, transferability and dependability. 4. Conclusions and interpretations were directly derived from the primary data.

Source: Adapted from Van Heerden (2005:55)

Member checking is a research procedure used to guarantee the research's credibility and validity in the context of controlling objectivity. According to Carlson (2010), member checking takes an interview or observation transcript and asks participants to double-check its correctness. Participants can pause, explain, or confirm elements of the interview in this way, ensuring that their perspectives, experiences, and observations are correctly recorded during the relevant interview. As a result, a member check was implemented to ensure the research's legitimacy. On the other hand, some participants were hesitant to participate in quality assurance activities, citing a tight work schedule and limited leisure time as reasons for their refusal.

4.8 ETHICS AND ETHICAL CLEARANCE

In the framework of my study, ethics concerns confidentiality and strict rules on how tests were conducted and how participants were protected from both physical and psychological harm (Patten & Newhart, 2018:35). For the sake of complete confidentiality, I applied to the responsible authorities for ethical clearance, which facilitated my research and protected the right to privacy of the participating schools, teachers and learners' Design works, all of them identified by participant codes and categorised accordingly (see *APPENDIX B: Structure of participant codes and avatars).* The level of sensitivity/intrusiveness is medium, although participation required divulging personal information that was not regarded as sensitive/intimate (a direct reference to the Research Ethics Committee approval).

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I also have complied with the following aspects of the ethical code:

1. Before participating in the study, each participant was provided with and had to sign a letter of consent.
2. Participants were informed that their involvement in the study is voluntary and anonymous.
3. The information collected from participants remained confidential.
4. Participants were advised that no information will be shared without their permission. Knowledge will be shared only after obtaining personal consent (Patten & Newhart, 2018:35).
5. Results were reported in a collective form and not per individual participant.
6. Participants were reassured that the study outcomes would not be presented or used to discredit them in their future work environment.
7. Any information provided was treated with due cognisance of protecting the human rights of all participants.
8. The data was examined, analysed and interpreted so that the actual findings are accurate and truthful.
9. To do my research to the highest ethical standard and avoid inaccuracies, I constantly exercised caution.
10. I have sought information from experts at the University of Pretoria and refrained from dishonest practices and
11. Participants had the opportunity to choose to withdraw from the study at any stage without any adverse effect.

4.9 LIMITATIONS AND STRENGTHS OF DATA COLLECTION

4.9.1 Introduction

As an experienced and practising Design teacher, my familiarity with the subject matter, I believe, to have facilitated the completion of my study. To prevent subjectivity from becoming a limitation, I have relied on my commitment as researcher and my discretion as inside observer. Therefore, I trust, to have significantly maintained the necessary distance from stereotypes, personal prejudices, biased judgements, and wrong conclusions. This can be justified by the following three factors and activities: First, I have carefully studied and built the relevant theoretical framework, which has guided the process of my research. Secondly, I was not involved neither directly nor indirectly in the process of the teaching (Topic 1) or the making of the final product (Topic 2) apart

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from supplying the Design brief[16]. Thirdly, the process and final works were assessed and marked by the Design teachers using the CAPS rubric and PAT guidelines (refer to *APPENDICES K and* L).

Consequently, I am aware that great caution is needed when discussing and analysing the collected data. As Malterud (2001) explains, sampling and data collecting in qualitative studies can easily lead to a generalisation of the final results. These results should not be considered facts applicable to a broader population but refer to specific situations (Vaterlaus & Higginbotham, 2011). According to Hsieh and Shannon (2005), if a complete understanding of the context does not develop, the key categories cannot be identified. In this situation, the findings do not correctly represent the data. Therefore, it is critical to assess how effectively the categories cover the data and discover whether there are any similarities or variations between them to assure the conclusions' trustworthiness and, more importantly, credibility.

4.9.2 Limitations of data collection

Qualitative research generally does not draw samples from large-scale data sets, owing to the time and cost involved (McLeod, 2017:3). A further limitation is that qualitative research is cost- and time-intensive because it intends to acquire a deep understanding of the phenomenon of focusing on the meaning of asking questions, such as *why* and *how*. My research has not been generalised to a larger population of interest and did not rely on testing hypotheses but studied specific phenomena in a particular sample group in Design education (Dworkin, 2012). My total sample in this study is based on 50 participants. Much time was required for data collection, analysis and interpretation. I wanted to visit participating schools twice: first, to conduct interviews, second, to take digital photographs of learners' Design sourcebooks. Owing to the subjective nature of qualitative data, criticism can be levelled for trustworthiness. Qualitative research can be biased. In this case, bias may result from my view of how teachers apply CAPS because of my experience as a practical design teacher.

My data collection from the seven schools was scheduled for the end of April 2020, when the schools were intended to open for Term 2, 2020. Unfortunately, as the total lockdown of the country due to COVID-19, was still in effect and enforced according to law, schools did not open. Basic Education Minister Angie Motshekga announced and published dates on the DBE website

[16] Reference School 1 (RS1) supplied the Design brief.

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for learners to be admitted and return to schools in grade groups after schools were sanitised, masks and sanitiser supplied to use as a daily routine were in place at schools. Many teachers returned to school on 1 June 2020 to prepare learners to return a week later, while other teachers opted to teach from home. During Level 3 lockdown, it was announced on 8 June 2020 that Grades 7 and 12 would return to school. Grade 11, the group that forms part of my study, returned on 6 July 2020. I started my data collection visiting schools after the principals granted prior permission on 22, 23 and 24 June 2020. During this time, I completed three schools, as the reference school was completed first on 19 March 2020 before total lockdown started on 26 March 2020. School 7 was closed twice after positive COVID-19 cases surfaced at the school; one closure was announced the same day, after my visit, on 24 June 2020. School 4 was also closed on my scheduled date, 25 June 2020, but I returned on 6 July 2020 to complete my data collection. The DBE published government report analyses on their website on school-level data submitted by Gauteng schools on teachers and learners – 104 found to have tested positive for COVID-19 from 25 May to 8 July 2020 (DBE, 2020).

Although COVID-19 has not yet been defeated, the virus had little effect on my research as I could complete all the tasks as planned. The only impact of COVID-19 on my study was the timeframe for completing my study, as it was extended due to this pandemic. Yet, as a result, the prevailing crisis has tried our capacity to deal with a far-reaching destruction. In the future, we should build a more resilient society as its legacy (Schleicher, 2020:26).

Other obstacles, as previewed in my proposal in the context of the process to be followed for the collection of my research data from the design teachers, the following incidents caused limitations that hindered the smooth running of my research: '*due to school hours or not having transport, teachers were unable to get in time to the moderation centre, which was set as a collection point for my research data, with*' the Design learners' sourcebooks. Delivery of such work could be at different times than the Design teacher had set their schedule. Ideally, I should be present to receive the six Design learners' works per participating school. After that, I conducted the following: firstly, digitally photographing the sourcebooks with data produced for this study. Afterwards, I assessed (marked) the Design Process and the Design Products (Topic 1 & Topic 2) with my customised research tool Rubric B (peer-assessed). When I reviewed the Design Process and the Design Product, Rubric B indicated differences in grades related to the teacher's subjective approach to a more objective view. The challenge here was time-related as I was pressured to photograph data produced and assess 42 processes and products within a limited

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timeframe. As indicated at the beginning of the paragraph, the above-mentioned data collection process was planned in my proposal. Still, after careful consideration, it was agreed with Design teachers to assess and photograph the Design products at their respected schools. School 1 was documented at the end of March 2020 before the end of Term 1. Unfortunately, the COVID-19 protocol nationally implemented at schools limited the collection of my data as planned. The data collection process from participating schools was finally completed at the end of Term 3, September 2020.

4.9.3 Pandemic | Corona Virus – COVID-19

The Corona Virus – COVID-19[17] is a virus without any cure, but several vaccines have been developed and administered (up to this time of writing this thesis) that affected South Africans as the virus has been declared a pandemic. According to the South African National Space Agency (Sansa, 2020), COVID-19 is the new coronavirus that labels severe respiratory syndrome coronavirus-2 (SARS-COV-2). In a significant article by Mhlanga and Moloi (2020:3), the conditions around the COVID-19 pandemic in the South African context are described and supported by statistics. On March 5, 2020, the first verified case of COVID-19 was reported in South Africa. Fears about the pandemic infecting individuals at the projected pace prompted the South African government to declare the pandemic a national disaster under the Disaster Management Act (Mhlanga & Moloi, 2020:3, Motshekga, 2020). Under President Cyril Ramaphosa, the South African Government announced a South African total lockdown, level 5, from the end of March 2020. The government's decision was made to flatten the infection curve as citizens were urged to stay home.

At level 5, all businesses and schools were closed; no family visits and gatherings, including funeral gatherings, were allowed. Recent worldwide studies suggest that lockdowns, school closures, and natural catastrophes increase levels of substance misuse, despair, dread, loneliness, spousal violence, and child abuse (Van den Berg, 2020). Financial problems, according to Van den Berg (2020), cause stress in many homes, leading to emotional weariness, despair, and anxiety. With my focus on South African education, the COVID-19 pandemic has forced the educational system to bow on a speedy pivot into virtual and online engagements and presentations, working from home, etcetera in line with 4IR. Education will never be the same,

[17] COVID-19 virus spreads from person to person by respiratory dews sneezed, coughed, or exhaled by humans (Sansa, 2020).

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but the COVID-19 pandemic did arrive with a lot of challenges too. More affluent homes are better able to cope with online learning, however it comes at a cost in terms of work and problems for teachers and parents. In impoverished families, many children lack a desk, books, internet access, a computer, or parents who can take on home-schooling responsibilities and demands. The gap in access to digital devices and connectivity between the wealthy and the rest of the population is huge (Van den Berg, 2020). According to Reddy, Soudien, and Winnaar (2020), the longer lockdown and social distance are in place, the greater the learning losses for learners, particularly the most disadvantaged, increasing disparities. However, the global pandemic has unlocked positive scenarios for the country to streamline its educational approach to focus on emerging technologies for all.

Furthermore, Mhlanga and Moloi (2020), on the other hand, state that during the lockdown, different 4IR-tools were released for education, and that educational activities were transformed to online learning. As a result, the South African government should advocate for economic development mechanisms that would support the transition of certain aspects of education to the internet while still adopting the 4IR. In addition, a thorough examination of the strengths and weaknesses of the systems in place during the lockdown should be carried out (Mhlanga & Moloi, 2020:9). Lastly, Mhlanga and Moloi (2020:9) found that COVID-19 has had a significant impact on the adoption of various 4IR-tools in the education sector.

Finally, a second wave struck South Africa in December 2020, according to Lucille Blumberg and John Frean published on the National Institute of Communicable Diseases (NICD) (December 2020) website, following the outbreak of COVID-19 in early March 2020 and cases peaking during the week of 5-11 July 2020 (over 13,000 cases daily). To manage the second wave, President Cyril Ramaphosa announced measures to address the rise in affected and dying people as South Africa was placed in lockdown level 3 until 15 January 2021. After this date, the status of the lockdown level will be reviewed again.

4.9.4 Strengths of data collection

Strength owing to my professional and personal involvement in the subject matter, my insider's view may prove helpful and effective. Openness was created by aiming to give depth, observe detail, and encourage Design teachers to expand their responses, which may open up new issues

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not initially considered. I have planned every detail beforehand, set my schedules, recharged all equipment, and prepared my camera for full storage capacity.

Interviews with teachers who had set up their sourcebooks and products, prepared and ready when I arrived at the confirmed date and time as scheduled, were conducted with ease. Data collection during this stage took me between 120 to 160 minutes each at the school's premises. Although the data collection was performed during COVID-19 safety regulations and protocol, no interruptions or hindrances were experienced.

Another strength is the fact that I have seen and handled both the *Design Process* and the *Design Product* (Topic 1 & Topic 2) (primary data source). Handling design work purposefully, looking at small detail and observing technical excellence gave me great insight into the work produced.

4.10 CHAPTER SUMMARY

The research design was described in this chapter. Within the interpretivist paradigm, explanations were offered as to why this study employs a qualitative method and a case study approach. The collection and use of qualitative data to address the study questions was also justified in this chapter. The research design includes a description of the research site, data collecting technique, access difficulties to the research venues, participants, and sample processes. There was also a discussion on the instruments that were utilised. Data limitations were discussed, indicating its strengths and positive outcomes. The COVID-19 pandemic was discussed and its impact and opportunity in pivoting the current educational approach in South Africa. Finally, the chapter described the methods of data analysis using manual processes and Microsoft Word and ended with a discussion on the trustworthiness and ethics of the study. In the next chapter, I present the analysis and discuss the findings of the data collected.

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CHAPTER 5

DATA PRESENTATION, ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

In the preceding chapter, I described the research location and the data collection methods applied in the study. Then, an account was given on each data collection stage (this research has three phases) and how stakeholders were approached. In addition, I briefly highlighted the challenges I faced during the data gathering process, specifically the negative impact of COVID-19. Furthermore, an elucidation of the process for data collecting and the data analysis method was addressed, and lastly, trustworthiness was given an account of.

Henceforth, this chapter intends to answer the primary research question and two research sub-questions, namely, *"How do teachers interpret the design process?", "Why do teachers interpret the design process the way they do?"* and *"How does teachers' interpretation influence their teaching of the design process?"* As laid out in the preceding chapter, the data information was gathered by document analysis, semi-structured interviews, data documentation by digitally photographing the *Design Process* (Topic 1) and the *Design Product* (Topic 2) of the *design process.*

In Chapter 5, I am presenting the data, analysis and discussion of findings in three parts, as follows:

- *Part One*: Design teachers' interviews.
- *Part Two*: Design learners' outcomes of the *Design Process* – Sourcebook (Topic 1).
- *Part Three*: Design learners' outcomes of the *Design Product* (Topic 2).

A clear account of the following is provided under each part:

- [1] Description – where the participants' feedback was identified and merged into themes; followed by
- [2] Analysis – my findings from what the participants said and my interpretation of all the data resources, as grouped in themes; which is presented under
- [3] Discussion – An explanation of my interpretation, linking what I have found with what was discussed in *Chapter 2, Literature review and Conceptual framework* – is presented under the heading for each *part.*

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Then, I have colour coded the three themes, red, orange and green, which have a repetitive function linked with the Van Deventer D+NQ Model. Under the discussion heading, *Part Two* presents the *Design Process* – Topic 2 conferring the different stages and steps of the Van Deventer D+NQ Model. *Part Three* follows the same format of discussing all the criteria together. I looked for similarities, inconsistencies, gaps, and new information. Throughout the collection development, special attention was paid to data that provided a better understanding of the specific issues related to how and why Design teachers interpret the *design process* they do.

As an interpretive researcher, relying on the more personal and pliable research construct (Carson, Gilmore, Perry & Gronhaug, 2001), I attempted to originate the data through direct interaction with the phenomenon being studied. As a result, in my qualitative case study, one key part of data processing is the quest for meaning through direct interpretation of what the Design teachers experienced and reported through their interviews. Notwithstanding, my data collection refers to transcripts from interviews conducted via the Zoom online platform (none of the participants had any objection to video recordings being made) and analysis from data captured in digital photographs.

Finally, by analysing the presentations of the sourcebooks in Parts Two and Three, the *design process* (sourcebooks) and products as completed by Design learners are shown (the *Design Process* and the *Design Product*). Furthermore, the Van Deventer D+NQ Model was tested in Part Two and Part Three. To summarise, my analysis is based on non-numerical data that captures this study's ideas, thoughts, and views. The colour-set, red, orange, green and grey are used in pertinent headings as the colour thread to guide the flow and structure in the presentation of the data analysis of this section of the thesis. See an explanation of the Van Deventer D+NQ Model colour makeup in *Chapter 3, 3.2.2 Colours and Meanings.*

5.2 PART ONE: DESIGN TEACHERS' INTERVIEWS

5.2.1 Teaching Design in the South African classroom: The Design teacher: the what, the how, and the why

5.2.1.1 Method

In this section, I elaborate on the methodology I used and the choices I made in analysing the interview data. Furthermore, the description represents the participants' feedback, which I identified and merged into themes. I chose the inductive technique, which is often associated with qualitative research, for my data analysis. Moreover, I grouped the data according to my

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primary research question and two research sub-questions and then looked for 'similarities and differences in the interviewees' answers. Content analysis entails categorising transcribed verbal data (interviews) for classification and summarisation. I continued to use content analysis as a research tool to identify certain words, themes, and concepts within the qualitative interview data. Therefore, I can quantify and analyse the presence, meanings, and relationships of particular terms, themes and concepts using content analysis. Because of my intimate connection with the data, I was able to apply my analysis circularly, iteratively, gradually, and progressively. I used interviewee quotes to demonstrate the links to the data, as they are descriptive and illustrate the research data's credibility. I aimed to use illustrative quotes, portray the range of issues and report opposing views.

Furthermore, I used my research questions (*discussed under 4.5.6.6 Research questions*) as guidelines to support my explanatory framework. My interpretation, as exemplified in the discussion, focuses on presenting the core of the data. The content was analysed on two levels to elaborate further, namely:

- [1] Descriptive analysis of the data;
- [2] Interpretative analysis, which looked at what was meant by the data.

Furthermore, I used content analysis to identify the participants' focus in answering the primary research question and two research sub-questions. To continue, my descriptive data analysis approach and process allowed me to use interpretive, content analysis, inductive and open coding analysis. Though based on specific ground rules, the qualitative analysis method's freedom does not follow a rigid process. Hence, the process I used was dictated to me by the circumstances of my research.

Finally, the liberty of the qualitative analysis approach, which is not limited to a particular procedure, has allowed me to conduct my studies systematically, even though it is anchored in a specific basic rule. In the previous chapter (see *Chapter 4,* section *4.3 RESEARCH METHODOLOGY*), I mentioned that qualitative content analysis employs inductive reasoning. Therefore, the data is derived from a thorough investigation and constant comparison of subjects and categories: Data transcription, data organisation and data coding. Hence, an essential phase in qualitative data analysis is coding, which allowed me to provide meaning to data obtained in the field. The study's codes came from a combination of sources. Therefore, the qualitative data analysis I applied was simply the process to examine the data to explain the data collected and investigate the phenomenon of the *design process* in FET Design education. *Table 5.1: Stages of analysis* summarises the steps I followed.

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Table 5.1: Stages of analysis

	STAGES OF ANALYSIS: The process followed	
1	Stage	• Prepared and organised data. • I reviewed and explored the data. • Printed out transcripts, gathered notes, documents and arranged images from digital photographs, according to the eight stages of the D+NQ Model.
2	Codes	• Anchors were identified – key points of data were gathered. • Initial codes were created.
3	Concepts	• A set of codes were used to categorise the data with related content.
4	Themes	• Groups of similar concepts are placed together.
5	Theory	• Presented themes in a cohesive manner.

Source: Anriët van Deventer

5.2.1.2 Structure of the arrangement of data

The interview schedule, consisting of 55 questions, was divided into four parts, as indicated in the preceding chapter (see *Chapter 4,* section *4.6.2 Semi-structured interviews*). First, participants responded to Part A (Q1-9) with biographical data and teaching and learning responses. Next, Part B (Q10-35) asked about Design education in general, as well as CAPS and PAT documents. Next, the *design process*, the primary research question, and two sub-questions were discussed in Part C (Q36-45). Lastly, Part D (Q46-55) dealt with resources and the interview's conclusion. The results from Part C of the questionnaire are described, analysed and discussed in the section below.

To start, using semi-structured interviews, the question of '*what*' the Design teachers are teaching is answered using the transcribed data. Furthermore, this segment contains a description of what the participants said. Next, this data was identified and merged into themes. The data collected from my interviews are semi-structured, as indicated and followed in the sequence of questions grouped, as explained above. Then by using this structure, three overarching themes: Cognitive, Emotive and Empathetic, were identified and assisted me in the roll-out of my data presentation, analysis and discussion. Here below, in *5.2.1.3 Themes: Cognitive, Emotive and Empathetic,* I unpack these topics. At this point, it is tempting to argue that *Design thinking* is based on a visual and empathetic review (Puccio *et al.,* 2010:155). To make sense of the primary field data, therefore, and in the context of my research, I have made use of transcriptions.

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Moreover, I have transcribed the interview data of each Design teacher totalling six months, by converting the audio from the recorded videos to textual form. Then, I analysed the data manually. Owing to the considerable amount of information available after the interviews were transcribed, I proceeded to organise the data according to the objectives of my study. Therefore, the data organisation took shape in a visually clear way. Firstly, tables were used listing my research objectives, and then data was allocated according to each goal. Next, I coded the data, which involved categorising the data into concepts, properties, and patterns.

Lastly, I used the last pillar validating data to successful completion of the study. First, the confirmative of my research was done through my data analysis process by validating the accuracy of my research design. Secondly, I produced consistent and dependable results with the procedures I followed to ensure reliability.

5.2.1.3 Themes: Cognitive, Emotive and Empathetic

Three themes emerged in presenting and analysing the interview data, which are discussed in this section. These themes are:

- **(1) Cognitive** – The way the Design teachers think about the *design process.* This refers to or entails conscious cognition like thinking, reasoning, or recollection. (Webster, 2005:223).
- **(2) Emotive** – The way the Design teachers feel about the *design process* and Design education. This refers to [the teachers'] instinctive or intuitive feelings (Webster, 2005:376).
- **(3) Empathetic** – The means Design teachers show their understanding, compassion and responsiveness. This refers to the ability to recognise and understand [learners'] emotions (Webster, 2005:376).

The layout was further structured by incorporating my primary research question and two sub-questions by applying the three themes to each research question. As stated in *Chapter 1, 1.5 MAIN AND SUB-QUESTIONS OF THESIS,* my research questions are: [A] How do teachers interpret the *design process*? [B] Why do teachers interpret the *design process* the way they do? [C] How does teachers' interpretation influence their teaching of the *design process*? The third sub-question [D] How can Design teachers enhance diversity in creative and critical thinking by an innovative and easily applicable Design teaching model? is applied to Chapter 3, *DESIGN THINKING: VAN DEVENTER D+NQ MODEL.* I will now present the semi-structured interview findings and analysis to determine the types of descriptions that arose

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about teachers' interpretation of the *design process*. In *Table 5.2: Theme identification*, I used examples to demonstrate my method to arrive at the three main themes.

Table 5.2: Theme: Identification

	THEME	SEGMENTATION PATTERNS (CODES & CONCEPTS)	STATEMENTS (STAGE)
1	COGNITIVE	Steps, uncover, understand, structured & answer	 RST1[18]: *"…or you can come across issues and think, hang on, there must be another way."*
2	EMOTIVE	Blessed, courageous, honest, panic, freedom, excited & interest	 T3 : *"I'll give them a lot of freedom, not a bit, a lot. So, the way they dealt with the brief is, it's totally up to them."*
3	EMPATHETIC	Pressure, fascinating, stress, troubled, moody & impressive	 T4 : "*add to the pressure on my learners as I expect a lot of variety of sketches and exploration."*  *T2 : "the one thing I do guards [sic] against its stereotypes."*

Source: Anriët van Deventer

5.2.2 Report on the data (all participants' names are participant codes)

5.2.2.1 Presentation and analysis of data

Theme 1: Cognitive

Research question 1*:* How do teachers interpret the *design process*?

❖ **Theme 1: Cognitive - Presentation of data**

In question 38, the interviewees were asked how they interpret the *design process* (see *Chapter 4,* section *4.6.2 Semi-structured interviews*). The four Design teachers referred to below contrive the *design process* as an iterative process and regard it as a cognitive thinking process, as seen by the following extracts:

-  RST1: "*It's definitely all over the place. I think as soon as you have a recipe for something, there is a problem".*

[18] **Source**: Avatars (a graphical persona depiction) of which 60% of the original designs have been changed for use in this thesis: colour, size, value & lines (Vectors, 2020)

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- T5  : "*Teaches them a lot more going back and forth".*
- T6A  : "*Iterative".*
- T6B  : "*It is iterative; you move to the front and back, front and back".*

The resultant excerpts from four Design teachers show how they regard the *design process* as linear:

- T2  : *"It's easier to take the linear approach, and children like to know the sequence of what they have to do".*
- T3  : "*I'd go with linear".*
- T4  : "*I am a very one, two, three, four, five, six, seven, eight, nine, ten-process, as I do believe one thing needs to happen before the next can happen".*
- T7  : "*I think step 1, 2, 3, 4, 5, that is the process".*

In addition, the four Design teachers listed below see the *design process* as a starting point for learners as they generate ideas based on the Design brief. Then, starting with the Design brief, work your way through the *design process* in phases to arrive at the final answer and deliver it as a product:

- T4  : "*Making phase steps and moving on to getting your final design before you start actually making the final design".*
- T6A  : "*First, you get the brief, then try and identify the key concepts that are in the brief. And I think the key requirement of the brief".*
- T6B  : "*I follow the different steps for brainstorming to the solution".*
- T7  : "*Those are the stages that you can do until you apply and get the final colour. It is the steps that we should follow when we have conceptualised ideas of [a] product that we want to design".*

Then the reference schoolteacher interprets the *design process* as an expansion of thoughts:

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- RST1  : "*I make sure that we go through development".*

One Design teacher refers to the *design process* as planning:

- T2  : "*I would plan".*

One Design teacher interprets the *design process* as a problem that needs to be arranged:

- T3  : "*It is a problem that you have to order".*

❖ **Theme 1: Cognitive - Analysis of data**

According to my findings, the Design teachers' approach to the *design process* is a definite two-way approach, as they distinguish between step-by-step and linear ways to apply it. This *process* is also viewed as a "system, structure, or strategy" (CAPS Design, 2011:8; Lawson, 2005:234; Xu & Wang, 2018:407) to solve the problem, issues, requirements, or demands: "*they have to kind of go back and forth, back and forth between ideas until you kind of get you a final product"* (T3 ). Hence, those who prefer the linear technique do so because it allows them to think in a more organised manner. Furthermore, the *design process* is approached similarly to building a structure, whereby one needs to start with a foundation, as the whole structure needs to follow a specific pattern indicating a step-by-step approach – "*You can't build the house just by starting at the walls"; "unpacking the problem and simplifying the problem, so it becomes a manageable entity" (T4*  *).* Consequently, Williams (2000) claims that the systematic depiction of the *design process* is appealing to Design teachers since it gives a definite order to teaching Design. These Design teachers' views on problem-solving in Design [design] signify a diverse and complex issue. However, by utilising Design theory understanding, desired praxis may be used to solve a specific problem. Interestingly, for example, Gyabak *et al*. (2015) refer to synergy [needed] as a meaningful entirety similar to the outcome of a multifaceted problem.

The analysis highlights which issues these Design teachers recognise and focus on in a problem, usually presented in the Design brief: *"... depends on the brief and also the learner, but they need to start with a concept"* (RST1 ). Thus, the problem first needs to be identified, only then the brainstorming follows: *"there's a problem that posed you unpack that*

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problem, you will research the issue, you brainstorm..." (T2  *), "... need to do uncover what it means and what needs to be designed or what needs to be done"* (T6B ). To continue, "we [teachers and learners]" reach the end-result and final stage due to the uniqueness of our subject – "*remember we have different skills, and then the person reaches the final stage, and the person says this is correct, or this is the final product"* (T7 ). As a result, Design teachers appear to place a premium on identifying the problem, which may be found in the Design brief, as a starting point for conceptualisation. In my opinion, the Design teacher should use this approach. Therefore, leading the Design learners in a brainstorming session would undoubtedly help them since it allows for various thinking skills. As an implication, it is realistic to presume that the challenge and topic are the most compelling components of the *design process* for Design teachers to rely on at the beginning of the PAT to engage Design learners in finding a range of solutions to the problem at hand.

Theme 2: Emotive

Research question 1: How do teachers interpret the *design process*?

❖ **Theme 2: Emotive - Presentation of data**

In question 38, the interviewees were asked how they interpret the *design process*. The two Design teachers referred to below express their opinion that the *design process* is a sensitive, influential, and compassionate development:

- RST1  : *"That we don't just jump to a conclusion".*
- T5  : *"I feel you start with an idea, and then you look for influences in your own work".*

❖ **Theme 2: Emotive - Analysis of data**

These Design teachers' approaches above are sensitive to emotions. Clearly, a need is created as it is expected for one to be aware of the sensitivity of the *design process* together with taking into consideration the users' feelings. Therefore, emotions influence the way one approaches the problem and look at the *design process* with compassion. For example, Stanko-Kaczmarek (2012:304) claims that learners' emotions impact their willingness to complete a task.

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Theme 3: Empathetic

Research question 1: How do teachers interpret the *design process*?

❖ Theme 3: Empathetic - Presentation of data

Again, in question 38, the interviewees were asked how they interpret the *design process.* The three Design teachers described below reveal extracts from evidence on how the *design process* method affects Design learners' motivation and serves as inspiration:

- T5  : *"Very similar to how I try to motivate my kids to do it".*
- T5  : *"That's different, maybe everyone else in the class. And then also they need to look for images as well as designers and everything that influences them documented and use it as inspiration, not just copying something else, but always look at past designers what they've done. So, you can influence your own work. Don't live in isolation of the world you are living in is just what I'm doing, and I'm not going to change it".*
- T6B  : *"It's affecting people".*

❖ Theme 3: Empathetic - Analysis of data

Concerning the above, for T5  , it is imperative to motivate and expose learners to being empathetic towards whom they design. Furthermore, the indication that we "don't live in isolation" (T5 ) supports the consideration of being a compassionate member of society. Therefore, designs impact people by offering a platform for expression and providing solutions to problems and needs.

According to T6B  , learners are affected by how the *design process* is interpreted. Hence, learning from other prominent designers, their failures and successes assume awareness and understanding of human emotions. Thus, emotions as a human quality are inseparable from human existence, creating a design solution for other humans who must utilise the product as a solution to a problem to such an extent that it remains sensitive to user-affability.

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Theme 1: Cognitive

Research sub-question 1: Why do teachers interpret the design process the way they do?

❖ **Theme 1: Cognitive - Presentation of data**

- In question 39, the interviewees were asked why they interpret the *design process* they do and if there are specific factors in their considerations. Design teachers quoted below believe that the *design process* aids the teaching of Design education:
- RST1  : *"To make sure that we go on a journey, we've got to go through that process in the hope that we come up with new ideas. If we don't, we all will conclude; we'll jump to the easiest possible notion. I think".*
- RST1  : *"Yes otherwise you are producing pretty things, that the road to that final, whatever needs to be about the design process, it needs to be, it needs to be made in such a way that it answers a need, and it can only answer a need if you test that need".*
- T2  : *"Planning is very important".*
- T2  : *"It's definitely important. It prepares you obviously before the final, and it sort of eliminates many problems that you can, uh, get along the way. But fails to allow learners to work from the other way up, end-idea backwards. So, the design process is extremely important, but it's not always everything. It's not the only means to your product".*
- T3  : *"Move out of the classroom like Norway and Sweden, their way of teaching where they [are] outside, they've got to work. [Learners] have to do everything themselves. That's the model that we are striving for. But if you're going to start something creative".*
- T4  : *"Yes, definitely that design process plays a big role as it doesn't always rule out the problems, but it does move through a variety of problems, and it helps the learner as well to find new and creative solutions for the problems".*
- T5  : *"The process is very important. I feel that it helps kids learn from one step to another how they can develop. And I think it also teaches them that your first original idea is only a start, and you end up 500% further away from that as you go on".*

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- T5  : *"I think that also, they need to research the concepts in their own way, in their own terms, as well as what's given to them in the class. And then they need always to try to go a step further to interpret it in a creative manner".*
- T6A  : *"In the way that they would understand what's expected from them".*
- T6B  : *"I interpret it in this way from the brainstorming up until the solution, so it becomes simple".*
- T6B  : *"It is indeed important. Because I think it teaches, it helps learners and teachers manage problems, not fear problems. But to treat problems as challenges, there is a solution, and you have to follow a particular way. So, I feel it helps people manage their life as well".*
- T7  : *"It is very important because if we fail in the process, we cannot come up with a final product".*
- T7  : *"We cannot reach our destination if we don't understand the process".*

❖ **Theme 1: Cognitive - Analysis of data**

The *design process* is a mental function most essential in Design education. Its importance explains the reasons why Design teachers interpret the *design process* the way they do, either understanding it as a planned journey or as a discovery. However, Design teachers have stated that understanding the *design process* is beneficial since it illuminates easy solutions, or even beautiful and nice-looking solutions created by the learners.

Therefore, it allows being taken on an 'open road journey'. Notably, *T2*  *worked backwards, from the product to the process – "I also do it in my own art".*

Furthermore, RST1  allowed the Design learners to examine their problems and credibly incorporate their understanding into the final project. By doing so, linking to the theme of the Design brief[19], Hats and Headpieces, design for a communications conference with a celebrity by expanding the link to an activist, somebody who stands for something other than being

[19] Design learners were described as one of a handful of world-class hat designers who have been invited to create a hat or headpiece to be worn by a celebrity of their choice. The design could refer to the theme of the conference by taking inspiration from the use of the alphabet used by ancient civilisations, such as the Mesopotamian, Egyptian, Ancient Chinese civilisations etcetera.

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glamorous. As mentioned prominently by RST1  that the activists' campaign should be classified as either environmental or socio-cultural. The notion of education is not only about teaching a skill. It is also about building responsible citizens who are aware and well-equipped to contribute to a better future.

Furthermore, T3's  interpretation of the *design process* allows not only for individual exploration but also for the development of self-dependence. The possibility of teaching outside of the classroom empowers learners to find their *'creative voices'*. Therefore, the *design process* becomes a vehicle for the journey, stopping and visiting different places (solutions to the design problems). Delightfully, it allows for a giant leap forward in discovering their own abilities and potential.

Theme 2: Emotive

Research sub-question 1: Why do teachers interpret the design process the way they do?

❖ **Theme 2: Emotive - Presentation of data**

In question 39, the interviewees were asked why they interpret the *design process* they do and if there are specific factors in their considerations. The interpretation that the *design process* allows for feelings, introspective holistic participation and freedom to research alternatives is encouraged by the five Design teachers' excerpts listed below:

- RST1  : *"Learners are free to investigate any of the alternatives. And the reason I do so is that I believe establishing that notion is important. So, the concept that I grant as important is focused on and developed".*
- T4  : *"Following a process of creating, instead of focusing on just a final design or final product".*
- T5  : *"It depends on themes. And I think you have the basics of what you're doing, but you kind of learn more ways of doing it along the way".*
- T6A  : *"Is that the way I feel, would bring about appropriate results".*
- T7  : *"The design process led us to the final product".*

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❖ **Theme 2: Emotive - Analysis of data**

The quoted Design teachers explained why they interpret the *design process* by relying on emotions to build a point of view. Emotions in a *process* connect to real feelings to better understand the design problem, explore ideas, and play around with them responsibly. Therefore, themes may trigger particular emotions in the *design process*. Notwithstanding, moods and outlooks impact the learners' awareness and encourage them to '*look differently*' to the solutions they find.

Theme 3: Empathetic

Research sub-question 1: Why do teachers interpret the *design process* the way they do?

❖ **Theme 3: Empathetic - Presentation of data**

In question 39, the interviewees were asked why they interpret the *design process* they do and if there are specific factors in their considerations. The four Design teachers referred to below revealed and supported empathy that a Design learner should possess, teachers' promotion of compassion as a skill, general and specific people-empathy, accepting that Design learners do not know cooperation and inspiration of peers or 'clients' yet:

- T2  : *"You sort of nurtured your idea from the beginning".*
- T3  : *"I think it's people".*
- T5  : *"Perhaps you see a child creating a planning layout that you feel works really well. And then you motivate other learners to do the same".*
- T7  : *"If the learners do not understand the brief, the learner cannot follow the process".*

❖ **Theme 3: Empathetic - Analysis of data**

Design teachers' empathetic kindliness explains why they link their interpretation of the *design process* with problem-solving, which is validated by the designed evidence in the Design learners' sourcebooks. For example, RST1  emphasised that a design is not only an aesthetic end-product; its purpose is to create solutions for issues that confront society. Furthermore, T6B  thinks problem-solving in Design is a complex issue, therefore, Design learners should empathise with a human-centred *design process* as it is crucial to understand

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the end-users' needs. Hence, during the problem-solving quest, one should use knowledge of Design theory to resolve a particular problem while bearing in mind that design solutions affect people's lives.

Then, T7  refers to positive engagement with social issues relating to the immediate community. In return, the learners are aware of real challenges and consider creative and critical thinking skills to solve a problem: *"Problem-solving is when you have noticed that the community [has] a problem. It would help if you came up with a unique, uh, solution to solve that problem".*

Importantly, T2  stated that problem-solving concerns are taking an idea or concept and engaging in that problem, theme or topic and changing it to make it one's own, essentially to make it user-friendly for your 'client'. Problem-solving should have a satisfying outcome positive for the client and the designer. *"I get so sick-and-tired of 'thinking out of the box', it's such a cliché, but to think more individually, so problem-solving can be. Can you really draw from yourself and your client?".* However, there are many different problem-solving strategies or ways to approach the *design process* empathetically. For example, problem-solving in a practical sense could be figuring out how one's design will work practically, or problem-solving is getting to why one's composition is not working correctly. Thus, problem-solving does not necessarily have to be about a problem that needs to be solved. Yet, it is a necessary process to work through to find the right combination of elements and design principles in presenting the solution empathetically.

Theme 1: Cognitive

Research sub-question 2: How does teachers' interpretation influence their teaching of the *design process*?

❖ **Theme 1: Cognitive - Presentation of data**

In question 40, the interviewees were asked how they think their interpretation of the *design process* influence their teaching of it. The two Design teachers referred to below highlighted positiveness and understanding:

- T6B  : *"It influences a lot, positively. I think, it helps not to be static but to have different approaches".*
- T7  : *"I want [the learners] to understand the Brief".*

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❖ **Theme 1: Cognitive - Analysis of data**

The two Design teachers above affirmed that their interpretation influences their teaching positively as it focuses on making sure learners understand the Design brief. Therefore, the problem indicated in the Design brief challenge is broken down into different steps to solve the problem. In a way, it allows for other ways to assemble the pieces once it has been pulled apart. To continue, this probably will allow for much more freedom to explore. Thus, a view is further placed on the positive impact, focusing on various approaches to solving the problem.

Theme 2: Emotive

Research sub-question 2: How does teachers' interpretation influence their teaching of the *design process*?

❖ **Theme 2: Emotive - Presentation of data**

In question 40, the interviewees were asked how they think their interpretation of the *design process* influence their teaching of it. The assertion made by the two Design teachers in this part about their own stressors, moods and decisions has an influence and rubs off on their Design learners, as seen in the following extracts:

- T4  : *"I do think I add to learners' stress level. But at the end of the day, it does equip them better for the school studies or even workplace".*
- T5  : *"I do tend to react to certain mediums more than others".*

❖ **Theme 2: Emotive - Analysis of data**

Concerning the Emotive theme, T6B  indicated he has a positive impact on Design learners, however, both T4  and T5  regard their impact as unfavourable. Subsequently, negativity affects and limits the use and preference of certain media to complete the task. The applied stress in the Design teachers' approach to challenge learners might be negative at first but have a positive turn-out beyond the Design class. Therefore, the ripple effect may find its way into other subjects and learning areas and eventually contribute to the workplace. Furthermore, according to Kivunja (2015:225), Kwek (2011) and Owen (2007:25), the changing difficulties and circumstances that our learners face necessitate the inclusion of new, 21st century competencies and abilities. However, Design teachers who have received the required assistance and direction are willing to allow learners to study more

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autonomously, improving their self-reliance and incorporating any emotional sentiments that may impact their inner drive and design ideas.

Theme 3: Empathetic

Research sub-question 2: How does teachers' interpretation influence their teaching of the *design process*?

❖ **Theme 3: Empathetic - Presentation of data**

In question 40, the interviewees were asked how they think their interpretation of the *design process* influence their teaching of it. The following extracts reflect the substantial impact on how Design teachers view the *design process*. The three Design teachers below claim to have empathy, and they want their learners to be aware of it and reflect empathy in a way that they can comprehend:

- T2  : *"It influences in a great way because, I tried to enforce, you know, I try to practice what I preach".*
- T3  : *"What they want to do".*
- T6A  : *"It influences the ways the learners would interpret the brief. In the way that they would understand, what's expected from them".*

❖ **Theme 3: Empathetic - Analysis of data**

Having an empathetic approach and identifying Design teachers' interpretation of the *design process* show that these three Design teachers engaged fully with 'understanding'. If the approach is persistent and optimistic, doing what the teacher knows, but simultaneously distinguishes what the learners are designing for. At the school level in the Design class, the 'client' is personified by the Design teacher. An example, T6A's  empathy relates to understanding how the learners will interpret the Design brief, but learners will also know what is expected from them in an empathetic way.

The discussion of data presented and analysed under *5.2.2 Report on the data* follows in the next section.

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5.2.3 Discussion of data

According to the data collected from the participants in my study, most Design teachers view the *design process* as a cognitive problem-solving thinking process. As indicated, the data was organised into three themes: **(1) Cognitive**, **(2) Emotive**, and **(3) Empathetic**
. To continue, critical thinking with its co-joined thinking partner, creative thinking, comes into play here as Design learners need to start thinking independently from their teachers. Research by Lombard and Grosser (2008:572) has shown that when learners become more aware of their own learning, they start to think more freely from their teachers. Subsequently, Design teachers distinguish themselves with their approaches, either following a step-by-step or an iterative one. The participating Design teachers evidently view the *design process* approach equally, either as an iterative or linear approach.

Furthermore, the data analysis of Part Two and Part Three tested the Van Deventer D+NQ model, which instead was crafted to encourage a reiterative approach (Part Three to be discussed under *5.4 Part Three: Design learners' outcomes of the Design Product (Topic 2*). Evidently, what should be understood about 'iterative' within the *design process* is that it also refers to finalising a step; it is not only applicable as a step-by-step process. Therefore, my first research question is answered from the data as I continue to explain.

Design teachers T2's  , T3's  , T4's  and T7's  viewpoints of the *design process* negate the cyclical view and limit the *design process* to a fixed procedure that unfolds in a certain order, for example, *"you identify, define and solve the problem".* The preceding perspectives on the *design process* imply that learners cannot omit steps to arrive at a solution. This links directly to the CAPS Design and how the *design process* is defined in this policy document.

Hence, the *Design Process* refers to the step-by-step method outlined in CAPS (DBE, 2011:8) (see *Chapter 1,* section *1.2.2 Context*) as the Design teachers and learners understand and prefer this method. Furthermore, a robust indication from the study shows that 50% of the Design teachers who participated in my research follow this definition strictly from the CAPS document. The reason given is that learners find it much easier to follow step-by-step instructions and I assume also ease the task of the Design teacher, who can have more control over the progress, work-ethic, and output of each learner.

To continue, it became clear in this study that not enough freedom is granted to learners' exploration of the theme and engagement in their solution-possibilities. Design learners'

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independence refers to how much Design teachers allow learners to explore and search for solutions to the problem in the Design brief. However, a widespread perception among Design teachers – referring to Mawson (2003), Steyn (2020), and Williams (2000) – is that the *design process* is linear. In other words, the *design process* is a set of stages specified by teachers, such as '*find-plan-create-assess'*, and learners are required to follow these steps in their projects systematically and meticulously. It is worth noting that RST1  , T5  , T6A 
and subsequently, T6B  preferred an iterative *design process* as previously mentioned (*5.2.2.1 Presentation and analysis of data).*

Theme 1: Cognitive Question: How do teachers interpret the design process? voiced opposing viewpoints to the previous group of teachers. For these Design teachers, the *design process* is viewed as iterative: a *"collection of steps that must be followed"* (RST1  , T5  , T6A
 and T6B  . To continue, Brown (2009), Hill (1998) and Lawson (2005) see the *design process* as an *iterative* method, defining it as a repeated process that produces a string of creative outcomes. Furthermore, learners' creativity is hampered by the linear perspective of the *design process* since they cannot explore design solutions using their own ideas or techniques. Finally, Ohemeng-Appiah (2014:52), who conducted a similar study on the *design process* in a technical subject, refers to Rowell (2004) and other scholars who believe that the seemingly strict structure of the *design process* does not allow for the development of the learners' creative talents, and have proposed the need for a new pedagogy or methodology. However, I believe that the *design process* is most effective as an iterative method. Still, Design teachers should always be in touch with their Design learners to establish which learners, due to their learning styles and personality types, prefer to work with the *design process* linearly. Therefore, I promote flexibility around the *design process'* application, taking all variabilities into account.

Furthermore, RST1  believes the *design process* begins with a concept, and the learners are requested to develop and design a solution in any of the Design fields (CAPS Design, DBE 2011:13). Then, learners are at liberty to explore any of the options.

My first research sub-question is answered as follows (*Why do teachers interpret the design process the way they do?):* RST1's  rationale behind the way the *design process* is

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interpreted links it to the development of a specific concept, which needs to come from the most appropriate solution for that development. This particular approach links to the research of Flowers (2010); Jones, Buntting and De Vries (2013); Lawson (2005); Potgieter (2013); Pudi (2007); and Williams (2000), who depict the conceptualisation stage in the DTF as a primary reasoning measure. Hence, T5  is very open-minded in her teaching approach – "*I tackle problems from a different angle, and I look for individualism, I think that's one of the most important things in my teaching".* Therefore, it indicates that her openness creates a space for Design learners to take ownership of their own learning and use the liberty to engage with the design-problem independently, similar to RST1  and T2  . To continue, I want to include T7  here, as she highlights the point *"that we are not all the same*". T3  stresses the unique individual – *"I like the learner to find their own means…"* – on the same open platform for learners to explore and experiment.

However, similarly to RST1  and T2  , T7  allows for learners to discover independently in the little time she has to engage with the learners. She assesses her influence on learners as minimal – *"In Design, we give learners in our process a week. Remember, we have categories, research, intention, rationale and all those things. We have to unpack all of those things. And that is a lot of time for learners to go home and Google. Then they have to design their own hat and headpieces. That is part of communication at a gala dinner. So, I think there's a process. They have to go and Google, and then we give them a lot of time".*

In my view, it became apparent that Design teachers value and place high importance on the *design process* in the Design practical execution-stage, as this echoes the focus of Cassim (2013), that the *design process* is seen as the pillar in creative subjects. However, for example, when learners begin the *process*, neither the Design teachers nor their learners have any idea of what will be created for their final product, be it a film, an animation, or a functional item for home use. Furthermore, RST1  succeeds in interpreting the Design brief entirely as open-ended, with the expectation that each learner will discover their own conclusion. Although the Design brief was crafted in collaboration with RST1  and myself, it clearly stated that the learner had to make a hat or headpiece. It appears that the *'solution'* had already been given,

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and no design problem was identified. Therefore, the teacher's (RST1 ) frustration could not be more precise: *"I never do that [giving learners the solution, that is what to make] anymore! I did at the beginning; I've now developed to a point where it's important for me that [learners] come to that [own solution] conclusion [solution to the problem identified in the Design brief]".*

Hence, the importance for Design learners to make sense of their work processes is to encourage their thinking to be more design-like (Galle & Kovács, 1996; Ho, 2001). Whereby *Designerly thinking* through standardising decision-based procedures lead learners to experience the reality, reaching their conclusions for the problem presented, more in a *Designerly thinking* way, as Leong and Clark (2003) and Oxman (1999; 2004) refer to it. The way the Design brief is constructed allows learners to have many options and choices. Then by allowing the thinking process to manifest fully guards the outcome of a suitable end product. In other words, put the problem on the table; the solution needs to come out of the development of that problem. Thus, the more we examine, analyse, and discuss a problem, the more multi-layered and complex it becomes. Thoughtfully, the answer or solution is never separate from the problem (Krishnamurti, 2018:18, 125). Therefore, rather than providing the problem, create open-ended practical projects for Design learners to propose their ideas and conclude with the most appropriate solution for that particular problem. Whilst keeping the growth factors (Rabie, 2015:24-25) in mind, this links to Carroll *et al's.* (2010:39) statement that *"Design thinking requires learners to identify problems themselves".*

Equally, T5  allows freedom at large – *"The way [the learners] dealt with the brief, it's totally up to them. The one thing I do guard against is stereotypes, we steer away from that, and we do a lot of problem-solving, creative problem-solving".* However, Krishnamurti (2018:33) says there is no such thing as free thought; all thinking is conditioned. Therefore, thinking can never be free; it results from our orientation, past, culture, environment, and socio-economic and political circumstances.

Lastly, my second research sub-question, *"How does teachers' interpretation influence their teaching of the design process?"* is answered by the amount of freedom given to learners. This freedom allows for confidence in processing, not focusing on one thing or the medium the learners feel comfortable in, but it will allow them to explore a variety of possibilities serenely. Furthermore, it became clear not to discourage Design learners from exploring and finding their own way rather than driving them in a specific direction. Notably, the answers to the critical questions asked around the Design brief will come only at a later stage. Therefore, the primary purpose of creating the hat or headpiece presented as the topic for Design

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learners to explore was to keep in mind that the design (solution) will be auctioned at a charity event. (*See APPENDIX I*) – *"The way I would structure it in retrospect would be to say, there would be a need, which has come out of whatever, the auction could be auctioning a variety of things. So, it could be auctioned, for example, a service or an event".* (RST1 ). It is clear that the auction would still fundraise for the event, but the end product could be a wealth of possibilities. With the human-centred focus in mind and linking to substantial works by Brown (2009), Cassim (2013:90-201) and Giacomin (2014), who present the human-centred focus as paramount to creative problem-solving, allow learners to take the idea 'thinking with NO box' and create, e.g., an animation piece, which would then be auctioned. Seemingly, T5  motivates her Design learners, starting from Grade 10 and, as they move onto senior grades, progressively allowing more freedom – *"They're motivated to go into their own version of media instead of just following a simple brief"* – echoing human-centred focus as paramount to creative problem-solving, as referred to by Brown (2009), Cassim (2013:90-201) and Giacomin (2014) above.

To continue, RST1  highlights the freedom offered to learners by putting the hat (i.e., learners had to design their own headpiece) at the end of the process – *"It is limiting learners' thinking, it takes them to a conclusion, and I'd like them to find their own conclusion".* Then, T4  similar to RST1,  tends to push learners to do a lot of exploration as this helps them not only focus on just one idea, but then they have got multiple ideas. T3's  teaching approach is that every learner is a unique individual. Therefore, they are encouraged to be confident individuals in what is presented in their portfolios, as well as in the final work – *"I want the child to find their own way of drawing. I've got kids who can't draw, so I let them stipple, and they can stipple beautifully so they can stipple".*

Subsequently, T2  allows learners to liberally explore ideas into finding a solution for the design problem posed – *"A lot of, I don't feel threatened by new ideas, or it is not only me, the approach, or the results. I mean the product itself".* However, T2  highlighted the dilemma all Design teachers, unfortunately, face: In the final assessment, the learners see the marks as the ultimate task. The unfortunate reality, as the teacher echoes, *"it's about the results, so [the learners] worried much about the results".* Nonetheless, Runco (2003:320) stipulated learners should be encouraged to risk-taking and creativity without fear of final marks, but T6B

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 reverberates the paradox of this viewpoint *"they themselves have that limit because they say it's going to affect my marks. Because they are only worried about marks".* Unfortunately, this causes learners to lose interest, enthusiasm, experimental periods and discoveries throughout the conceptualisation stage (Topic 1). Thus, fear is jointly innate and learned; it is linked to the past. But, to understand the formerly through the present, it is required to liberate thought-feeling from bygones. Yet, all fear stems from the ego (self) (Krishnamurti, 2018:57).

To continue, T6A  reported that learners limit themselves, not the Design teachers, because the latter encourages exploration and experimentation. As such, Design learners want the easy way out, and they will end up using the same media and material that they found worked for them before – *"We cannot in our situation limit the number of mediums for experimentation. It's just that to find it from the learners, and they limit themselves to certain materials or certain mediums".* Furthermore, part of the challenge for T6B  is that learners do not know and understand other mediums, and they are, therefore, scared to use and experiment with new mediums. The learners prefer only to use mediums they are comfortable with.– *"You bring [a] new medium for them to experiment with, they don't have that much freedom because they are so accustomed to a particular type of medium".*

Hence, Design teachers value new approaches and fresh opinions tabled by Design learners – *"I actually quite enjoyed when they're a bit different".* An indication also reflects that they are *surprised* by what Design learners produce – *"I'm often surprised by what they do and what they present. So, it is pleasing to me that I'll give them a bit of freedom, not a bit, a lot".* This Design teacher (T3 ), to her credit, has realised the potentiality of her learners, which in fact, is a sincere step towards positive class-communication and fruitful creativity. According to Steyn (2020), the element of freedom is extremely important to both teachers and learners as long as it is well controlled and wisely administrated. Applying an innovative approach, T3  surprised her learners by placing them in unfamiliar environments, creating challenges that needed urgent and accurate solutions.

To conclude this section, I will give a brief overview of other important aspects mentioned in the interviews with the Design teachers, as a comparative summary. Design teachers on a scale of 1 to 4 (with four being the highest) indicated how they would evaluate their confidence

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level in teaching Design practice. When each Design teacher was asked about their confidence level, they evaluated themselves as follows. Confident teachers scored themselves a 4/4, RST1  , T4  , and T6B  . T2  and T3  indicated they could be either a 3 or 4, whereas T5  , T6A  , and T7  gave themselves a score of 3 in their confidence level. Level three indicates that the teacher would benefit from teacher and professional development. In terms of the teachers' knowledge of Design, specifically CAPS Design, T2  , T4  , T6A  , T6B  and T7  scored themselves a 4/4. T3  and T5  scored a 3/4 with RST1  who scored herself as low as a 2 or 3. I find the score of RST1  startling as her Design learners' results resembled the top of the class in Gauteng year after year. Design teachers scored their knowledge of the PAT Guidelines document as follows: T3  and T5  scored 3/4, T2,  T4  , T6A  , T6B  , and T7  indicated a score of 4/4. Seemingly interesting is that RST1  again scored a low 2 or 3 out of 4 for herself.

To add, Design teachers defined the two approaches, namely *Design thinking* and *Designerly thinking*, as follows:

RST1  : *"**Design thinking** is about approaching issues in the world with the spirit of problem-solving, you can come across issues and answer them directly, or you can come across issues and think, hang on, there must be another way. There must be another way to deal with this issue that all the answers have not been exhausted in the world. Does that make sense?"*

Designerly thinking: *"No".*

T2  : *"**Design thinking** is a way of solving problems of getting solutions. That's how I interpret Design thinking".*

Designerly thinking: *"Designerly Thinking, that is thinking like a designer is supposed to think. A design thinker is a good designer, that is how a design thinker is supposed to think. In other words, with all the problem-solving tools in mind".*

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T4  : *"I don't really know what* ***Design thinking*** *is. But I'm sure if I go and do research, I will be able to answer that".*

Designerly thinking: *"No, I don't know what the Designerly thinking is, but I would presume that it is a getting your mindset into a way of Design thinking, as in following a certain process and using certain elements".*

T5  : *"***Design thinking**, *I think it's where the difference is. We have to always think of function instead of just wherewith Art. It can just be aesthetically pleasing. But you have to think, how is my function going to work? Is it going to have a purpose? Is it going to be able to be used for what it was designed? So, you constantly have to ask those questions of why, how, where".*

Designerly thinking: *"I don't know what the Designerly thinking is, but I would presume that it is…getting your mindset into a way of Design thinking as in following a certain process and using certain elements".*

T6B  : "***Design thinking***, *I feel, is a process. As a person, not only as an educator but also as a person, you're approached by solving problems geared towards functionality. The utilisation of products, how do we use these products to solve a particular problem. I think that is my basic understanding of Design Thinking".*

Designerly thinking: *"Designerly Thinking is when you take the process, design process, and apply it to a particular product".*

T7  : *"I know common sense.* ***Design thinking*** *is when you become an entrepreneur in an environment whereby some services are not there. You have to think. Let us take a typical example of toilet paper. I used to live in rural areas. There were no toilet papers, and they used to use newspapers and stones in my time. And there comes a person who came up with a new thing, which is toilet paper. So, I think this person tries to reason or solve a problem".*

Designerly thinking: *"You don't just think just like an ordinary person, but you think like a designer. Let us talk about the roles".*

RST1  , T2  , T3  , T4  , T5  , T6A  and T6B  all showed their knowledge and could explain and give a synopsis of Bloom's taxonomy; however, T7  indicated she knows the term but does not know what it comprises – *"I know the term, but I*

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don't want to lie, but I couldn't describe what the taxonomy is". While the PAT Guidelines document does not prescribe but proposes Williams' taxonomy, see my discussion in *Chapter 2,* section *2.6.3.2 Creative Thinking* as cognitive level descriptors to use in Design practical (practical projects), all Design teachers except T2  were unfamiliar with the taxonomy. Furthermore, PAT (2018:13) shows how to utilise the taxonomy in precise detail. Unfortunately, although several Design teachers have stated that they are aware of Williams' taxonomy, as used in the PAT Guidelines (2018:13), they are not familiar with the taxonomy nor effectively implementing the taxonomy of Williams in their teaching of Design praxis. Therefore, I can assume that (1) teachers do not use the PAT document as intended, (2) they do not read the document due to lack of interest, (3) they do not read the document due to lack of time or the (4) unavailability of the document, as indicated by T7  .

However, it is not required but is provided as an example in the document to use Williams' taxonomy as a cognitive levels descriptor for practical projects – the *Design Process* (Topic 1) and the *Design Product* (Topic 2). Furthermore, none of the teachers used any other distinguishing theorists or scholars to aid them in the practical aspect of teaching Design, except for T6A  , who highlighted his appreciation for social psychologist Albert Bandura (1982) and how he used Bandura's theory in his Design class.

Finally, I would like to endorse Eriksson *et al.* (2019:21-22), who highlighted the following essential attributes required of a Design teacher to fulfil the nature of Design education and the CAPS document:

1. Teaching Design requires a thorough hold of the *design process*. Design necessitates an investigation of intricacy, potential possibilities, and creative answers, requiring the teacher's confidence in the *design process* to lead and support such an investigation.
2. The capacity to develop a Design brief that requires critical (analytical) and creative thinking.
3. The capacity to scope the time and resources required by a Design brief and guarantee that learners can finish the project effectively within the timeframe.
4. The technical abilities required to teach the subject in a way that allows for advancement and growth.
5. The capacity to describe learning engagements, practical results, and deliverables across various sectors (including graphic design, product development, fashion and the environment, among others) necessitates fair and comparable participation from learners and stakeholders.

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6. Rather than focusing on the end look, encourage experimentation and exploration of the creative process (Eriksson *et al*., 2019:21-22).

Seemingly considering continued onslaughts like poverty and the ongoing COVID-19 pandemic, key skills for the 21st century (i.e., critical thinking, creativity, communication, collaboration, among others) are becoming increasingly prominent as a conscious quest to learn relevant skills. Hence, Design teachers should focus on allowing learners more freedom of thinking for environmental exploration and self-discovery and use the benefits of *Design thinking* as a problem-solving approach. Thus, both Design teachers and learners will produce the kind of contribution we as citizens aim for as a demand in the 21st century workplace.

To conclude, this chapter processed the Design teachers' interviews in presenting what has been said, then analysed and discussed what resulted from the data source. Furthermore, in the discussion segment, I evaluated what had been found. Then, I explained my interpretation by linking my findings to *Chapter 2, Literary review, and Conceptual framework*. Lastly, I looked at similarities, contradictions, gaps, and new insights found in the interview feedback.

5.3 PART TWO: DESIGN LEARNERS' OUTCOMES OF THE DESIGN PROCESS (Topic 1) - SOURCEBOOKS

5.3.1 The Design learner: The what and the why

The Design Process (Topic 1) – Data digital photographs

5.3.1.1 Method

In this section, Part Two, I am presenting the data captured by digital photographs. All the data from the Design learners' sourcebooks were captured through digital photographs. The *Design process* was divided into two folders: *Topic 1* (the development: process) and *Topic 2* (the realisation: product). First, photographs were downloaded from the digital camera onto my laptop. The digital photographs were then resized, grouped, numbered, and labelled under each school and learners' participant codes. Next, sub-folders were created under the main folder, the *Design Process* (Topic 1). Each sub-folder represents, in turn, a participating school labelled with a participant codes. Finally, each sub-folder contains all the data from each Design learner in its own compartment.

I began using the Van Deventer D+NQ Model (see *Chapter 3, Figure 3.1: Van Deventer D+NQ Model. The Design process: 8-Steps in transforming the existing way of solving problems)* with

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STAGE A of the model, utilising Steps 1 and 2. I then employed the different developing stages and actions alongside the guidelines on each card of the model. This section (STAGE A) uses the same prerogative for testing STAGE B and STAGE C of the Van Deventer D+NQ Model. Furthermore, for the structure of the reporting on the data, I have divided the presentation and analysis for the data in table format under each separate STAGE, together with each step, developmental stage, and action of the Van Deventer D+NQ Model.

After that, I compiled *Table 5.3* as a summary. The Van Deventer D+NQ Model serves as a quick reference for this chapter section.

Table 5.3: Summary of the Design Process – Topic 1: Stages and steps

Van Deventer D+NQ Model | THE DESIGN PROCESS – Topic 1			
STAGE	**STEP**	**DEVELOPMENTAL STAGES**	**ACTION**
STAGE A	Step 1 & 2	Understand	Define, Debone
STAGE B	Step 3 & 4	Explore	Discover, Data
STAGE C	Steps 5, 6 & 7	Materialise	Design, Develop & Deliver

Source: Anriët van Deventer

5.3.1.2 Presentation and analysis of data

I start each section by indicating which Van Deventer D+NQ Model stage and steps will be presented and analysed. The colour coding corresponds, as illustrated in *Table 5.3.* Next, in *Table 5.4,* each of the stages and steps are outlined, which serve as indicators for the data analysis I followed.

Table 5.4: Van Deventer D+NQ Model | Stages and steps indicators

STAGE A | *Understand – Red Zone*: Step 1. DEFINE and Step 2. DEBONE
Step 1 | DEFINE ▪ This process outlines the issue or challenge learners need to address: • Define the problem/challenge. • Understand/investigate the brief. • Develop a deep understanding of the problem or challenge. • Develop a concept demonstrating creative and critical thinking. • What pain points do you face in the context? • Formulate a problem statement and/or a point of view.
Step 2 | DEBONE ▪ Unpack real user problems and start building empathy: • What do I need?

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- What do I need to know?
- How is it observed? Is it observed with having discussions between the two parties?
- What needs of the user (the Other) and challenges consistently are coming up during discussions?
- What do I see, hear, feel and think in connection with what I am referring to?
- Continuous reflection on the process must be evident = critical thinking.

STAGE B | *Explore* – Orange Zone: Step 3. DISCOVER and Step 4. DATA

Step 3 | DISCOVER

- Explore different avenues without a specific route or direction:
- Do research, get more facts.
- Brainstorm and/or create a mind map.
- Continue with paste-ups and a mood board.
- Allow space for freedom to explore.

Step 4 | DATA

- Organise your thoughts rationally and present them in a structured way.
- Combine different ideas and build different options around a proposed solution to the relevant problem.
- Based on the findings from the DEBONE and DISCOVER steps, start piecing Steps 2 & 3 together.
- You are encouraged to venture away from the norm, explore new angles and think *'outside the box'.*
- ***Think with NO box!***

STAGE C | *Materialise* – Green Zone: Step 5. DESIGN, Step 6. DEVELOP and Step 7. DELIVER

Step 5 | DESIGN

- Turn your ideas into something tangible, which can be tested on real users.
- This is crucial in maintaining a user-centric approach, allowing yourself to gather feedback before developing the whole product.
- Among the different options, put to the table, choose the best solution and build on it. This ensures that the final design or solution solves your/user's problem and is a delight to use!

Step 6 | DEVELOP

- The testing phase: add detail to your solution.
- Create more ideas to increase choices. Testing will quickly highlight any design flaws or solutions that are not suitable for addressing your problem.
- Based on what you learn through user-testing, you will make the necessary adjustments and improvements. The testing phase results will often require you to revisit the DEFINE and DEBONE stages or run through a few more DATA and DESIGN sessions.

Step 7 | DELIVER

- The drawn-up plan is materialised. A suitable solution is found.
- The way forward: Reiterate the *design process*.

Source: Anriët van Deventer

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5.3.1.3 The Design brief

Design learners were challenged to design a hat or headpiece to be worn by a celebrity of their choice. The history of typography should be taken into consideration when creating the design. Each design must also 'compliment' the celebrity the Design learner is designing for. A communications conference would follow during a grand gala opening. The celebrity would then wear the once-off hat or headpiece creation to be auctioned for charity in the same evening.

The following *Table 5.5: The Design brief: An introduction* it serves as an introduction to the Design brief. Also see *APPENDIX I: Design brief | English and Afrikaans.*

Table 5.5: The Design brief: An introduction

***BRIEF/TOPIC: A HISTORY OF TYPOGRAPHY	HATS and HEADPIECES***
DESIGN FOR A COMMUNICATIONS CONFERENCE
You are a designer of *"Couture Hats"* for the Fashion Industry.
An *events company* is to organise a Communications Conference celebrating the History of Typography. The conference will be used as a marketing strategy by a group of publishing houses to highlight their work. It is to be held in Johannesburg – Design City 2020. The creative director of the events company wishes to launch the conference with a lavish gala opening night. Celebrity guests will be invited to lend status and dazzle to the gala evening. These celebrities will be asked to wear *'over-the-top'*, once-off hat creations, auctioned for charity in the evening.
You are one of a handful of world-class hat designers who have been invited to create a hat or headpiece to be worn by a celebrity of your choice. The design could refer to the conference's theme by taking inspiration from the alphabet used by ancient civilisations, such as the Mesopotamian, Egyptian, Ancient Chinese civilisations, etcetera. Again, you may consult your Design theory.

Source: Anriët van Deventer

❖ **Presentation and analysis of data**

Table 5.6: STAGE A | Step 1 & 2 and PAT guidelines

PRESENTATION	**STAGE A**	**Step 1**	***Understand***	**DEFINE** (Red Zone)
	STAGE A	**Step 2**	***Understand***	**DEBONE** (Red Zone)
ANALYSIS	*Define the problem.*	*Seek to understand.*		
PAT (2018:12)	Intention and rationale of the brief: brainstorm, mind-map & collage.			

Source: Anriët van Deventer

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Table 5.6 summarises the stage and steps of the Van Deventer D+NQ Model used as an orientation for my data presentation and analysis.

To start, RST1  presented a clear research cause with her learners. Therefore, L1-L5 clearly stated a social or environmental issue. Furthermore, the informal but structured discussion that RST1  led with her learners was executed well. To continue, proper problem statements were detected by all of these learners, as well. Hence, the focus on a celebrity was adjusted to the attention of an activist with a social or environmental campaign by RST1  in the Design brief. RST1  gave an activity around it, which added significant value to the Design learner's emphasis in conceptualising their solutions for the problem statement. Yet, no amendments were made by other Design teachers as they all used the celebrity as per the Design brief.

Additionally, Design learners completed technical drawings from tools the learners brought to school, as RST1  included an exercise for learners to complete in their sourcebooks. Yet, another task was added and presented in their sourcebooks: *What is a bibliography*? Furthermore, a time management outline was shown on the board in the classroom.

L1-L6 showed progress in building empathy with their end-user. Notably, L2 effectively deconstructed the message beyond what was expected. Then, at Step 1 – DEFINE, L1 logically unpacked the Design brief, while L4-L6 demonstrated well-structured unpacking of what is required in Step 1.

It is commendable that T2  incorporated a font exercise, project 4 from the prescribed Design Grade 11 textbook (Stassen, Coetzer, Crafford, Du Preez & Lubbe, 2012:97). Furthermore, all learners had to combine and link a Design theory question in an extended question related to the history of typography. In addition, L9 presented a time management timeline in the sourcebook. L1-L6 showed RST1's  influence in the structure and layout of the sourcebooks. These learners (RS1) all used their chosen activist related to a social or environmental issue as a sub-theme. More specifically, learners 19, 21, 23, 24 and 28 used typography as sub-themes. Continuing with Step 1, L13, L19, L22 and L24 showed exceptionally detailed insight into the initial layout and dismantling of the Design brief. Lastly, L10 and L20 explored the Arabic alphabet as a sub-theme.

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Moreover, as a concern, T3  did not supply nor did learners show a time management plan for the practical task. Neither did T4  supply nor did learners present a time management plan for the practical assessment task.

In contrast, T5  included a theoretical exercise for the DBC, which forms part of the *Design Process* (Topic 1). All the learners from S5 completed their DBC. However, it is presented as guided questions, and neither the teacher nor the learners provided a project time management plan.

Next, T6A  and T6B  did not supply nor did learners present a time management plan for the project.

Lastly, T7  did not supply nor did learners offer a time management plan for the project. The intention *What*? and the Rationale *Why*? were not clearly identified. L14 has a thought-provoking approach by presenting Step 1 utilising big letter headings: Why? and What?

Prestigiously, RST1  and S3 overall, with the guidance of T3  , did remarkably well facilitating the learners into the Step 1 – DEFINE of the Van Deventer D+NQ Model. Furthermore, T3  guided learners toward resourcefulness and creativity by allowing *"their own voices*" to surface. Thus, this is apparent in the Design learners' sourcebooks as they showed their unique points of view.

To continue, STAGE A – Step 1 – DEFINE, which seeks to understand, was well exploited, especially by learners L1-L6, who produced a clear understanding of what they need to know, as they have discovered in the Design brief. Then the development of a concept demonstrating creative and critical thinking and the highlights of the pain-points in the context of focusing on their chosen activist was successfully demonstrated in their sourcebooks. Moreover, L4 showed creative and critical thinking in the graphic layout in the sourcebook, while L23, L24 and L41 lacked these skills.

Finally, Step 1 – DEFINE the problem statement from the Design brief was well explored, understood, and investigated by L25-L28, L31-L37, L39 and L41. At the same time, L12 and

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L29 failed to define any problem statement. In the absence of identifying the problem, these learners found it visibly challenging to use the *design process* to unload the problem to find a suitable solution.

To continue, Step 2 – DEBONE of the Van Deventer D+NQ Model determines unpacking real user problems and building empathy. Noticeably, L2 plotted the social issue of African hair as part of an individual's identity = male and female, in a critical thinking manner by applying continuous reflection on the *process.* Furthermore, L3 deboned this step into creating a visually appealing montage that indicated what this learner sees, hears, feels, and thinks, all connected. However, L9 and L10 botched any further research to sufficiently debone in step 2. In comparison, L31 presented a layout that reflected patterns appealingly. Finally, L6 and L10 focused on deboning typography '*to the bone'*, taking it further after defining the problem in step 1.

Importantly, Step 2 – DEBONE required learners to apply continuous reflection on the process as it must be apparent. For example, L19, L21, L22 and L23 created an Egyptian look-and-feel and pointed out T4's  direct influence. However, the '*freedom*'-aspect is visible in the unique approach to deboning the problem at hand. Providentially, L7, L15, L27 and L30 showed thorough analysis and comprehensive exploration of the theme. The following learners, L13, L25, L26 and L28, presented the connection of what they are referring to with what they see, think, and feel, with visual appeal.

Furthermore, commendable collages were developed by L1-L6, L11, L15, L16, L25 and L34. To continue, L15 and L35 presented brainstorming in a top hat-shape using words to form the shape, while L2 used the head of Michelangelo's famous David sculpture dated 1501–1504 AD. To continue, L6 included a pencil drawing of a bee and other elements building and developing visual aspects collected with a collage filling up the bee's torso. Coherently, L25 highlighted *"Gala Night*" juxtaposed on a female's profile filled with text, while L26 used contrast by selecting light-and-dark text, creating a simplistic side-view silhouette with it. Whereby L31 started his/her sourcebook with a bow-shape filled with text and successfully developed this idea into conceptual sketches as part of the *design process* for the final product. Although L37 used colour to compliment the mind-map, though visually appealing, the learner failed to debone this step enough. Finally, L40 is applauded for the considerable effort put in developing step 2, but unfortunately, not enough exploration and development happened beyond the obvious. Then, in response to learners L19-L26 who successfully interpreted and presented steps 1 and 2 of the Van Deventer D+NQ Model (understanding

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stage) as part of the *design process* is acknowledged. However, L41's output with this step showed a need for guidance by the Design teacher (T7 ). To continue, L7 and L36 showed monotonous mood-boards: images were pasted without much thought. Unfortunately, L12 was unable to complete Step 2 – DEBONE successfully. To continue, L17 and L18 both showed a lack as no further research and very elementary visual representation for the collages were developed. Finally, L8's, L14's, L23's and L42's presentations were lacking in achieving the expectations of Step 2 – DEBONE, together with the Intention and rationale of their PAT not stipulated and omitted were their presentation of brainstorming, mind-mapping, and creating a collage (PAT, 2018:12).

❖ **Presentation and analysis of data**

Table 5.7: STAGE B | Step 3 & 4 and PAT guidelines

PRESENTATION	**STAGE B**	**Step 3**	***Explore***	**DISCOVER** (Orange Zone)
	STAGE B	**Step 4**	***Explore***	**DATA** (Orange Zone)
ANALYSIS	*Research, Identify your facts.*	*Build on different ideas, alternate options, think with NO box!*		
PAT (2018:12)	Evidence of research, experimentation, inspiration, *exploration*, words/images & reflection.			
	Evidence of detailed planning, *technical drawings,* drawing skills/drawings, paste-up, ideas, problem-solving.			

Source: Anriët van Deventer

Table 5.7 summarises the stage and steps of the Van Deventer D+NQ Model used as an orientation for my data presentation and analysis.

In STAGE B – Step 3 – DISCOVER, L1-L6 at RS1, presented research on each activist in a creative layout combined with typography and images. The images used and selected by the learners included copied images and hand-drawn illustrations by themselves to build-up as a visual representation in the sourcebook. Then, L13-L16 presented developments showing the 'freedom' of the thinking process recapping T3  as her approach to proper idea-development. Furthermore, S2 produced work in the sourcebooks that showed a clear link of the theory with the practical. It is a clear indication that learners are allowed in 'free' space to explore and come up with something '*fresh*'. Grippingly, L4 researched the San people of South Africa and incorporated the importance thereof as a heritage treasure. Whereas L7

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continued brainstorming and included the facts with the celebrity (Madonna) as a feature in the solution. See *5.3.1.2. Presentation and analysis of data* below *Table 5.4 (page 151)* where RST1  changed the celebrity to an active activist running with a social or environmental drive.

T2  achieved an individual approach in each learner's sourcebook, which is evident in the results as learners chose different sections of the four Design Categories (CAPS) and presented it as their design solution.

Finally, T3  supported and guided the learners through the thinking process (which she viewed as very important) although L7-L12 have too much digitally printed text, cut-and-pasted in sourcebooks but L17, L22, L24, L26, L28 and L30 need much more creative exploration. L34, on the other hand, created a distinct feeling with the use of hand-drawn ornamental flowing lines in the titles, in doing so developing a new stylised font. Furthermore, L34 achieved a flow through the sourcebook from the first page until the last page.

Some Design teachers revealed that a struggling developed trying to balance teaching thinking skills with technically sound abilities (talent) in recent years – *"I think people misunderstand that if somebody can draw very beautifully, accurately or can make beautifully made bowls for argument's sake, that puts them in that league, as far as I'm concerned, those skills can be taught"* (T3  . This is an indication that some learners have very basic skills. Thinking skills, brainstorming and conceptualising are all skills that are the crux of the matter of teaching. T3  encouraged learners to think *("How do I think?")*. Important questions are also raised, such as, "*How do I develop the idea?"* In my mind, how do I move from point A to point B? Importantly, it is expected from learners to generate creative solutions through the foundation of creativity techniques laid down from Grade 10, such as biomimicry and mind-mapping. Which, in return, should be developed further as a Design learner during Grade 11 and Grade 12 courses. However, these are taught as different compartments, i.e., theory and practice do not come together. Hence more purposeful creativity techniques need to be taught practically. Incorporating this role, T3  , T6A  , T6B  , and T7  should do more in preparing learners' creativity methods foundation. The limited display of students' creativity is addressed in the thesis as an emerging theme based on the findings.

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To continue, T4  views exploration and experimentation as a challenge since learners can interconnect the new technologies and social platforms without the restrictions accompanying them. Instead, the problem for the Design teacher is striking a balance between allowing learners to use their cell phones to snap photographs of various scenarios, such as a local scene the learner finds himself in but encouraging learners to utilise their cell phones as other modes of image-capturing. Instead, Design learners need to be encouraged not to use cell phones only for social media or for playing games but rather utilise the phone to access and discover the internet as a new way to incorporate technology into design. An apparent lack of research was observed in the sourcebooks of L19, L21 and L24. The enforcement of using technology is essential, but learners need to learn how, in moderation, to use it, when to use it and how to use it. However, unpacking Step 3, DISCOVER, was attempted by L31-L33 and L36, but more creativity is needed in how new ways can be sourced, and resources used more effectively. Stavridi (2015:2278) claims that creativity is the doorway to innovative problem-solving. As exhibited in the sourcebooks of RS1, RST1  managed to have learners understand that a clear golden thread can be followed in each learner's journey through the *design process*. The social or environmental issue which each learner focused on was pulled through into the visual presentations of the collages. In this section, very creative and thought-through collages were presented. The learners showed integration moving effectively from the collage into the final tonal drawings. To continue, L15, L23-L25 traced their final tonal drawing. Unfortunately, L15, L23-L25 showed little drawing skills. Although L23 lack drawing skills, research and more facts were efficaciously sought, which L27 also showcased. L35 needs more guidance related to layout as this learner does show potential. With the required outlines of Step 3 – DISCOVER, L18, L28, L29 and L42 undoubtedly struggled with this step, and therefore, did not succeed to unpack this step as required. L20, L34, L37-L40 developed delightful Step 3 – DISCOVER presentations.

Step 4 – DATA focuses on 'thinking with NO box' combined with different ideas and building different options around a proposed solution to the relevant problem; L34 showed one technical drawing of a hat-idea with measurements. Furthermore, RST1  gave L1-L6 an exercise supporting hand-eye coordination and technical skills drawing practice. A simple tool like pliers, as an example object, were drawn with technical precision. Finally, various drawings were completed of the instrument. These are included in the learners' sourcebooks and can be viewed with the QR code or URL-links (See *Figure 5.1*). Then, three learners from

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RS1, namely L1-L3, showed technically sound drawing abilities. However, L12-L14, L18, L21, L23 and L42 also displayed good drawing skills.

Nevertheless, the work from L4-L6, L11, L19, L27 and L29 emphasised the need that Design teachers should focus on developing learners' drawing skills and abilities. Then, based on the findings from the DEBONE and DISCOVER steps, learners needed to start piecing the facts and ideas found together. Learners from the reference school continued to display and illustrate their understanding of the *design process*. L7, L12-L14, L20, L27 and L39 demonstrated a compelling variety of elements in totally new design solutions. The encouragement by Design teachers educating L21, L22, L25, L26, L30-L32, L35, L37 and L38 to venture away from the norm, explore new angles and think *'outside the box'* presented their sourcebooks with new ideas of old established *'thinking patterns'*. After analysing L15's, L18's, L19's, L33's, L34's and L40's data for Step 4 – DATA, it was found that these learners were not able to construct new ideas and visibly needed more direct guidance from their Design teachers. L9, L10, L11, L16, L28, L29 and L41 struggled to organise their thoughts rationally and presented them in an unstructured way. Finally, L9, L16, L17, L19 and L40 gave no reflections in their sourcebook.

In addition, Design teacher T5  , a novice Design teacher, exemplifies the lack of knowledge of the requirements in the PAT Guidelines (2018:12) *design process* as all her learners (L25-L30) had not included a reflection in their sourcebooks either.

Lastly, STAGE B, the exploration stage in the Van Deventer D+NQ Model, opened up interesting facts and unique discoveries. For example, some learners managed their approach to *"thinking with NO box"* by creating ideas and displaying more than one solution for the problem pertained in the Design brief.

❖ **Presentation and analysis of data**

Table 5.8: STAGE C | Step 5, 6 & 7 and PAT guidelines

PRESENTATION		**STAGE C**	**Step 5**	***Materialise***	**DESIGN** (Green Zone)
		STAGE C	**Step 6**	***Materialise***	**DEVELOP** (Green Zone)
		STAGE C	**Step 7**	***Materialise***	**DELIVER** (Green Zone)

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ANALYSIS		*Choose the best solution and expand on it.*	*Test your design through user-testing and improve if needed.*	*Produce/present your solution.*	
PAT (2018:12)		Presentation, overall impression and neatness.			

Source: Anriët van Deventer

Table 5.8 summarises the stage and steps of the Van Deventer D+NQ Model used as an orientation for my data presentation and analysis.

In this section, the presentation of steps 5, 6 and 7 focus on the value given to learners participating in STAGE C's learning experience. The data analysis clarified that quality is challenging to measure: marks and grades are not the only tools. Instead, the focus is on changing a learner, a structure and the entity to perform better to be viable and spot-on in creating user-friendly designs and products.

RST1  and T2  reason when the learners are left to themselves, they are nevertheless capable of performing practical activities. The information captured from Design theory, other practical tasks, tests and exams taught learners enough to display self-confidence in executing practical tasks on their 'own' – *"You can actually see what they actually [sic] know without you telling them what they know".* (T2 ). L1-L6, L13, L17, L19, L21, L25, L27, L30 and L37 succeeded exceptionally in exhibiting the construction of Step 5 – DESIGN. T4  tends to push learners to do a lot of exploration as this helps them focus on not just one idea but accomplishing the discovery of multiple ideas. Even yet, they might eventually come up with a complete design solution from all of those many concepts. It is evident from the sourcebooks that if learners perform multiple investigations rather than simply sticking to one and not developing a more diverse variety of ideas, they will generate a more differentiated display of ideas. L7 and L15 displayed an ability to expand simplistically on the best solution chosen but could also develop the solution further. Nonetheless, L8-L11 could not extend and fine-tune their solution as more exploration and development were needed. The collaboration of T5  with the *Design in a Business Context* research project (*Design Process*, Topic 1) assisted learners in working with other people outside the school instead of just themselves, answering questions, conducting interviews, doing research, and applying skills on different

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levels. Design learners materialised their design work in a variety of mediums, thus also producing work in different dimensions, including 3D or 2D. The following learners presented 2-dimensional work as their final products: L8-L10, L12, L23, L28, L30, L33 and L38, whereby the remainder of learners created 3-dimensional prototypes.

T2 has indicated that she enforces the use of technology in a thoughtful way, which in my opinion, shows that these learners are more privileged in having access to technology. In contradiction to T2, T5 clearly stated that her learners have limited access to technology and devices. The lack of technology resulted in learners creating mainly 2D, working with paint or coloured pencils and koki's. *"They don't have a lot of options for digital, some kids do, but it's always a bit of a gap between who can work with technology and who can't"* (T5). I assume that S6 and S7, based on the quality and choice of material for the practical task presented in the sourcebooks, have no or minimal technologically advanced devices within reach (Design learners from Category D – low performing schools).

On the other hand, PAT Guideline (2018:12) requires learners to display sound drawing skills. It is prevalent through the data that Design teachers need to start and invest in developing the drawing skills of learners. For example, these learners L4, L5, L11, L32, L36, L38, L40 and L41 showed ill-found drawing skills and needed urgent Design teacher intervention at this level, Grade 11 Design. Delightfully, the following learners displayed exceptional drawing skills L1, L2, L18, L21, L25 and L26. Furthermore, the next learners presented completed and skilled final tonal drawings too: L7, L13, L14, L20, L30 and L42.

Furthermore, T5 pointed out the methods to the thinking process and referred explicitly to her Design teaching approach, which allows learners always to create their own version of the problem to solve. Nevertheless, L16's design solution appears to be all-over-the-place; as such, this learner would need direct intervention from the Design teacher. Appreciatively plagiarism is taken very seriously by T5. Her monitoring of copying and pasting of an image is approached in a controlled manner. Furthermore, T5 succeeded in thinking ahead of the learners to give them different options as she believes her approach will give her learners a head-start in life once they have finished school.

I place T6As link to problem-solving skills of the DESIGN, DEVELOP and DELIVER outcomes of the Van Deventer D+NQ Model as important. Noticeably is T6As capability to follow the *design process* with his learners as a conception activity to solve any human need

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or community problems. *"It entails a lot of things because it looks at everything around humans that the humans need to use" (T6A*  *).* The focus on problem-solving for T6A  . I also included visual interpretation of different works and design solutions – *"Including visual interpretation of other environmental focus relating to human. It can be human problems or human betterment*".

To continue, T7  believes that more attention should be given to the presentation of the sourcebooks. The Design brief supplied gave ample opportunity to experiment and explore different typography. Yet, learners provided little detail and care. For example, pages were not numbered, and headings were poorly executed. This adds to the professional presentation of design work. Unfortunately, because there was not enough developmental proof artistically depicted in the sourcebooks, L20, L26, L28, L31-L36 and L38 could not properly capture the essence of Step 5 – DESIGN in the *design process*.

Nonetheless, I found that S2 in general and T2  specifically should guide the development of the *design process* more constructively. Learners did not explore and experiment enough in the conceptualising phase. Although each learner's sourcebook looks different, which expressed each learner's individual personality and freedom in making their choices, they had to apply and present the sourcebooks in a way that felt true to themselves. Unfortunately, though, this resulted in some learners' construction and output in their sourcebooks as incomplete, and in some cases, certain sections were not presented with headings at all. For example, pages were skipped and left open. However, compared to S3 learners' sourcebooks, all were presented with clear headings, and the sourcebooks were attainable in a *Designerly thinking* way. Although more creativity might have been applied to the headers by the learners of S3, the intention and rationale were clearly stated.

Fortunately, T4  has a clear understanding of the *design process* and guides the learners accordingly. Moreover, the sourcebooks are aesthetically pleasing to look at. Hence, STAGE C – Materialisation chooses the best solution and tests it. Yet, the intention of development seems to be flaunted by L18, L22-L24, L29, L39 and L40-L42, as a solution. These learners have presented the final design solution, but no evidence of the *design process* was found in Step 5. Furthermore, such learners should explore many more options to put on the table before developing the best solution. Then guided by the freedom the Design teacher allows in these instances, the learner's will be more confident in their choice as the best human-centred solution.

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In Step 6 – DEVELOP, outlined as the testing phase to add more detail to the solution, not many examples were presented in the sourcebooks that support this requirement. Nonetheless, L19 and L39 included extra sketches in this step. L37 also added colour studies and other ideas to increase choices. Based on what feedback learners receive through user-testing, they will make the necessary adjustments and improvements. The testing phase results will often require learners to revisit the DEFINE and DEBONE stages or run through a few more DATA and DESIGN sessions. The following learners mastered a final tonal representation of the design solution, as prescribed by the PAT guideline (2018:12), L4, L6, L8, L12, L15-L17, L27-L29, L31, L32, L34, L35, L38, L39, L41 and L42. Unfortunately, L9, L10, L22, L23, L33, L37 and L40 presented incomplete final tonality drawings.

The last step, Step 7 – DELIVER of the Van Deventer D+NQ Model, with step-by-step guidance through the *design process*, features the drawn-up plan's materialisation and includes the *design process'* reiteration. Included in this segment is the evaluation of the designerly-like presentation of the sourcebooks. Importantly, as it is, Design learners must be taught the value and necessity of presenting their design work in a designerly manner. Unfortunately, sloppy, disorderly, inept, and untidy sourcebooks form part of the data collected for my study. L5, L9-L11, L16-L18, L24, L29, L33 and L40 are examples of these jumbled sourcebooks, while L2 displayed a unique creative layout, for example, the index. To continue, L13, L19, L21-L23, and L26 illustrated excellent comprehension of the materialise stage, steps 5,6, and 7 of the Van Deventer D+NQ Model. L18 should reiterate the *design process* as this sourcebook does not have any research, inspiration, experimentation, images, or a variety of ideas. Although this learner has outstanding drawing abilities, as previously stated with *Stage A, steps 1 and 2,* L18 has not acquired the necessary *design process* skills, which allow for the development of critical, creative, and other thinking skills.

Lastly, the next learners L1- L8, L13-L15, L25, L27, L28, L31 and L38, presented well-constructed, visually appealing, and thought-provoking *designerly* sourcebooks.

In the following section, I continue with the discussion of data presented and analysed under *5.3.1.2. Presentation and Analysis of data* follow in the next segment.

5.3.2 Discussion of data

Taking cognisance of the 4IR demand for 'empathy' and higher-order thinking skills (Saavedra & Opfer, 2012:10-12), such soft skills are highlighted and applied in this section. Specifically, 'empathy' emerged as a theme after analysing my data. Although there were teachers who

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very much cultivate empathy towards their learners and instil the quality in learners when they think, plan and design their problem solution in a user-centred, empathetic way. However, Stage C revealed that learners need more skills directed to explore, experiment, and empower, enhancing individual creativity. Furthermore, learners need to take responsibility through discovering their own approach to the *design process*. It is clear from the data analysed that those teachers do not assess each step of the process to keep track of each learner's progress.

T7  evidently struggled with concepts, Design terminology and definitions. Learners' work from S7 presented a lack of understanding of concepts. The sourcebooks of learners from S2 revealed minimal similarities in the layout of their sourcebooks and products alike. Instead, the sourcebook appears nebulous but taken into account, T2  did give learners the freedom to apply their own headings and titles concerning the development of the *design process* and should be taken as a leap in the right direction. Sourcebooks were mostly incomplete as DBCs were not found in sourcebooks for S4, S6 and S7 under the *Design Process* (Topic 1) except for RS1, which presented creative layouts in presenting their research. S2, S3 and S5 also showed DBCs in the sourcebooks. S7 winged the study's impact – it may be due to the lack of discipline in her school, absenteeism by both the teacher T7  and learners from the school. Learners, in some cases, were directed on a path by interpreting the Design brief "Hats and Headpieces" literally and focused on 'hats' only. Furthermore, especially visible in S7's presentation, they are more familiar with hats like the visor cap, bucket hat, cadet and baseball caps. Seemingly, little exploration happened into researching 'headpieces' or even finding any solution in that direction. Noteworthy is T5's  focus on thinking skills, ideas and how not to get stuck in the brain – with exposure and experimentation, learners can *'free'* themselves from progressing from point A to point B, all in mind (intellectually). This supports Gardner (2012), who promotes an integrated learning strategy and believes that this will accommodate and develop the skills needed to confront problems successfully. Finally, T4's  approach of *"enforcing technical use"* of technology indicated her understanding of the importance of including and using the skill to learners' advantage. To support T4's  outlook, I have highlighted the importance thereof in Chapter 2 for example, Ahmadi and Besançon (2017:8) advise using digital technology and social media conjunctly.

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Therefore, the technological integration that characterises the 4IR and the demands of 21st century workplaces narrow the gap between the digital and physical worlds.

Furthermore, the PAT document should be used as a guideline for partitioning the *design process.* However, the PAT document version 2018 lacks detail and meaningful headers for the steps and the design process is not given a label in the guidelines (PAT, 2018:12). The *Design Process* is now explicitly unpacked with a header and phases in the 2021-version of PAT Guidelines, in which DBE has now changed the descriptors to reflect the *design process* as anticipated (PAT, 2018:12-14).

To continue, the sourcebooks of T4  showed that her quality of teaching is adapted to the different learners, to not only adapt but to identify the other learning skills and learning abilities and the methods of learning and, therefore, adapting to the specific learner's capacities to be able to help them achieve their goal through their way of learning and not be stuck in one form of teaching – *"the goals that need to be achieved by the learner are achieved. I believe they've learned what they need to learn".*

To recommence, from the data produced, the *Design Process* pertaining to Category D schools, S6 and S7, need more support and guidance to meet the expectation of Design education. It has been documented that no subject specialists are available to the Design teachers of these two schools. Clearly, Design teachers in need lack the skills as the responsibility are placed on them to guide learners constructively through the *design process*. However, Design learners need to explore much more than they do with their ideas and creative processes to reach a final solution. Furthermore, Design teachers clearly indicated they are familiar with the descriptors set apart in the amended 2021 PAT Guidelines. However, teachers should be presented with specific training in utilising the skills and meaning of each stage of the *design process*.

Advisably, each learner should photograph and document the development of each stage and present it as part of the sourcebook. Therefore, this will allow each learner to witness the progress of their own work.

In general, learners' technical ability is lacking in drawing skills and should be supported more. For example, Design teachers should give short activities and exercises to develop drawing skills. Furthermore, the DBC is largely neglected; therefore, it loses purpose, which is set out to gain research skills. However, the DBE has made the necessary amendments in the 2021-

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version of PAT Guidelines and included presenting the DBC-research and the assessment descriptors. Therefore, I recommend that the structure of the sourcebook should be clearly stipulated in the PAT document.

To resume Categories C and D, the middle and low performing schools showed a lack of commitment and completion of their *design process*. More so, Design teachers should direct learners to refrain from copying-and-pasting without sound critical and creative thinking applied. Therefore, skills need to be developed to be analytical and work systematically (may it be linear or iterative) – learners need to find their own rhythm to express and explore possibilities within the design process structure. Lastly, some learners' sourcebooks were incomplete, untidy, disorderly, poorly presented and showed a lack in the development of the *design process,* which was all over the place.

To summarise, Steps 5, 6 and 7 dealt with the materialisation of the final solution. First, the sourcebooks were presented in such a way that the lack of self-worth was apparent in neatness. Next, I saw an absence of imagination in problem-solving beyond the complexity exposed with all the aspects that needed to be blended from the Design brief. Finally, however, I was mostly able to pinpoint a solution created in each sourcebook.

5.4 PART THREE: DESIGN LEARNER OUTCOMES OF THE DESIGN PRODUCT (TOPIC 2)

5.4.1 The Design learner: The what and the why

The Design Product (Topic 2) – Data digital photographs

5.4.1.1 Method

In Part Three, I will provide the data gathered by the digital pictures of the *Design Product* (Topic 2). All of the data from the Design learners' final projects were recorded using digital photographs. As mentioned in Part Two, two main folders were formed to separate the *Design Process* (Topic 1) and the *Design Product* (Topic 2). Then, once the digital photographs were transferred, they were labelled and numbered under the participant codes of each school and learner. Under the *Design Product* folder (Topic 2), subfolders were created; each of them was labelled with a participant code to reflect each participating school. Lastly, each sub-folder has its own compartment consisting of the data from each Design learner.

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To continue, I have compiled *Table 5.9* to summarise the Van Deventer D+NQ Model, which serves as a quick reference for this chapter segment.

Table 5.9: The Design Product folder – Topic 2

THE DESIGN PRODUCT FOLDER – Topic 2			
STAGE	***STEP***	***DEVELOPING STAGE***	***ACTION***
STAGE D	Step 8	Critique	Debrief

Van Deventer D+NQ Model | THE DESIGN PRODUCT – Topic 2	
CRITERIA	**DESCRIPTION**
CRITERIA 1	**Plagiarism, 60% change and relevance to the Design brief.**
CRITERIA 2	**Use of art elements and design principles.**
CRITERIA 3	**Technique, craftsmanship and methods used.**
CRITERIA 4	**Creative and originality.**
CRITERIA 5	**Professional presentation and functionality.**

Source: Van Deventer D+NQ Model

5.4.1.2 Presentation and Analysis of data

Table 5.10: STAGE D | Step 8 and PAT guidelines

PRESENTATION	STAGE D	**Step 8**	*Critique*	**DEBRIEF**(Grey zone)
	5 Criteria			
ANALYSIS	Produce/present your solution	• Ask reflective questions • Use the five criteria to look at your solution/product and evaluate		
PAT (2018:12)	Presentation, overall impression & neatness			

Source: Anriët van Deventer

Table 5.10 summarises the stage and steps of the Van Deventer D+NQ Model used as an orientation for my data presentation and analysis.

STAGE D – Step 8 – CRITIQUE in the Van Deventer D+NQ Model outlines five criteria to evaluate the solution – product design. I will present and analyse the data for this section under each criterion. The five criteria consider and propose a leading question to Design teachers and Design learners to use. Each measurement looks at different aspects, called CRITIQUE, namely in Step 8 in the final product presented. As illustrated in *Chapter 3, Table 3.3* before, guided questions, but not limited to those posed under each criterion, are included in *Table 5.11* below. I have also included my analysis on PAT Guidelines (2018:12).

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Table 5.11: STAGE D | Critique – five criteria with specific questions

Full Questions for STAGE D | Critique | **Step 8 | Debrief** | DESIGN
Criteria 1 6. Have I plagiarised any existing Idea/Concept? 7. Have I copied the Idea as is? 8. Have I changed 60% of the Idea/Concept/Solution? 9. Is my interpretation relevant to the brief or scope? 10. Is my solution relevant to the brief or scope?
Criteria 2 3. Have I taken the Art Elements in account? 4. Does my Solution/Design/Product reflect effective consideration of the Principles of Design?
Criteria 3 5. What is quality of my craftmanship? 6. Are my techniques applicable? Have I tried something new/else? 7. Do my methods reflect innovation? 8. Have I applied Thinking with NO box?
Criteria 4 4. Have I applied creativity? 5. Have I created/suggested an Idea/Concept/Product/Solution that never existed before? 6. To what extent is my Idea/Concept/Product/Solution original?
Criteria 5 3. How practically functional is my design Product/Solution? 4. Is the presentation of my Idea/Concept/Product/Solution professional, aesthetic and appealing?

Source: Anriët van Deventer

❖ Presentation and analysis of data

CRITERIA 1: Plagiarism

To start, RST1  believed to begin with the concept development relevant to the brief, where the learners are asked to develop a design solution in any field. Then, learners are granted the liberty to identify the most appropriate solution. Furthermore, T2  emphasised the process as significant, but Design learners often disregard it. Yet, it might be instinct to jump in and start with a final work or final product, but it is important to linger a bit on the journey. That is important because Design learners can discover so much and change their minds. Thus, the final work must speak for itself, like being the 'grand finale' of good quality – *"40% time spent on the workbook and the process and 60% time on the final". "Therefore, once*

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learners start with a final product you know, that must be sorted and be sure what they want to do" (T2 ). As a result, the presentation of L1's-L6's final products clearly showed the freedom RST1  gave learners – all the options available to the learners to make a final choice in terms of creating the product. Yet, the thinking process guides the end product. So, in other words, put the problem on the table, and then the solution development needs to come out of that problem, instead of handling the challenge along with the solution.

Two learners (L32 & L40) presented no products, meaning they did not arrive at a design solution in creating a prototype. Additionally, the requested "transformation and manipulation of the source material" (PAT, 2018:16), in other words, L23 and L24 could not alter 60% of a resource: they plagiarised by duplicating the image exactly as it was found. It is also evident that these two learners are friends because their sourcebooks have a lot of commonalities besides the identical outcome in 2D. Furthermore, even though some adjustments to existing photos and other visual resources were made, it is clear from S7 that not enough changes were accomplished to provide a distinct or original design as desired. Design teachers have to assist these learners in practising creative and critical thinking skills. Then regarding L15-19, L26, L28, L29, L32, L37, L40 and L42, I found they exhibited undesired products with reference to Criteria 1, not enough thinking skills and ideas and '*thinking with NO box'* were utilised to arrive at a unique and interesting design solution.

Furthermore, T3  also grants importance to the final design product but spent much more time with the *design process* – a reversed 60/40 compared with T2  mentioned above (40/60%) *"Because once the problem-solving has been done, which takes the longest for me, that's the thinking that's where the "giving birth" takes place. So, if that is done, the actual execution of the product will be so much faster"* (T3 ). Moreover, T4  allowed the learners to do a great deal of exploration as this helps learners put their ideas together – *"...by not only focus on just one idea, but they've also got multiple ideas".* However, interestingly the following learners solved the problem in the Design brief but accomplished that without full exploration and utilising the *design process*: L10, L26, L31-L33 and L37.

More specifically, the question: "Are an interpretation and solution relevant to the scope of the Design brief?" is being asked as I further applied Step 8. Thus, the following Design learners

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L1-L7, L11-L14, L20-L22, L25, L27, L34, L35, L38 and L39 fulfilled the expectations set-out in criteria 1.

Lastly, the data analysis revealed that the Design teacher does not exercise enough effort to prevent low-performing learners from copying or finding any other ways to execute the Design brief. Most of the time, learners run out-of-time due to bad time-management and planning. Therefore, this is challenging and frustrating for the Design teachers to manage reluctant learners in completing their tasks with rigour.

❖ Presentation and analysis of data

CRITERIA 2: Use of Art elements and Design principles

This study aims not to dissect and assess the creative design work produced for the *Design Process* (Topic 1) and the *Design Product* (Topic 2) but rather to evaluate the usability of the newly developed *Design thinking* tool born through my personal empirical research. Therefore, criteria 2 were conducive in assisting Design teachers in considering the elements of art and the principles of design in evaluating Design learners' products.

Therefore, I will subsequently report using criteria 2 on the exceptional use and understanding of this section's art elements and design principles. The following learners mastered creating balanced and aesthetically pleasing products: L1-L5, L7 and L10 (2D-work), L17-L20, L25-L27, L29 and L30. Thus, Design education intends to inspire, guide and have learners find freedom in expressing their own 'voices' utilising the ground rules of art. Furthermore, delivered products by the following learners were granted as good but can even be better when the Design teacher gives the necessary input and advice: L21, L22, L24 and L28 (2D-work), L31, L33-L39 and L42. Although 2-dimensional produced work is acceptable, the poster-like products made by L9 and L12 do not justify the effort put into the *design process* in arriving at the final solution.

❖ Presentation and analysis of data

CRITERIA 3: Technique

To commence, T6A  includes freedom in his teaching of Design and let Design learners explore as much as possible because T6A  and T6B  experience that some learners do not want to explore a variety of solutions to the Design brief, for example, to work with different mediums, techniques and materials. Instead, they tend to stick to the mediums they know and

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are comfortable in using. However, the Design teachers does encourage innovation in their learners to experiment and explore to reach a relevant solution to the scope of the Design brief – *"learners limit themselves to certain materials or certain mediums, but we tell them you explore as much as possible"* (T6A ). Unfortunately, L41 lacked any innovation, and L9, L23 and L37 also produced boring solutions under criteria 3. Then, L14's-L16's and L41's craftsmanship and techniques showed a lack of cohesion. T6B explained that some learners have never seen mediums like oil pastels. However, the Design teachers do expose and encourage learners to try out any new mediums the teachers bring to class. Unfortunately, it seems like they are so accustomed to a particular medium, for example, pencil, as learners are more concerned with the final marks. – *"Even if you try to push as much as possible, the learners have that limit because they say it's going to affect my marks".* L1- L5, L7, L8, L13, L19, L20, L25, L26, L31 and L33 demonstrated quality craftmanship with relevant techniques. However, structural problems were also detected and are directed towards products produced by L6, L11, L14-L16, L21, L24 and L39.

Furthermore, using criteria 3: Techniques, T7  mentioned that Design is viewed by learners and other teachers as a *'simple'* subject. Learners that cannot cope, for example, with Economics, are sent to the Design classroom, the Design teachers end up with the responsibility to bring that learner up to speed. That learner needs to understand the *design process* and develop enough thinking skills to 'think with no box'. That in itself is a whole process and usually starts in Grade 10 when the learner selects Design as one of the subjects they take until matriculate. However, it is not 'easy' if a learner joins Design in Grade 11 or 12 without the necessary skills. As a result, this puts immense pressure on the learner. *"I really hate that thing* [idea or outlook] *because most of them think Design is simple, and they come running that we have to remember you have to explain the terms, methods and techniques before we teach. When you explain elements and principles"* (T7 ). Learners who were comfortable trying out a new technique are welcomed as this should be how Design teachers encourage innovation. Such learners are L10, L12, L14, L17, L22, L28, L30, L35, L36 and L42. Then, Design learners who tried new methods in pursuit of innovation is noted L1-L7, L13, L18-L20, L25-L27 and L29.

To conclude with the expectations that criteria 3 hold, I highly commend L1-L6, L8, L18- L20, L25-L27 in presenting products that seem to withhold any limitation but to 'think with NO box'.

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❖ Presentation and analysis of data

CRITERIA 4: Creative and original

Creativity and its many definitions have been an ongoing debate. Hence, I ask what we design in school and present as solutions, is it original and unique or new? First, however, my definition of creativity as a parameter using criteria 4 is as follows: Creativity is a *newly formed* intangible idea/product or solution.

The view of T3  in how she approached creativity and originality is with *"basic thinking about having a little idea"*, she progresses to encourage a conversation with learners amongst themselves. Then very similar in the manner as T3  , RST1  follows a method by breaking the *design process* down, allowing for creative thinking and freedom. Notably, these Design teachers permit their learners to experiment and explore. On face value, L1-L8, L10, L13, L17 and L18-L22 applied enough creativity to judge the products successfully. Yet, L11, L12, L14-L16, L23, L33 and L41 could not produce a product that reflects the criterion that none such design has existed before. These were evaluated as solutions with little creativity instilled in the final product but directly referenced the ineffectiveness and lack of the implementation of the *design process.*

❖ Presentation and analysis of data

CRITERIA 5: Professional presentation

Design teachers ought to guide, advise and expose or even intervene in the presentations of a learner's design work. It is advisable to remind and correct Design learners frequently in the way they go about presenting their work. Therefore, continually directing them to submit their design work with care. Learners have access to enough quality designer-like presentation examples to see what is possible and not impede themselves or set themselves to limiting beliefs. The neatness and functionality of the presentation are as important as the very first mark the Design learners make in their sourcebooks. Criteria 5 go beyond design work and may reflect the emotional state, self-confidence, self-worth, and self-esteem of the individual Design learners.

The following learners are commendable as they were able to design a prototype with outstanding practical and functional qualities: L1-L8, L10, L13, L24-L31, L34-L36 L38 and L42. In contrast, the following learners' products were deemed non-functional: L9, L11, L12, L14,

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L21, L22, L39 and L41. Disappointedly, L32 and L40 failed to produce and present a final product.

To continue, looking at professionality, aesthetics and appeal, learners L1-L8, L19, L20, L23, L25, L26-L38 and L42 demonstrated high-level care of their design work throughout the *design process* thus, presenting their work with the respect it deserves. Products that stood out for their neatness, construction and presentation were: L1-L4, L6, L8, L17-L19, L22 and L29. However, neatness and the quality of production appearance should be paid more attention to. As for the rest of the learners will need to keep developing skills holistically. According to Larson and Rusk (2011:94), intrinsic motivation in the creative process is triggered by a problem or challenge that has to be solved. Nevertheless, a lack of the *design process* was observed in the work of L15, L19, L22-L24 that showed difficulty meeting any of the criteria, as both the *design process* and final product lacked the expected attention and output. On the other hand, the presentation and neatness of some learners' sourcebooks and their engagement with the *design process* were satisfactory but lacked severely in practical skills in building, making or creating their final prototype: L9, L10, L11, L14, L16 and L21.

Lastly, I conclude this section with learners who could deliver and present high standard work, meet set criteria and are seemingly proud of the subject they present. However, there are always areas where improvement can be invested in, for example, drawing skills. Nevertheless, the Design brief was executed exceptionally well by understanding and exploring the design process by L1-L7, L12, L13, L20, L25-L27, L34, L35 and L42. Hence the recorded *design process* and the expansion on the delivery of their work into the presentation of the final product are heartfelt.

In the next section, the discussion of data presented and analysed under *5.4.1.2 Presentation and analysis of data* is presented.

5.4.2 Discussion of data

Firstly, three Design teachers graded themselves as very assertive when asked how confident they are to teach Design practicals. However, two Design teachers were hesitant to be graded as very confident as three teachers acknowledged that there is unquestionably room to expand and learn more in the Design field. RST1  , T6B  , and T4  indicated their confidence in teaching Design practice as 4/4. A confidence level of 3/4 was specified by

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Design teachers T6A  , T5  and T7  . However, T3  and T2  found it hard to rate themselves and indicated their confidence level to be between 3/4 and 4/4. *"It's almost difficult to answer this question because when you answer four, that means, you know everything, and I will never know everything, there's always room to improve. But, although I've been teaching for many years, I've got a lot of experience"* (T2 ).

Furthermore, the five criteria of this section targeted specific areas in evaluating the final product. As a result, a strong level of confidence came through from different Design learners from all the categories. An example is L42, who falls in Category D, one of the low performing schools in Design and identifies as the lowest-performing learner from the participating school. However, L42, regardless of having been labelled as the lowest-performing Design learner in the group of six by T7  , managed to excel despite the criteria evaluated against and taking into consideration the lack of resources and design exposure.

STAGE D is the stage in the Van Deventer D+NQ Model that allows learners to criticise their final product led by thought-provoking questions. The five criteria looked at the most important and prominent aspects to evaluate, like if a suitable user-friendly solution was found related to the scope of the Design brief. Therefore, presentation and neatness go hand-in-hand as the last criteria teach learners to take pride in their work – both in the *design process* = neatness and the final product = in its presentation.

To continue, documentation, that is, the development of each stage, should be photographed by each learner. This will allow each learner to witness the progress of their own work they build-up in their sourcebooks.

Lastly, all learners, except for L32 and L40, successfully reached a solution for the design-problem derived from the Design brief.

5.5 DISCUSSION OF SELECTED DIGITAL PHOTOGRAPHS: THE DESIGN PROCESS AND THE DESIGN PRODUCT (TOPIC 1 & TOPIC 2):

In the next portion, I am confident to present designed works, primary data selected from each school to illustrate the stages of the Van Deventer D+NQ Model. After visiting the participating schools, I captured all the research data produced from the Design brief with digital

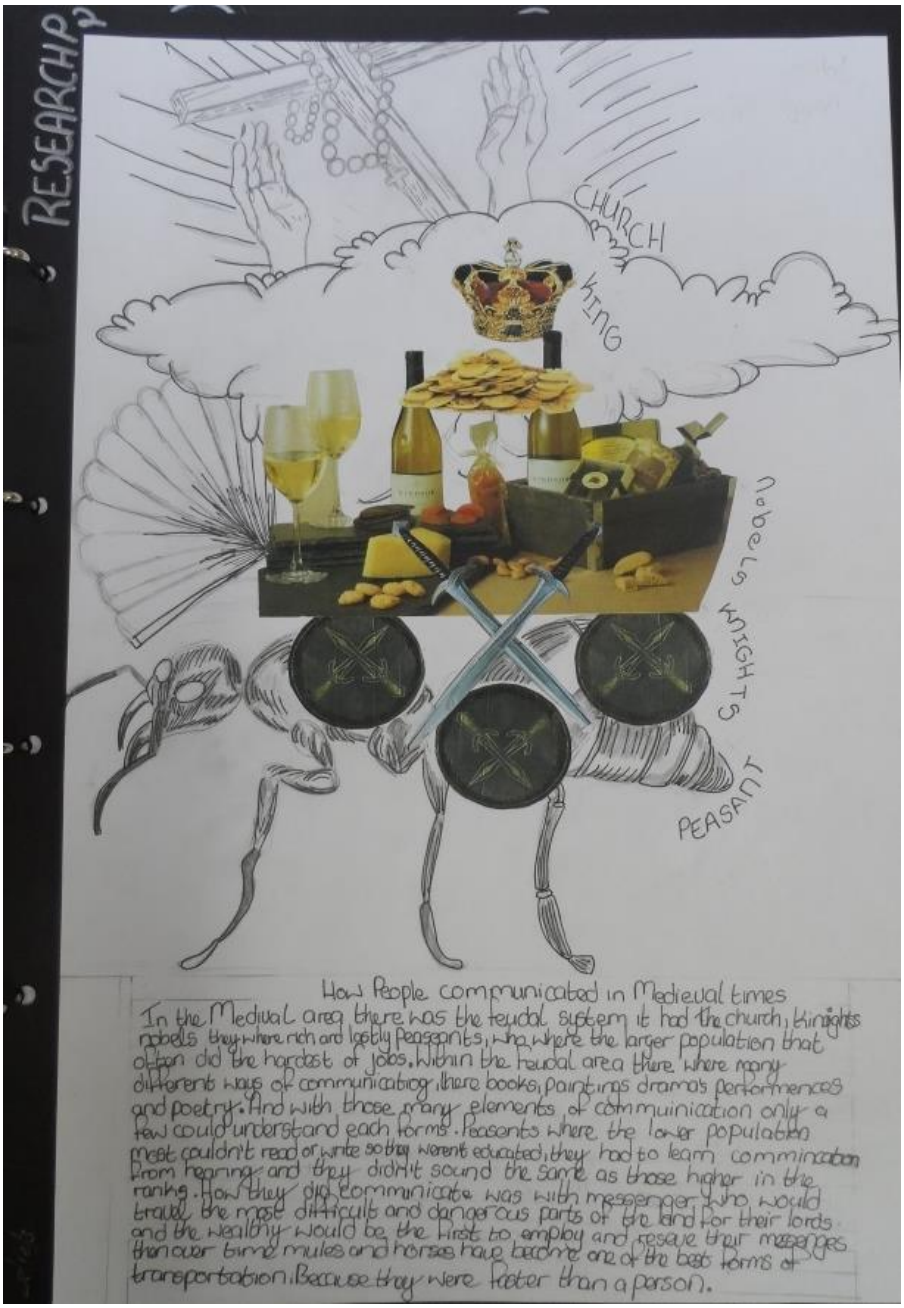
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photographs. Thus, a total of 1635 digital photographs were collected in the third data collection phase. The remainder of the bulk data captured is presented by scanning a QR code or clicking on the URLs (the preferred option). I found that viewing the presentation on a laptop does justice to the design work created in my research. To view the rest of the designed works, see *Chapter 5,* section *5.5.1 QR code and URL-links for image carousels of the Design Process and the Design Product.*

Selected images from the Design learners designed work, seven from the *Design Process* (Topic 1) and seven from the *Design Product*, are contained below (Topic 2). My selections in *Table 5.12* represents a learner from each of the participating school. I aimed to display a broad spectrum of different designs that resonated in this segment, reflecting uniqueness, individuality and creativity. See *Table 5.5: The Design brief: An introduction* it serves as an introduction to the Design brief. Also see *APPENDIX I: Design brief | English and Afrikaans.*

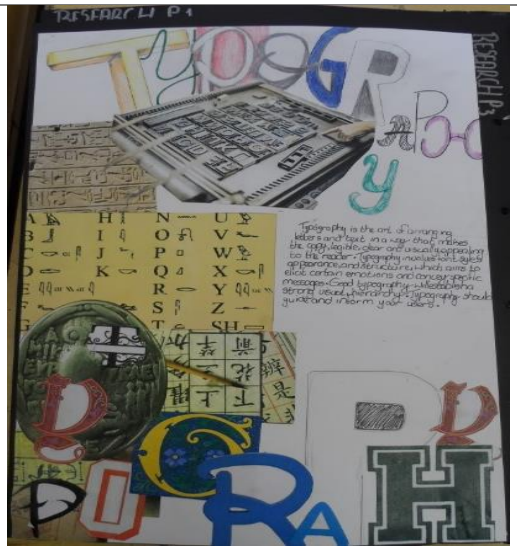
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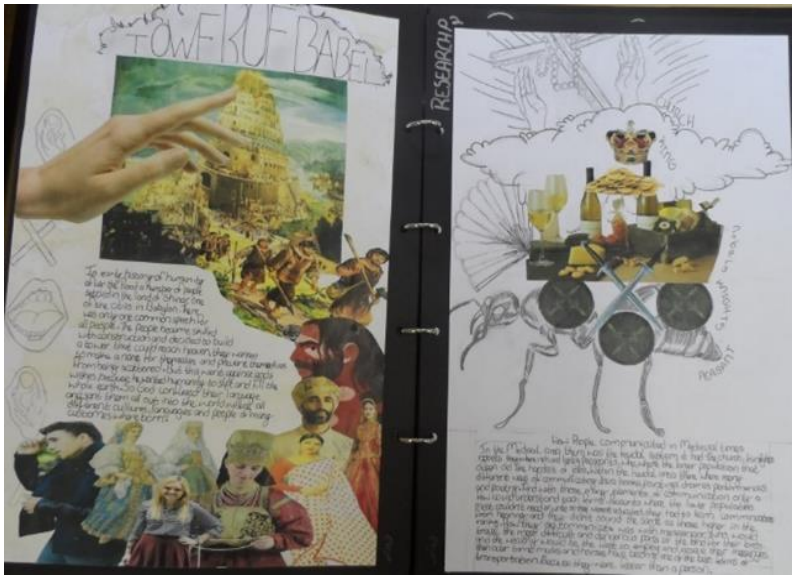
Table 5.12: Presentation and discussion: Digital images

IMAGE REFERENCE & IMAGE	DISCUSSION
Image 5.12.1 **Reference School 1** Topic 1: RS1L6[20] Media used: White paper, found magazine images, black paper cut-outs, pencil, pen, colour pencils & acrylic paint.  	L6 visually communicated the knowledge of research evidence using words/images with a selection of a bee. Image 5.12.1 has reference to **STAGE B, Step 3 | *Explore* | DISCOVER** (Orange Zone) of the Van Deventer D+NQ Model and **STAGE B, Step 4 | *Explore* | DATA** (Orange Zone) references *technical drawings,* drawing skills/drawings, paste-up, and other ideas. The space utilised for the expression of freedom is explored as a different avenue for communication ideas. L6 further mastered the ability, with encouragement, to venture away from the norm, explore new angles and think *'outside the box'.* The technical drawing exercise is included here (see last images for L6), which was coordinated as an additional activity beyond the requirements of the Design brief at the start of the unpacking of the problem at hand.

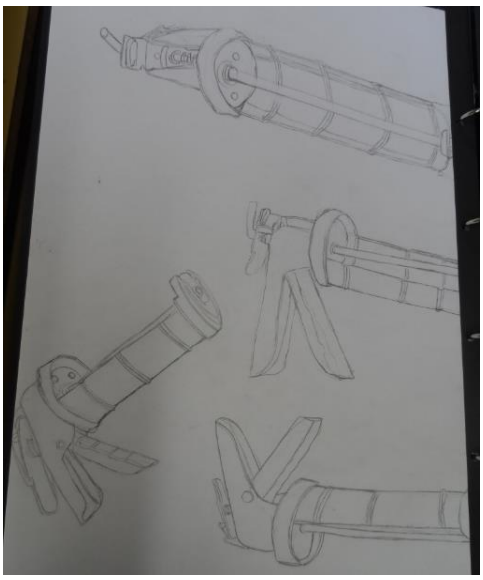
[20] The participant codes in this section include both the school and learner (in that order).

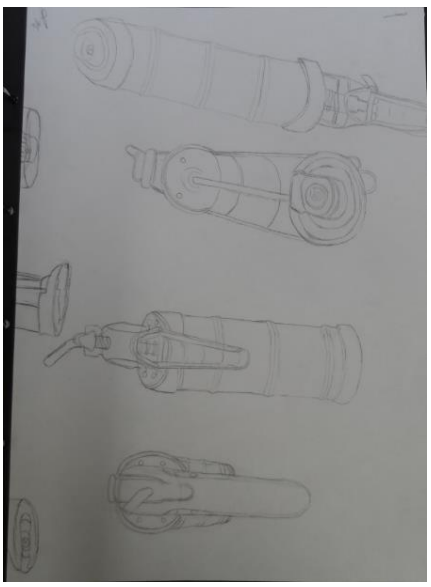
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Media used: White paper & pencil





L6 *continued*

The images that follow serve as a visual representation of the *design process* as L6 progressed.

The last two images are the technical drawings referred to above.

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Image 5.12.2

School 2

Topic 1: S2L7

Media used: Black paper, white paper, pencil, pen, acrylic paint.



L7 demonstrated a keen sense of visual construction, referring to STAGE C | *Materialise* – Green Zone: Step 5. DESIGN & Step 6. DEVELOP

L7 turned ideas into something tangible which can be tested on real users. Then, the best solution was chosen and built on among the different options put to the table. This ensures that the final design or solution solves the user's problem and is a delight to use!

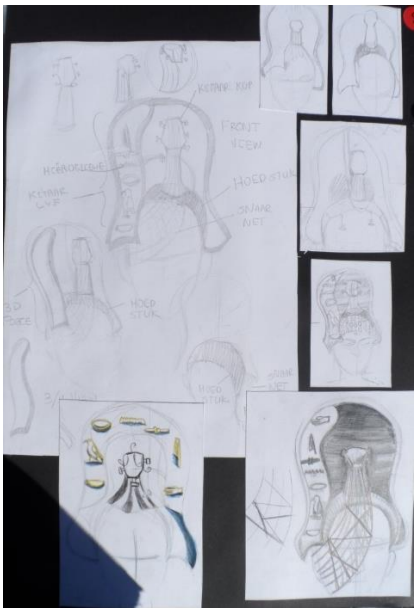
STAGE C | *Materialise* – Green Zone: Step 7. DELIVER

L7 have a drawn-up plan that is materialised. Therefore, a suitable solution is found. I have included the final product of L7 to illustrate how effectively the *design process* was explored to result in a very new and unique design product.

The presentation, overall impression and neatness of L7's work acts as a successful representation of the aims of this study.

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L7 *continued*

The images that follow serve as a visual representation of the *design process* as L7 progressed.

Although this section deals with the *Design Process* (Topic 1), I have included two images of L7's final product – the *Design Product* (Topic 2) (see last two images).

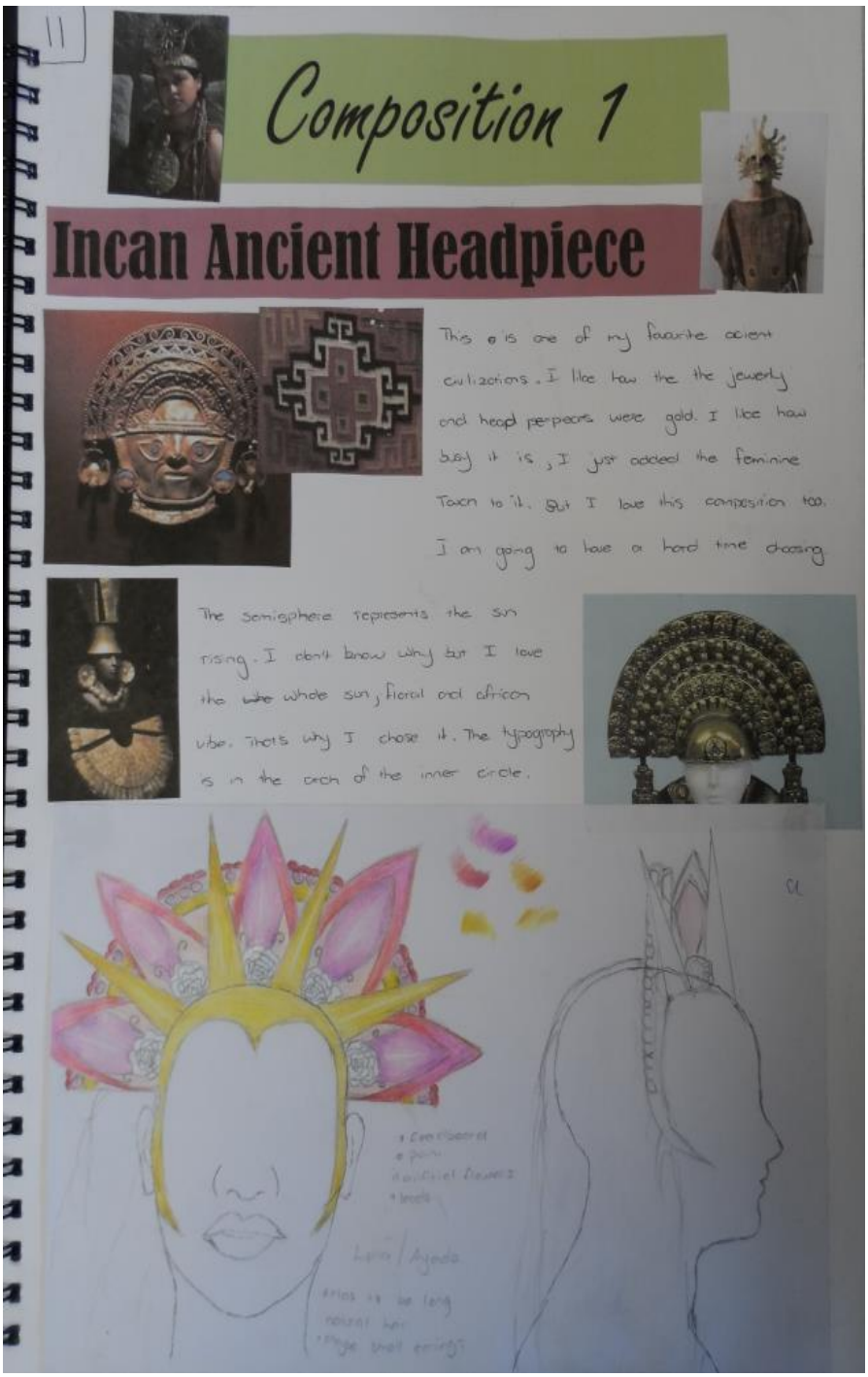
© University of Pretoria

Image 5.12.3

School 3

Topic 1: S3L13

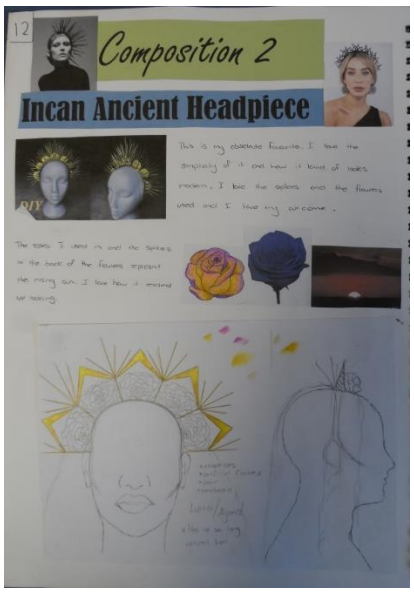
Media used: White paper, pen, colour printed images,text and colour pencils.

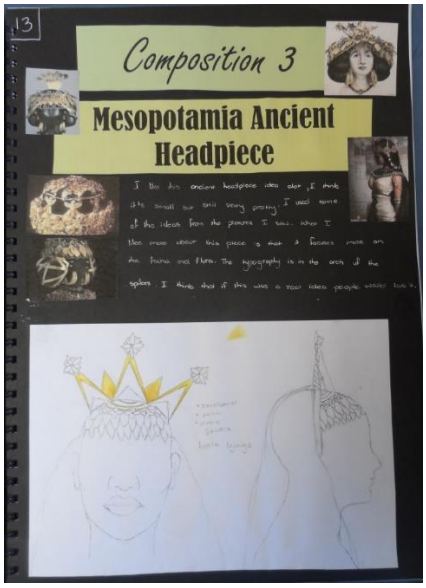


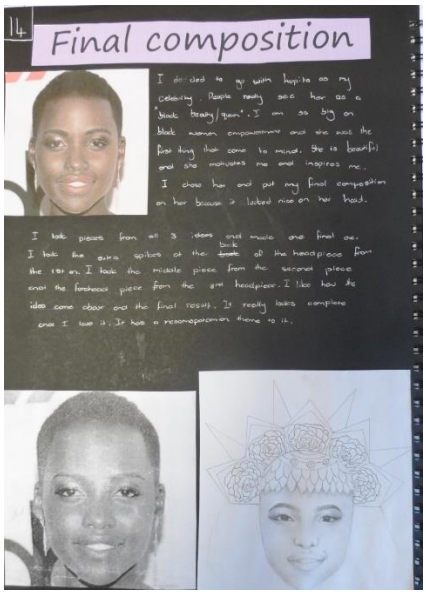
L13 successfully demonstrated the ability to transform concepts into something concrete that can be tested on real users referring to STAGE C | *Materialise* – Green Zone: Step 5. DESIGN

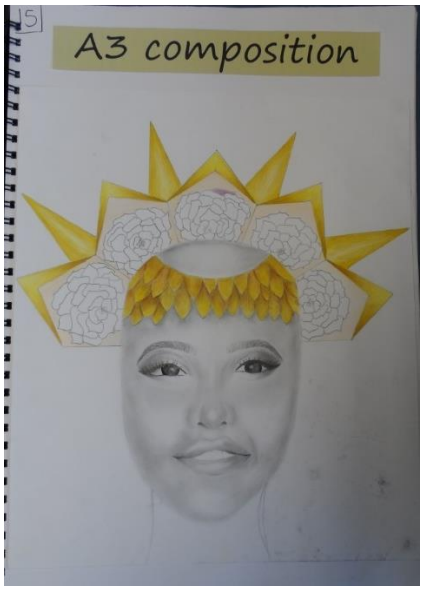
Also included here is STAGE C | *Materialise* – Green Zone: Step 6. DEVELOP putting pieces constructively together to end-up with a new user-friendly design. Lastly, the presentation is neat.

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L13 *continued*

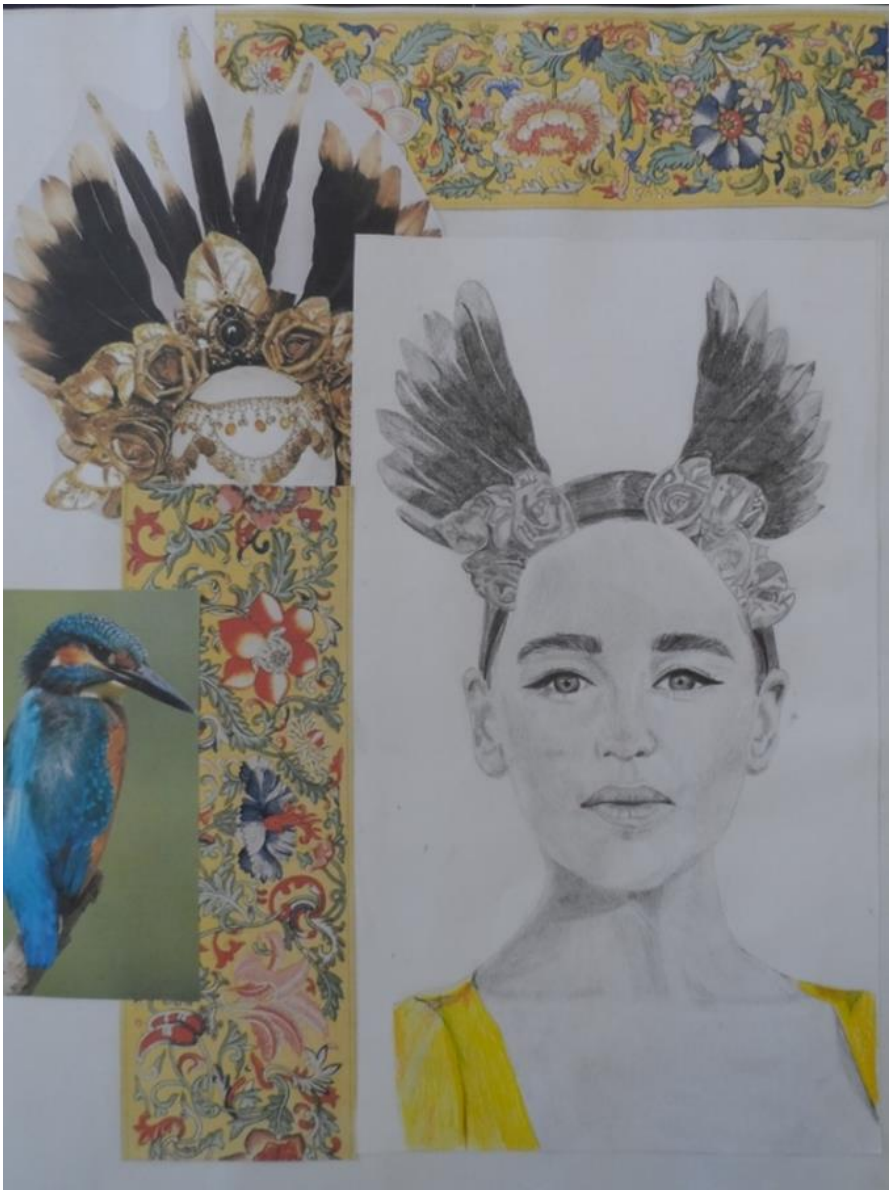
Apart from the presentation of three compositional sketches, putting 'new' design possibilities together, I include L13's Final tonal drawing – labelled A3 composition.

Although this section deals with the *Design Process* (Topic 1), I have included two images of L13's final product – the *Design Product* (Topic 2) (see last two images).

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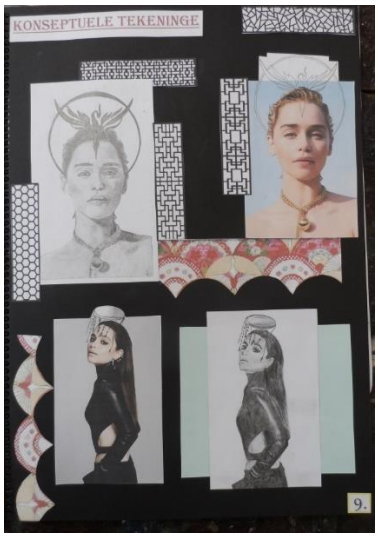
Image 5.12.4
School 4
Topic 1: S4L21

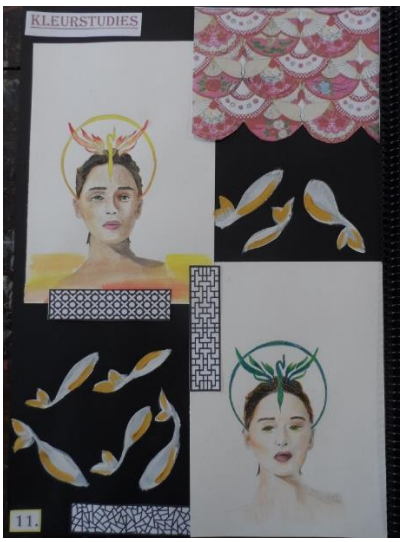
Media used: White paper, colour printed images, magazine images, decorative pattern (wallpaper-like) (pre-manufactured), colour pencils and pencil, pen & black-and-white copies.

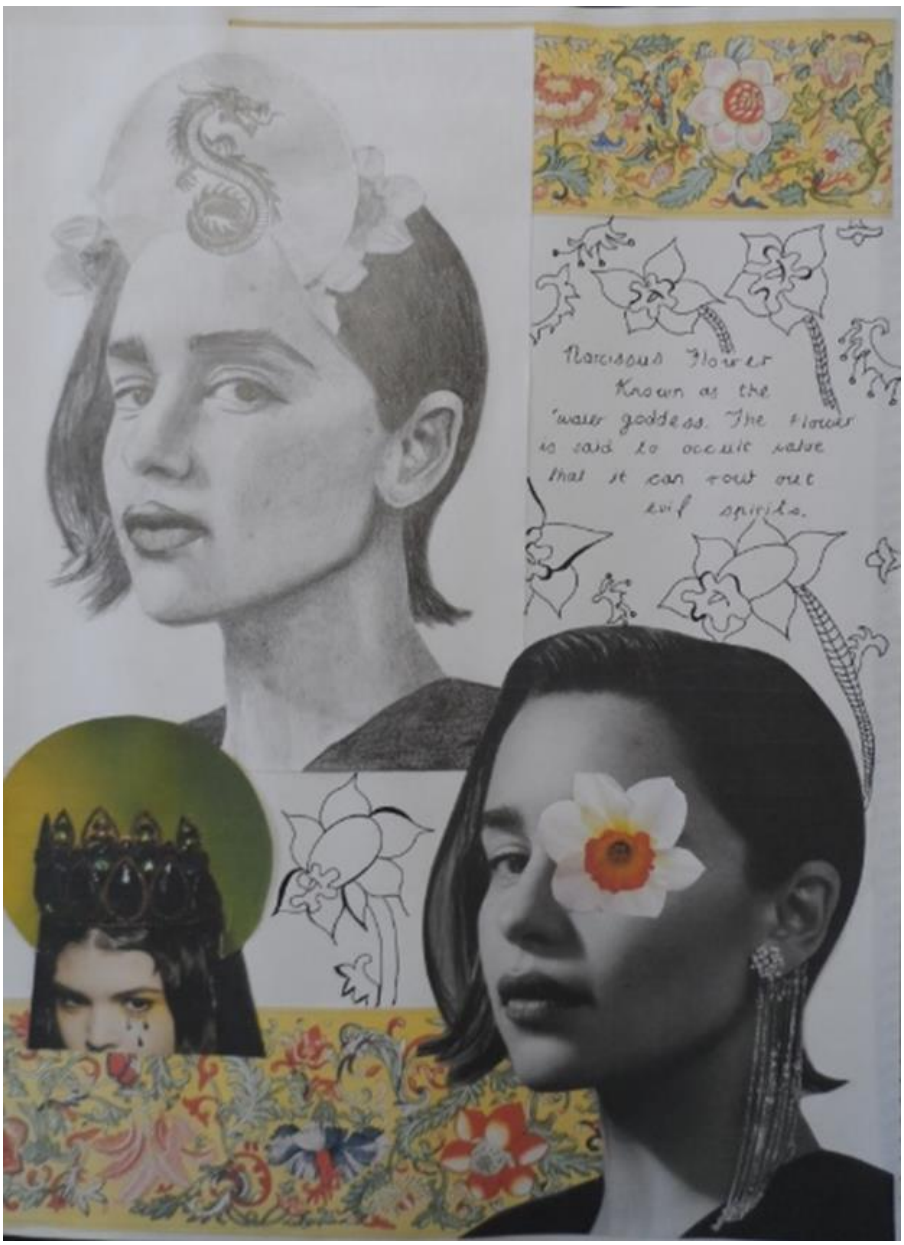


L21 unpacked **STAGE B, Step 4 | *Explore* | DATA** (Orange Zone) by building on different ideas, alternate options and successfully illustrated the freedom it brings to 'think with NO box!'

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L21 *continued*

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Image 5.12.5

School 5

Topic 1: S5L27

Media used: White paper, colour printed images, found magazine images & digital generated ideas.



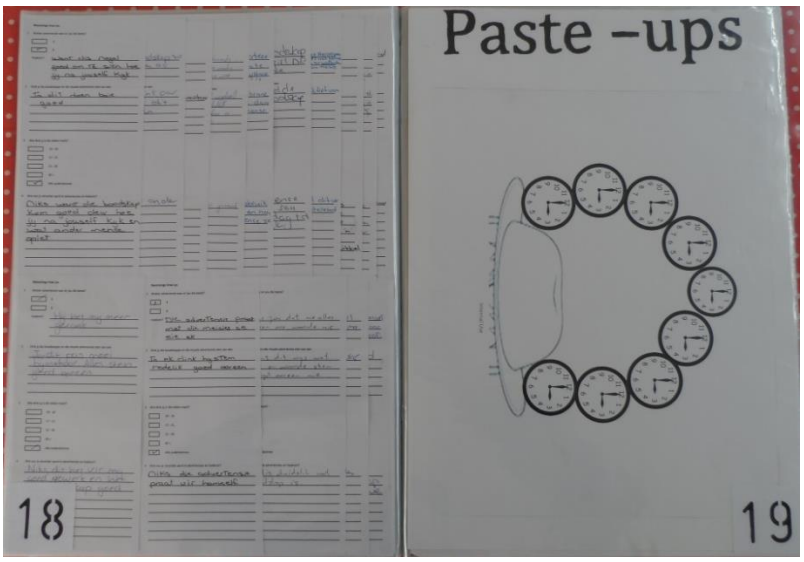
L27 demonstrated a keen sense of visual construction by creating collages with elements of different clocks. By identifying facts about typography and thorough research on the history of typography, L27 discovered the timeline or time-zone as an idea to create a solution for this design problem.

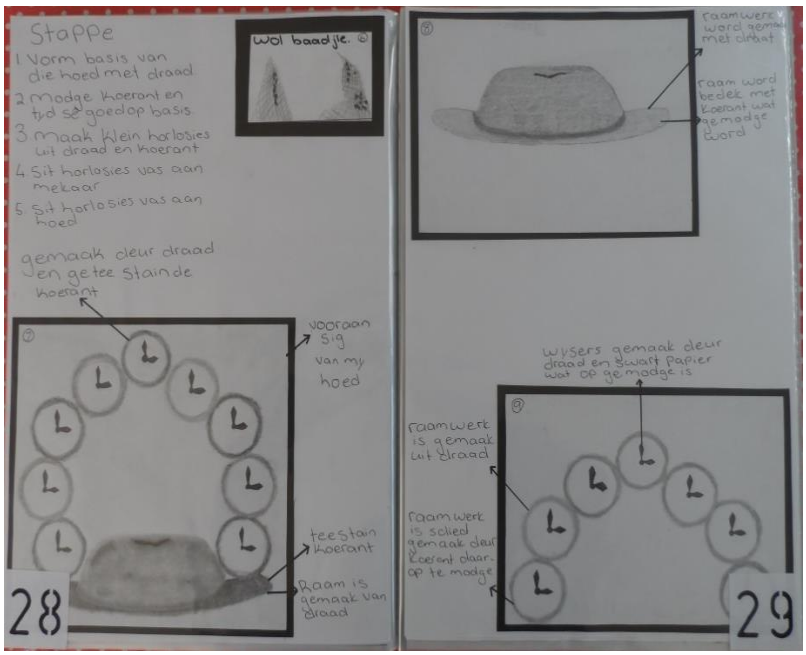
L27 further engaged fully with **STAGE B, Step 4 | *Explore* | DATA** (Orange Zone), reflecting on more detailed planning, drawings, paste-ups: collage and other digitally generated planning where different rudiments were combined in different settings and layouts.

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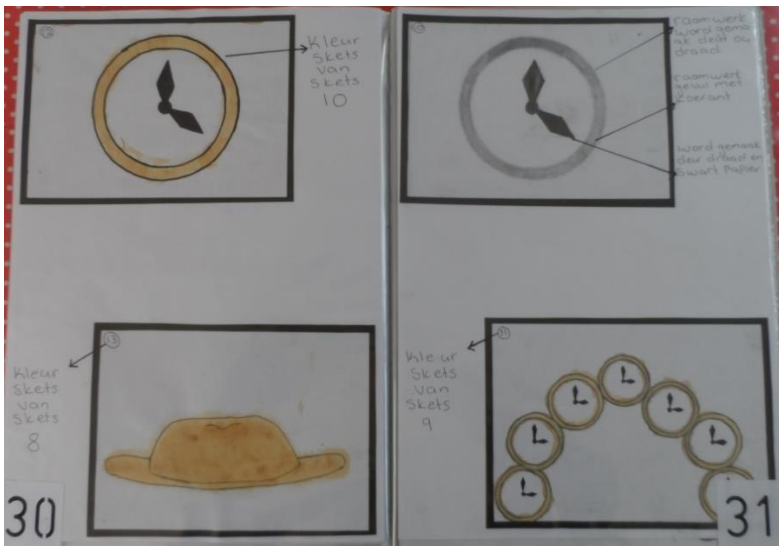


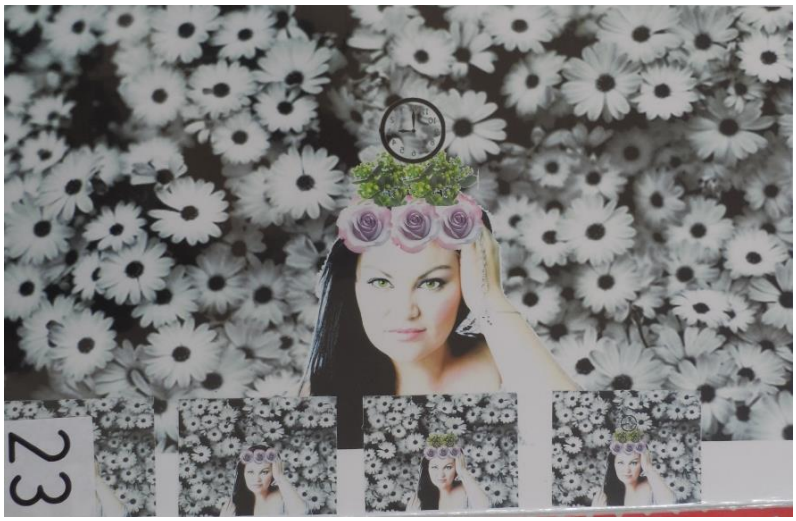


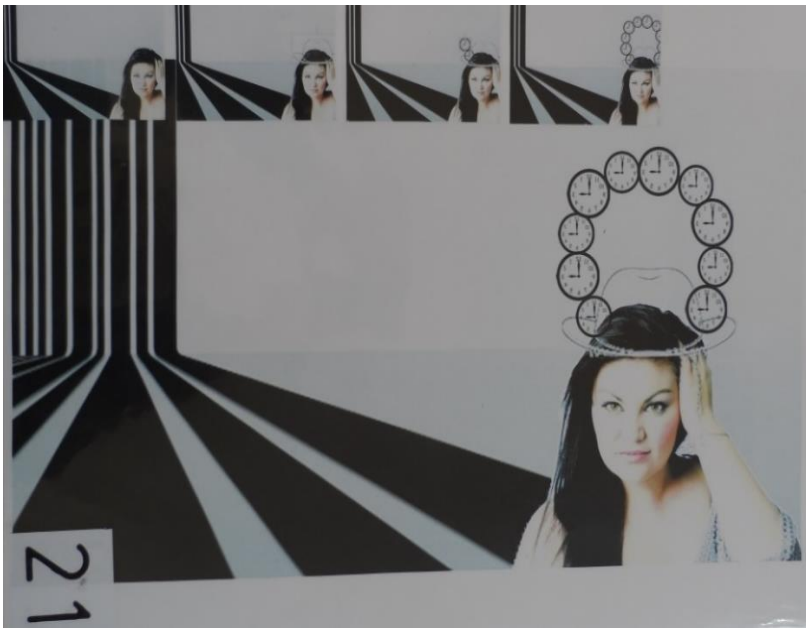
L27 *continued*

The following images are added to illustrate L27's progress, thoughts, and development of ideas.

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L27 *continued*

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L27 *continued*

Although this section deals with the *Design Process* (Topic 1), I have included an image of L27's final product – the *Design Product* (Topic 2) (see last image).

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Image 5.12.6

School 6

Topic 1: S6L34

Media used: White paper, red colour pencil, printed colour copy of Design brief.



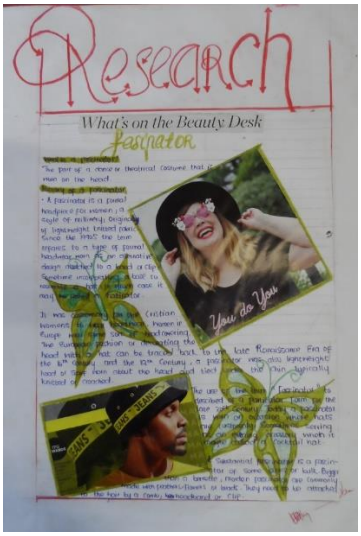
L34 captured **STAGE A | *Understand – Red Zone*: Step 1. DEFINE and Step 2. DEBONE** by starting the *design process* with the presentation of the Design brief.

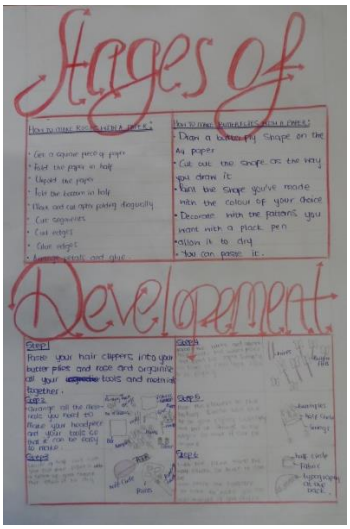
Furthermore, this learner continued to display quality and neatness in the sourcebook. The use of decorative hand-drawn headings, similarly in red colour pencil, creates a repetitive flow whereby the heading style is applied as a golden thread from start to finish in this learner's sourcebook.

L34 was able to define and understand the problem from the Design brief.

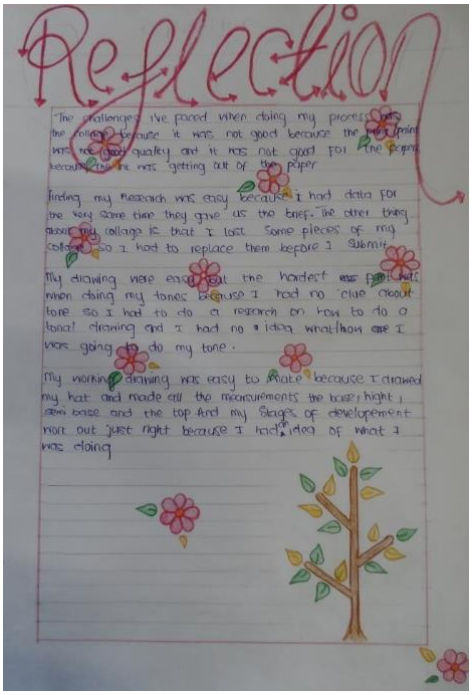
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L34 *continued*

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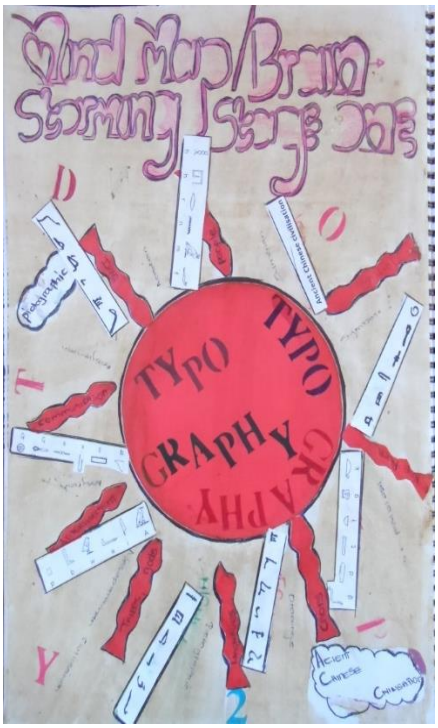
Image 5.12.7

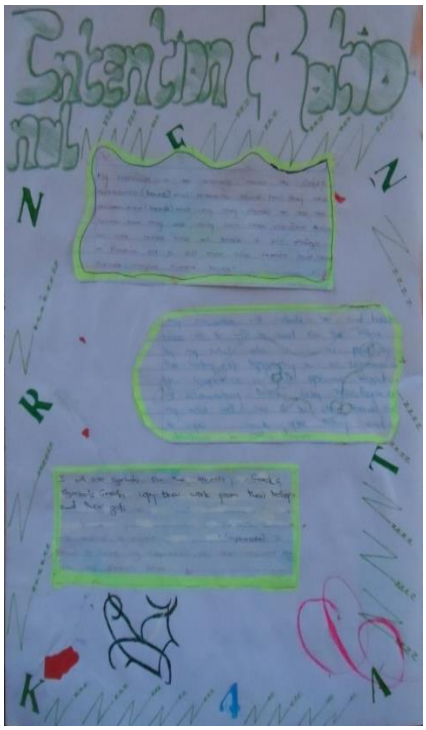
School 7

Topic 1: S7L38

Media used: Brown paper, colour pencils and acrylic paint.



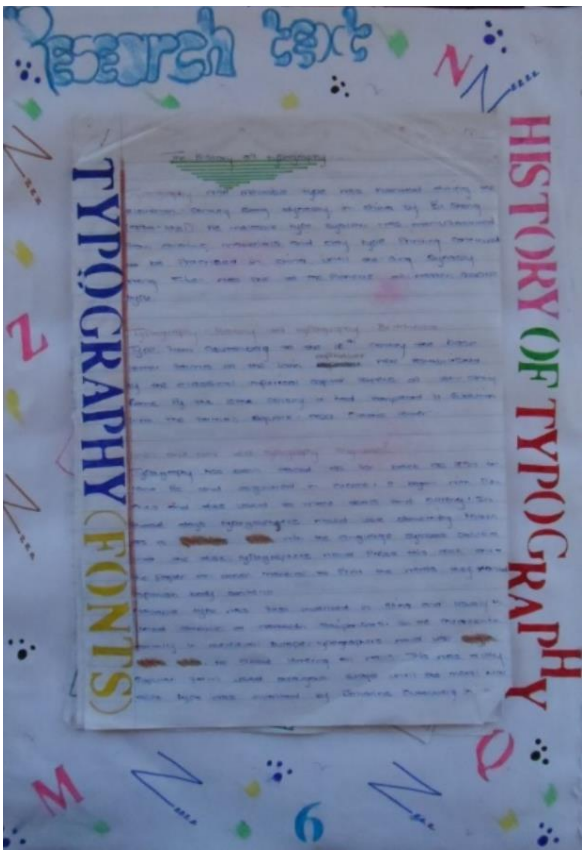
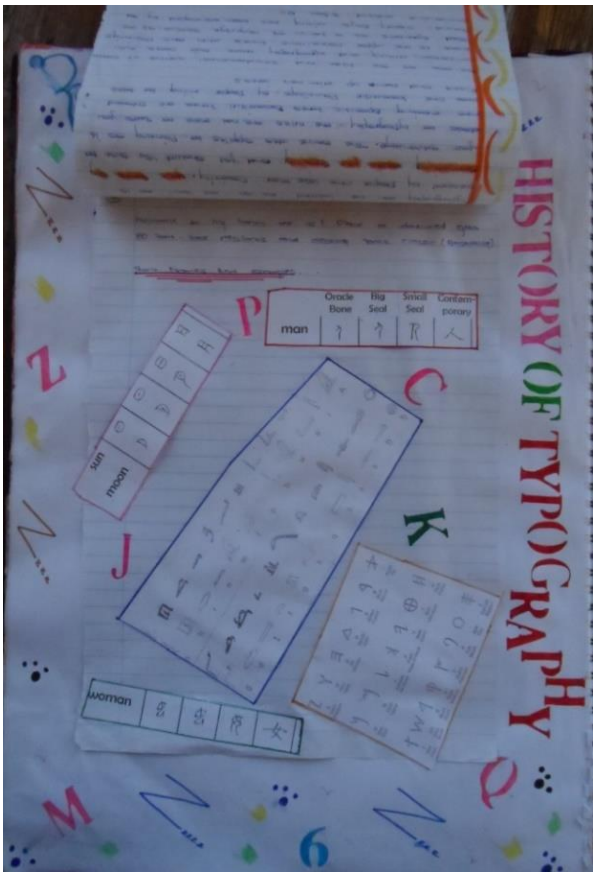




STAGE A | *Understand – Red Zone*: Step 1.

DEFINE: L38 displayed the ability to recognise and apply letters to define and present the problem derived from the Design brief. In addition, the sub-theme of celebration by using synonyms like birthday created some tension in anticipation in how L38 unpacked the design problem further in the sourcebook.

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 	L38 *continued*
Source: Digital photographs taken by Anriët van Deventer	

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IMAGE REFERENCE & IMAGE

STAGE D | Step 8 | *Critique* | DEBRIEF (Grey zone)

Step 8. DEBRIEF

Criteria 1-5

Produce/present your solution

(Presentation, the overall impression

& neatness)

- Ask reflective questions.
- Use the five criteria to look at your solution/product and evaluate.

Image 5.12.8

Reference School 1

Topic 2: RS1L4

Media used: Wire, wool, glue, recycled cone shapes & colour transparencies (circles).



DISCUSSION

L4 visually unpacked **CRITERIA 1: Plagiarism** with 60% change of the final product solution. This is a unique and new design, therefore 100% fresh and a new design solution. The idea is first fully developed and not copied and reflects a clear understanding and relevant interpretation of the Design brief. L4 managed to successfully construct and establish a solution pertinent to the scope of the brief.

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Image 5.12.9

School 2

Topic 2: S2L8

Media used: Recycled material, clay, wood, wire, cornice adhesive, glass mosaic tile & paint.











DISCUSSION

L8 demonstrated **CRITERIA 4: Creative and original** by following a 3D design solution other than a hat or headpiece and presenting a product reflecting creativity. Therefore, the successful approach and thorough planning led to creating an appealing end architectural final product. Still, L8 delivered this product within the scope of the Design brief. The solution has never existed before and represents something original, newly formed and tangible.

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Image 5.12.10

School 3

Topic 2: S3L18

Media used: Polyesterene, toothpicks, craft carton & acrylic paint.









DISCUSSION

L18 exhibits the construction of **CRITERIA 3: Technique** successfully with the presentation of the final product with applicable techniques. Furthermore, L18 showed mastering of technically sound skills by showcasing his quality craftsmanship. This product is an exciting example of methods that encourage innovation as a hat and, in this case, a very successful headpiece. This learner succeeded in thinking 'with NO box'.

The image in the centre of the bottom three is L18's final tonal drawing: an illustration of fine drawing skills and techniques using pen-and-ink & colour pencils demonstrated the *Design Process* (Topic 1)).

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Image 5.12.11

School 4

Topic 2: S4L19

Media used: carton, beads, buttons, material, elastic, lace, stone, glue, stapler & golden spray paint.









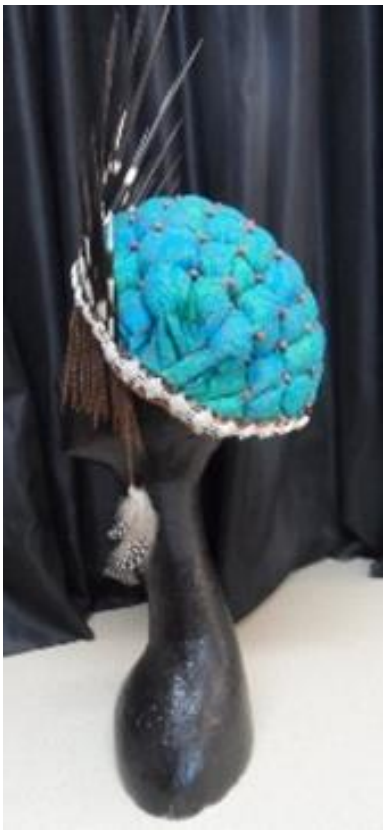
DISCUSSION

L19 took advantage of **CRITERIA 1: Plagiarism** by crafting a new idea with the initial conceptualisation showing an altered solution (more than the required 60%). L19 used found objects like beads, small stones, buttons and sand as media to construct the final product. Furthermore, the centre part, I found interesting by which L19 has used crumpled paper very cleverly to enhance the 3D-construct. Thus, gold spray paint for the final product adds to the solution being even more unique and original. This solution is appropriate to the scope of the brief.

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Image 5.12.12 **School 5** Topic 2: S5L25 Media used: porcupine quills, lace, recycled material, feathers, chain, needle and thread & beads. 	L25 visually communicated **CRITERIA 2: Successfully used art elements and design principles** and demonstrated an exciting interplay with a mature approach to this design solution. The *design process* was executed to the full, leading L25 to arrive at this visually gorgeous and functional product. Using the elements of Arts in an evocative manner results visually in a kind of '*pleasing to the eye'*-feeling. Lined together with repetition of the circle-shapes are astutely used to accomplish rhythm and movement. Furthermore, the contrast was created through the elongated porcupine quills, which is 'hard' and has a solid shape with the softness of the chain. Finally, the clever creation of the loose chains in front of the headpiece appears as a bridal veil.

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L25 *continued*

The two chains with feathers attached at the ends on either side give a feeling of symmetrical balance or lead the eyes down in a soft flowy direction, whereas the porcupine quills head upwards at a 45-degree angle. To continue, L25 balanced the porcupine quills' straight lines with the hanging chains with the beaded material on the headpiece itself. These have detailed work whereby this piece is divided into a geometrical grid. Different textures and materials in the hat compliment the symmetrical balance that presents itself as the main feature of this design. Texture work together with proportion to form a satisfying unity.

Finally, L25 documented her development and progress in finding her suitable solution to the

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	L25 continued problem presented in a definite and confining manner.
Image 5.12.13 **School 6** Topic 2: S6L34 Media used: paper, tissue paper, feathers, different textured paper & drawing pin.   	L34 demonstrated **CRITERIA 5: Professional presentation** to the extent that is valued for its simplicity. This solution is practically functional, and the presentation aesthetic and appealing. The construct of this solution was followed through, which started as a circle and was constructed out of paper and decorated with the utmost care to present the product in full glory.

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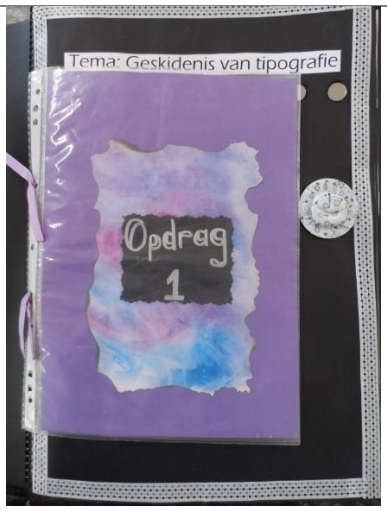
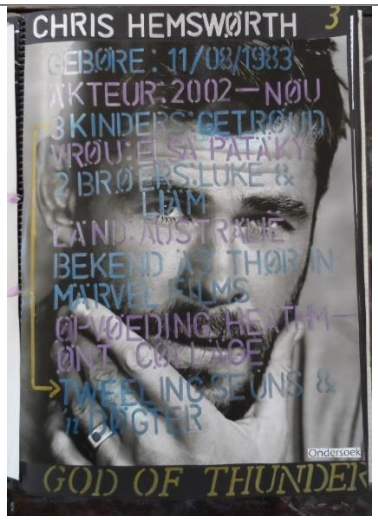
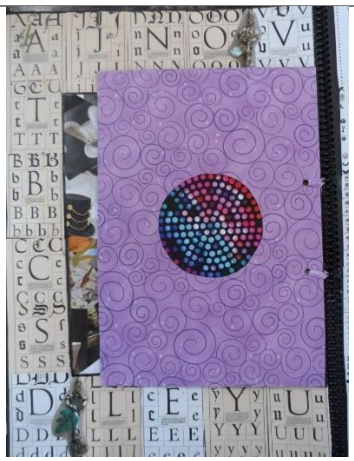
Image 5.12.14 **School 7** Topic 2: S7L38 Media used: Cloth, embroidery thread (different colours), paint, carton & silver stars. 	L38 unpacked **CRITERIA 4: Creative and original** with an original and out-of-the-ordinary solution. L38 applied creativity with a solution concept product that never existed before. The solution is original as it is presented as a serviette. L38 succeeded in finding a newly formed tangible creative solution to the Design brief.

Source: Digital photographs taken by Anriët van Deventer

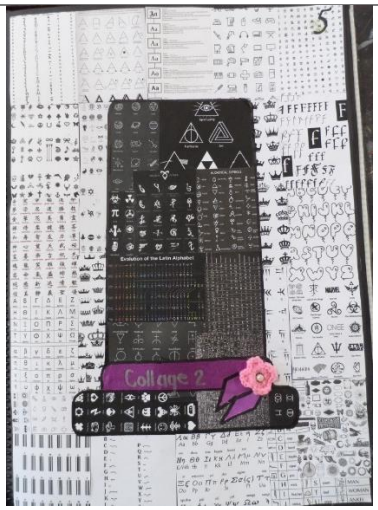
To end this part, I present all the aspects of L20's unpacking of the Design brief: Hats and Headpieces connected to the alphabet's history below. I include the *Design Process* (Topic 1) (Digital photographs 1- 27) and the *Design Product* (Topic 2) (Digital photographs 28-33) of L20. However, the DBC and assessment by the Design teacher T4 are omitted from this presentation. My goal here is to give a visual experience rather than data that has been analysed and presented. The digital photographs are exhibited as it appears chronologically in L20's sourcebook. See *Table 5.13* below.

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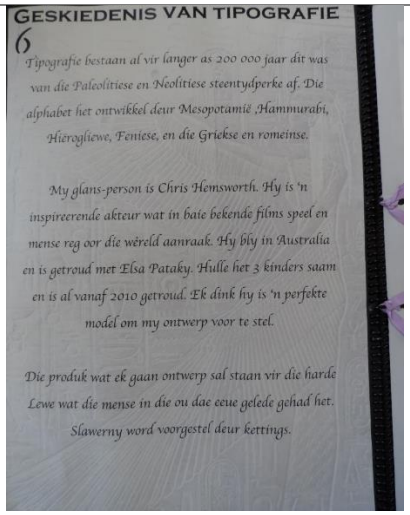
Table 5.13: Learner 20 (School 4) – Hats and Headpieces

		
1 *Design Process (Topic 1)*	**2** *Design Process (Topic 1)*	**3** *Design Process (Topic 1)*
		
4 *Design Process (Topic 1)*	**5** *Design Process (Topic 1)*	**6** *Design Process (Topic 1)*
		
7 *Design Process (Topic 1)*	**8** *Design Process (Topic 1)*	**9** *Design Process (Topic 1)*

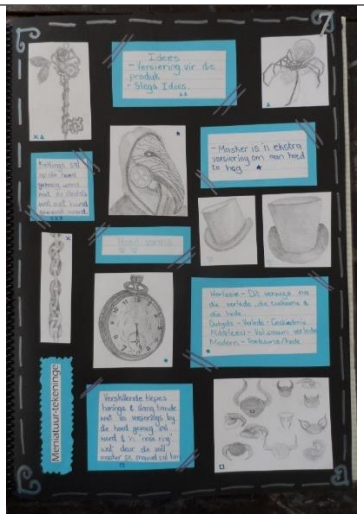
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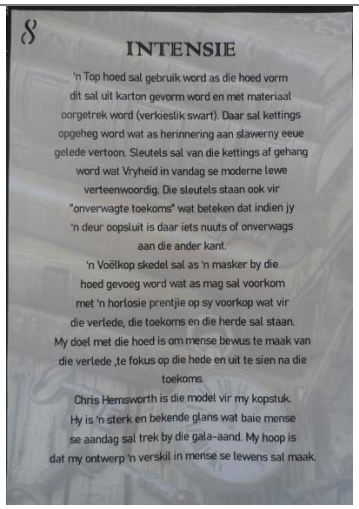
10 *Design Process (Topic 1)*



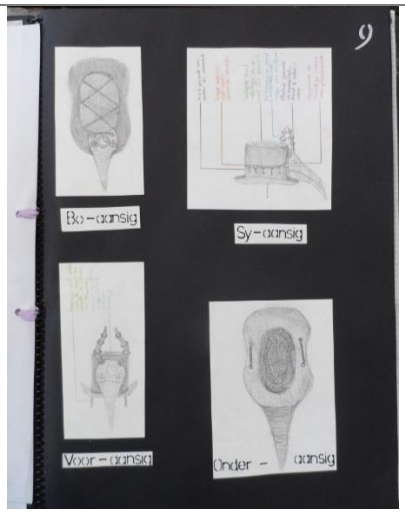
11 *Design Process (Topic 1)*



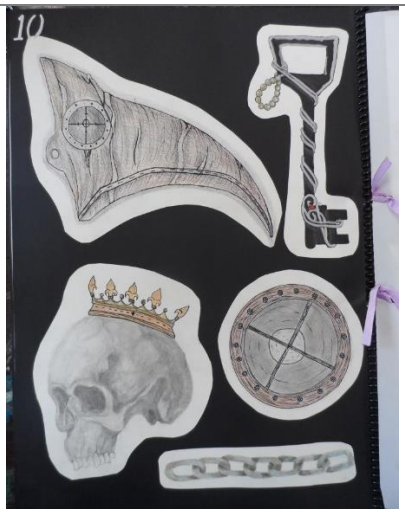
12 *Design Process (Topic 1)*



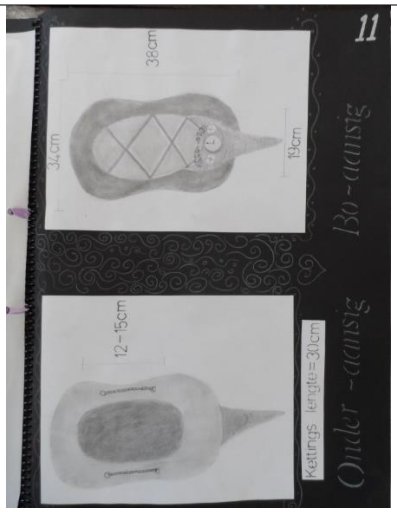
13 *Design Process (Topic 1)*



14 *Design Process (Topic 1)*



15 *Design Process (Topic 1)*



16 *Design Process (Topic 1)*



17 *Design Process (Topic 1)*



18 *Design Process (Topic 1)*

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19 *Design Process (Topic 1)*



20 *Design Process (Topic 1)*



21 *Design Process (Topic 1)*



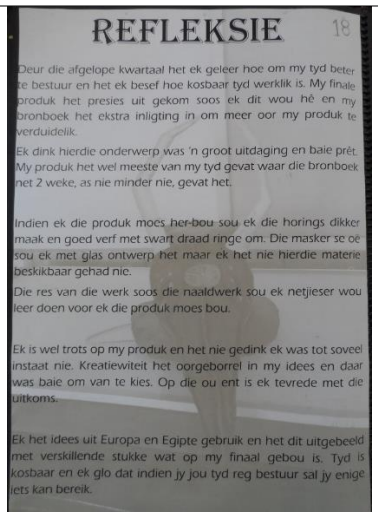
22 *Design Process (Topic 1)*



23 *Design Process (Topic 1)*



24 *Design Process (Topic 1)*



25 *Design Process (Topic 1)*



26 *Design Process (Topic 1)*



27 *Design Process (Topic 1)*

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28 *Design Product (Topic 2)*



29 *Design Product (Topic 2)*



30 *Design Product (Topic 2)*



31 *Design Product (Topic 2)*



32 *Design Product (Topic 2)*



33 *Design Product (Topic 2)*
Photograph of me

Source: Digital photographs taken by Anriët van Deventer

5.5.1 QR code[21] and URL-links for image carousels of the Design Process and the Design Product (Topic 1 & Topic 2)

After selecting 96 data digital photographs as shown in this chapter, I view them as some of the best representations of each step-and-stage of the Van Deventer D+NQ Model. The remainder of around 1539 digital photographs were labelled with participant codes. The digital photographs were organised into two folders: The *Design Process* (Topic 1) and The *Design Product* (Topic 2). All labelled with the participating schools' names, the seven sub-folders contain all the learners' design-work (six learners per school) grouped, for example, L1, L2, L3, L4, L5 and L6 in an image carousel. Thus, all data digital photographs are represented.

[21] Quick response code

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According to Elo, Kääriäinen, Kanste, Pölkki, Utriainen and Kyngäs (2014:6) referred to in Chapter 4, the data collection's trustworthiness may be validated by specific information. Consequently, I deemed it practically and technologically viable to make the image carousel accessible through a QR-code and URL-links. You may scan the QR-code with a smartphone to access my PhD student homepage, but the images display better on a laptop when accessed through the URL-links. To view all of the design work done by the Design learners for this research, click on the active tab when the mouse hovers over either the *Design Process* (Topic 1) or the *Design Process* (Topic 2), click https://rb.gy/wjb6aq or the direct links are supplied below. See *Figure 5.1: QR Code and URL-links: Image carousels of the Design Process and the Design Product* for the QR-code and URL-links below.

Click URL-links:
https://rb.gy/w3omck
https://rb.gy/u8ej67

Scan QR code

Figure 5.1: QR Code and URL-links: Image carousels of the *Design Process* and the *Design Product*

Source: Anriët van Deventer

5.6 RUBRICS – RESULTS OF ASSESSMENT

5.6.1 Rubric A: Assessment by Design teachers

Rubric B: Assessment by the researcher

5.6.1.1 Design Process (Topic 1) and Design Product (Topic 2)

Regarding the use of my rubrics and assessment results, thus in this context, my research focuses on the praxis of Design education Grade 11 in South Africa, rather than assessment. Furthermore, because I chose a qualitative strategy instead of a mixed methods approach, I want to report on the noteworthy findings in comparative graph tables, which I have included in the Appendices. The information gathered here may be used to conduct more research on

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the topic of assessment in future. See *APPENDIX S: The Design Process (Topic 1) – Sourcebooks and the Design Product (Topic 2) | RS1 - S7: Graphic representation Design teachers' assessment marks (Rubric A) vs. Researcher's assessment marks (Rubric B).*

5.7 DISCUSSION ON THE EFFECTIVENESS AND FUNCTIONALITY OF THE DATA ANALYSIS TOOL: VAN DEVENTER D+NQ MODEL

Conducting the literature review and my interest in alternative thinking and problem-solving models provided by other scholars resulted in the birth of the Van Deventer D+NQ Model, which was not planned initially as a research goal. However, it also gave me the chance to put the Van Deventer D+NQ model to the test as part of my data analysis for Parts Two and Three, the *Design Process* (Topic1) and the *Design Process* (Topic 2).

The Van Deventer D+NQ Model is intended to guide an iterative problem-solving approach based on the *design process'* roots that have been proven functional and manoeuvrable by jumping between the main stages and several steps that hold the Van Deventer D+NQ Model together. For example, the structure layout is presented in stages, with each phase ending with a CRIT card to keep the thought process going. To continue, the Van Deventer D+NQ Model's effectiveness came into action as the correlation in analysing the Design learners' designed works was guided by each stage-and-step card with ease.

Despite the fact that more piloting of the Van Deventer D+NQ Model is planned, I can report that the Van Deventer D+NQ Model's first testing application accomplished the goals established. Furthermore, despite its infancy, the Model proved to be a useful analytical tool.

5.8 CHAPTER SUMMARY

The data analysis reported in this chapter was divided into Parts One, Two and Three. Furthermore, semi-structured interviews were analysed to address my study's research sub-questions "Why do teachers interpret the *design process* the way they do?" and "How do their interpretation influence their teaching of the *design process*?"

After all, a challenge or problem that needs to be solved, according to Larson and Rusk (2011:24), introduces intrinsic drive during the creative process. Intrinsic motivation kicks in when learners are eager to solve whatever problems they may confront. In addition, driven learners are more likely to retain the information gained from their art experience and design classes.

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There is a meaningful connection between the facts analysed and the questions addressed to summarise my findings. The data analysis aided me in comprehending my research goal of learning how and why Design teachers interpret the *design process* they do. Furthermore, how their interpretation and understanding influence their teaching of the *design process*. Three themes: Cognitive, Emotive and Empathetic, were uncovered from the information gathered and presented in Part One. With the Van Deventer D+NQ Model's aid, Parts Two and Three's data analysis was made invigorating. Scholars, such as Burmeister (2013 cited in Rabie, 2015), Carroll *et al*., (2010), and Faust and Howland (2013) encourage research that explores the implementation of *Design thinking* in the classroom. It was set out as the aim of this study, which successfully reports on the status quo of the Design teachers' interpretation of the *design process* in this section.

Finally, Design teachers may become the movers and shakers of 21st century education provided they are given support, professional development, respect for their contributions and their views are heard. Design teachers who are well-informed on how to support learners thrive in school and have an impact on the *ethos of problem-solving*, which may better reflect society's needs. (Arnell, 2014; & CAPS, 2011:8). The findings and recommendations of my study's results of Design teachers' use of the *design process* are discussed in the closing chapter.

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CHAPTER 6

OVERVIEW, CONCLUSIONS AND RECOMMENDATIONS

6.1 OVERVIEW OF THE STUDY

South Africa's democratisation in 1994 has ushered in an unprecedented period of transformation in politics, society, and education. As a result, the Ministry of Basic Education has developed new policies that are scheduled for updates every five years. Considering the need for practical and entrepreneurial skills, intellectuals and visionaries introduced more pragmatic-related subjects, such as Design, into the South African education sphere. Design is a creative problem-solving subject that encompasses both its theory and practice components. Subsequently, the goal is to educate learners to meet the challenges of 21st century teaching and learning, which are centred in the now realised 4IR. Hence, these 21st century learning skills requirements include collaboration, communication, creativity and critical thinking, aimed to group more well-rounded learners capable of dealing with the world's demands they live in. Of late, an array of new challenges to education was brought on by the ongoing COVID-19 pandemic. Thus, with the introduction of Design as a FET specialised subject in 2014, many opportunities in teaching, job creation and technology arose. As a result of this potential, my empirical knowledge and involvement as a Design teacher led to my study in the subject Design, which is based on the *design process* and used as a paradigm whereby theory, creative, and critical thinking are by definition integrated with practical application and productive action.

Notably, South Africa's social and cultural complexities have forced teachers to be constantly aware, sensitive, and empathetic towards the manifestation of trending experiences of learners. As a result, some Design teachers involved in my research had initially been teaching in associated areas, which encompassed but were not restricted to, Creative Arts, Visual Arts, Languages, Technology and other subjects. As a result, these teachers have brought along a wealth of knowledge, practical experience and relevant skills. Yet, others often revealed some lack of knowledge, skills and practice supporting the *design process* because of their limitations. As a result, iterative design techniques are beneficial through experimentation and failure of primary ideas and concepts and may, therefore, be considered as an innate part of the *design process*.

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Based on the interpretivist epistemology, my world view has determined that reality is relatively subjective and has many aspects related to socio-economic and political influences. As a result, epistemology, in terms of my understanding of social processes, is generated by each Design teacher's output on their *design process*. Therefore, this study aimed to determine how Design teachers understand the *design process* and, as a result, how they apply and teach it to learners. Hence, this study was conducted based on a research question presented in *Chapter 1,* section *1.5 MAIN AND SUB-QUESTIONS OF THESIS* regarding Grade 11 Design teachers in Gauteng, South Africa, interpreting the *design process*. Inevitably, the primary question led to three sub-questions:

a. How do Design teachers interpret the *design process*?
b. Why do Design teachers interpret the *design process* the way they do?
c. How does teachers' interpretation influence their teaching of the *design process*?
d. How can Design teachers enhance diversity in creative and critical thinking by an innovative and easily applicable Design teaching model?

In my research, RST1  , at a school specialising in the Arts (RS1), set themselves the bar for the *design process* standards, which, according to my judgement, are reasonably fair. Therefore, my comparative approach using RS1 is about setting a benchmark to evaluate S2 to S7 rather than to have compared learners and teachers in my study.

My generation of data included document analysis of CAPS Design (2011) and the PAT Guidelines (2018-version) as prescribed by DBE, Design teachers' interviews, and Design learners' data captured by digital photographs. This qualitative data was produced in a case study by Design teachers and Design learners. The data reflected the outcomes after the Design teachers had taught the *design process* in both topics, the *Design Process* (Topic 1) and the *Design Product* (Topic 2). This investigation led to an enhanced understanding of the interpretations, demands and challenges placed on Design teachers to deliver the *Design process,* discuss concepts, and reveal some new insights.

My critical analysis based on the data about how Design teachers engage with the *design process* has been described in Chapter 5 and this chapter of my thesis. In addition, this study allowed me to develop a problem-solving model for the South African school system. As mentioned above, this resulted in creating the Van Deventer D+NQ Model blueprint to support and guide the South African learners in acquiring a simple and easily understandable problem-solving model. Furthermore, to verify its efficiency, I used this model as a data analysis tool too. As a result, the Van Deventer D+NQ Model, based on longstanding international *Design*

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thinking standards, showed to be an effective and useful tool as it is in line with the expected outcomes set by the DBE.

Finally, chapter 6 summarises the key findings that emerged from my study and the conclusions drawn from them.

6.2 SUMMARY OF THE RESEARCH FINDINGS

My understanding of what I have found in my research is reported in this segment. To answer the pivotal research question and accompanying three sub-questions of this study, I selected seven South African high schools offering Design as a FET subject. The primary research question on which this study was based is: *How do teachers interpret the design process?* The following sections describe perspectives in answering this question.

Having identified the unique components present in Design education, namely the possibility to integrate theory with practice effectively referred to as praxis, it is essential to note that Design teachers share characteristics with teachers from other fields who aim to address 21st century complexities and skills. Therefore, such ability as defining learning engagements, practical outcomes, and deliverables across multiple areas requires open-mindedness and analogous input from learners. In addition, the necessary technical skills for teaching the Design subject allow for progression and development. Design teachers can facilitate the exploration of the *process* instead of merely focusing on the final product (Eriksson *et al.*, 2019:21-22, 39). In terms of this study, the methodology, content and assessment methods in the CAPS document allowed for adaptation to existing learning environments and the curriculum provided Design teachers with a lot of latitudes. Although I regard the flexibility and openness of the curriculum as a strength, it also created disadvantages. Knowledge gaps were formed in areas of the *design process* where Design teachers were not confident and competent in teaching Design. As a result of these gaps, challenges in teaching the *design process* and assessing learners' works arose, reducing the practical assessment tasks' overall quality and output. However, according to my study, many of the issues surrounding this matter were addressed by evaluating best practices and providing more specific guidance and standards to Design learners. Besides, considering that learners develop holistically toward learning new skills and abilities due to Design, their creative capabilities increased, and they learned more about the *design process* (Jenson, 2018:75).

Then, having conducted interviews allowed me to get a full range and depth of information. The PAT Guidelines document (2018:5, 8-11) was sent in advance to Design teachers and

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learners to ensure that they do have access to the *design process* and Rubric. The PAT Guidelines served as a guide to what was expected from them. Here is when subjectivity came into play as I found that the Design teachers marking the Design learners' work had a particular empathy towards some learners they know. In the contrary, all participants were unknown to me which took my journey to findings through their *Design Process* – sourcebook and the *Design Products* only. Therefore, my assessment can be substantiated as objective, whereas the teachers' evaluation was mainly subjective. To briefly touch on assessment as a topic for further research: at the national centres, the DBE Design PAT serves as the guideline in moderating and marking Grade 11 final year practicals. I employed the same categories in the Rubric and assessment criteria descriptors (PAT, 2018:12) but subdivided the chunks into smaller, more detailed sections. Learners had to fully submit proof of the development of their design process in the sourcebooks. However, each Design teacher received the same assessment tool as prescribed on page 12 of the PAT document, namely Rubric A (PAT, 2018:12).

Furthermore, since my research revealed that when learners are intrinsically driven to learn and understand, they can draw on their previous experiences and create 'new' knowledge, intrinsic motivation during the learning process should be continually emphasised. Therefore, Design teachers should define, discuss, and explain how intrinsic motivation can benefit learners to learn from their errors and mistakes and improve their understanding of using various methods during the *creative process* (Hansen, 2000:24 & Heard, 2007). Another finding is that students' creativity was lacking or limited, as no innovative thinking came through neither was visible in the final product of some learners. Therefore, as stated in *Chapter 1,* section *1.9.3 Data Analysis*, I have paid attention to each step's outcome of the *design process* in *Chapter 5,* sections *5.3 Part Two and 5.4 Part Three*, by utilising the Van Deventer D+NQ Model as an analysis tool.

Thus, there is a significant shift noticeable in teaching methods, from a *teacher-centred approach to learner-centredness.* I find the change in line and applicable with the demands of the 4IR's skills. The digital photographs of the Design learners' sourcebooks align with technological possibilities in presenting all the data derived and available for this study. Furthermore, the data collected from Design learners, the *Design Process* (Topic 1) and the *Design Product* (Topic 2) (digital photographs) are made available via a QR code and URL-links in this thesis.

Concerning Design praxis, my study avoided absolute terminology and depicted Design teachers' experiences, methods, and results in the interpretation and teaching of the *design*

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process. This study aimed to portray, through its well-substantiated findings and results, the strengths and weaknesses of the *design process* to outsiders. Although the CAPS Design requirements and the PAT document guidelines are clearly formulated, my research has shown that design in South African classrooms is mostly product-driven. However, no precise reference to the *design process* phases was found in the PAT Guidelines of 2018, the version I utilised for my study. Subsequently, the DBE rectified this in the 2021 version, where a clear indication is stipulated under the heading *Design Process* (PAT, 2021:12-15). As a result, learners are yet to be fully equipped with skills like practical problem-solving and thinking skills with the 'no box' required by the state-of-the-art education system in line with the 21st century.

6.2.1 How do Design teachers interpret the design process

The case study on the Design teachers' experience in Design education allowed for a comprehensive cross-comparison analysis between the reference School 1 and the other six schools participating in my research. The nub of Design education requirements and regulations in CAPS and PAT Guidelines request specific qualities in Design teachers. Simultaneously, the teaching of Design necessitates a comprehensive understanding of the *design process* and the inspiring confidence of a leader, as teachers guide Design learners through the exploration and development of the relevant *design process.* In line with these requirements, my research has shown that Design teachers do know what the *design process* entails. Depending on their interpretation of the *design process*, they present its requirements in the realms of complexity, future possibilities and creative solutions. Yet, Design teachers' intensity in how they deliver the subject matter to the Design learners differ in terms of intricacy and methodology.

In my study, Design teachers were split 50/50 depending on how they taught the *design process.* Three Design teachers defined their approach to the *design process* as 'iterative' and the other three as a 'step-by-step' process. Teaching the *design process* as iterative was backed-up with possibilities, employing different thinking skills, creating more ideas and 'freedom'. This relates to my Van Deventer D+NQ Model, in which I encourage 'thinking with NO box'. As for the Design, teachers who followed a method of a step-by-step approach indicated that it is easier for the learners to follow and complete each step before moving on to the next. It was referred to as the 'foundation' one needs before the learners can start 'building' and continue the rest of the exploration. It highlighted that if a teacher is more restricted in their own way of doing things, including their approach to learning, the Design teacher will use the same approach to teaching learners about the *design process*.

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Furthermore, the Design brief used in this study had various aspects to consider. The guidance of Design teachers revealed the degree of their influence in which direction learners were led to develop their solution for the problem identified. For example, as the study's primary focus is the teachers' engagement with the *design process*, it was interesting to note how different the teachers interpreted the Design brief (*A history of typography* | *Hats and Headpieces*), see *APPENDIX I: Design brief* | *English and Afrikaans*. Hence the brief was not focused only on typography, yet some Design teachers' interpretations and references steered their learners in that direction. Importantly, the Design teacher should have the ability to create a Design brief that involves critical creativity and *Design thinking* (problem-solving). For example, the skill to scale the required time and resources needed by a Design brief to ensure learners can successfully complete the project within given time management.

6.2.2 Why do the Design teachers interpret the design process the way they do, and how does their interpretation influence their teaching?

Design teachers who followed the step-by-step guidelines said that by offering a more structured method, Design learners tended to be less stressed and knew what to do, what steps to follow, and as such, to progress in their own time. As a result, Design learners conceptualised a bigger picture with the 'route map' included. I assume that it is easier and more manageable for a Design teacher to monitor each learner's progress when a step-to-step approach is followed. Design teachers who opted for the iterative process based on the trial-and-error method were confident that their approach had influenced the Design learners' inner motivation because there was no limitation in terms of freedom of space and time to explore and create accordingly. The Design teachers felt that Design learners must find themselves in 'free' creative spaces, in other words, a space of freedom where Design learners should have the liberty of thinking, expressing their own voices through different thinking skills to capture as many diverse innovative ideas as possible. However, my research has also shown that leaving Design learners with too much 'freedom' hinders their ability to complete each stage successfully. Neither does it necessarily lead learners to experiment more with the problem contained in the Design brief. Moreover, the problem-solving process was not applied to its full extent. In some cases, Design learners omitted the experimentation phase in their sourcebooks.

Design teachers used their own strengths in teaching Design, mainly based on their own areas of expertise. This confirms the assumption I made in Chapter 1 that Design teachers teach Design learners according to one of the following Design categories they are qualified in: *Visual Communication Design/Digital Design, Surface Design, Product Design or*

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Environmental Design (CAPS, 2011:13). This choice undoubtedly creates a comfort zone for the teacher but of uncertain future use for the learner. My research has found that Design teachers who were initially Visual Arts trained find it hard to meet the specialised teaching requirements for Design education. Design teachers with Visual Arts training backgrounds tend to approach the *design process* as a step-by-step method. Their interpretation of being more structured is evident in the *Design Process* (Topic 1), namely the Design learners' sourcebooks. S3's, S4's, S5's, and S6's sourcebooks had headings and chronologically followed each other. RS1, S2 followed an iterative approach where pages and images were added as extras in the sourcebooks.



T2's Design learners' sourcebooks resulted in each Design learner's presentation as original and unique, as no two learners' sourcebooks looked the same. However, my finding of not having enough control in teaching the *design process* like some learners from S7, S2, S3 and S4 resulted in no proof or evidence of the *design process* while developing the solution for the Design brief. Therefore, the sourcebooks were presented as a bit sloppy. To continue, I drew meaning from the data produced by Design learners captured by digital photographs in Chapter 5 and used the data to illustrate and support the answering of my research questions.

My study has also found that Design teachers do not use additional instructional material other than the CAPS Design, the PAT Guidelines and the only comprehensive Design Grade 11 textbook currently available (Stassen *et al.,* 2012). In addition, none of the Design teachers is using the DBE Design Compact disk (CD) (2017) as a resource. The Design teachers' choices in interpreting the *design process* the way they do were demonstrated by their choice and use of teaching materials. To encourage these Design teachers for more favourable outcomes, they need to look for additional teaching material that can assist them with their instruction of the *design process*.

Lastly, referring to the assumption in *Chapter 1, 1.2.2 Context* that Design teaching is seemingly product-driven, as opposed to the CAPS problem-solving process requisite, my research findings verified that it is indeed the case. This became evident in how the Design teachers' interpretation of the *design process* was shown as impactful on the delivery of the *Design Process* (Topic 1). Unfortunately, some learners failed to fully explore the *design process* due to their goals set on the PAT final mark, lack of enough time, absence of a time management schedule, absenteeism, the demand for adjusted ways of delivering teaching due to the COVID-19 pandemic, and the lack of guidance by some Design teachers.

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6.2.3 Design thinking vs Designerly thinking

As indicated in *Chapter 2, 2.2.1 Design Teaching,* I have looked at the two approaches, namely *Design thinking* and *Designerly thinking*. Concerning the current curriculum, I have made some suggestions and highlighted the strong points they each have. The answers supplied by Design teachers about their knowledge or awareness of the existence and/or difference between the two approaches gave insight into their interpretation of *Designerly thinking* and *Design thinking*. Only two Design teachers could clearly explain the difference. However, I found that there are more similarities than differences between the two approaches. I concluded that the Design teachers were most familiar with the term *Design thinking.* The Design teachers described *Design thinking* as a more simplified method and approach to *Designerly thinking*, and the latter leans strongly on the academic and Design industry fields of the *design process*. When design practice and expertise are used outside of the design environment, *Design thinking* applies. I consider it necessary for Design teachers to understand the two approaches as distinct entities to provide a more concise interpretation of the *design process*. Then the second discourse is *Designerly thinking*. *Designerly thinking* is based on an academic extension of design since it connects theory and practice from a more formal design standpoint (industry). *Designerly thinking* vocalising designers' approaches incorporated into a theoretical or practical management conversation transformed *Designerly thinking* into a simplified description of *Design thinking*. (Johansson-Sköldberg *et al*., 2013:123).

Design thinking has emerged as a phrase to describe a design's cognitive qualities. It has become part of the favoured lexicon of contemporary design practice and, increasingly, part of the idiom of business and management. More broadly, *Design thinking* describes a style of creative thinking-in-action, which can be seen as non-discipline-specific and is gaining influence in education across the disciplines. Hence, the use of design and the belief that all people, to differing degrees, have an intrinsic ability for creative thought, both overt and connotative meanings, are cited at various times in my thesis. For example, Austin (2015:68) defined creative thinking as an ability that everyone possesses.

Establishing a recent composite picture of the professional practice of Design in this chapter, I identified the emergence of the view that design (designing) incorporates a convergence between knowledge, particularised action, and artefact production in line with Cross (1982:225), who initiated the term *Designerly* in the early 1980s to reflect these attributes. Although *Designerly* is widely acknowledged and accepted terminology, explaining the nature

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and semantics of the terminology remain one of the central themes for design research (Austin, 2015:69).

The notion of *Designerly*, in the sense that design 'has its things to know' and 'ways of knowing them', stated by Cross cited in Oxman (2004:65), provided one of the starting points for developing this chapter (Austin, 2015:68). Added to this is the view that *Designerly* knowledge generates, develops, and communicates ideas central to the whole notion of design (designing), resulting in several related issues requiring exploration. For example, how can these thoughts and opinions be framed, given they may be visual, concrete, or abstract? Although drawing has been synonymous with art for centuries, there is a particular connection between drawing and design (Austin, 2015:83).

6.2.4 Design teacher interviews

I find it relevant to report that most teachers were more spontaneous after the interviews were conducted. Although my interviews were semi-structured, the less formal environment led them to talk and refer to other aspects of importance to the study. It seems that the traditional question-and-answer setting of the interviews restricted the Design teachers. They kept a concern in the back of their head that there was a correct answer for each question and would be judged about their recorded responses. Therefore, Design teachers considered the interviews as criticism of them. After explaining the interview's intention as an opportunity to have their voices heard and understand their interpretation of CAPS Design, they appeared to be more trusting in responding more genuinely.

Furthermore, the insurance that their inputs are respected as it may impact decisions taken by higher authorities in the future made them realise the value of their inputs through this research. Thus, Design teachers appeared to be sensitive and were guarded against judgement. However, various teachers voiced that this particular learner-group, Grade 11, class of 2020, mostly seemed unmotivated and lacked drive and goal setting.

6.3 LIMITATIONS OF THE STUDY

In Chapter 1, I described possible limitations to the study. As foreseen, not all Design teachers earmarked for my research, participated. I approached 13 schools, which DBE categorised according to their National School Certificate (NSC) Design Class 12 results from the previous five years (ranking High-, middle- and low-performing schools). After receiving permission for this study from the Gauteng Department of Education, permission was also granted by seven principals and eight Design teachers. A limitation was created by the principals' delayed

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response to approve my request to conduct my study within their school. My study only started when all consent forms were returned by principals, Design teachers, Design learners and parents.

Furthermore, the limitation to previous Design exposure and exploration of the Grade 11 learners who partially or totally skipped the *design process* provide proof of this gap. But most Design learners took on the challenge in the Design brief and delivered a design solution. Moreover, the low performing schools (Category D) and the low performing Design learners from the participating schools evidenced my claim in *Chapter 1, 1.2.1 Background* about Design learners' focus on the topic only. Finally, some learners failed to provide a clear design problem statement but nonetheless delivered a solution for the problem. However, in other circumstances, the solution's adequacy as a final product solution is in doubt.

Moreover, a factor that caused other limitations was the Design teachers' availability in terms of punctuality and their lack of technological skills. The poor presence of certain teachers slowed down my data collection. In addition, poor Wi-Fi connectivity caused by inclement weather negatively influenced the quality of the recording, resulting in more limitations. Interviews were conducted online on Zoom for the convenience of the Design teacher. To have the interview via a laptop proved to be the best option, but cell phones worked equally well. The availability of the former determined the privacy of the interview that took place.

Furthermore, my study categorised participating schools (high, middle and low) according to the GDE's five-year Design performance status. Design teachers ranked participating learners in positions from one to six. Design learners moving up or down, exchanging 'rankings' according to their Design marks, showed that learners could improve. Thus, this might imply the Design brief, which I view as a suggested research topic in future. Therefore, I cannot conclude that the low-performing learner (L6) will always be ranked last.

On the contrary, I found that the only 'stable' position ranking was the number 1 position, the top-performing learner from the participating schools. As evidenced in the design work produced, L1 of all the participating schools were the best-skilled learners. In reference to S5, the L5 interpreted and understood the Design brief very well, as reflected in the Design product made. Subsequently, the learner *moved up* various slots in the ranking, from L5 to L2, when marks were allocated.

Furthermore, it was time-consuming to generate data, organise and describe the data for this case study. Consequently, the end output indicates information in depth rather than in breadth.

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Other constraints include the female Design teachers being in the majority compared to the number of male teachers, the average household income of the learners and socio-economic strains of the communities involved.

Last but not least, I need to stress the consequent COVID-19 limitations by which, in line with the rest of the globe, South Africa was directly impacted. The impact, I believe, was harder for certain countries due to limited technological knowledge and absence of infrastructure. Under the new circumstances and needs, traditional education teaching methods mainly based on face-to-face contact, proved insufficient to provide instruction to learners. On the other hand, the Design as a subject by definition flourishes under challenges which need urgent solutions.

With regard to my own research process, the participants' involvement in my study was completed at the end of Term 1 as planned and thus, initially, the pandemic had no direct impact for the finalisation of the Design work produced. Teachers being responsible for their own marks for this Term did mark the created designed work on time. As for the interviews, notwithstanding the importance of interviewing within the studio space, we had to opt for plan B due to the COVID-19 pandemic, i.e., conducting interviews online.

Furthermore, the COVID-19 pandemic had a serious impact as it delayed the collection of data. What constrained me was the lockdown enacted by the South African Government from 21 March to the end of April 2020, when schools had to open for Term 2, but unfortunately, they remained closed until July 2020. Hence, my data collection (visiting schools to photograph and assess Design work) was delayed. Finally, the last phase of data collection was concluded in September 2020 ready for analysis and processing for this study.

6.4 CONTRIBUTION OF MY STUDY

The awareness of Design teachers' responsibility is to teach learners how to learn and view the challenges, opportunities and possibilities presented by the world. Henceforward, Design education makes teaching the *design process* to learners an effective problem-solving tool through its contribution and openness to pedagogy. The 21st century necessitates a method of instruction that encourages learners to learn on their own. Design teachers can utilise the *process* as a catalyst for integrating different ways of communication, collaboration and study approaches that make the most of learners' mental strengths, problem-solving skills, inner motivation and technical skills.

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To continue, there is a need to change the existing teaching methodology by accommodating and equipping the learners to break the barrier between learning and the technological world they live in. Secondly, to bring technology and Design education together in the Design classroom to prepare learners to be appropriately productive and responsible citizens in society living in the 21st century.

Then, I believe this research will refine and revise existing knowledge in the subject area. I value my study as significant and original as no prior research, to my knowledge, has been conducted on this topic due to the newness of Design education in high schools in South Africa. Therefore, my research results may impact future scholarly research, theory, practice and policymaking. Professional education tailored to social requirements can be improved by paying close attention to society's behaviour. Thus, Design teachers must adjust their teaching methods to the changing needs of society, which requires going outside the classroom and understanding the homes and communities in which learners live. However, factors such as shifting societal interpretations of family, community and education must be considered. It is now clear that these once-familiar systems have changed, and Design teacher preparation programmes should emphasise new outlines. Therefore, start to identify methodological factors that might significantly influence the future of Design education. By doing so, positive contributions and the most sensible methods for Design education will be on offer to affect change in schools so desperately needed.

Nevertheless, if Design teachers can change how they think about education, they can change how they teach to meet the learning styles of their learners. As Design teachers stand back and enable learning and knowledge production, the importance of allowing these processes to occur will become increasingly evident. This will result in a community of Design learners motivated by their interests that can change the world. However, Design teachers and Design learners need support towards time management, the number of learners in Design classes, absenteeism of both Design learners and Design teachers, and lack of resources, for example, the internet for research purposes. In addition, every Design class should have a colour photocopy machine to enhance the *creative process*. It became clear from this research that many different factors, like having a colour photocopier in class, play a role in how the Design teachers interpret the *design process.* This, in return, clearly impacts what and how Design teachers understand when teaching the *design process* to the learners. Therefore, one of the key contributions of this thesis is whether or not the *design process* can be enhanced and made more real by establishing further effective teaching and learning ways for Design learners.

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In closure, although developing a *Design thinking* problem-solving model was not the focus of my study, it spontaneously developed into a prototype presented from this thesis. Nonetheless, the design and layout of the Van Deventer D+NQ Model prototype were developed and might serve as a blueprint of how a *Design thinking* model might look for South African Schools. I am expectant that the creative Van Deventer D+NQ Model blueprint serves as a significant innovative contribution to Design education.

6.5 IMPLICATIONS AND RECOMMENDATIONS FOR DESIGN EDUCATION

6.5.1 Development of instruction – design process

It is reasonable to assume that Design teachers are familiar with CAPS Design and the PAT Guidelines but rely on their particular talents in teaching Design to the disadvantage of the curriculum. Conversely, Design teachers' development and teaching of the *design process* in Design education are understudied research fields. The implications for Design learners are evident in the data collected and which I have reported on. The Design teachers' approach in teaching the *design process* is based on the Design teachers' preferred style, talent, and knowledge. Design learners take a primarily rational approach to learning. They consider what is logical to them, and perhaps Design teachers should expose Design learners to more complex abstract thinking, thus, challenging their creative and critical thinking skills. My study has found that some Design teachers neglect the importance of developing creative and critical thinking of their learners. Some sourcebooks of learners prove to have very little or no experimentation and exploration in the course of problem-solving stages.

Launched in 2005, Woolworths played an important role in developing learning and teaching support materials. They hosted an annual design competition for FET phase learners when Design was introduced as a subject in the curriculum. This partnership ended in 2016, however, and was replaced by Woolworths Educational Programmes, with more of a focus on Intermediate Phase (Grade 4 to 6) topics. The big Design industry companies should purposefully come on board and make contributions to improve the understanding, growth, and success of *Design thinking*. Design education might not develop and receive much support, in the absence of these companies' collaboration and input. Seen in this light, the DBE should consider re-issuing a revised version of the current Design CD in an easily accessible online-format to keep up with the demands of the 4IR. This will be particularly helpful to novice Design teachers.

As a result, in the 4IR and digitally oriented learning context, design as a topic may play a critical role, as *Design thinking* and the creative process have always been inextricably linked

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to technology. The absolute balance between the human component and the artificial intelligence of the computer is the most important part of this dependency in the development of Design abilities. Therefore, teacher education programmes that improve teachers' skills, strategies and understanding, resulting in teaching learners in ways that match the modern approaches required for the future, may benefit from educational reform.

Furthermore, CAPS Design places specific requirements on teachers to teach Design effectively. Thus, the Design teacher plays an integral part in forming the Design learners' perceptions of what is needed and essential in the Design class. This, as much as the Design teachers' style of presenting the subject matter, influences what and how learners learn and use the *design process* constructively or not.

Ideally, throughout the *design process*, the Design teacher serves as a facilitator, encouraging Design learners to participate and emphasising each response's importance in the creative process. The goal of facilitation is for the Design learners to engage in comprehensive, critical observation and thinking rather than making definite, rational, or flawed, superficial judgments. Furthermore, the Design teachers connect the Design learners' remarks and responses, highlighting their interactions and collaboration. The teachers also enhance the discourse and, consequently, learners are assisted in developing various concepts to solve a problem (Yenawine, 1999:7-8).

In this context, my investigation of the content of the existing learning plan for Design education in South Africa showed that more focus and effort should be implemented in equipping learners with the required 21st century skills. Although the PAT Guidelines lay out an amended version of the *design process* (PAT, 2021:12-15), it seems like learners have not yet fully acquired the necessary skills by utilising problem-solving. I, therefore, report that the current structure directing the *design process* (PAT, 2021:12-15) is inflexible and restrictive to the Design learner's ability to acquire creative skills, implying the necessity for a new pedagogy or methodology. Future skills for the 21st century are essential for preparing engaged citizens who can confront the difficulties of a global society, be inventive in solving complex issues and use the power of technology to improve the world (Alismail & McGuire, 2015:154). However, according to Wiggins and McTighe (2005), learners may have a bright future if they combine core teaching content with required future skills. According to research, the implementation of the 21st century curriculum and learning has consistently proved to be highly important in equipping learners with the key abilities to help them satisfy their desire to succeed in the future (Alismail & McGuire, 2015:154).

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6.5.2 Pedagogical framework

In the Design education context, the teaching classroom forms the central instructional location, a studio and its pedagogical role is essential in adolescent learners' emotional and mental development. In line with this statement, concerning the current Design teaching state of affairs, the following shortcomings were brought to the fore: inadequate directives of the *design process*, motivating stimulus concerns, and learning inadequacies are issues that need to be addressed. Additionally, the identified weakness in the relevant studio classroom paradigm shows that it is carried out exclusively and intensely, depending on the character, knowledge, and understandable style of the Design teacher and the Design learner.

Teaching the learner how to acquire, organise and apply Design knowledge depends on the Design teacher's cognitive comfort and teaching style. Therefore, the Design teacher's teaching style greatly influences how Design learners are taught the skill to obtain, absorb, integrate with existing knowledge, and utilise Design information to express it creatively. Furthermore, the Design teachers' perspectives on what is essential to be learned and communicated are influenced by their personal experiences, talents and interests. Unfortunately, despite this standard's supremacy in Design education, there is a lack of an alternative or additional way to impart information, as CAPS Design is left to each Design teacher's interpretation on their own terms. Design teachers help Design learners prepare for the future. The ongoing COVID-19 pandemic created a blended working-from-home-model, which is directing our worlds, at least for now.

As indicated before, the DBE did amendments and included a much-needed framework in the 2021-version of the PAT document. Although the said document provides basic step-by-step guidelines, Design teachers, I believe, should be trained through each step of the *design process.* Furthermore, I suggest specialised and experienced Design teachers demonstrate and explain, through roadshows, the different steps of the *design process* to the novice and concerned teachers, reminding them that this process is iterative.

These instructive workshops can be made more efficient through practical demonstrations – perhaps if the Chief examiners use relevant examples from sourcebooks and present them at roadshows to empower Design teachers. Currently, it is not allowed to take any photographs of the learners' Design works in the examination centres. Perhaps this approach needs to be changed through exposure to practical examples and different assessment methods regarding criteria, values and standards.

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Equally important is to develop short courses for continuous learning for Design teachers. Universities could initiate design postgraduate seminars through accredited programmes, such as short (three months) certificate programs on the *design process* offered online. Through this approach, technology will readily, I believe, integrate with creativity opening a platform both to teachers and learners for further skill development.

When used correctly, technology may offer new avenues for developing creative and critical thinking and problem-solving skills in various situations. Additionally, it may help learners on different levels to reflect on their own and others' thinking. Furthermore, Design makes it simpler for teachers to motivate Design learners by framing technology as a tool for creativity and learning. Such proposals engage Design teachers, academics, curriculum designers, politicians and researchers to work together towards the larger aim of integrating creativity and technology in education on a systemic level. Therefore, research, practice and policy come together in this way. Yet, if we genuinely feel that creativity is vital for the future of education, our efforts should be coordinated in this way (Henriksen, Mishra & Fisser, 2016:33).

Creativity is recognised as a critical component in employment creation and driving cultural, social and economic advancement, due to its involvement in innovation. Design learners can improve their creativity and expertise by the encouragement of their Design teachers. Simultaneously, Design teachers focus on learner-relevant activities and projects that encourage creativity. After identifying these nine important components in Design education, it is important to remember that teachers in other areas, like Design teachers, are obligated to address 21st century complexity and required abilities.

Furthermore, Design concepts should not be presented as non-specific but as work-in-progress in developing terminology for Design education. Therefore, Design teachers are encouraged to own and master the language of the subject. The newly South African published 2021 Arts Dictionary, edited by Duffey and Roets, is a valuable reference and resource.

Ultimately, the South African Design education classroom model remains unsupported by authorities, despite multiple adjustments. As a result, learning advantages in the Design classroom changes are slow. However, as stated in *Chapter 1,* section *1.1 INTRODUCTION* gaining the necessary skills in school to be participative problem-solvers and creative thinkers in a 21st century workplace is a current and real need.

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6.5.3 Design teachers' empathy

Across an ideal world, empathy, a multidimensional phenomenon, is required in a wide range of human endeavours. It promotes diversity acceptance and admiration (Ratka, 2018:1141). We may use empathy to enhance our perspective by developing new relationships and communicating effectively in the Design classroom. However, Design teachers did not convey enough empathy in their teaching, according to my study findings. Therefore, the gap can be bridged with appropriate teacher training and increased awareness to become more empathetic professionals. Researchers frequently distinguish affective and cognitive empathy as two forms of empathy (Ratka, 2018:1140). Affective empathy refers to a person's ability to experience what another person is feeling. This might involve reflecting the other's emotions or having one's own distinct physical or emotional response. Cognitive empathy is seeing things from another's point of view and comprehending why someone is feeling a certain way. Empathetic Design teachers can create empathy in their Design learners in addition to just demonstrating it. Furthermore, Design teachers cannot expect to influence their learners' intellectual growth unless they also become involved in their emotional development. Similarly, if empathetic Design teachers make a conscious effort, a caring relationship may be developed.

As mentioned in *Chapter 1,* section *1.1 INTRODUCTION,* empathy is a significant soft skill in the workplace and everyday life. Therefore, Design teachers may play an essential role in promoting and exhibiting empathy in their classrooms. Compassionate Design teachers can create empathy in their Design learners, in addition to just demonstrating it. The learning milieu is substantially enhanced when Design teachers are caring, helpful and attentive to their learners. Therefore, an empathetic Design teacher promotes caring and support while also establishing acceptable rules for how learners interact with one another. As a result, everyone has a safe space to work through and overcome cultural, ethnic, social and personal difficulties.

Ideally, an empathetic teacher provides each learner with a foundation to develop their own ideas, opinions, feelings and differences. That is how substantial improvements in-class behaviour, effort and performance may be made. Therefore, Design teachers need to demonstrate empathy in the classroom by exhibiting compassion, positive regard and understanding towards every Design learner. Design teachers should develop greater empathy, by continuously interacting with learners and other teachers outside the Design classroom, in the corridors and even on the sports field. Importantly, Design teachers should

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make an effort to show empathy. An empathetic Design teacher uses teachable moments to explain how a learner could be experiencing a given situation in class.

In everyday South Africa, the reality is that a new set of difficulties are brought forward daily, whether it is violence, personal safety, hunger or poverty, all of which are represented by learners in the Design class. As a result, Design teachers should be aware of trigger points for Design learners and not be hesitant to discuss them. This will encourage learners to consider things from different viewpoints. I furthermore accentuate a point of mutual beliefs and interests rather than accentuating how Design learners vary from one another. Then, I further promote providing a safe space for Design learners to talk about their differences. This enables learners to understand that having differences is not a negative quality, but it does lead to a healthy respect for other learners' ideas and viewpoints. Both Design teachers and Design learners may use empathy to learn and grow emotionally, socially and academically.

6.5.4 Professional development

The capacity of Design teachers to create optimal environments in the Design classroom is highlighted in recent research issued by Umalusi (2020) (Eriksson *et al*., 2019:6-8). The paper identifies and proposes nine pedagogical components that should be included in Design teacher education and development, as recognised and recommended by specialised academics. I have highlighted three connected elements as they emerged through my research and presented them below:

1. Significance: environmental, social, economic and personal problems should be addressed in the Design classroom.
2. Different discipline-based instruction: Design teachers should inspire learners to access knowledge and abilities from various subjects, including native and foreign languages, Natural and Social sciences, Mathematics, and the Arts, to investigate the design issues thoroughly. Therefore, learners should apply their acquired knowledge and skills from many subjects to various areas of their lives.
3. Development of thinking skills: *The design process* relies on critical thinking and drawing abilities and hands-on experience with resources. Learners explore a variety of alternatives, test the practicality of their chosen options, critically assess the established process and the acceptability of their ultimate decision, and reflect on their practice from start to finish as they cycle through cycles of creative and analytical thinking (Eriksson *et al*., 2019:6-8).

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In short, suitable teacher qualification with practical experience and specialisation in Design is imperative if the subject is taught to achieve the specific aims. A Design teacher's suggested level of education is a professional qualification in Design (either as a transdisciplinary practitioner or disciplinary specialisation). Thus, the Design teacher would be considered a practitioner or specialist. In addition to this qualification, it would be beneficial for the teacher to have, or obtain, a Postgraduate Certificate in Education (PGCE).

A common perspective emerges through time and is frequently based on misunderstandings, preconceptions and prejudices. The *design process* helps learners of any age rectify prior errors and develop logically tested new understandings by researching specific issues, critically analysing stages and events and regularly assessing alternative explanations and solutions. Therefore, courage in Design education allows learners to analyse a situation and conceptualise solutions and innovative applications. Then, in more complicated scenarios, the same thought approaches may be applied, integrating additional empathetic attributes to use as a Design teacher.

As part of optimum learning in the 21st century, learners receive extraordinary value via cooperation and contact with other people. Furthermore, teachers can use collaborative activities to control, oversee and monitor group behaviour, instil qualities like mutual respect and humility, self-esteem, cooperation, and impart skills like adjusting to other points of view and dispute resolution.

To conclude, let us rather join forces with the Design shift – the transition from designing *for the end-user to creating with the end-user.* So, instead of planning for Design teachers, let us collaborate with them!

6.5.5 Van Deventer D+NQ Model

As described in *Chapter 3,* section *3.1 INTRODUCTION*, the Van Deventer D+NQ Model's usefulness is suggested as an outcome and possible application as a Design education tool. By developing the Van Deventer D+NQ Model the third sub-question were answered: *How Design teachers can enhance diversity in creative- and critical thinking by an innovative and easily applicable Design teaching tool.* The FET phase has already been included within the parameters of this study. The Van Deventer D+NQ Model can be modified according to the requirements of the cognitive levels of the other three phases in the South African education system namely, Foundation (Grade R-3), Intermediate (Grade 4-6) and Senior (Grade 7-9)

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Phases. For example, the cards will be simplified with less text, made more uncluttered and primarily focus on visuals by making use of enhanced geometric shapes of each shape.

6.5.6 Recommendation for further study

To start, considering all the issues mentioned above, the following proposals are made:

- Create a workgroup to examine Design teachers' existing problems to identify assessment concerns and determine the level of assistance needed to enable teachers to provide fair assessments.
- A desire for high-quality Design education and assessment across institutions and sectors will drive the initiative. Design guidelines and supporting documentation should be developed by a collaborative team (including novice Design teachers from both the public and private sectors) to assist teachers with the evaluation of Design.
- Simultaneously, ongoing teacher education and development are required to improve existing teacher competencies in the use of the Design curriculum: design content that covers *design processes* should be offered first and foremost in the form of formal qualifications, and short courses, seminars, and other problem-solving skill workshops. Therefore, existing Design teachers will benefit from this professional development as they learn to work constructively with the Design curriculum. In addition, the best approaches will be shared during teacher development workshops with design educational professionals.
- Design teachers' ability, confidence and appreciation for Design, and the evaluation of will be enhanced through supportive learning opportunities. These should be presented and perceived as positive initiatives, and they should be tied to agreements that allow qualified teachers to continue teaching Design. Specific teacher credentials for the topic, on the other hand, are produced.

However, as this research was directed to how the Design teachers interpret the *design process* and what and how they deliver it in the classroom, some questions and other areas relating to Design education remain unanswered and validate further research:

- What is the Design teachers' attitude towards curriculum change?
- Do tertiary institutions train pre-service Design teachers to prepare them for the demands of the Design classroom?
- Why is there a decline in the number of schools offering Design as a subject?
- Further explication of *Design thinking* concerning one of the central themes of my thesis: can *Design thinking* be improved and made more tangible by developing more effective problem-solving approaches for learners?

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- A practical suggestion is to keep Design teachers informed and effectively trained with the skills they need, to teach Design in the FET Phase.
- Investigate ways to engage Design teachers' in more effective teacher education programmes for Design education.
- Explore continuous education for Design teachers in the field.
- The importance of a well-structured Design brief, and
- Assessment in Design education.

6.5 CONCLUSION

Careful considerations were placed on every creative element I added to the formal academic document. My study subject encouraged me to think in new ways. My approach and decisions brought in creativity without jeopardising scholarly integrity. In addition, the red line underneath each chapter title and the page numbers refer to the red corporate colours of the University of Pretoria. Then, the subtlety of the personalised decorative footer is brought forth by repetition (Principle of Design) of the red colour. Then the red colour is repeated (Principle of Design) with subtlety with the customised decorative footer found at the beginning of the thesis.

In the method employed in my Van Deventer D+NQ Model, constructive criticism, feedback and others' input are positively sought and welcomed. Further testing of the Model's ability to successfully answer the research question may lead to new lines of inquiry and the creation of a new research project that would include both qualitative and quantitative analysis.

Additionally, the research indicated that specific skills required through the *design process* are essential qualities and tools to equip learners with problem-solving skills by using different ways of thinking or discovering other avenues to solve their design problems. The research highlighted some shortcomings in how and why Design teachers interpret the *design process*, which may explain the reasons for Design learners' design works' quality and output. Furthermore, Design teachers indicated their interpretation of the *design process* and how they impact what and how they teach Design to learners. Design teachers should be made aware of the importance of the *design process* and should include strategies to allow learners to experiment and explore themselves without the Design teachers projecting their preferred styles and mediums on the learners.

It is hoped that this research will inform policymakers, curriculum designers and teacher trainers of the importance of including Design teacher training and development in the curriculum to equip Design teachers when teaching the *design process*. Furthermore, the

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design process should be part of the Design teachers' and learners' '*natural*' vocabulary. Therefore, the *design process* should be valued and seen as part of Design education and not something additional or supplementary to teaching and learning.

Moreover, a possible way forward is by suggesting improvements, especially in the framework of my two proposed approaches or dialogues, namely *Designerly thinking* and *Design thinking*.

I hope that I have substantiated my ontological assumption that the presence of an idea in the mind tells us nothing about the existence of *'things in reality'*. However, Design teachers need a platform for expression and greater support to engage in constructive and fruitful collaborations. The future of the subject, Design, depends on the willingness to change and support this delightful *young* subject to reach maturity.

Having suggested ways to improve, benefit and provide solutions for Design in high schools, this study has manifested that the *design process,* unlike a talent, is a skill that can be acquired. Therefore, while Design education develops and grows, the focus should be on sustainability and innovation in teaching and learning in keeping up with the demands of the 4IR. As a result, we have an obligation to actively pursue '*Designification*'[22] in the world we live in!

[22] Neologism: 'Designification' (my word) for combining *Design thinking*, *Designerly thinking*, problem-solving and the *design process.*

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8. APPENDICES

APPENDIX A: Gauteng Department of Education | Approval letter

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	28 October 2019
Validity of Research Approval:	10 February 2020 – 30 September 2020 2019/307
Name of Researcher:	Van Deventer A
Address of Researcher:	
Telephone Number:	076 998 8153
Email address:	designthink50@gmail.com
Research Topic:	Teacher engagement with the design process: policies, problems and visions.
Type of qualification	PhD
Number and type of schools:	Seven Secondary Schools
District/s/HO	Ekurhuleni North, Johannesburg South, Ekurhuleni South, Johannesburg North, Johannesburg West and Tshwane South.

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

30/10/2019

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za

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1. *Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Mr Gumani Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 30/10/2019

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za

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APPENDIX B: Structure of participant codes and avatars

CATEGORY	SCHOOL	PARTICIPANT CODES
Category A	Reference school 1	RS1
Category B	School 2	S2
Category B	School 3	S3
Category C	School 4	S4
Category C	School 5	S5
Category D	School 6	S6
Category D	School 7	S7

Category	Teacher	Participant codes & Avatar
Category A	Teacher 1	RST1 
Category B	Teacher 2	T2 
Category B	Teacher 3	T3 
Category C	Teacher 4	T4 
Category C	Teacher 5	T5 
Category D	Teacher 6A	T6A 
Category D	Teacher 6B	T6B 
Category D	Teacher 7	T7 

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Continued **APPENDIX B: Structure of participant codes and avatars**

Category	School	Learners
Category A	Reference school 1	RL1, RL2, RL3, RL4, RL5 & RL6
Category B	School 2	L7-1, L8-2, L9-3, L10-4, L11-5 & L12-6
Category B	School 3	L13-1, L14-2, L15-3, L16-4, L17-5 & L18-6
Category C	School 4	L19-1, L20-2, L21-3, L22-4, L23-5 & L24-6
Category C	School 5	L25-1, L26-2, L27-3, L28-4, L29-5 & L30-6
Category D	School 6A	L31-1, L32-2, L33-3, L34-4, L35-5 & L36-6
Category D	School 6B	L31-1, L32-2, L33-3, L34-4, L35-5 & L36-6
Category D	School 7	L37-1, L38-2, L39-3, L40-4, L41-5 & L42-6

Source: Anriët van Deventer

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APPENDIX C: Detailed summary of structure and participant codes

Category A		
Reference school 1 (RS1) **Reference school**		
High performers	**Middle performers**	**Low performers**
Grade 11 learners: High performers	Grade 11 learners: Middle performers	Grade 11 learners: Low performers
Learner 1: Participant codes for learner (RS1L1)	Learner 3: Participant codes for learner (RS1L3)	Learner 5: Participant codes for learner (RS1L5)
Learner 2: Participant codes for learner (RS1L2)	Learner 4: Participant codes for learner (RS1L4)	Learner 6: Participant codes for learner (RS1L6)
Category B	**Category C**	**Category D**
School 2 (S2) **high performers**	**School 4 (S4)** **middle performers**	**School 6 (S6)** **low performers**
Grade 11 learners: High performers	Grade 11 learners: High performers	Grade 11 learners: High performers
Learner 7: Participant codes for learner (L7)	Learner 19: Participant codes for learner (L19)	Learner 31: Participant codes for learner (L31)
Learner 8: Participant codes for learner (L8)	Learner 20: Participant codes for learner (L20)	Learner 32: Participant codes for learner (L32)
Grade 11 learners: Middle performers	Grade 11 learners: Middle performers	Grade 11 learners: Middle performers
Learner 9: Participant codes for learner (L9)	Learner 21: Participant codes participant (L21)	Learner 33: Participant codes for learner (L33)
Learner 10: Participant codes for learner (L10)	Learner 22: Participant codes for learner (L22)	Learner 34: Participant codes for learner (L34)
Grade 11 learners: Low performers	Grade 11 learners: Low performers	Grade 11 learners: Low performers
Learner 11: Participant codes for learner (L11)	Learner 23: Participant codes for learner (L23)	Learner 35: Participant codes for learner (L35)
Learner 12: Participant codes for learner (L12)	Learner 24: Participant codes for learner (L24)	Learner 36: Participant codes for learner (L36)
School 3 (S3) **high performers**	**School 5 (S5)** **middle performers**	**School 7 (S7)** **low performers**
Grade 11 learners: High performers	Grade 11 learners: High performers	Grade 11 learners: High performers
Learner 13: Participant codes for learner (L13)	Learner 25: Participant codes for learner (L25)	Learner 37: Participant codes for learner (L37)
Learner 14: Participant codes for learner (L14)	Learner 26: Participant codes for learner (L26)	Learner 38: Participant codes for learner (L38)
Grade 11 learners: Middle performers	Grade 11 learners: Middle performers	Grade 11 learners: Middle performers
Learner 15: Participant codes for learner (L15)	Learner 27: Participant codes for learner (L27)	Learner 39: Participant codes for learner (L39)
Learner 16: Participant codes for learner (L16)	Learner 28: Participant codes for learner (L28)	Learner 40: Participant codes for learner (L40)
Grade 11 learners: Low performers	Grade 11 learners: Low performers	Grade 11 learners: Low performers
Learner 17: Participant codes for learner (L17)	Learner 29: Participant codes for learner (L29)	Learner 41: Participant codes for learner (L41)
Learner 18: Participant codes for learner (L18)	Learner 30: Participant codes for learner (L30)	Learner 42: Participant codes for learner (L42)

Source: Anriët van Deventer

(*APPENDIX C continued*)

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Continued **APPENDIX C**: **Detailed summary of structure and participant codes**

Summary of participants | total		
Category A: one school & one Design teacher		
High performers **2 learners**	**Middle performers** **2 learners**	**Low performers** **2 learners**
Category B: two schools & two Design teachers		
High performers 4 learners	Middle performers 4 learners	Low performers 4 learners
CATEGORY C: two schools & two Design teachers		
High performers 4 learners	Middle performers 4 learners	Low performers 4 learners
CATEGORY D: two schools & three Design teachers		
High performers 4 learners	Middle performers 4 learners	Low performers 4 learners
Schools	7	
Design teachers	8	
Design learners	42	
Total no. of schools	**7**	
Total no. of participants	**50 (Design teachers & learners)**	

Source: Anriët van Deventer

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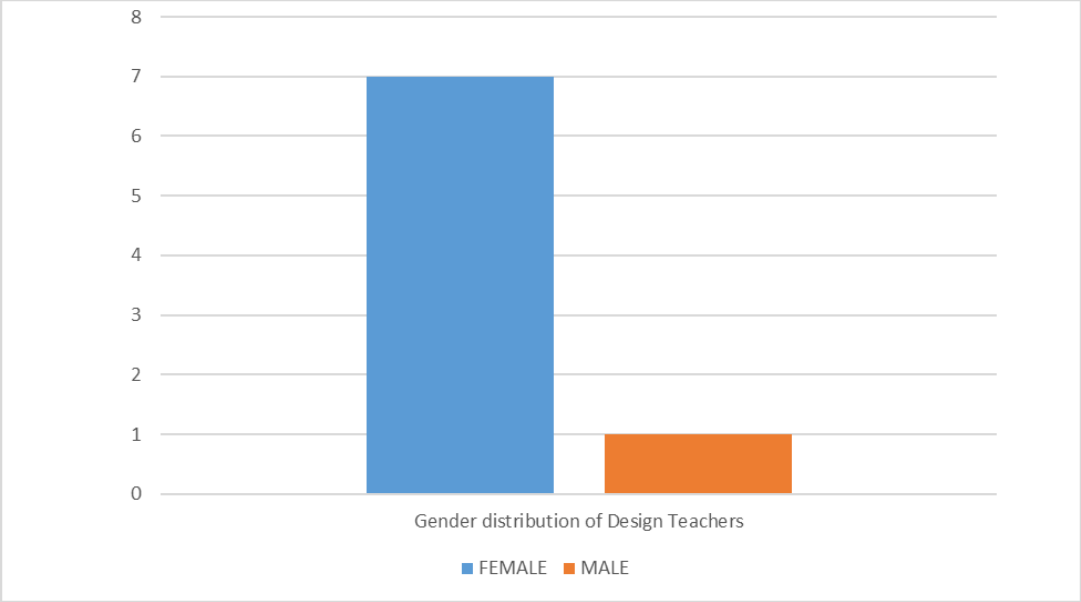
APPENDIX D: Qualitative data analysis process and phases

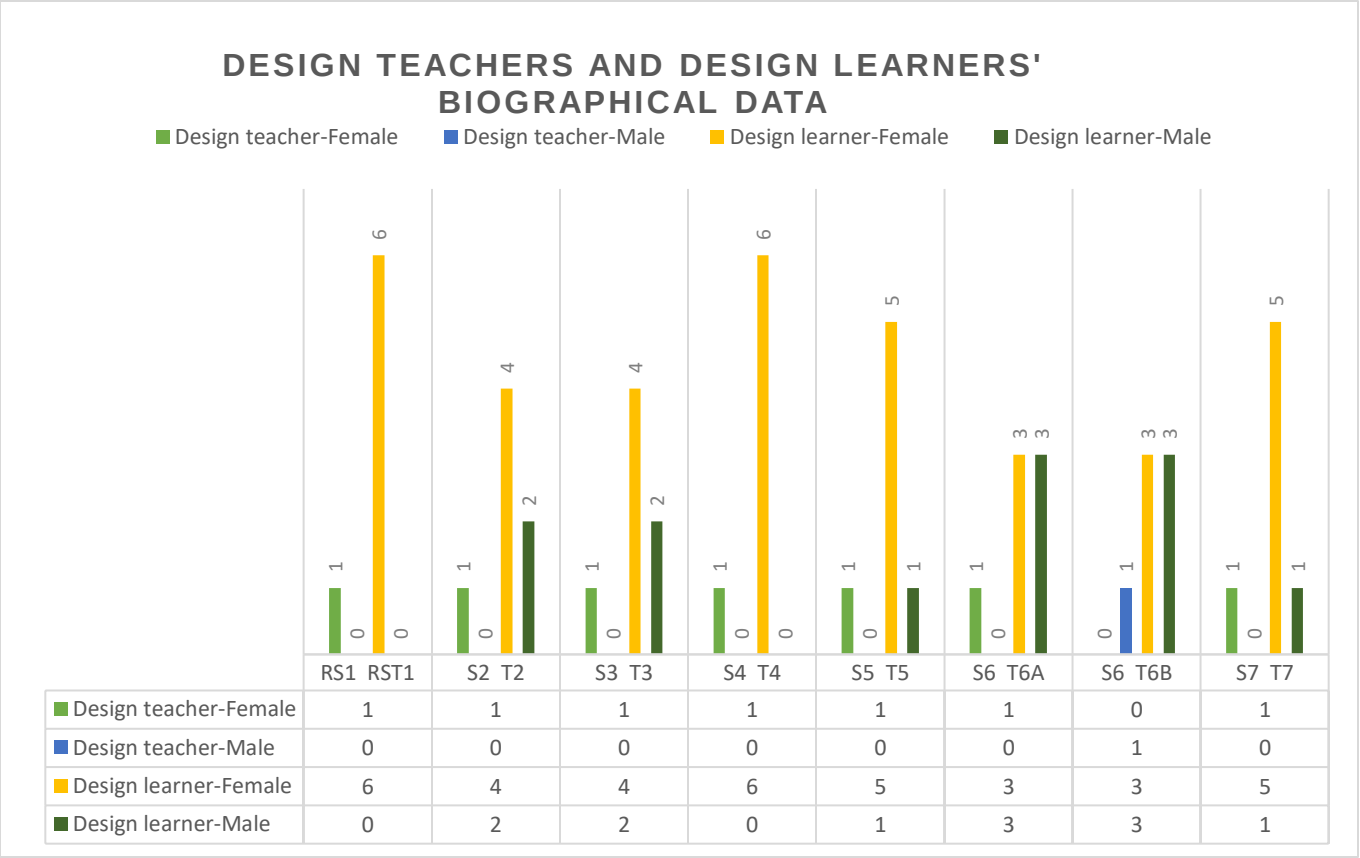
	Phase	Description of analysis process
1	Dissemination of data	a. Transcribe the data. b. (Re-)read the data and write down initial ideas.
2	Generate initial codes	a. Code interesting features of the data in a systematic way across the entire data set. b. Collate data relevant to each code.
3	Search for themes	a. Collate codes into potential themes. b. Gather all data relevant to each potential theme.
4	Review themes	a. Check if themes relate to the coded extracts. b. Check if themes work in relation to the entire data set. c. Review data to search for additional themes. d. Generate a thematic map of the analysis.
5	Define and name themes	a. Ongoing analysis to refine the specifics of each theme and the overall story the analysis tells. b. Generate a clear definition and name for each theme.
6	Produce report	a. Select and extract vivid, compelling examples. b. Final analysis of selected extracts. c. Relate the analysis back to the research question, objectives and literature reviewed.

Source: Adapted from Braun and Clarke (2006)

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APPENDIX E: Graph | Data collection – Design teachers and Design learners' biographical data



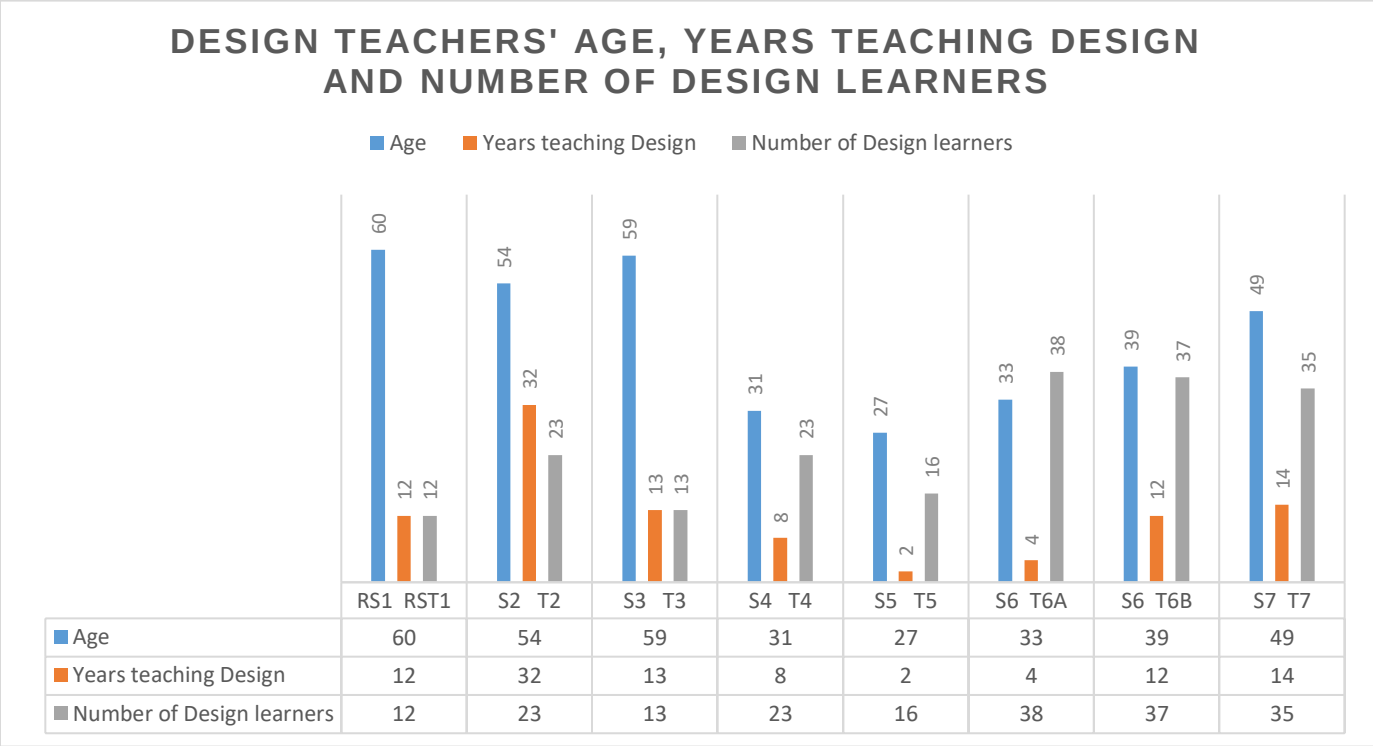


	RS1 RST1	S2 T2	S3 T3	S4 T4	S5 T5	S6 T6A	S6 T6B	S7 T7
Design teacher-Female	1	1	1	1	1	1	0	1
Design teacher-Male	0	0	0	0	0	0	1	0
Design learner-Female	6	4	4	6	5	3	3	5
Design learner-Male	0	2	2	0	1	3	3	1

Source: Anriët van Deventer

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APPENDIX F: Graph | Design teachers' age, years teaching Design and number of Design learners

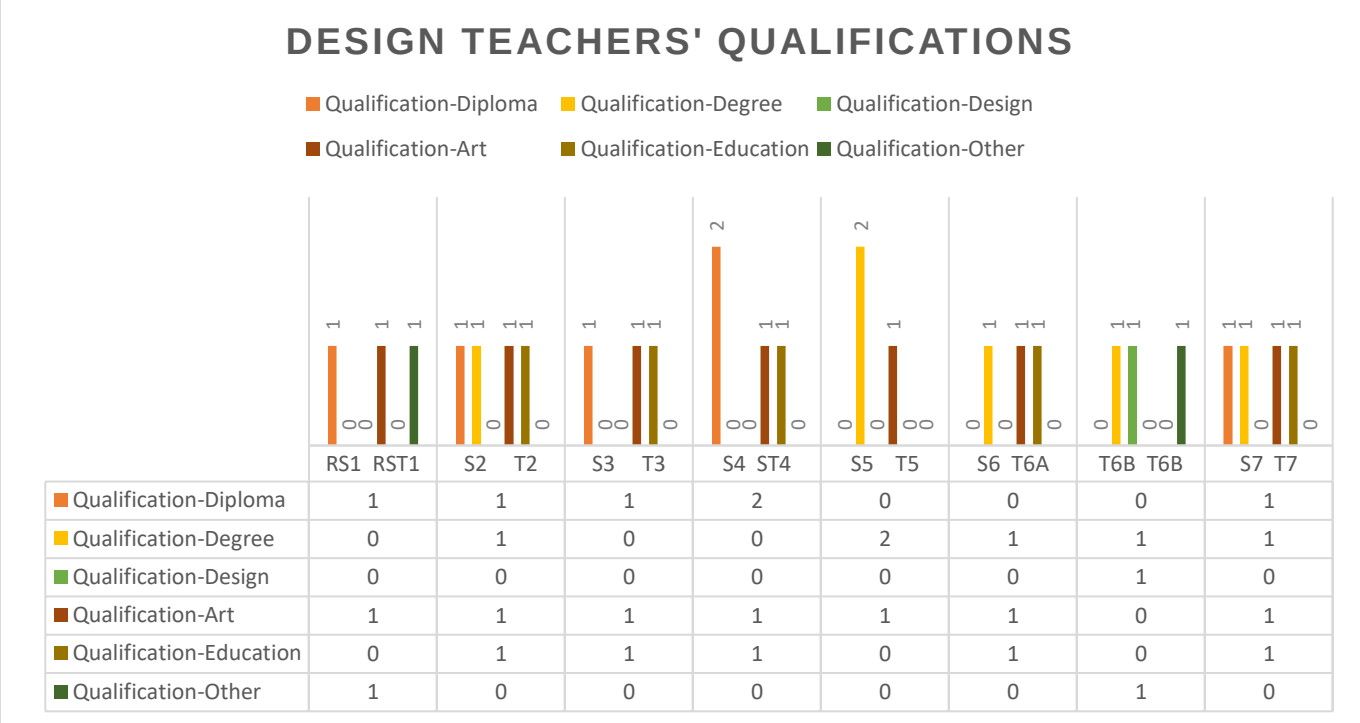


	RS1 RST1	S2 T2	S3 T3	S4 T4	S5 T5	S6 T6A	S6 T6B	S7 T7
Age	60	54	59	31	27	33	39	49
Years teaching Design	12	32	13	8	2	4	12	14
Number of Design learners	12	23	13	23	16	38	37	35

Source: Anriët van Deventer

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APPENDIX G: Graph | Design teachers' qualifications

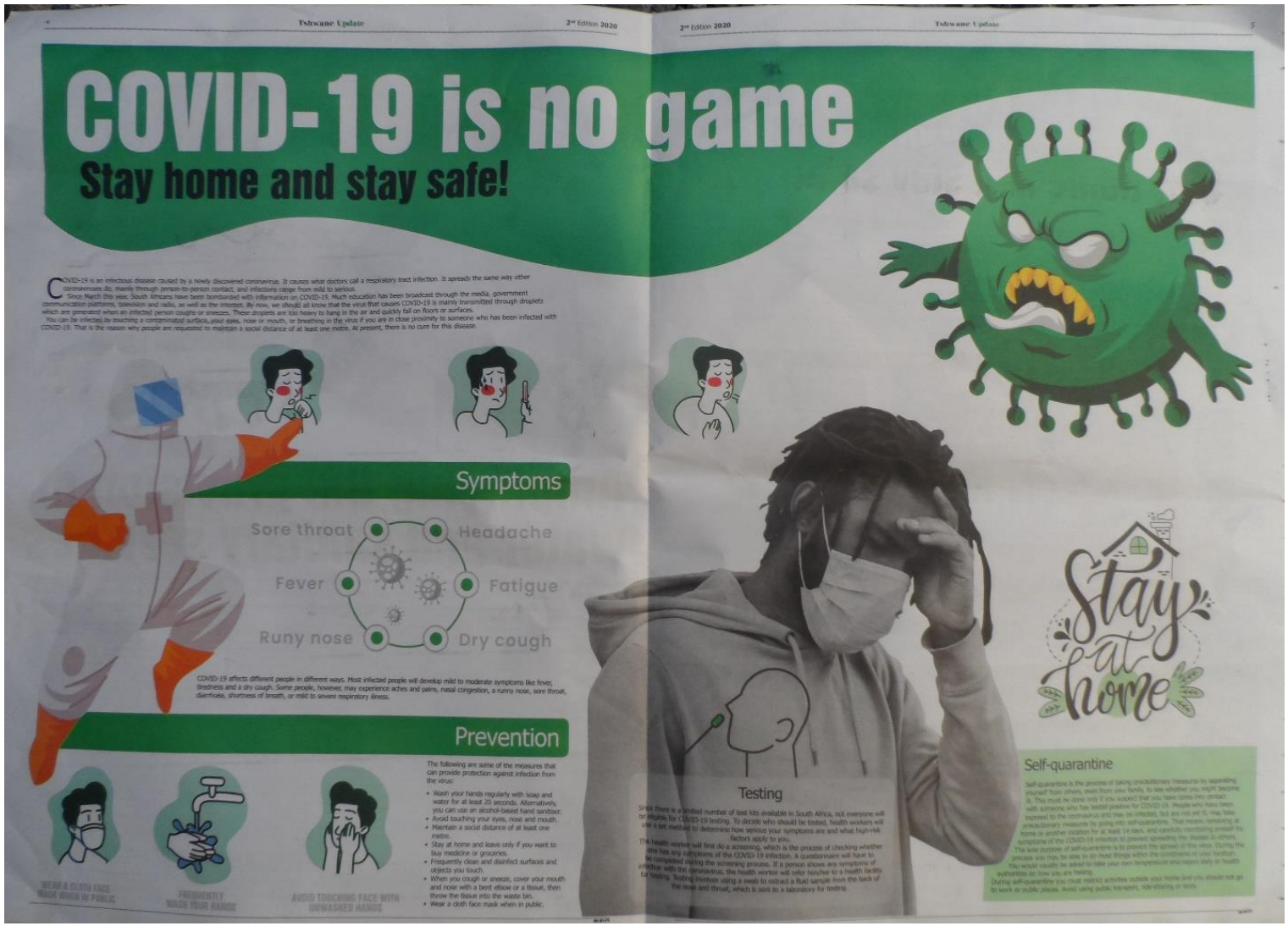


	RS1 RST1	S2 T2	S3 T3	S4 ST4	S5 T5	S6 T6A	T6B T6B	S7 T7
Qualification-Diploma	1	1	1	2	0	0	0	1
Qualification-Degree	0	1	0	0	2	1	1	1
Qualification-Design	0	0	0	0	0	0	1	0
Qualification-Art	1	1	1	1	1	1	0	1
Qualification-Education	0	1	1	1	0	1	0	1
Qualification-Other	1	0	0	0	0	0	1	0

Source: Anriët van Deventer

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APPENDIX H: Infogram | COVID-19



Source: Centurion Herald, 2nd ed. 2020

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APPENDIX I: Design brief | English and Afrikaans

2020 | DESIGN Practical | Grade 11 | Term 1

BRIEF/TOPIC: *A HISTORY OF TYPOGRAPHY* | HATS and HEADPIECES





DESIGN FOR A COMMUNICATIONS CONFERENCE
A HISTORY OF TYPOGRAPHY

HATS and HEADPIECES

You are a designer of *"Couture Hats"* for the Fashion Industry.
An events company is to organise a Communications Conference celebrating the History of Typography. The conference will be used as a marketing strategy by a group of publishing houses to highlight the work they are doing. It is to be held in Johannesburg – Design City 2020. The creative director of the events company wishes to launch the conference with a lavish gala opening night. Celebrity guests will be invited to lend status and dazzle to the gala evening. These celebrities will be asked to wear *'over-the-top'*, one-off hat creations, which will be auctioned on the evening for charity.

You are one of a handful of world-class hat designers who have been invited to create a hat or headpiece to be worn by a celebrity of your choice. The design could refer to the theme of the conference by taking inspiration from the use of the alphabet used by ancient civilisations, such as the Mesopotamian, Egyptian, Ancient Chinese civilisations etcetera. You may consult your Design theory.





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TOPIC 1 | PROCESS 50 marks converted to 40 marks

- Choose a celebrity (South African or international) that will wear your creation on the gala evening.
- Provide research in your portfolio, based on your theory programme – see the list on page 4 of your Brief (or refer to the theory textbook provided to you, as an example) and other sources. Your sources should be noted in a bibliography.
- Produce pages in your portfolio of brain-storming drawing and notes.
- Final planning for your hat or headpiece should be clear and well-drawn providing notes on scale, materials and processes to be used. Drawing to be developed from several views.
- All the usual requirements for TOPIC 1 (i.e.. rationale, reflection, collage etc.).
- Include an A3 tonal in your portfolio (the size of your workbook will determine the size of the tonal drawing).

TOPIC 1: RESEARCH | DESIGN in a BUSINESS CONTEXT | 50 marks converted to 10 marks

TOPIC 2: DESIGN BRIEF: Your brief is to create a design for *"Couture Hats"* for the fashion industry in ONE of the design categories below:

- Visual Communication/Information Design or Digital Design.
- Surface Design and Two-dimensional Craft Design.
- Product Design and Three-dimensional Craft Design.
- Environmental Design.

Communication Design examples:

- You are required to produce pamphlets/posters/business cards/packaging to be used for the couture hats for the fashion industry. Such designs may be used for the opening of the gala evening.
- It should complement the client and enhance the feeling of *Gala and Glamour*.

Surface Design examples:

- You are required to produce a design of patterns/decorations to be used for the couture hats for the fashion industry. Such designs may be patterns to be used on the material used to design the hats or fabric to be used to make curtains/tablecloths/serviettes for the opening of the gala evening.
- It should complement the client and enhance the feeling of *Gala and Glamour*.

Product Design (3D) examples:

- You are required to produce a well-constructed hat or headpiece using appropriate materials, executed in the appropriate manner for the opening of the gala evening.
- The piece should be functional, in other words, it should be able to be safely worn by your celebrity client.
- It should complement the client and enhance the feeling of *Gala and Glamour*.

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Environmental Design examples:

- You are required to produce a model of the venue to be used for the opening of the gala evening, or
- You are required to showcase ideas of how to set up the interior before the opening of the gala evening.
- It should complement the client and enhance the feeling of *Gala and Glamour*.
- Or your own interpretation of the theme within your choice of the four Design categories.

TOPIC 2: 50 marks

Source: Design brief based on CAPS supplied by the reference school in this study (*Instrument 1*).
Source: Rubric – Standard (DBE PAT document) (*Instrument 2*).
Source: Internet images only serve as examples.
THE TASK: Create an original design and develop your product with reference to the theme:

DESIGN FOR A COMMUNICATIONS CONFERENCE
A HISTORY OF TYPOGRAPHY | HATS and HEADPIECES

1. You are required to design and create a product that incorporates a field of study as used in Topic 1.
2. Apart from you researching Mesopotamian, Egyptian, Chinese or any other ancient civilisation and their development of typography you may also be inspired by point 3.
3. Use the history of typography as inspiration.
4. Use a Design movement, an international or local designer/design studio.
5. Your PRODUCT must show a good understanding of the elements and principles of Design and be **ENTIRELY FUNCTIONAL.**
6. Decide on a celebrity of your choice to design the headpiece for. Remember he/she is going to wear it at the gala event to be auctioned for charity.
7. Final product: prepare a display stand for your headpiece.
8. Secure your headpiece on the stand for presentation purposes.

TIME MANAGEMENT:
You are required to demonstrate good self-discipline, planning, an ability to organise your work and be able to honour deadlines.

SAFE PRACTICE:
You are required to comply with basic safety standards in the use of materials and equipment in the classroom.

OBJECTIVES:
- The learner understands the basic elements and principles of Design and is able to independently apply them.
- The learner is able to demonstrate an ability to apply different art making techniques in creating a well-designed product.
- To develop the dimensions of a 3D form.
- To develop the ability to understand a 3D form.
- To develop and understand technical and scale drawings.
- To develop the ability to work with extreme accuracy.
- To learn to work with various materials and tools, and

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- This task aims to develop a higher level of skills, knowledge and values.

ASSESSMENT:

- The work will be assessed by your Design teacher on the level of learner performance, as per the brief, particularly:
  - Technical skills, accuracy and neatness of models;
  - Accuracy and neatness of technical drawings; and
  - Achievement of the objectives of the task.

MARKS WILL BE ALLOCATED FOR:

- **Refer to RUBRIC at the end of the BRIEF;**
- **TECHNICAL DRAWINGS, TONAL, PLANNING, BRAINSTORMING etcetera:**
  - Neatness;
  - Technical drawings of each shape to scale;
  - Technical drawing and graphics indicating position of all shapes within final product.
- **3D CONSTRUCTIONS (if applicable):**
  - Creativity;
  - Technical skills;
  - Neatness; and
  - Completion of task.

NOTE 1:

- ✓ Read and understand the accompanying notes in this brief.
- ✓ Begin by brainstorming various options.
- ✓ Choose the best, most workable option.
- ✓ Give these form measurements.
- ✓ Use materials, such as card, glue, a steel ruler, a craft knife and masking tape, Perspex, metal or any re-cycled material etc. cut, model, sculpt and/or assemble 3D FORMS from the technical drawings you have produced.
- ✓ Photographs may be included in the work as you develop it and print to include in your portfolio file[23].



Order[24] to follow in your portfolio file:

1. Creative look-and-feel.
2. Term 1, Index, brief pasted.
3. Mind map/brainstorming (Stage 1).
4. Mind map 2 – A3 (Stage 2).
5. Intention and rationale.
6. Research: collage pictures (Mood page).
7. Research text: relevance of your creation:
   compliment the celebrity + enhance the feeling of the *Gala and Glamour*.
   Reflection on History of Typography, Mesopotamia, Egypt, Ancient Chinese Design Movements, International/SA Designer/Design studio.

[23] Portfolio File is also referred to as Sourcebook or Workbook.
[24] **Source:** DBE PAT document.

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8. Exploration – Research text on celebrity, photos, biography.
9. Thumbnails drawings x6 or more.
10. Conceptual x3 (A5 size).
11. Colour studies x2 (A5 size).
12. Final tonal.
13. Product.
14. Reflection.



***Think clearly about your look-and-feel for Term 1 practical and presentation in your portfolio file. Be creative!![25]**







TIME MANAGEMENT PLAN | DUE DATES[26]

	TOPIC 1 | Process	DEVELOPMENT | 9 January – 13 March 2020[27]	√Learner checklist
1.	Start of process and look & feel	**Start & due date: Thursday 9 January 2020**	
2.	Index page, Term 1 and headings, brief pasted, space for teacher assessment (Rubric – *Instrument 2*) (A4 space)	**Due date: Monday 20 January 2020**	
3.	Information and pictures different sources Mind map, Intention (What?), Rationale (Why?), Evidence of research photo's, ideas, collage Research: collage & text Thumbnails x6	**Due date: Monday 10 February** **Exploration *progress due*:** Friday 31 January. Final due: Monday 24 February 2020	
4.	Experimental/compositional drawings x2 A5 ideas	**Due date: Monday 17 February 2020**	

[25] **Source:** Images from Internet.
[26] Design teacher to supply time management plan if own is to be used.
[27] Public schools open for Term 1: Thursday 9 January 2020.
Public schools close for Term 1 on Friday 13 March 2020 – End of Design brief.

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	TOPIC 1 | Process	**DEVELOPMENT | 9 January – 13 March 2020[27]**	**√Learner checklist**
5.	x1 Chosen image form number 4 above – Colour studies x2 copies – different colour combinations, techniques	**Due date: Friday 21 February**	
6.	Exploration | Any findings, samples, swaps, techniques, different material testing and experimentation	**Due date: Monday 24 February**	
7.	Final tonal drawing (Monochromatic drawing)	**Due date: Friday 2 March**	
	TOPIC 2 | Product	**DEVELOPMENT | 2 March – 20 March 2020**	**√Learner checklist**
8.	Start product	Date: Monday 2 March	
9.	Final product	**Due date: Friday 20 March**	
10.	Reflection	**Due date: Friday 20 March**	
	Design in a Business Context | Term 1 Present a Design Product	**13 January – 24 February 2020**	**√Learner checklist**
11.	Start	Date: Monday 13 January	
12.	Progress	Date: Monday 3 February	
13.	Final due	**Due date: Monday 24 February**	
14.	Photographs: TOPIC 1 & TOPIC 2	**Date[28]:** April 2020: Researcher will confirm dates with Design teacher when photographs will be taken. Photographs to be taken in Term 2 at the moderation centre.	

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NO LATE SUBMISSIONS!







**The Design teacher may use this template to allocate their own due dates. Or you can use your own Time Management Plan layout/Form, which needs to be submitted together with all other documents for this study.*

[28] Photographs to be taken in April – Term 2 at the moderation centre – Dates to be confirmed.

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TIME MANAGEMENT PLAN | DUE DATES

	TOPIC 1 | Process	**DEVELOPMENT | 9 January 2020 – 13 March 2020[29]**	**√Learner checklist**
1.	Start of process and look & feel	**Start & due date:**	
2.	Index page, Term 1 and headings, brief pasted, space for teacher assessment (Rubric – *Instrument 2*) (A4 space)	**Due date:**	
3.	Information and pictures different sources Mind map, Intention (What?), Rationale (Why?), Evidence of research photos, ideas, collage Research: collage & text Thumbnails x6	**Due date:**	
4.	Experimental/compositional drawings x2 A5 ideas	**Due date:**	
5.	x1 Chosen image – Colour studies x2 copies – different colour combinations, techniques	**Due date:**	
6.	Exploration | Any findings, samples, swaps, experimentation	**Due date:**	
7.	Final tonal drawing (Monochromatic drawing)	**Due date:**	
	TOPIC 2 | Product	**DEVELOPMENT**	**√Learner checklist**
8.	Start product	Date:	
9.	Final product	**Due date:**	
10.	Reflection	**Due date:**	
	Design in a Business Context | Term 1 Present a Design Product		**√Learner checklist**
11.	Start	Date:	
12.	Progress	Date:	
13.	Final due	**Due date:**	
14.	Photographs: TOPIC 1 & TOPIC 2	**Date[30]:** April 2020: Researcher will confirm dates with each Design teacher when photographs will be taken. Photographs to be taken in Term 2 at the moderation centre.	

Source: Anriët van Deventer

[29] Public schools open for Term 1: Thursday 9 January 2020.
Schools close for Term 1 on Friday 13 March 2020 – End of Design brief.
[30] Photographs to be taken in April - Term 2 at the Moderation Centre. Dates to be confirmed.

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2020 | ONTWERP Prakties | Graad 11 | Kwartaal 1

OPDRAG/ONDERWERP: *'N GESKIEDENIS VAN TYPOGRAFIE* | HOEDE en KOPSTUKKE





ONTWERP VIR 'N KOMMUNIKASIE KONFERENSIE
'N GESKIEDENIS VAN TIPOGRAFIE

HOEDE en KOPSTUKKE

Jy is 'n ontwerper van *"Couture Hats"* in die modebedryf.
'n Geleentheidsonderneming moet 'n kommunikasie konferensie reël ter viering van die geskiedenis van tipografie. Die konferensie sal deur 'n groep uitgewers as 'n bemarkingstrategie gebruik word om hul werk te beklemtoon. Dit word in Johannesburg gehou – Ontwerpstad 2020. Die kreatiewe direkteur van die geleentheidsonderneming wil die konferensie met 'n buitengewone gala-openingsaand begin. Bekende glanspersoonlikhede sal as gaste uitgenooi word om status aan die gala-aand te verleen. Hierdie bekende persoonlikhede sal gevra word om 'n eenmalige hoedeskepping te dra wat op die aand opgeveil sal word vir liefdadigheid.

Jy is een van 'n handjievol hoedeontwerpers van wêreldgehalte wat uitgenooi is om 'n hoed of kopstuk te skep wat deur 'n bekende van jou keuse gedra kan word. Die ontwerp kan na die tema van die konferensie verwys deur inspirasie te put uit die gebruik van die alfabet ontwikkel deur antieke beskawings soos die beskawings van Mesopotamië, Egipte, Antieke China ensovoorts. Jy kan gerus jou Ontwerpteorie raadpleeg.





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ONDERWERP 1 | PROSES 50 punte omgeskakel na 40 punte

- Kies ‘n bekende glanspersoonlikeid (Suid-Afrikaans of internasionaal) wat jou skepping op die gala-aand sal dra.
- Verskaf navorsing in jou werkboek*, gebaseer op jou teorieprogram – sien die lys op bladsy 4 in die geskrewe opdrag (of verwys na die teoriehandboek wat jy gebruik) en ander bronne. Jou bronne moet sorgvuldig in ‘n bronnelys gelys word.
- Produseer bladsye in jou werkboek met breinstormtekeninge en -notas.
- Die finale beplanning van jou hoed of kopstuk moet duidelik en goed geteken wees, met aantekeninge oor skaal, materiale en prosesse wat gebruik moet word. Tekeninge moet ontwikkel word vanuit verskillende perspektiewe.
- Al die gewone vereistes vir ONDERWERP 1 (dit wil sê rasionaal, refleksie, collage, ensovoorts).
- Sluit ‘n A3 tonaal by jou werkboek in (die grootte van jou werkboek bepaal die grootte van die tonale-tekening).

* werkboek/bronboek/portefeulje – almal sinonieme

ONDERWERP 1: NAVORSING | ONTWERP in ‘n BESIGHEIDSKONTEKS | 50 punte word omgeskakel na 10 punte

ONDERWERP 2: ONTWERP OPDRAG: Jou opdrag is om ‘n ontwerp vir *“Couture Hats”* vir die modebedryf in EEN van die onderstaande ontwerpvelde te skep:

1. Visuele Kommunikasie/Inligtingsontwerp of Digitale Ontwerp.
2. Oppervlakontwerp en Tweedimensionele Handwerkontwerp.
3. Produkontwerp en Driedimensionele Handwerkontwerp.
4. Omgewingsontwerp.

1. Voorbeelde van kommunikasie-ontwerp:
   - Daar word van jou verwag om pamflette/plakkate/besigheidskaartjies/verpakkings vir die *“Couture Hats”* -hoede vir die mode-industrie te vervaardig. Sulke ontwerpe kan gebruik word vir die opening van die gala-aand.
   - Dit moet die kliënt aanvul en die gevoel van *Gala-en-Glans* versterk.

2. Voorbeelde van oppervlakontwerp (2D):
   - Daar word van jou verwag om ‘n ontwerp/e te maak met patrone/versierings wat deur *“Couture Hats”* -hoede vir die mode-industrie gebruik kan word. Sulke ontwerpe kan patrone wees wat gebruik moet word op die materiaal wat gebruik word om die hoede of materiaal te ontwerp om gordyne/tafeldoeke/servette vir die opening van die gala-aand te maak.
   - Dit moet die kliënt aanvul en die gevoel van *Gala-en-Glans* versterk.

3. Voorbeelde van produkontwerp (3D):
   - Daar word van jou verwag om ‘n goed gekonstrueerde hoed of kopstuk te vervaardig in die toepaslike materiaal wat op die gepaste wyse uitgevoer word vir die opening van die gala-aand.
   - Die stuk moet funksioneel wees, dit wil sê dat dit veilig gedra kan word deur jou gekose bekende glanspersoonlikeid (kliënt).
   - Dit moet die kliënt aanvul en die gevoel van *Gala-en-Glans* versterk.

4. Voorbeelde van omgewingsontwerp:

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- Daar word van jou verwag om ‘n maquette van die lokaal vir die opening van die gala-aand te skep.
- Daar word van jou verwag om voor die opening van die gala-aand idees te wys oor hoe jy die binneruim, wat die verhoog insluit, voorstel – hou die tema in gedagte.
- Dit moet die kliënt aanvul en die gevoel van *Gala-en-Glans* versterk.

Of jou eie interpretasie van die tema binne die keuse van die vier Ontwerpkategorieë.

ONDERWERP 2: 50 punte

Bron: Ontwerpopdrag gebaseer op die Department of Basic Education (DBE) CAPS-dokument, is deur die Verwysingskool (Reference school) in hierdie studie verskaf (*Instrument 1*).
Bron: Rubriek – Standaard (DBE PAT-dokument) (*Instrument 2*).
Bron: Internet prente – dien slegs as voorbeelde.

DIE OPDRAG: Skep ‘n oorspronklike ontwerp en ontwikkel jou produk aan die hand van die tema:

ONTWERP VIR ‘N KOMMUNIKASIE KONFERENSIE
‘N GESKIEDENIS VAN TIPOGRAFIE | HOEDE EN KOPSTUKKE

1. Daar word van jou verwag om ‘n produk te ontwerp en te skep waarin die studieveld, soos gebruik in Onderwerp 1, inkorporeer.
2. Behalwe dat jy Mesopotamiese, Egiptiese, Chinese of enige ander antieke beskawing ondersoek, asook hul ontwikkeling van tipografie, kan jy ook geïnspireer word deur punt 3 (volgende).
3. Gebruik die geskiedenis van tipografie as inspirasie.
4. Gebruik ‘n Ontwerpbeweging, ‘n internasionale of plaaslike ontwerper/ontwerpateljee.
5. Jou PRODUK moet ‘n goeie begrip ten toon stel van die elemente en beginsels van Ontwerp demonstreer en **MOET FUNKSIONEEL** wees.
6. Besluit op ‘n bekende van jou keuse om die kopstuk te ontwerp. Onthou dat hy/sy dit eenmalig gaan dra tydens die gala-geleentheid, waarna dit opgeveil gaan word vir liefdadigheid.
7. Finale produk: Berei ‘n vertoonstaander vir jou kopstuk voor.
8. Maak jou kopstuk aan die staander vas, maak seker dit kan nie afval nie, vir aanbieding.

TYDSBESTUUR:
Daar word van jou verwag om goeie selfdissipline te demonstreer, die vermoë om jou werk en beplanning te orden, en sperdatums na te kom.

VEILIGE PRAKTYK:
Daar word van jou verwag om te voldoen aan die basiese veiligheidstandaarde in die gebruik van materiaal en toerusting in die klaskamer.

DOELWITTE:
- Die leerder verstaan die basiese elemente en beginsels van ontwerp en kan dit onafhanklik toepas.
- Die leerder is in staat om verskillende kunstegnieke toe te pas in die skep van ‘n goed-ontwerpte produk.
- Om die dimensies van ‘n 3D-vorm te ontwikkel.
- Om die vermoë te ontwikkel om ‘n 3D-vorm te verstaan.

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- Om tegniese- en skaal tekeninge te ontwikkel en te verstaan.
- Om die vermoë te ontwikkel om uiters akkuraat te werk.
- Om te leer hoe om met verskillende materiale en gereedskap te werk, en
- Hierdie taak is daarop gemik om 'n hoër vlak van vaardighede, kennis en waardes te ontwikkel.

ASSESSERING:

- Die werk sal deur jou Ontwerp-onderwyser beoordeel en gemerk word op die vlak van leerderprestasie, soos in die opdrag, veral:
  - Tegniese vaardighede, akkuraatheid en netheid van maquette/modelle;
  - Akkuraatheid en netheid van tegniese tekeninge; en
  - Die suksesvolle bereiking van die doelstellings van die taak.

PUNTE SAL TOEGEKEN WORD VIR:

❖ **Kyk na die RUBRIEK aan die einde van hierdie OPDRAG;**

❖ **TEGNIESE TEKENINGE, TONAAL, BEPLANNING, IDEESSKEPPING (BRAINSTORMING), ensovoorts:**
  - Netheid;
  - Tegniese tekeninge van elke vorm volgens skaal;
  - Tegniese tekeninge en grafieke wat die posisie van alle vorms binne die finale produk aandui.

❖ **3D-KONSTRUKSIES (indien van toepassing):**
  - Kreatiwiteit;
  - Tegniese vaardighede;
  - Netheid, en
  - Suksesvolle voltooiing van die taak.

OPMERKING 2:

✓ Lees en verstaan die meegaande aantekeninge in hierdie opdrag.
✓ Begin deur aan verskillende opsies te dink.
✓ Kies die beste, mees uitvoerbare opsie.
✓ Gee hierdie vorm afmetings.
✓ Gebruik materiaal soos karton, gom, 'n staal liniaal, 'n ambagsmes en maskeerband, Perspex, metaal, of enige herwinbare materiaal ensovoorts. Sny, plak, modelleer, bou en/of monteer 3D-VORMS uit die tegniese tekeninge wat jy gemaak het.
✓ Ontwikkelings-foto's kan by die werk ingesluit word terwyl jy jou konsep ontwikkel en sluit/plak dit in jou werkboek[31] in.

Opskrifte[32] en volgorde om in jou werkboek te volg:
1. Kreatiewe voorkoms (look-and-feel).
2. Kwartaal 1, indeks, opdrag ingeplak.
3. Breinkaart/dinkskrum/gedagtes/idees (mind map) (Fase 1).
4. Breinkaart 2 (mind map) - A3 (Fase 2).
5. Intensie en rasionaal.
6. Navorsing: Collage-prente (Stemmingsbladsy).

[31] Werkboek is sinoniem met bronboek en portefeulje.
[32] **Bron:** Gauteng Department of Education PAT dokument.

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7. Navorsingsteks: Relevansie van jou skepping: Wat dra by tot jou glans-persoonlikheid ten opsigte van positiwiteit om ‘n glansvolle bydra te kan lewer tot die gala-aand. Refleksie gewy aan die geskiedenis van tipografie, Mesopotamië, Egipte, Antieke Chinese ontwerpbewegings, Internasionale/SA ontwerper/ontwerpatelje.
8. Ondersoek – navorsingteks oor jou glanspersoonlikheid, foto’s, biografie.
9. Miniatuur-tekeninge, klein-skaal tekening net idees x6 of meer.
10. Konseptuele tekeninge x3 (A5-grootte).
11. Kleurstudies x2 (A5-grootte).
12. Finale tonaal.
13. Produk.
14. Refleksie.

*** Dink mooi aan jou**
Werkboek uitlêg-en-voorkoms
vir kwartaal 1!
Wees kreatief!![33]











TYDSBEPLANNINGSSKEDULE | SPERDATUMS[34]

	**ONDERWERP 1	Proses**	**ONTWIKKELING	9 Januarie – 13 Maart 2020**[35]	**√ Leerder kontrolelys**
1.	Begin van die proses en werkboek se kreatiewe voorkoms (look-and-feel)	**Begin- en sperdatum: Donderdag 9 Januarie 2020**	
2.	Indeksbladsy, kwartaal 1 en opskrifte, opdrag geplak, ruimte (A4-spasie) vir assessering van onderwyser (Rubriek – instrument 2)	**Sperdatum: Maandag 20 Januarie 2020**	
3.	Inligting en foto’s van verskillende bronne	**Sperdatum: Maandag 10 Februarie** *Vordering van Eksplorasie (verkenning):* Vrydag 31 Januarie.	

[33] **Bron**: Internet foto’s.
[34] Ontwerp-onderwyser sal tydsbeplanningsskedule aan leerlinge verskaf of leerders sal self hulle eie skedule opstel indien die skedule van die navorser nie gebruik word nie.
[35] Openbare skole open vir kwartaal 1: Dinsdag 9 Januarie 2020.
Openbare skole sluit vir kwartaal 1 op Vrydag 13 Maart 2020 – Einde van die opdrag.

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	Breinkaarte, Intensie (Wat?), Rasionaal (Waarom?), Bewyse van navorsingsfoto's, idees, collage Navorsing: Collage & teks Klein-skaal tekeninge x6 Vordering van eksplorasie (verkenning)	Finale Sperdatum: Maandag 24 Februarie 2020	
4.	Eksperimentele/komposisionele tekeninge x2 A5-idees	**Sperdatum: Maandag 17 Februarie**	
5.	x1 Gekose komposisionele tekening uit nommer 4 hierbo – Maak daarvan Kleurstudies x2 kopieë - verskillende kleurkombinasies, tegnieke	**Sperdatum: Vrydag 21 Februarie**	
6.	Verkenning | Enige bevindings, monsters, material-stukkies, tegnieke, mediums of eksperimente aangaande	**Sperdatum: Maandag 24 Februarie**	
7.	Finale tonaaltekening (Monochromatiese tekening)	**Sperdatum: Vrydag 2 Maart**	
	ONDERWERP 2 | Produk	**ONTWIKKELING | 2 Maart – 20 Maart 2020**	**√ Leerder kontrolelys**
8.	Begin produk	Datum: Maandag 2 Maart	
9.	Finale produk	**Sperdatum: Vrydag 20 Maart**	
10.	Refleksie	**Sperdatum: Vrydag 20 Maart**	
	Ontwerp in 'n besigheidskonteks | Kwartaal 1 | Kwartaal 1 Analiseer 2 Advertensieveldtogte	**13 Januarie – 24 Februarie 2020**	**√ Leerder kontrolelys**
11.	Begin	Datum: Maandag 13 Januarie	
12.	Vordering	Datum: Maandag 3 Februarie	
13.	Finale sperdatum	**Sperdatum: Maandag 24 Februarie**	
14.	Foto's: ONDERWERP 1 & ONDERWERP 2	**Datum[36]:** April 2020: Navorser sal datums met jou Ontwerp-onderwyser bevestig wanneer foto's geneem sal word. Foto's wat geneem moet word in Kwartaal 2 sal by die modereringssentrum gedoen word.	

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GEEN LAAT INHANDIGINGS!!







** Die Ontwerp-onderwyser of leerders kan die templaat hieronder gebruik om sy/haar eie sperdatums toe te ken. Of jy kan ook jou eie uitleg/vorm van die tydsbeplanningsskedule gebruik*

[36] Foto's sal in April geneem word – Kwartaal 2 by die modereringssentrum – Datums sal bevestig word.

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wat saam met alle ander dokumente vir hierdie studie ingedien moet word. Die verwagte dokuments sal met die Ontwerp-onderwyser gekommunikeer word.

TYDSBEPLANNINGSSKEDULE | SPERDATUMS

	ONDERWERP 1 | Proses	**ONTWIKKELING | 9 Januarie – 13 Maart 2020[37]**	**√ Leerder kontrolelys**
1.	Begin van die proses en werkboek se kreatiewe voorkoms (Look-and-feel)	**Begin- & sperdatum:**	
2.	Indeksbladsy, kwartaal 1 en opskrifte, opdrag geplak, ruimte (A4-spasie) vir assessering van onderwyser (Rubriek – instrument 2)	**Sperdatum:**	
3.	Inligting en foto's van verskillende bronne Breinkaarte, Intensie (Wat?), Rasionaal (Waarom?), Bewyse van navorsingsfoto's, idees, collage Navorsing: Collage & teks Klein-skaal tekeninge x6 Vordering van eksplorasie (verkenning)	**Sperdatum:**	
4.	Eksperimentele/komposisionele tekeninge x2 A5-idees	**Sperdatum:**	
5.	x1 Gekose komposisionele tekening uit nommer 4 hierbo – Maak daarvan Kleurstudies x2 kopieë – verskillende kleurkombinasies, tegnieke	**Sperdatum:**	
6.	Verkenning | Enige bevindings, monsters, material-stukkies, tegnieke, mediums of eksperimente aangaande	**Sperdatum:**	
7.	Finale tonaaltekening (Monochromatiese tekening)	**Sperdatum:**	
	ONDERWERP 2 | Produk	**ONTWIKKELING**	**√ Leerder kontrolelys**
8.	Begin produk	Datum:	
9.	Finale produk	**Sperdatum:**	
10.	Refleksie	**Sperdatum:**	
	Ontwerp in 'n Besigheidskonteks | Kwartaal 1 | 2 Advertensieveldtogte		**√ Leerder kontrolelys**
11.	Begin	Datum:	
12.	Vordering	Datum:	
13.	Sperdatum	**Sperdatum:**	
14.	Foto's: ONDERWERP 1 & ONDERWERP 2	**Datum[38]:** April 2020: navorser sal datums met jou Ontwerp-onderwyser bevestig wanneer foto's geneem sal word. Foto's wat geneem moet word in kwartaal 2 by die modereringssentrum gedoen word.	

Bron: Anriët van Deventer

[37] Openbare skole open vir Kwartaal 1: Dinsdag 9 Januarie 2020.
Openbare skole sluit vir Kwartaal 1 op Vrydag 13 Maart 2020 – Einde van die opdrag.
[38] Foto's sal in April geneem word - Kwartaal 2 by die modereringssentrum – Datums sal bevestig word.

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APPENDIX J: Design in a business context | English and Afrikaans

Design in a Business Context | Advertising Campaigns |

Research module [10]

DESIGN | Grade 11 | TERM 1 | 2020

An **advertising campaign** is a series of **advertisement messages** that share a single idea and theme, which make up an integrated **marketing** communication.



CLAYBRiCK advertisement campaign

Analyse* **2 advertising campaigns** from print media (eg. newspapers, magazines or billboards) and/or digital media (eg. television or the internet) according to:
The headings and layout of the *Design in a Business Context* for Advertisement 1 and Advertisement 2 are as follows:

1. Introduction | Brief introduction to each advertisement (identification of need and motivation of your chosen advertisement);
2. Target market;
3. Relevant use of elements and principles of Design;
4. Style of typography;
5. Visual images;
6. Message communicated;
7. Identification of style/look and feel of the campaign;
8. Conclusion and
9. Bibliography.

*Analyse: A detailed and logical discussion (of the formal elements and principles of Art and Design).

Total: 50 marks converted to 10 marks (as per policy)

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Take note of the following when you **present your research**:

- *Prepare and present it in your file/sourcebook/workbook. Add a clear heading and follow the **layout**: Introduction, Content/Body, Conclusion and Bibliography;*
- *Include photographs of your two advertising campaigns. Make it visually appealing!*
- *6-8 pages (typed or neatly hand-written) and*
- *Research skills: observation, interviews, and data analysis,*

PS!! This is a research project which forms part of Topic 1; make sure you comply with the expectations of a successful research presentation!

DUE DATES:
Start: _____
Progress: _____
Due date: _____



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Example: The CLAYBRiCK advertising campaign's aim is to expand the market for clay brick through education, information and inspiration, 2019

Source: Internet images, CLAYBRICK.ORG.
Source: Anriët van Deventer

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Ontwerp in ‘n besigheidskonteks | Advertensieveldtogte |

Navorsingsmodule [10]

ONTWERP | Graad 11 | KWARTAAL 1 | 2020

‘n **Advertensieveldtog** is ‘n reeks **advertensieboodskappe** wat ‘n enkele idee en tema deel wat geïntegreerde **bemarkingskommunikasie** uitmaak.



#heldhaftig Super Bibi Slippers (Digter)
ATKV #heldhaftig advertensieveltog, 2018

Analiseer* **twee advertensieveldtogte** vanuit die drukkersmedia (bv. koerante, tydskrifte of reklameborde) en/of digitale media (bv. televisie of die internet na aanleiding van die opskrifte en uitleg van die *Ontwerp in besigheidskonteks* soos volg: Advertensie 1 en Advertensie 2 onderskeidelik:

1. Inleiding | ‘n Kort inleiding tot elke advertensie (identifisering en motivering van elke gekose advertensie);
2. Teikenmark;
3. Relevante gebruik van elemente en beginsels van ontwerp;
4. Styl of tipe asook die gebruik van tipografie;
5. Visuele beelde;
6. Boodskap gekommunikeer;
7. Identifisering van styl/voorkoms en gevoel van die veldtog;
8. Gevolgtrekking en
9. Bibliografie.

**Analiseer: Is ‘n gedetailleerde en logiese bespreking (van die formele ontwerpelemente en -beginsels).*

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Totaal: 50 punte omgeskakel na 10 punte (volgens beleid)
Let op die volgende wanneer jy jou navorsing aanbied:

- Berei dit voor en bied dit in u lêer/bronboek/werkboek aan. Gebruik duidelike opskrifte (sien hierbo) en volg die uitleg: Inleiding, Inhoud, Gevolgtrekking en Bibliografie;
- Sluit foto's van jou twee gekose advertensieveldtogte in. Maak dit visueel aantreklik!
- 6-8 bladsye (getik of netjies met die hand geskryf) en
- Navorsingsvaardighede: waarneming, onderhoude en data-analise.

PS!! Dit is 'n navorsingsprojek wat deel uitmaak van Taak 1; maak seker dat jy voldoen aan die verwagtinge van 'n suksesvolle navorsingsaanbieding!

SPERDATUMS:
Begin: _____
Vordering: _____
Sperdatum: _____



#heldhaftig Super Bouwer Bosch (Akteur)

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#heldhaftig Super HemelBesem (Simon Witbooi) (Kletsrymer)

Voorbeeld van die ATKV se #heldhaftig-advertensieveldtog om die dinamiese organisasie se 88ste verjaardag te vier, 2018
Die nuwe ATKV-veldtog moedig jou aan tot méér as lippetaal!

Kyk na: https://www.youtube.com/watch?v=0Y8aRHLG6Zk - #heldhaftig: Ons is Afrikaans – ons is die ATKV!

Bron: Internet Prente, https://afrikaans.com/leefstyl/afrikaans-is-heldhaftig-die-nuwe-atkv-veldtog-moedig-jou-aan-tot-meer-as-lippetaal/
Bron: Anriët van Deventer

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APPENDIX K: Rubric A | English and Afrikaans

RUBRIC A: DESIGN PRACTICAL | Hats and Headpieces | Grade 11 | Term 1, 2020

Name: ……..…..

Date: ……..……..….

School: …….

Design teacher: ……..

DESIGN PROCESS				DESIGN PRODUCTION		
TOPIC 1: SOURCEBOOK CRITERIA				**TOPIC 2: THE PRODUCT** CRITERIA		
Expression of intention and rationale	(10)			Creativity/originality/interpretation in terms of brief and solutions relevant to the brief	(10)	
Evidence of research, experimentation and reflection	(10)			Evidence of Design involvement: the appropriate use of Design elements and principles	(10)	
Evidence of detailed planning, drawing skills and presentation	(10)			Technique/craftsmanship/method	(10)	
Evidence of final drawing/collage/maquette related to the final concept	(10)			Time management	(10)	
Research (Design in a Business Context)	(10)			Professional presentation and functionality of design solution	(10)	
TOTAL	**50**			**TOTAL**	**50**	
GRAND TOTAL /100						

Source: DBE: 2018 Design guidelines for practical assessment tasks (PAT).
Source: Anriët van Deventer .
Comments by teacher:

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RUBRIEK A

ASSESSERINGSINSTRUMENT: ONTWERP PRAKTIES | ONDERWERP 1 & 2 | Hoede en Kopstukke (Hats and Headpieces) | Graad 11 | Kwartaal 1, 2020

Naam: …….

Datum: ……..……

Skool: …….

Ontwerp-onderwyser: ……..

ONTWERPPROSES				ONTWERPPRODUK		
ONDERWERP 1: WERKBOEK* KRITERIA				**ONDERWERP 2: DIE PRODUK** KRITERIA		
Uitdrukking van doel en rasionaal/grondrede/konsep	(10)			Kreatiwiteit/oorspronklikheid/interpretasie in terme van die konsep en oplossings relevant tot die opdrag	(10)	
Bewyse van navorsing, eksperimentasie en refleksie	(10)			Bewyse van ontwerpbetrokkenheid: die gepaste gebruik van ontwerpelemente en -beginsels	(10)	
Bewyse van gedetailleerde beplanning, tekenvaardighede en aanbieding	(10)			Tegniek/vakmanskap/metode	(10)	
Bewyse van finale tekening/collage/maquette	(10)			Voltooiing van werk/tydsbestuur/bewyse en volle gebruik van beskikbare tyd	(10)	
Navorsing (Ontwerp in ‘n Besigheidskonteks)	(10)			Professionele aanbieding en funksionaliteit van die ontwerpoplossing	(10)	
TOTAAL	**50**			**TOTAAL**	**50**	
GEKOMBINEERDE TOTAAL /100						

Bron: DBE: 2018 Ontwerpriglyne vir praktiese assesseringstake (PAT)
*Bronboek/portefeulje

Opmerkings deur onderwyser:

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APPENDIX L: Rubric B

RUBRIC B

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

"A History of Typography | HATS and HEADPIECES"

Grade 11 Design Practical | Term 1 | Due date - Tuesday, 31 September 2020

Teacher Comments:

Name & Surname: .....

School: .....

Design teacher: .....

Grade 11

	TOPIC 1: PROCESS | DEVELOPMENT | 09 January 2020 – 31 March 2020		Marks		Due Date 1st	2nd	3rd
1.	Term 1, Index, brief, mind map, Look & Feel (/5)	Presentation on one page	(5)				
2.	A3 Rationale, Intention (/5 each)	Interesting Layout & good discussion	(10)				
3.	A3 Evidence of experimentation and research (photographs): Collage & Text (/10) And Evidence of generative ideas (for example thumb-nail sketches) x6 Sketches (/5)	Interesting and complete Typography – reflection of history, Mesopotamia, Egyptian, Ancient Chinese, Design Movements, International/SA designer/Design Studio	(10) (5)				
4.	Exploration – Research on celebrity, photographs, biography, other images	Evidence of experimentation, materials and media, other	(5) (5)				
5.	X3 A5 Inspiration and Evidence of developmental concepts (/5) & Drawing Skills (/5)	Interesting and complete + theme typography clearly developed with a golden thread	(5)				
6.	X2 Colour studies (/5)	Show colour studies	(5)				
7.	Final presentation: Final Drawing - Tonal Value / Collage / Maquette (/5) Drawing Skills (/5)	Effective drawing techniques and use of tonal value	(5) (5)				
		TOTAL	**60**		**Converted to 40**		

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RESEARCH | Design in a Business Context | Present your Design | Tuesday, 17 March 2020			Marks		Due Date 1st	2nd	3rd
1.	Introduction	Identification of need, motivation of concept choice	(5)				
2.	Visual image/s	Applicable visual images to support the research	(5)				
3.	Target market	Ability to identify	(5)				
4.	Body	Ability to execute the brief	(5)				
5.	Content layout as prescribed	Ability to follow instructions	(5)				
6.	Final evaluation and success of product	Ability to analyse	(5)				
7.	Conclusion	Ability to summarise	(5)				
8.	Bibliography	Correct method used	(5)				
9.	Presentation	Neatness, creativity, originality, presentation, cover page	(10)				
		TOTAL	**50**		**Converted to 10 TOPIC 1 TOTAL /50**		
TOPIC 2: PRODUCT | FINAL DESIGN | 20 February 2020- 20 March 2020			**Marks**		**Due Date 1st**	**2nd**	**3rd**
1.	Art Elements and Design Principles (/5)	Use of design elements and principles	(5)				
2.	Techniques, relevant art material (/10)	Appropriate techniques and material used	(10)				
3.	Effort and instruction- Theme and details of Brief(/5)	Clear effort learner on project, ability to follow instructions	(5)				
4.	Celebrity	Relevance of creation – male/female, complement the celebrity + enhance the feeling of Gala and Glamour for the event	(10)				
5.	Creativity and originality in terms of the concept and solution(s) (/10)	Did the learner think out of the box	(10)				
6.	Time management/completion of work/evidence of full utilization of time (/10)	Task completed timeously	(10)				
7.	Neatness (/5)	Final design was kept clean and neat	(5)				
8.	Reflection (/5)	Effective evaluation of own product (Topic 2)	(5)				
9.	Finish – Professional presentation and functionality (/10)	The overall presentation of the work	(10)				
60% completed in class Yes | No		**TOTAL**	**70**		**Converted to 50 TOPIC 2 TOTAL /50**		
		TOTAL	**180**		**Converted to 100 TOPIC 1 + TOPIC 2**		
		GRAND TOTAL /100					

Source: Anriët van Deventer

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APPENDIX M: Interview guide for Design teachers

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

INTERVIEW GUIDE FOR DESIGN TEACHERS

Name of the researcher: Anriët van Deventer

- **Title of the research:** "Teacher engagement with the Design process: policies, problems and visions".
- **Purpose of the study**: Gain an in-depth understanding of the current efficiency in the methods used to teach Design practice in the FET phase, Grade 11 whereafter proposals will be suggested upon the findings of the research. Reference will be given to products produced in Term 1 of 2020.
- **Final | Topic 1 & Topic 2**: Design products of learners will be photographed and identified by participant codes in the research.

Design teacher 1
Date of the interview:
Place of the interview: Premises of participating school 1 and this interview is recorded

I would like to thank you for taking the time to meet with me today. My name is Anriët van Deventer and I would like to talk to you about your experiences of teaching Design Practical FET, Grade 11. This interview will be conducted in English.

Specifically, I would like to gain an understanding of the nature of your approach to teaching a Design Practical, both Topic 1, the Design Process and Topic 2, the Design Product. The interview should take between 60 to 90 minutes depending on the length of your answers. This is a recorded session, which will ease the task of transcribing the content accurately. Since we are being recorded, please try to speak up so that we do not miss your comments.

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All responses will be kept confidential. This means that your interview responses can only be shared with the research team members and we will ensure that any information included in our report does not identify you as the respondent. Please relax and answer as honestly and thoughtfully as possible. Remember, you do not have to talk about anything you do not want to and may end the interview at any time.

Do you have any questions about what I have just explained? Yes or No?

Are you still willing to participate in this interview? Yes or No?

Name of your school: ……

Your name and surname: ……...

The grade levels you teach: ……..…

Your highest level of education attained……

What is your work experience in teaching Design in high schools: ……..…

……..…

……..…

What is your gender: ……..

What is your age: ……....

The total number of Grade 11 Design learners you teach in Term 1 of 2020:……

Your contact details, please give an e-mail address: ……

The start time of this interview is:……

Duration of Interview: ……..……

End time:……

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INTERVIEW		OBSERVATIONS / COMMENTS			
1	1. Kindly tell me about **yourself and your teaching involvement in high schools**. 2. Indicate the **number of different schools** where you have taught. 3. Which other **subjects** have you taught, or do you teach?				
2	1. What are your **qualifications**? Name all of them. 2. Where did you study? 3. When did you complete your studies?				
3	Give a **summative description** of your school.				
4	Share your thoughts about the **general background** of learners in your school.				
5	What is the nature of **discipline** in your school?				
6	How do you interpret **quality** teaching and learning?				
7	Some **super skills,** namely collaboration, creativity, critical thinking and communication, have been identified for the 21st century. How do you think learners can acquire the necessary skills to equip themselves for the demanding modern working world?				
9	What are some of the **factors** that influence the quality of teaching and learning in your high school?				
10	Give your **definition of Design** and what it **entails**.				
11	How **long** have you been teaching FET Design education?				
12	In your opinion what influence does **your field of interest, knowledge or expertise have** in your approach in teaching Design practical?				
13	Would you say your approach is more **product-driven as opposed to a problem-solving process**? Explain.				
14	In your opinion, how much **freedom** do you allow learners to experiment with the problem contained in the Design brief? By freedom, I mean letting learners explore as much as they can. Indicate None, Minimal or A lot. Elaborate on your answer.	**None**	**Mini-mal**	**A lot**	
15	You have implemented the Design brief supplied by me as part of this study. 1. Are there any **difficulties you** have experience in the implementation process? Yes or No? Explain. 2. Have any of the **learners** experienced any difficulties thus far? Yes or No? Explain. 3. How were the difficulties mentioned **solved**?				
16	1. **Have you used my Design brief supplied, as is?** Yes or No? 2. Have you **added anything** to it? Yes or No? **If Yes**, What did you add? Explain.				
17	1. **Have you used my standard rubric supplied, as is?** Yes or No? 2. Have you **added anything** to it? 3. What did you leave out or added? Explain.				
18	Have you used **your own rubric that you have created?** Yes or No? Please **tell me more** about your rubric.				
19	What is your **confidence level** in teaching Design practice? On a scale of 1 to 4: 1 is not knowledgeable at all and 4 is very knowledgeable. Please indicate 1, 2, 3 or 4.	**1**	**2**	**3**	**4**

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20	In teaching and learning, what are the **current challenges you face,** as a Design teacher?				
21	Define your **practical approach** and the way you apply it to the classroom.				
22	Share your thoughts on factors that greatly affect **learners' motivation and performance** in Design in high school.				
23	Describe your school's Design learners' **parent-engagement**.				
24	1. Tell me in **general about the availability and quality of resources** in your school. 2. Then **specifically for the Design class**.				
25	What do you think must be done to **further promote the teaching quality of Design** in high schools?				
26	How would you rate your **knowledge** of CAPS Design? On a scale of 1 to 4: 1 is not knowledgeable at all and 4 is very knowledgeable. Please indicate 1, 2, 3 or 4.	**1**	**2**	**3**	**4**
27	In your opinion, are there **any problems** in the current CAPS Design, Grade 11 document? Yes or No? 1. **If Yes**, please mention all the problems with the document. 2. Propose solutions (ways to improve CAPS) for the problems mentioned.				
28	Highlight the **strong points** of CAPS Design.				
29	How would you rate your **knowledge** of the Design PAT document? On a scale of 1 to 4: 1 is not knowledgeable at all and 4 is very knowledgeable. Please indicate 1, 2, 3 or 4.	**1**	**2**	**3**	**4**
30	Describe your understanding/knowledge of **Bloom's taxonomy**.				
31	Describe your understanding/knowledge of **William's taxonomy**.				
32	Name and describe **any other educational teaching and learning theory** you are a follower of and use effectively in your teaching.				
33	**Explain** what is **problem-solving** in Design.				
34	Do you know what **Design Thinking** is? Explain.				
35	Do you know what **Designerly Thinking** is? Explain.				
36	1. **Define** the design process. 2. Name the different **phases or steps** you are familiar with? Yes or No? Explain. *[Emphasise, Define, Ideate, Prototype, Test, [Implement/Launch]*				
37	Is a design-process focus in Design education **important** for you? Explain.				
38	**How** do you **interpret** the design process?				
39	**Why** do you **interpret** the design process the way you do? Are there certain specific factors you consider? Explain.				

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40	**How** does your **interpretation influence** your teaching of the design process?	
41	In your opinion, is the design process **a linear or iterative process**? Explain.	
42	Do you make the design process more **simplified** and understandable for learners? Yes or No **If no** – Why not? **If yes** – How?	
43	What **coping strategies** do you have if **insufficient knowledge and lack of preparation** by learners are observed in the process phase? Please elaborate as much as you can.	
44	It is a vision in South African education to have *Design Thinking* – the *design thinking process* in the curriculum – starting from grade R right through to Grade 12, to be applied to all subjects. In your opinion what should be taken into **consideration**, what **changes** should be applied to make the design process – **Design Thinking more accessible, simplified and understandable for both Design teachers, other teachers and learners**.	
45	If I may refer to *De Bono's Six Thinking Hats Theory* for example where **hats and colour are used as symbols as a vehicle to guide the thinking process,** please answer the following questions: 1. Describe how you visualise **"a new"** CAPS design process model. 2. Which **Symbols** should or could be used, if any? 3. Which **Colours** should or could be used? 4. **Anything else** of importance to be noted in creating "a new" CAPS design process model for education?	
46	Are you familiar with the **GDE teaching Design CD tool**? Yes or No?	
47	Do you **use** the CD? Yes or No? Explain.	
48	Give **feedback** on the use of the CD.	
49	Do you make use of **textbook/s to teach Design practical?** Explain.	
50	**Name** the textbook/s that you use.	
51	Give **feedback on the use** of the textbook/s.	
52	What **other resource material** do you use to teach **Design practical?** Explain.	
53	Is there **anything else** you would like to add to be included in **my final report?**	
54	Do you have **any other questions** for me?	
55	**This marks the end of our interview. I thank you for your time, contribution and participation.**	

Source: Anriët van Deventer

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APPENDIX N: Consent form | Principals

Department of Humanities Education
Faculty of Education
University of Pretoria
Pretoria 0001
2019/11/01

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

THE PRINCIPAL

Dear Sir/Madam

CONSENT FORM – SECONDARY HIGH SCHOOL

My name is Anriët van Deventer and I am currently enrolled for my PhD (Humanities Education) at the University of Pretoria. I would like to invite your school to participate in my study aimed at gaining understanding in the current approach in teaching and learning of Design practical in the FET phase. I also aim at capturing elements that can be used in developing a uniquely South Africa *Design thinking* framework for facilitating learners' learning in Design practical. The focus will be on the Design teacher with specific reference to his/her interpretation of the design process.

We, the undersigned, hereby agree that the study, as specified below, will be conducted by Anriët van Deventer in the manner as explained and agreed below:

- **Title of the research:** "Teacher engagement with the Design process: policies, problems and visions".
- **Purpose of the study:** Gain an in-depth understanding of the current efficiency in the methods used to teach Design Practice in the FET phase whereafter proposals will be suggested upon the findings of the research. Reference will be given to products produced in Term 1 of 2020.
- **Term 1 of 2020:** Grade 11 Design learners' sourcebooks and your Design teacher will be involved in this study.
- **Design teacher**: The Design teacher will be required to conduct a 60-90 minutes interview after school hours at a convenient time that suit both of us in the Design class or office. An audio recording will be made as part of data collection for this study. Term 1 PAT package will be supplied in November 2019 to the Design teacher: these

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consist of a CAPS' aligned Design brief, Design in a Business context (DBC) and Rubric A for assessment of the task. The Design teacher will select six learners whose work will be photographed at the end of Term 1; yet the whole Grade 11 Design class will be doing the same PAT for the Term. The Design teacher exclusively evaluates the learners' Term mark.

- **Final | Topic 1 & Topic 2**: Design products of learners will be photographed and identified by participant codes in the research.

Detailed activities to be performed:

- Gathering data on the nature of the teaching of Design practical in the FET phase. How do teachers interpret the design process?
- Conducting document analysis, interviews and learners' Design products – digital photographs **(sourcebooks only)** with the selected school Design teachers on:
    - How can teachers be directed into the DTF as a basis to teach Design practical?
    - How can the teacher allow the learner to experiment more, to explore various problem-solving ideas in a holistic learning environment and development of skills in the learner?
    - How to assist both learners and teachers to develop and grow design solutions (which form part of the problem-solving process of design practical) to no longer produce just aesthetical as final products but rather a thought-through design product with relevance.
    - How to incorporate more critical and creative thinking processes into the problem-solving process.
    - How can the demographics (qualifications, experience and expertise in a specific field) of a Design teacher have an inextricable impact on the final product?

To be completed by the individual/person duly **authorised** to sign:

Name of the institution:……

Name of the individual:……

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Job title:……

Do you grant full consent for the study to be conducted?	Tick your answer:			
	Yes		No	

1. The undersigned parties further agree that no compensation will be payable and that all research-associated cost will be covered by the researcher.
2. The undersigned parties acknowledge that participation in this research is through purposive selection but the participant may choose to withdraw at any stage.
3. The undersigned parties understand that anonymity will be respected and that no names of participants and schools will be revealed.
4. The undersigned parties further agree that no material of any kind, including data and research findings, obtained or resulting from the study, would be passed on to any third party or used for any purpose other than that specified in this form, except with the written consent from the University of Pretoria.

…….
Signature of Principal of School SHOOL STAMP

Name: …….....

Date: …….

Please supply the Design teacher's name and contact detail.

Name & surname: ……..

Cell phone number: ……

Email address: ……

A Van Deventer
Researcher
Date: 2019/11/01

Dr R Steyn
Supervisor
Date: 2019/11/01

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Name of Student	Ms Anriët van Deventer		Name of Supervisor	Dr Raïta Steyn
Student number	96 254 590			
Contact number	076 9988 153		Contact number	012 420 4257
E-mail address	designthink50@gmail.com		E-mail address	raita.steyn@up.ac.za

Source: Anriët van Deventer

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APPENDIX O: Informed consent form | Participant Design teacher



Faculty of Education

Department of Humanities Education

Faculty of Education
University of Pretoria
Pretoria 0001
2019/11/10

INDIVIDUAL CONSENT FORM

THE DESIGN TEACHER

Dear Sir/Madam

CONSENT FORM – DESIGN TEACHER SECONDARY SCHOOL

My name is Anriët van Deventer and I am currently enrolled for my PhD (Humanities Education) at the University of Pretoria. I would like to invite you to participate in a study aimed at gaining an understanding of the current approach in teaching and learning of Design practical in the FET phase. I also aim at capturing elements that can be used in developing a uniquely South African *Design thinking* framework for facilitating learners' learning in Design practical. Your Principal, as well as the Gauteng Department of Education, have given permission to conduct this study.

This letter aims to explain my study for you to make an informed decision whether to participate or not.

- **Title of the research:** "Teacher engagement with the Design process: policies, problems and visions".
- **Purpose of the study**: Gain an in-depth understanding of the current efficiency in the methods used to teach Design Practice in the FET phase: Grade 11 whereafter proposals will be suggested upon the findings of the research. Reference will be given to products produced in Term 1 of 2020.
- **Final | Topic 1 & Topic 2**: Design products of learners will be photographed and identified by participant codes in the research.

Participation in this research project will involve the following:

- In the first phase of the research, you will receive a standardised PAT package inclusive of a CAPS-aligned Design brief, DBC and Rubric A in November 2019 to implement in

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Term 1 of 2020. This PAT must be completed in Term 1 of 2020 as normal with the whole Grade 11 Design class.

- You will select six learners based on their Grade 10 Design marks: two high-, two middle- and two low performing learners. Please do the selection without bias, motivate their participation as highly valued and appreciated in this study. Refer to them as Learner 1, Learner 2, Learner 3 etcetera. – (they need not know they fall in any of the categories).
- Continue with your Design practical methodology and teaching as usual. You have the freedom to apply this Design brief to your CAPS knowledge and interpretation thereof.
- You will also receive Rubric A: A CAPS standardised assessment tool. After the completion of this PAT you will assess your learners' work as this will be their Term 1 mark. The Design teacher (you) exclusively evaluates the learners' Term mark. If you use your own rubric please continue to do so, but please let me have a copy of your final assessment tool (rubric) and also complete Rubric A that was supplied.
- Phase 2: You are requested to participate in a one-to-one interview with me during which your thoughts about teaching Design practical in high schools will be explored. The interview will be recorded so as to ensure accurate recording of your views and opinions to ensure that no information is lost. For your convenience, the interview will be conducted online with Zoom, scheduled at a convenient time after school. The interview will be conducted during February 2020: the date and time will be confirmed.
- More detail regarding Zoom will be communicated with you in February.
- The third and final phase, providing data on the nature of Topic 1 – Design Process and Topic 2 – Design Product digital photographs will be taken of the learners' sourcebooks. No learners will be present or involved in this phase. This will take place during April 2020 probably at the moderation centre. But I will keep you posted in this regard.
- Your participation in this study is voluntary without any compensation. Learners, as well as parents, need to sign the consent forms, which will grant me permission to take digital photographs of their finale Design work for Term 1. I will appreciate your assistance in Learners' and Parents' Consent Forms collection.
- If possible, please return all signed Consent Forms *before the school closes for Term 4 of 2019*: Design teacher, Parent and Learner consent forms.
- The fourth and final phase: During April 2020, I would need Rubric A (a copy), and your own Rubric (copy), if applicable and the six learners' sourcebooks for digital photographs to be taken. Participant codes will be used.
- Your contribution is of great value to my study! Thank you for your participation.

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Participation in an in-depth semi-structured interview on:

- How can teachers be directed into the design process as a basis to teach Design practical?
- How can the teacher allow the learner to experiment more, to explore various problem-solving ideas in a holistic learning environment and develop learners' skills?
- How to assist both learners and teachers to develop and grow design solutions (which form part of the problem-solving process of design practical) to no longer produce just aesthetical as final products but rather a thought-through design product with relevance.
- How to incorporate more critical and creative thinking processes into the problem-solving process.
- How can the demographics (qualifications, experience and expertise in a specific field) of a Design teacher have an inextricably impact on the final product?
- What are the current Design Education teaching approaches employed in schools?
- Various questions regarding teaching and learning in the broader sense will be put to you. Hereafter, questions will be related to your current teaching methodology and approaches in the Design class.
- Design education specific questions will conclude the interview.

The research results will be used in the composition of a PhD, in partial fulfilment of the academic criteria for the PhD (Humanities Education) at the University of Pretoria. The results of this study will as such become public domain for the scrutiny of examiners and the academic community.

Please note the following:

- The interview will be recorded by means of an online platform, Zoom and verbatim transcriptions of the conversations will be typed, analysed and quoted in the final thesis. Prior to processing the data, I will send you a copy of your typed interview and afford you the opportunity to review it, if you choose to.
- Your identity will be protected and your privacy respected. Participant codes will be used.
- Your responses in the interview will be treated confidentially.
- No compensation will be due for participation.
- Participation in the study is voluntary and you are allowed to withdraw from the research at any time.

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DECLARATION (To be completed by you)

Having read the above request for consent, I declare that I am fully aware of the nature and purpose of the study conducted by Anriët van Deventer and I consent to take part in the research project. I also consent to the publication of the research findings, subject to anonymity and confidentiality.

……..

Signature of Design Teacher SCHOOL STAMP

Name: ……

Date:……

A Van Deventer
Researcher
Date: 2019/11/10

Dr R Steyn
Supervisor
Date: 2019/11/10

Name of Student	Ms Anriët van Deventer		**Name of Supervisor**	Dr Raïta Steyn
Student number	96 254 590			
Contact number	076 9988 153		**Contact number**	012 420 4257
E-mail address	designthink50@gmail.com		**E-mail address**	raita.steyn@up.ac.za

Source: Anriët van Deventer

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APPENDIX P: Consent form | Individual Design learner

Department of Humanities Education
Faculty of Education
University of Pretoria
Pretoria 0001
2019/11/15

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

NAME OF SCHOOL
DESIGN LEARNER

Dear Learner,

CONSENT FORM – NAME OF SCHOOL

My name is Anriët van Deventer and I am currently enrolled for my PhD (Humanities Education) at the University of Pretoria. I would like to invite you to participate in a study aimed at gaining an understanding of the current approach in teaching and learning of Design practical in the FET phase. I also aim at capturing elements that can be used in developing a uniquely South African *Design thinking* framework for facilitating learners' learning in Design practical.

This letter aims to explain my study for you to make an informed decision whether to participate or not.

- **Title of the research:** "Teacher engagement with the Design process: policies, problems and visions".
- **Purpose of the study**: Gain an in-depth understanding of the current efficiency in the methods used to teach Design Practice in the FET phase, Grade 11 whereafter proposals will be suggested upon the findings of the research. Reference will be provided to products produced in Term 1 of 2020.
- **Final | Topic 1 & Topic 2**: Learner Design products will be photographed and identified by participant codes in the research.

Participation in this research project will involve the following:

- In the **first phase**, you will receive a standardised Design brief, Design in a business context (DBC) to complete in *Term 1 of 2020*. The Grade 11 Design class will receive the same Design brief and DBC. Phase 2 will apply to you in terms of your Design product/s and sourcebook **only**.

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- **Phase 2**: Digital photographs will be taken of your sourcebook: Topic 1 – Design Process and Topic 2 – Design Product.
- For ethical reasons your name will not be mentioned anywhere and no photographs will be taken of you in person.
- Your Design work will also only be identified with a participant codes in this study.
- An article may also be published based on the findings of this study.
- The final study and findings will be available from the University of Pretoria Library.

The research results will be used in the composition of a PhD, in fulfilment of the academic criteria for the PhD (Humanities Education) at the University of Pretoria. The results of this study will as such become public domain for the scrutiny of examiners and the academic community.

Please note the following:

- Your identity will be protected and your privacy respected. A participant codes will be used.
- The images taken from your sourcebook will be treated confidentially.
- Participation in the study is voluntary and you are allowed to withdraw from the research at any time.
- No compensation will be given for participation.

Please return the declaration below to your Design teacher by 30 November 2019.

DECLARATION – LEARNER 2

If you are willing to participate by having your Design products: Topic 1 – Design Process and Topic 2 – Design Product, digitally photographed for the purpose of this study, please sign this letter as a declaration of your consent. The anonymity of any participants will be respected and their identity will not be revealed in any reports, the final thesis, research articles or papers.

Herewith I, _____ (learner name & surname), grant Anriët van Deventer permission to take photographs of my Design sourcebook relating to Term 1 of 2020 Design brief: Topic 1 – Design Process and Topic 2 – Design Product only.

Name of the high school: _____

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Name & surname of learner: _____

Signature of learner: _____

Date: _____

Yours sincerely

A Van Deventer
Researcher

Name of Student	Ms Anriët van Deventer		**Name of Supervisor**	Dr Raïta Steyn
Student number	96 254 590			
Contact number	076 9988 153		**Contact number**	012 420 4257
E-mail address	designthink50@gmail.com		**E-mail address**	raita.steyn@up.ac.za

A Van Deventer
Researcher
Date: 2019/11/15

Dr R Steyn
Supervisor
Date: 2019/11/15

Source: Anriët van Deventer

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APPENDIX Q: Consent form | Parent of Design learner

Name of School Parent 1 – Learner 1

Department of Humanities
Education
Faculty of Education
University of Pretoria
Pretoria 0001
2019/11/15



Faculty of Education

Dear Parent/Guardian,

PARENT/GUARDIAN CONSENT FORM

My name is Anriët van Deventer currently enrolled to complete a PhD (Humanities Education) at the University of Pretoria. The Principal of Secondary High School has granted me permission to do my research at this school. With this letter I would like to request your permission for photographing your child's Design work in the sourcebook. Participation in my study aimed at gaining understanding in the current approach in teaching and learning of Design practical in the FET phase, Grade 11. I also aim at capturing elements that can be used in developing a uniquely South African *Design thinking* framework for facilitating learners' learning in Design practical.

The focus will be on the Design teacher with specific reference to his/her interpretation of the design process. For my study, I need six Grade 11 learners' sourcebooks that can assist me with information about teaching and learning of Design Practical FET Phase. Your child's sourcebook has been chosen as part of my data collection for this study. After completion of the practical task for Term 1 of 2020, ONLY the sourcebook: Topic 1 – Design Process and Topic 2 – Design Products will be photographed to be used for analysis and supportive data in the thesis. Your child's Design work will not be identified in any way but reference will be made using participant codes. No photographs of the child will be taken. Photographs of the sourcebook and product will be taken in Term 2, April 2020 at the moderation centre.

The photographs obtained from this study will be treated with the strictest confidentiality possible, and it will be used for research purpose only. The research findings might be published in an accredited journal, but confidentiality and anonymity will be honoured. No reference will be made to any information that may convey any personal or identifiable information. Your child's name

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will not be revealed. For ethical reasons, I will make use of participant codes in this research. There will be no compensation for participation in this study.

The Design brief, DBC and Rubric used in this study are CAPS prepared and aligned. Your child's Design teacher will assess the PAT Design brief for Term 1 (as supplied for this study) as his/her Term 1 mark. Please support your child to approach his participation in eagerness and enthusiasm. I look forward to the end results!

You are free to ask me any questions regarding this study at any time. You can contact me on 076 9988 153. Please note that your child's participation is voluntary and that he/she may withdraw from the study at any time.

Let me know if you need more information. Thank you in advance for your cooperation in this project. I would appreciate if you could complete the attached permission slip and return it to the Design teacher.

Neem asseblief kennis dat u kind sy/haar: 1. Ontwerp-Opdrag, Graad 11, kwartaal 1 en 2. Ontwerp in 'n Besigheidskonteks in **Afrikaans** sal ontvang.

Please return the Declaration below to the Design teacher by 30 November 2019.

DECLARATION – NAME OF SCHOOL PARENT 1 (Learner 1)

If you are willing to allow your child's Design product/s and sourcebook to be digitally photographed for the purpose of my study, please sign this letter as a declaration of your consent. The anonymity of any participants will be respected and their identity will not be revealed in any reports, the final thesis, research articles or papers.

Herewith I, _____ (name & surname), grant Anriët van Deventer permission to take photographs of my child's Design sourcebook relating to Term 1 of 2020 Design brief: Topic 1 – Design Process and Topic 2 – Design Product only.

Name of the high school: _____

Name & surname of the child: _____

Parent's name & surname: _____

Signature of the parent or guardian: _____

Date: _____

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Yours sincerely

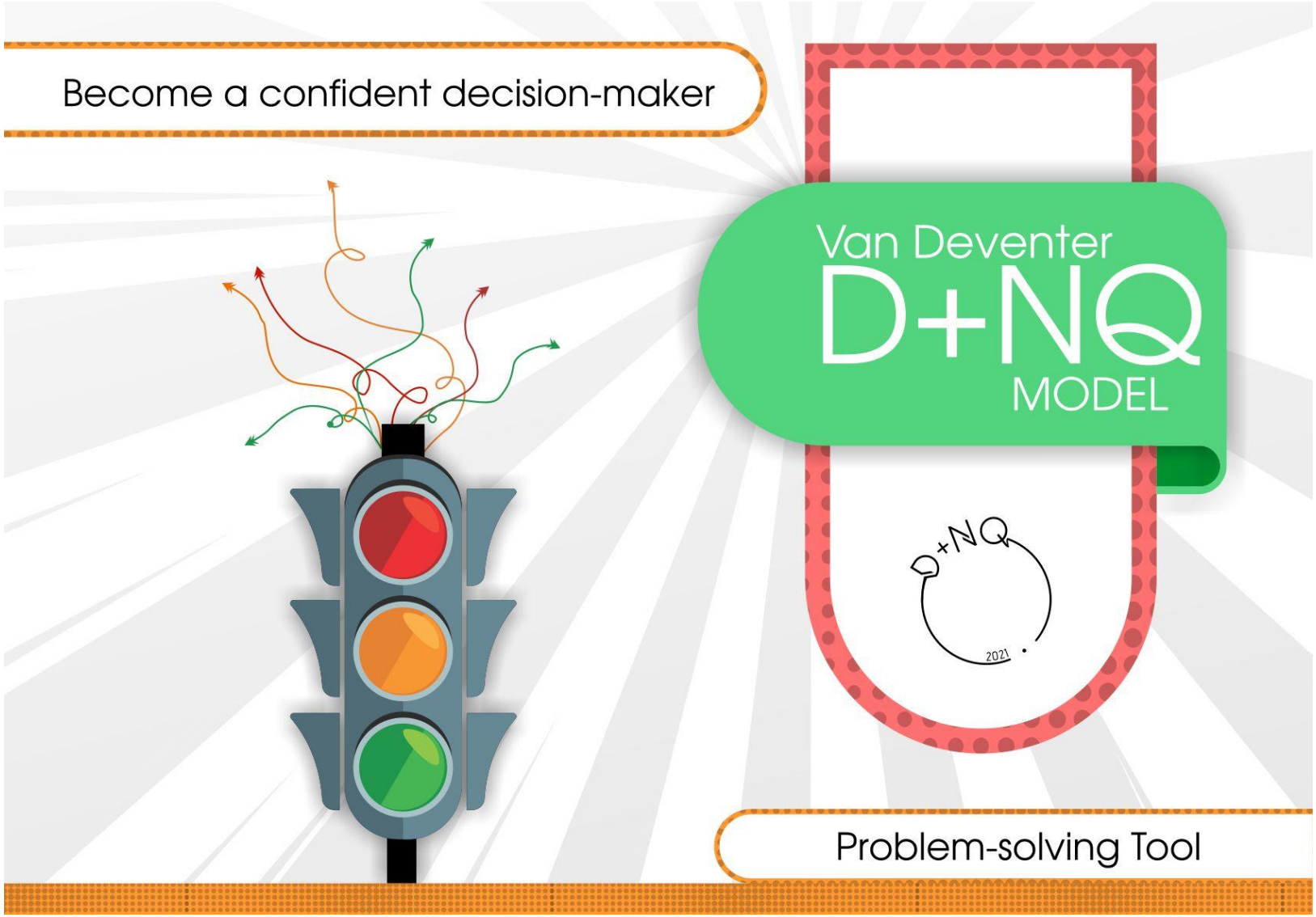
A Van Deventer
Researcher

Name of Student	Ms Anriët van Deventer		**Name of Supervisor**	Dr Raïta Steyn
Student number	96 254 590			
Contact number	076 9988 153		**Contact number**	012 420 4257
E-mail address	designthink50@gmail.com		**E-mail address**	raita.steyn@up.ac.za

Source: Anriët van Deventer

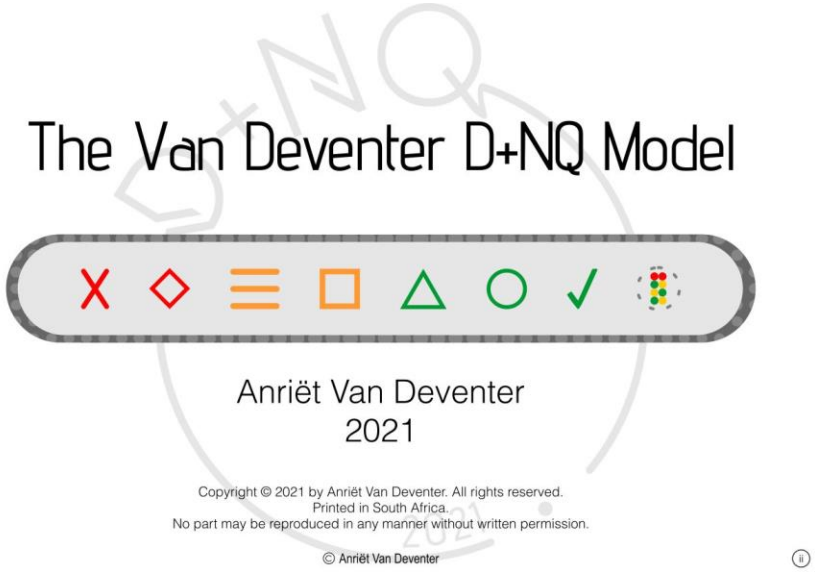
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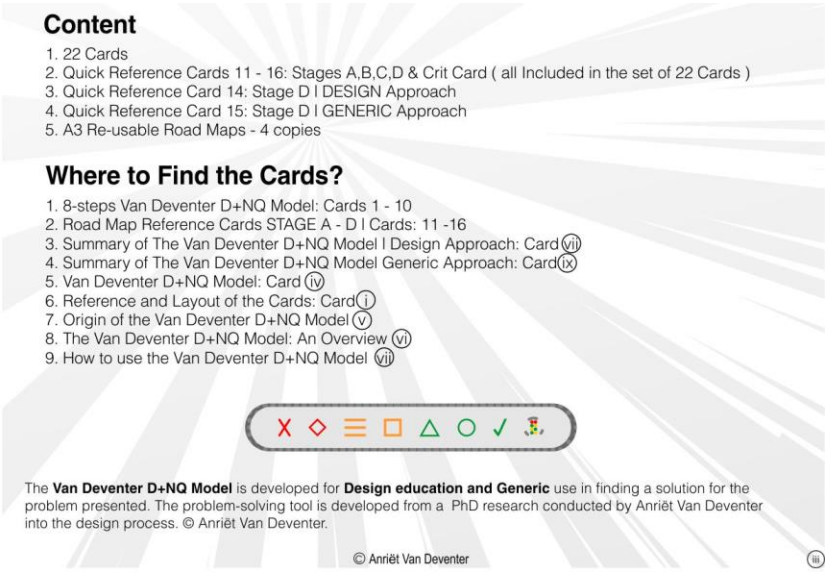
APPENDIX R: Card layout of the Van Deventer D+NQ Model

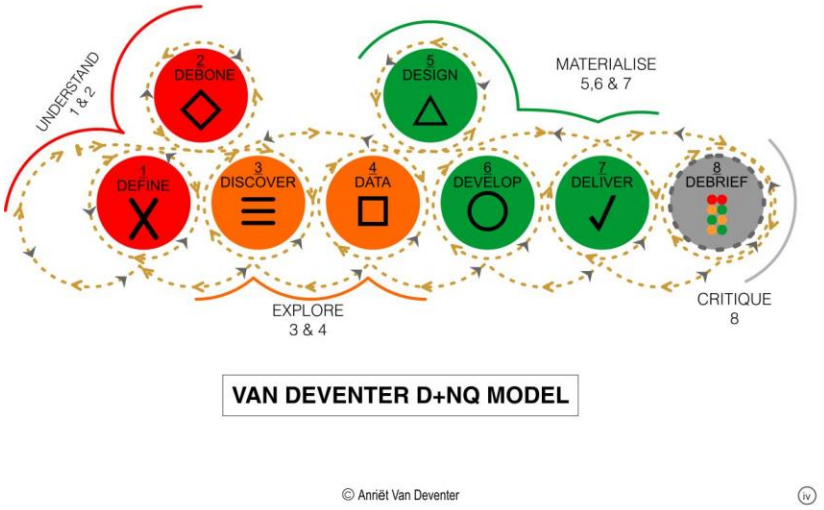


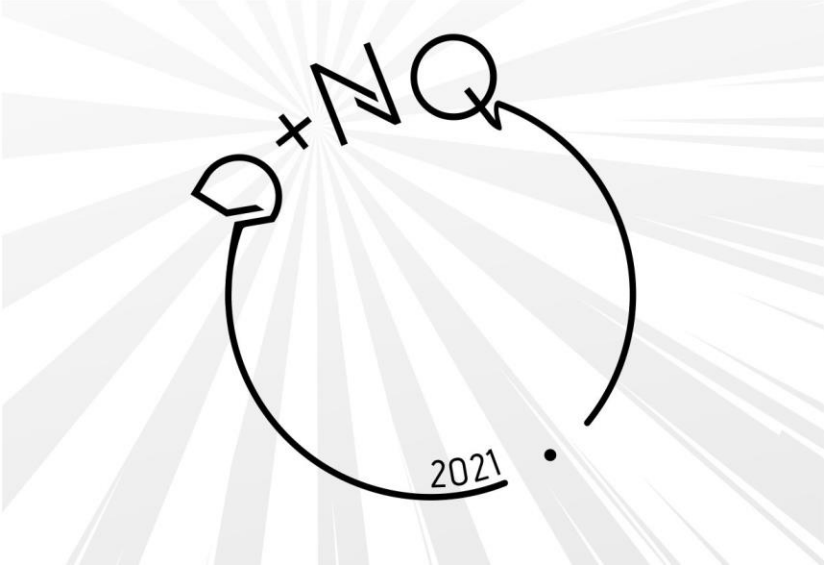
Source: Anriët van Deventer

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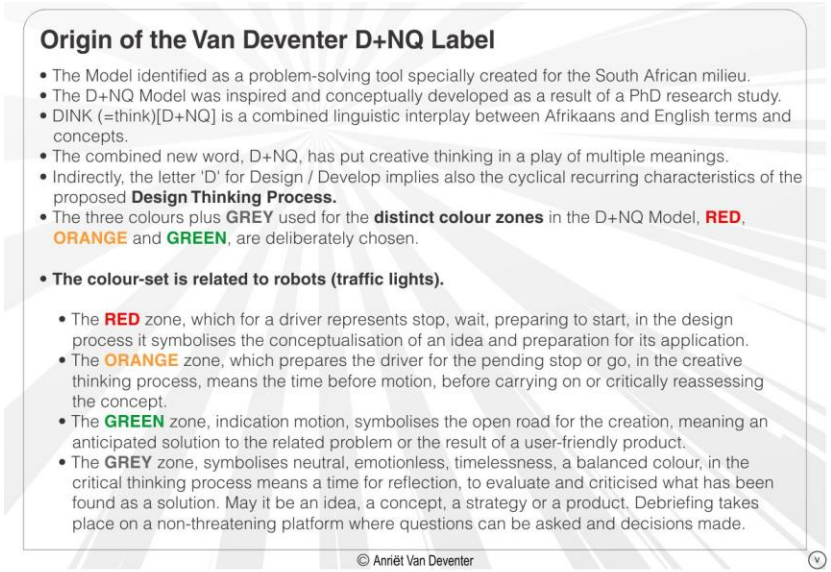


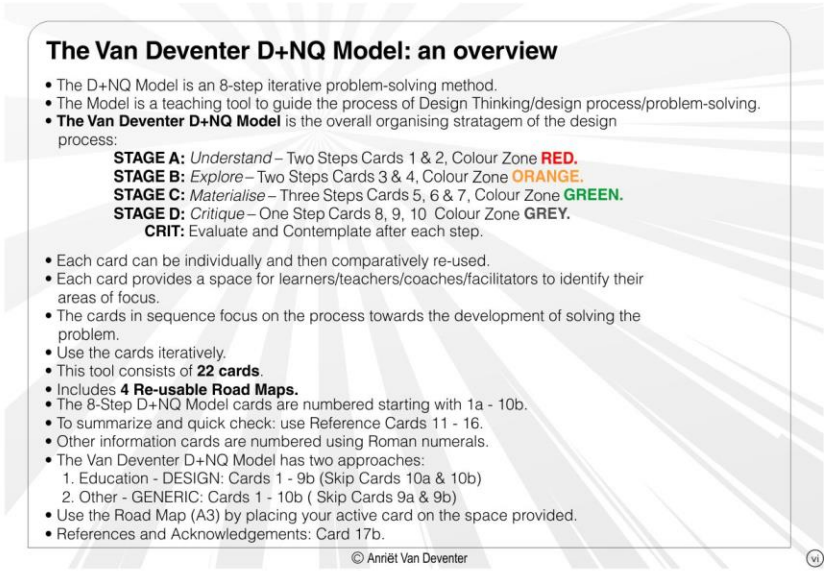


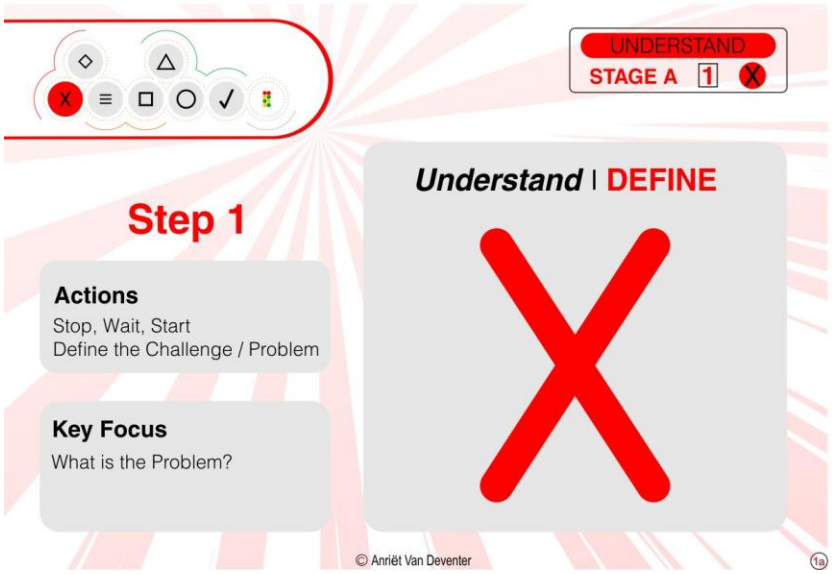


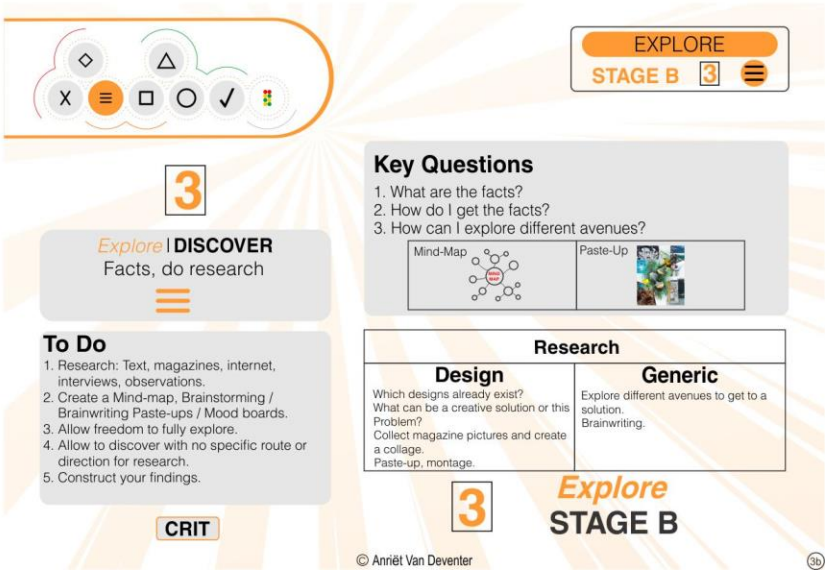
Source: Anriët van Deventer

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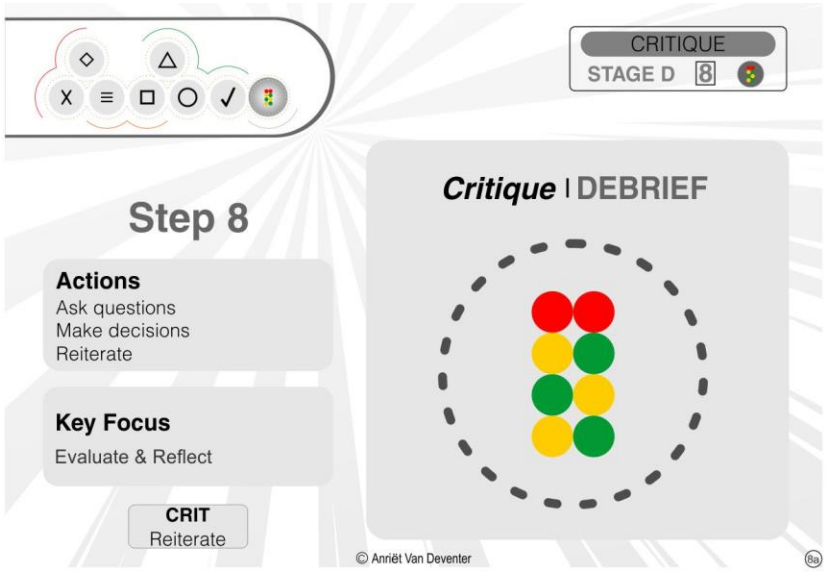


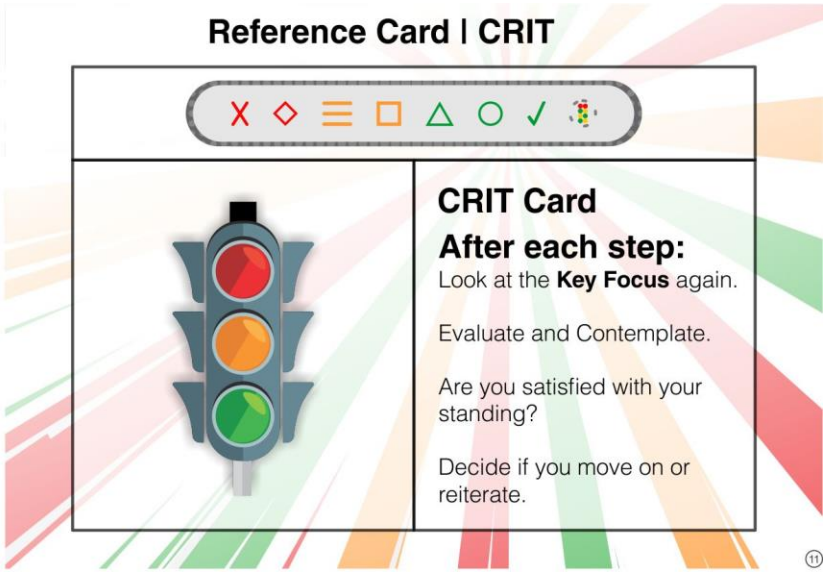


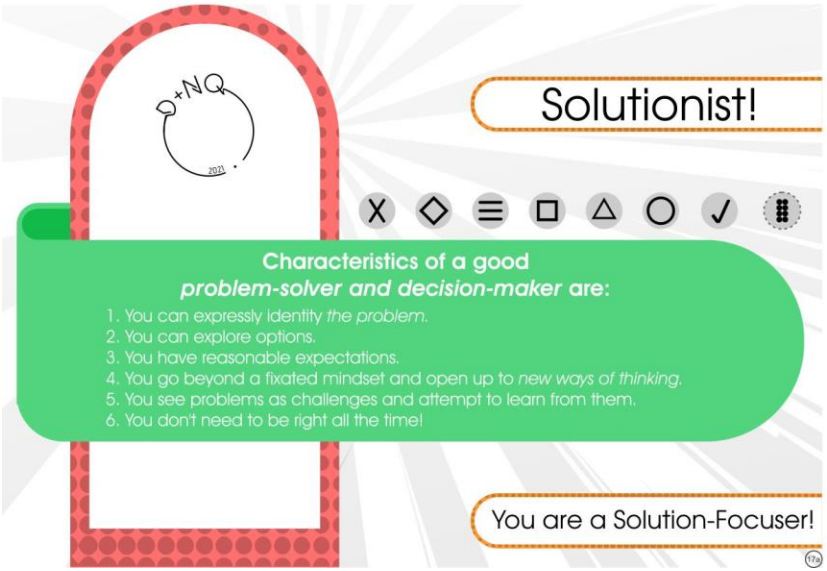


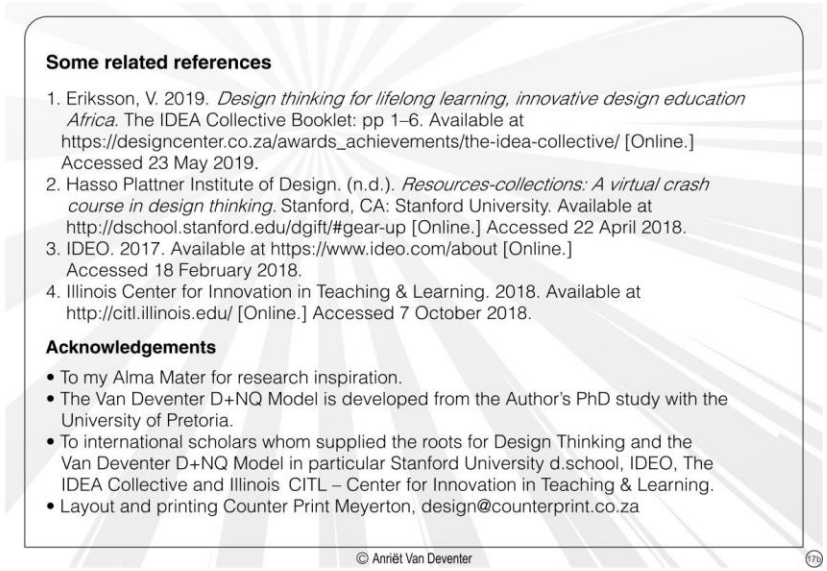
Source: Anriët van Deventer

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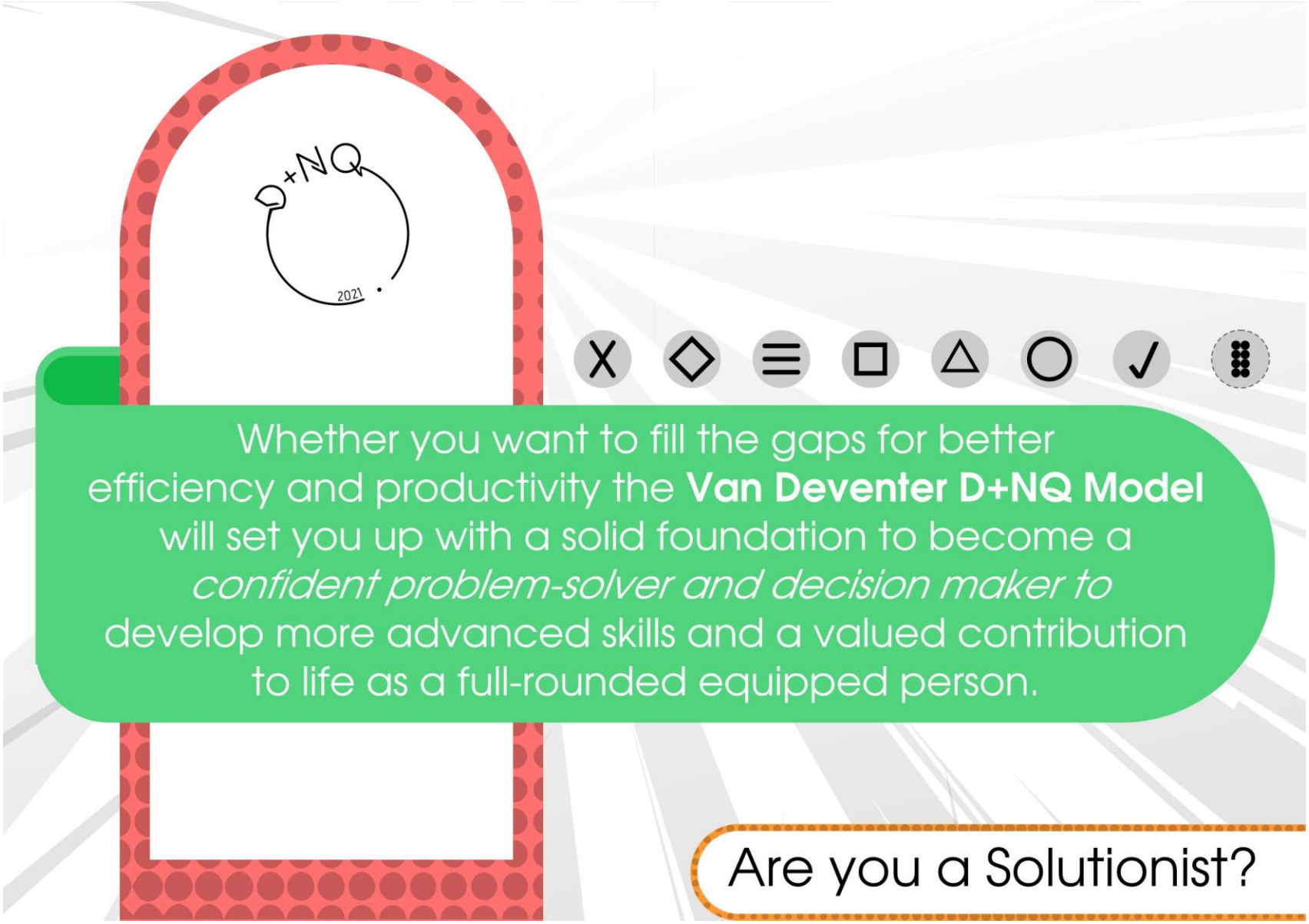






Source: Anriët van Deventer

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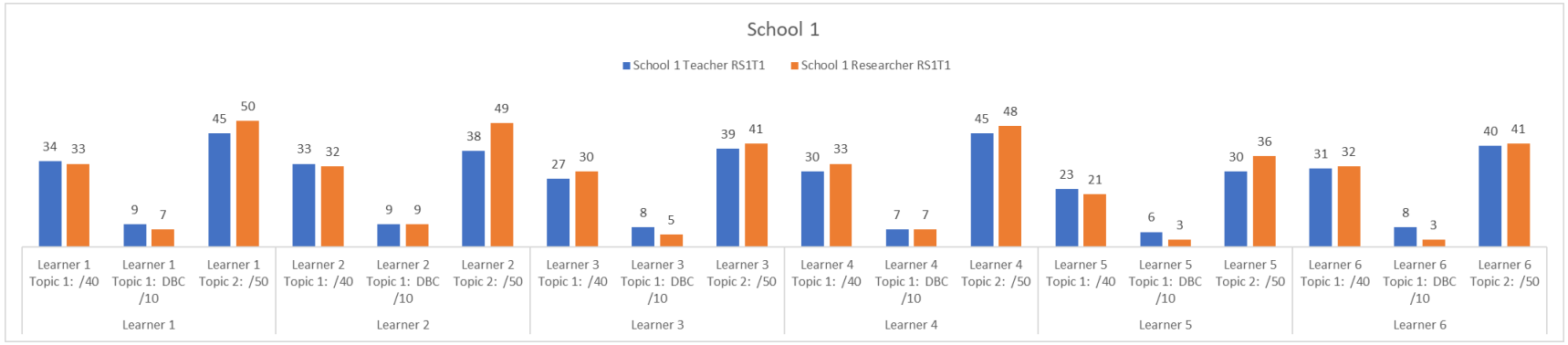


Source: Anriët van Deventer

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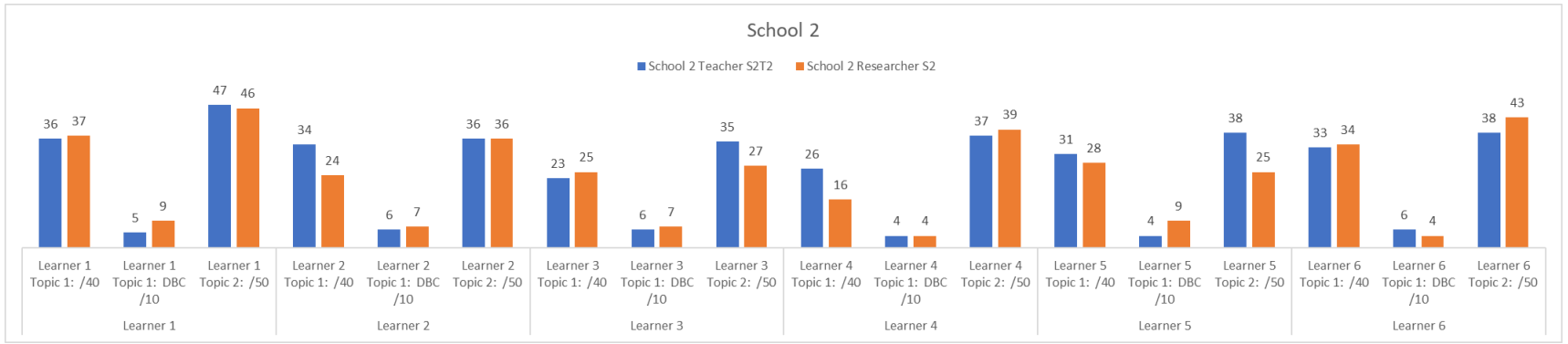
APPENDIX S: Comparison | The Design Process (Topic 1) – Sourcebooks and The Design Product (Topic 2) | RS1- S7 – Graphic representation Design teachers' assessment marks (Rubric A) vs. Researcher assessment marks (Rubric B)

RS1



Source: Anriët van Deventer

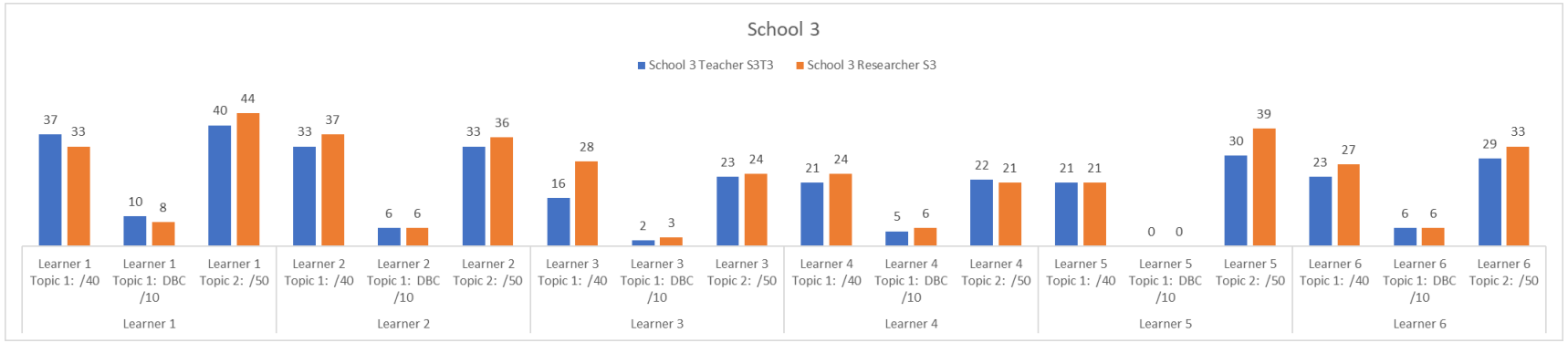
S2



Source: Anriët van Deventer

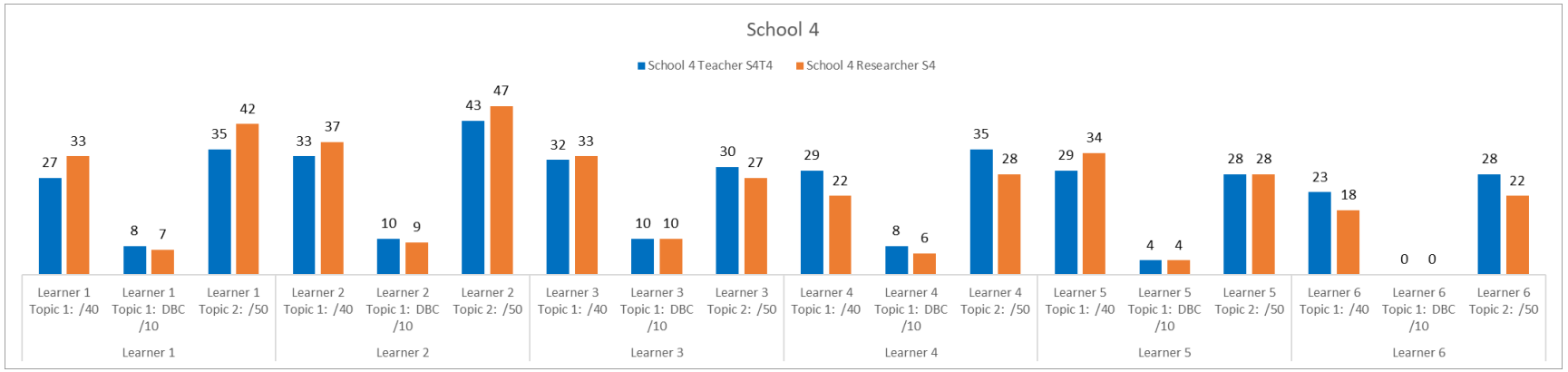
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S3



Source: Anriët van Deventer

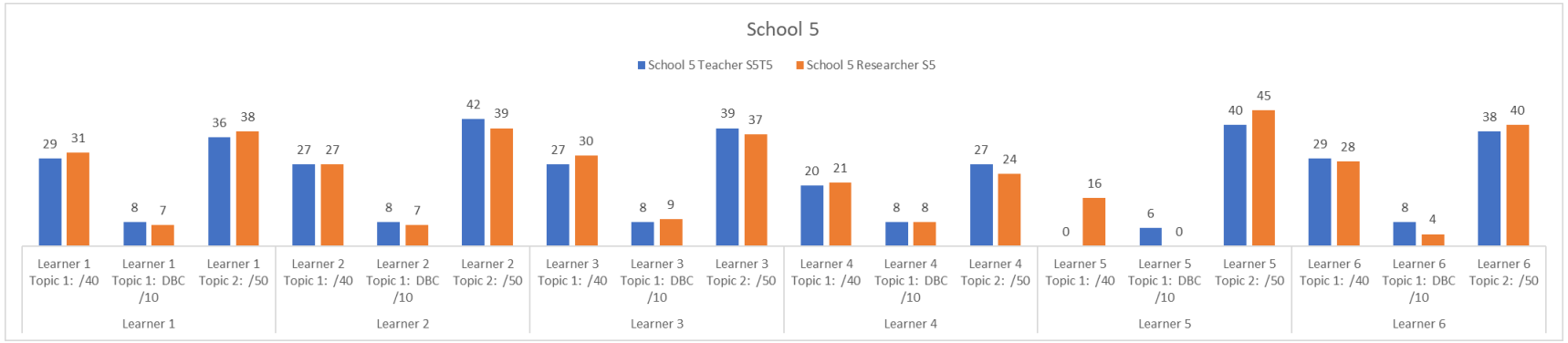
S4



Source: Anriët van Deventer

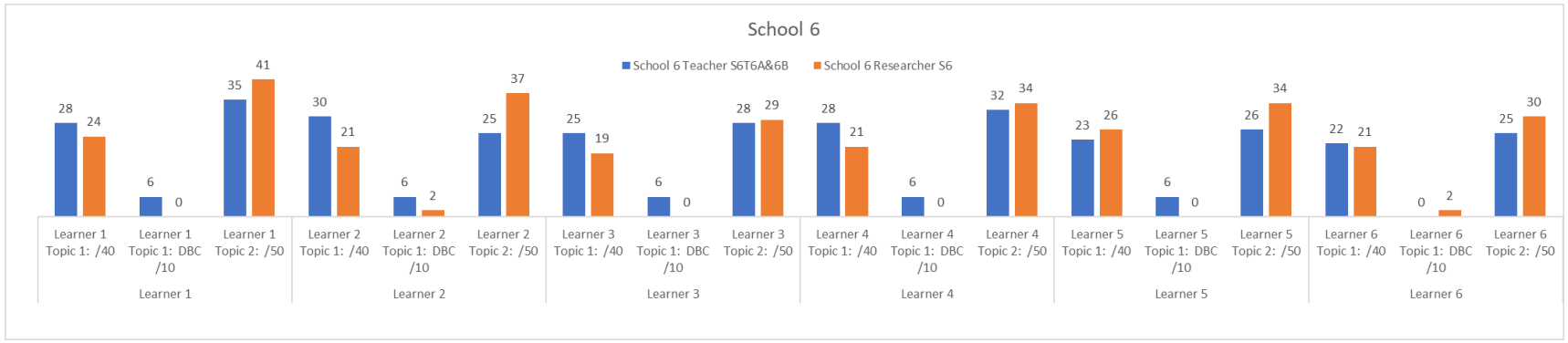
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S5



Source: Anriët van Deventer

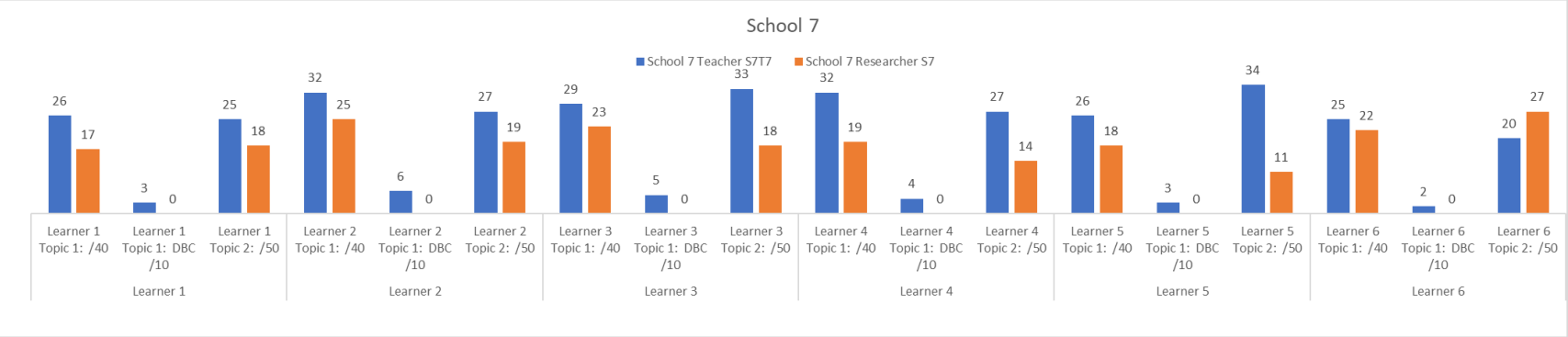
S6



Source: Anriët van Deventer

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S7



Source: Anriët van Deventer

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