ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

C. MAPALING

2023

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

By

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Submitted in fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR EDUCATIONIS

in the

FACULTY OF EDUCATION

at the

NELSON MANDELA UNIVERSITY

April 2023

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Charlene Bermosky

for showing me what academic resilience is long before I knew it existed.

"It takes a village to raise a child."

∴

Umuntu Ngumuntu Ngabantu

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ACKNOWLEDGEMENTS

It would not have been possible for me to pursue my doctoral studies had it not been for the blessings, love and grace of my Almighty Heavenly Father, who strengthened me and opened the hearts, minds, and souls of all those involved. I give all glory to God for this accomplishment.

I am forever indebted to my promoters, Emeritus Professor Paul Webb and Dr Belinda du Plooy for their patience with me over the last four years. Thank you, Prof, for the privilege to be under your tutelage as your last doctoral candidate. Thank you, Belinda, for always being beside me (sometimes literally) from as early as my preliminary proposal. Thank you both for your immense care and concern during my period of serious illness in 2022. Even though I sometimes missed and sometimes delayed submissions, took career decisions, and made other decisions which delayed my completion of this degree, the two of you never gave up on me, and for that I am deeply grateful.

A heartfelt thank you to an expert in the field of resilience, Prof Linda Theron, who helped me identify this area as a gap during a Telegram call at the start of 2019. I express further gratitude to resilience experts Prof Adrian van Breda, Dr Simon Cassidy, Prof Liesl Ebersöhn, Dr Phillip Jefferies, and Prof Linda Liebenberg for their support and wise counsel at various points of my doctoral journey. I appreciate my "false start" at the University of Cape Town for the year of coursework I could complete through the Centre for Research in Engineering Education. My sincere thanks go out to Prof Zach Simpson and Prof Brandon Collier-Reed for their guidance and support from the beginning and at various points throughout.

I am eternally grateful for the financial assistance which made this research possible, notably a PhD scholarship from the East and South African-German Centre of Excellence for Educational Research Methodologies and Management (CERM-ESA) and the German Academic Exchange Service (DAAD). Thank you, CERM-ESA, for the socio-ecological and relational support from the family of scholars and specialist facilitators. Dedicated time to complete the study this year was made possible through the support of a University Capacity Development Emerging Researcher Grant. Thank you to Research Capacity Development at the Nelson Mandela University for the Doctoral Support Programme, facilitated by Prof

Louise Vincent and Prof Kelvin Mwaba and for providing assistance towards finalisation costs.

To my research assistants, especially Dominique RalaRala, for being there when this submission was just a dream. More recently, Casey Botha and Daniel Felix, are both greatly appreciated for their assistance, encouragement and accountability in the final year of the study.

My data generation and analysis would be incomplete without the excellent transcription services provided by Mary-Ann Snyders and the meticulous statistical support provided by Kirstie Eastwood and Dr Danie Venter. Thank you to my language editor, Ella Belcher and my technical editor Connie Park for making sure that many years of hard work read well and is presented professionally.

To my participants, THANK YOU for Flocking together and making this study possible through sharing your personal and socio-ecological enablers and constraints of your resilience.

To my parents, Ivan and Joan, for their many, many years of tireless sacrifice and unwavering support. To my father, a special thank you for giving me the blueprint for hard work, and to my mother for her unconditional love. To my sisters, Farryn and Leonisha, thank you for reminding me that there's more to life than academia and for setting the example of how to live fully and fearlessly. To my brother, Greg, for challenging and supporting me to be the best version of myself and for sharing your family with me.

I am thankful to be surrounded by supportive colleagues, line managers, mentors and friends in academia, psychology, academic development and engineering education; thank you all for the moral support and for providing a critical ear over the years. I would like to extend my gratitude to Dr Christiaan Bekker, Prof Retha Bloem, Dr Duane Booysen, Curtis, Dr Avie Cherrington, Dione, Dené, Ekaterina, Dr Hashali Hamukuaya, Prof Alida Herbst, Prof Caroll Hermann, Prof Jonathan Jansen, Kryska, Prof Ann Lourens, Maelani, Mariam, Mianda, Dr Frans Matlakala, Aus Naane, Prof Choja Oduaran, Philile, Ronelle Plaatjes, Prof Johan Potgieter, Suntosh, Thomas, Dr Wandile Tsabedze, Viwe, and Dr Jennifer Winstead.

ABSTRACT

Extensive research has been done and much knowledge exists about academic resilience among youth in school contexts, but there is a lack of data and literature on academic resilience at university level. This knowledge gap is especially critical in disciplines such as engineering, where student dropout rates have historically been high. In 2017, a redesigned engineering degree qualification, the Bachelor of Engineering Technology, was introduced at South African universities. This case study explored the academic resilience of the first cohort of final-year Bachelor of Engineering Technology students at Nelson Mandela University. Mixed methods and multiple theories were employed, which allowed for the generation of rich data for this exploratory case study. In the quantitative phase, 66 students from Industrial, Civil, Electrical, Marine and Mechanical Engineering courses participated by completing a series of standardised psychometric measurement tools. Descriptive and inferential statistical analysis was conducted on the quantitative data collected from the measurement items. In the qualitative phase, 13 engineering students, 6 engineering lecturers and 6 support staff members were interviewed individually, to explore their perceptions and experiences of academic resilience. Qualitative data generated through the semi-structured interviews were analysed using thematic analysis. The findings suggested that staff and students perceive academic resilience differently. It also seems that staff wellbeing impacts the academic resilience of students, and the relationship between staff wellness and student academic resilience is suggested as a next step for research on the topic of academic resilience at university level, especially among courses with high drop-out rates like engineering. Although not generalisable, it appears that a variety of extracurricular support structures and initiatives and strong relationships between the higher education sector and engineering industries can contribute significantly to students' academic resilience.

Key words: Academic resilience, Bachelor of Engineering Technology, case study, Flocking theory, engineering lecturers, engineering students, resilience, socio-ecological approach, support staff

ABBREVIATIONS, TERMS AND KEYWORDS

APA:	American Psychiatric Association
ARM-R:	Adult Resilience Measure-Revised
ARS:	Academic Resilience Scale
BEngTech:	Bachelor of Engineering Technology
DSM-5 CCSM-A:	Diagnostic and Statistical Manual of Mental Disorders Fifth Edition Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult
ECSA:	Engineering Council of South Africa
K10:	Kessler Psychological Distress Scale
LEC:	Learning Enhancement Checklist
HPCSA:	Health Professions Council of South Africa
NMU:	Nelson Mandela University

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CHAPTER ONE

INTRODUCTION AND OVERVIEW

1.1 CONTEXTUALISING THE STUDY

Entering a university and pursuing university studies is an experience fraught with challenges and difficulties. Research conducted in South Africa indicates that young people entering university navigate multiple life transitions and a variety of challenges posed by new types of intellectual demands (Maree, 2015). Earlier, Young and Campbell (2014) investigated a student population at one of the South African universities. These researchers noted that South African undergraduate students experience more psychological distress than postgraduate students since they have already demonstrated academic success and their futures are more secure than those who have not yet graduated. Recent research by Nieuwoudt (2021) has confirmed the well-documented link between psychological distress and poor academic performance related to multiple factors ranging from high academic workload, to transitions, to sociodemographic and situational factors.

In South Africa, universities are continuously dealing with difficulties related to poor academic performance and high dropout rates (Bantjes et al., 2020; Bantjes et al., 2021). Several factors have been identified as the cause of the lack of academic resilience and high dropout rates (Dreyer, 2011; Ramrathan, 2013; Tudor & Spray, 2018). These include poor school background, high unemployment rates, high levels of student debt, impact on families, insufficient financial resources to support their studies, impact on higher education institutional budgets, and personal sense of failure (Ahmed et al., 2018; Dreyer, 2011; Letseka & Maile, 2008). Stressors such as financial difficulties, accommodation issues, academic demands, and

not making the right choice of study have caused many students to drop out (Letseka & Maile, 2008).

Maree (2015) specifically notes that progression from school to higher education in sought-after fields such as engineering in South Africa often faces a specific challenge, namely poor school environments with subsequent learner achievement. Engineering courses, specifically, seem to be prone to high dropout rates, thus the particular interest in the academic resilience of engineering students in this study, a choice that is also a result of my experience as an academic advisor in the School of Engineering at the Nelson Mandela University. In 2016, Statistics South Africa (Stats SA) indicated that engineering programmes are a popular choice of study at South African universities (BusinessTech, 2017), while at the same time, the Council on Higher Education (CHE) also noted that engineering students had the highest dropout rate at universities, with half of them not completing their studies (Sunday Times, 2018). Therefore, academic resilience is a significant concern in faculties of engineering at South African universities (Van Wyk et al., 2022). At one South African university, Bengesai and Pocock (2021) quantitatively analysed patterns of persistence amongst engineering students. They found that "[s]tudent persistence in engineering can also be classified based on first-year accumulated credits, admission point scores, race, and financial aid, of which first-year accumulated credits is the most critical factor" (2021, p.1). Burton and Dowling (2009) conducted a longitudinal study on key factors influencing Australian engineering students' academic success. They found that prior positive educational experiences, visualisation ability, extroversion, a problem-based learning curriculum, and self-knowledge of learning profiles were critical indicators for success.

Firstly, prior educational experiences and extroversion are seen as essential factors that would assist a student in achieving academic success in their final year of study in engineering

programmes, as prior educational experiences provide students with greater confidence in their academic abilities (Antaramian, 2017). At the same time, visualisation ability aids in academic success greater than having prior knowledge (Burton & Dowling, 2009). Additionally, a problem-based learning curriculum presents an ideal learning environment for extroverted students who excel when learning in social contexts. Lastly, knowledge of student learning profiles allows educators to create the perfect learning and teaching environment that promotes learning and encourages students to succeed (Burton & Dowling, 2009).

Building on this knowledge, South African researchers such as van der Merwe and Maharaj (2018) identified various factors specifically influencing South African engineering students' success. In order to clarify the context of the current case study, four of the factors will be elaborated on individually, namely (i) the problematic South African school system, (ii) high student dropout rates at South African universities, (iii) the high cost of engineering programmes at South African universities, and (iv) the required professional accreditation of engineering programmes by the Engineering Council of South Africa (ECSA). These four factors are elaborated on in Chapter Two.

Despite the bleak picture painted above, institutional data at one South African university, Nelson Mandela University, showed an increase in retention rates among students registered for the newly introduced Bachelor of Engineering Technology (BEngTech) degree in 2018, despite their self-reported contextual risk factors. Data about these risk factors were obtained through a Learning Enhancement Checklist (LEC) administered by the University's Student Counselling, Career and Development Centre (SCCDC, 2018). In 2017, in the previous diploma course, the retention rate for first-time entering students was 84%, and the dropout rate was 16%. In 2019, however, Sheppard et al.'s study showed that in the new BEngTech course, introduced in 2018, the retention rate for first-time entering students in 2018 was 86%, and the

dropout rate was 14%, a small but significant retention rate improvement of 2%, despite moving from a diploma course to a degree course.

At this stage it is important to note that the BEngTech students enrolled for the new degree course were the first to formally receive academic advising. Having an academic advisor may have contributed to their academic resilience, but this remains unknown, and there are numerous other factors that may have contributed, which made this group of students a good case study for investigating academic resilience. As revealed by the literature, reasons for increased resilience are important and are worthy of investigation. Therefore, this study explored possible reasons for this cohort of engineering students' apparent increased academic resilience as compared to their peers in earlier cohorts.

1.2 STATEMENT OF THE PROBLEM

The South African Government's National Development Plan (NDP, 2030; National Planning Commission, 2011) recognises that it is essential that interventions support young people to adopt a 'youth lens' to expand opportunities and reduce marginalisation. Along similar lines, the National Youth Policy (NYP, 2015–2020; National Youth Development Agency, 2015) places an equal emphasis on outcomes such as educational attainment, employment, and health, which are critical to the overall wellbeing of young people. However, the available evidence on resources that support the transitions of South African young people (Graham et al., 2019; Graduate School of Business, 2014) highlights the enthusiasm and resilience of young people to progress in life. In a post-apartheid South Africa, academic resilience is an elusive concept; hence, there is a lack of understanding of it as a process embedded within dynamic socio-cultural and socio-ecological contexts. This study, therefore, crucially acknowledges the need for addressing both a social and an academic gap that exists in resilience research.

In a critical review of South African child and youth resilience studies, Van Breda and Theron (2018) note that there is a growing body of literature that seeks to understand resilience processes that are relevant for young people. Resilience is often defined as the capacity to do well, despite adverse conditions (Theron & Theron, 2013). For the context of this study, the focus was exclusively on the concept of *academic resilience,* which can be defined as the attainment of academic achievement despite adversity (Morales, 2008). In essence, academic resilience refers to how students can manage stressful situations throughout their studies and continue to achieve good results (Ahmed et al., 2018; Holdsworth et al., 2018). Accordingly, previous studies suggest that students who have encountered unfavourable situations in their studies need to be more academically resilient to manage these unfavourable situations effectively and obtain success (Borman & Overman, 2004; Martin & Marsh, 2006).

While a number of researchers have researched resilience in primary school children and adolescent youth (Cortina et al., 2016; Dass-Brailsford, 2005; Theron, 2012; Van Rensburg et al., 2018), in youth transition (Van Breda, 2017; Van Breda & Dickens, 2017; Zolkoski & Bullock, 2012), and in community and family settings (Ahmed et al., 2004; Liebenberg et al., 2016; Mosavel et al., 2015), there has not been a strong focus on academic resilience at university level.

Zolkoski and Bullock (2012) state that school children and adolescent youth face multiple risk factors on the path to adulthood. It has become a norm to identify children and youth who are at risk of failing to succeed due to life's misfortune (Rak & Patterson, 1996). Liebenberg et al. (2016) and Zolkoski and Bullock (2012) specifically mention factors such as substance abuse, poverty, family dissonance, and violence (Liebenberg et al., 2016; Zolkoski & Bullock, 2012). The common concern is that these young individuals will become dysfunctional and unable to establish healthy relationships. However, many children who

encounter adversity and stressful life events do indeed manage to succeed, despite their exposure to severe challenges (Zolkoski & Bullock, 2012). These data are very useful in understanding resilience among youth but have not been translated to the sphere of academic resilience at university level. This study aimed to bridge this knowledge gap and apply existing knowledge to a new context.

A scoping review was initially conducted on 73 items related to resilience to inform the research study and help identify the knowledge gap. As scoping reviews are relatively new approaches to evidence synthesis, they are less commonly used than systematic reviews (Munn et al., 2018). A scoping review refers to a "preliminary assessment of potential size and scope of available research literature" and is helpful in research practice to investigate the current state of knowledge (Grant & Booth, 2009, p. 95). Whereas a systematic review "attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question" (Higgins et al., 2019, p. xxiii). Academic resilience was the focus of seven of the 73 items reviewed, namely six journal articles (Borman & Overman, 2004; Cassidy, 2016; Gayles, 2005; Kuldas et al., 2015; Martin & Marsh, 2006; Morales, 2008) and one doctoral dissertation (Foster, 2013). None of the items on academic resilience had been conducted in South Africa. Six of the scoped items were previous review articles (Haffejee & Theron, 2017, Liebenberg, 2020; Theron & Theron, 2010; Ungar, 2015; Van Breda, 2018; Van Breda & Theron, 2018), and none of them focussed on academic resilience or resilience within the context of higher education. The scoping review revealed a dearth of data on academic resilience at university level and served as motivation for this study. More specifically, the study was underpinned by the fact that there is (i) a paucity of studies on academic resilience in higher education institutions, (ii) little to no existing empirical data about how university students perceive and achieve academic resilience, and (iii) a need to improve understanding of support mechanisms that could assist students who face adversity.

1.3 THEORETICAL AND CONCEPTUAL FRAMEWORKS

While rooted in a general theoretical framework of resilience, this study drew from two conceptual positions. First, it was informed by Ungar's work on the socio-ecological approach to resilience (Ungar, 2008; Ungar, 2011; Ungar, 2015; Ungar, 2018), which argues that resilience processes operate across the micro-meso-macro continuum and are not primarily rooted within the individual person. The second position, namely Ebersöhn's Flocking's (2019) work on the indigenous psychology of resilience theory, was used to strengthen the study as it brought to the fore aspects that constrain and enable academic resilience processes in university settings. Chapter Two engages in detail with these theoretical positions that formed the theoretical and conceptual frameworks for this study.

1.4 RESEARCH QUESTIONS

The following primary research question was formulated for this study:

- What explains the academic resilience of the first cohort of final-year Bachelor of Engineering Technology (BEngTech) students at Nelson Mandela University?

The following secondary research questions were formulated to assist in answering the primary research question of the study:

i. How can the academic resilience of engineering students be contextualised within South African higher education?

ii. What perceptions do engineering students have of their academic resilience?

iii. What perceptions do engineering lecturers have of the academic resilience of engineering students?

iv. What perceptions do support staff have of the academic resilience of engineering students?

1.5 RESEARCH AIM AND OBJECTIVES

The study was undertaken with the following research aims and objectives in mind:

1.5.1 Research aim

This study aimed to explore the academic resilience of the first cohort of final-year Bachelor of Engineering Technology (BEngTech) students at Nelson Mandela University.

1.5.2 Research objectives

The following objectives underpinned the overall aim of the study:

i. To contextualise the academic resilience of engineering students in South African higher education
ii. To examine the perceptions of engineering students regarding the personal and the socio-ecological enablers and constraints of their academic resilience
iii. To identify the perceptions of engineering lecturers about the personal and the socio-ecological reasons for the academic resilience of engineering students
iv. To explore the perceptions of support staff about the personal and the socio-ecological reasons for the academic resilience of engineering students

1.6 RESEARCH DESIGN AND METHODOLOGY

This study investigated the perceptions of engineering students and staff members about academic resilience at one South African university using an exploratory case study (Yin, 2018) research design within an interpretivist paradigm (Assalahi, 2015; Bertram & Christiansen,

2014). The benefit of such an approach is that it allows for rich data-gathering (Patton, 2002; Rule & John, 2011). The case or unit of analysis was the first cohort of final-year engineering students in the new BEngTech degree programme at Nelson Mandela University. Both qualitative and quantitative methods were used to investigate the research questions. By drawing on the voices of engineering students, their lecturers, and university support staff through means of interviews, qualitative 'meaning-making' responses were generated instead of the more conventional quantitatively empirical studies that are often used to measure resilience. This allowed for a deeper and richer investigation of the concept of academic resilience from different perspectives. This primary data collection process included the utilisation of an existing institutional data set.

Pre-existing institutional data originated through the implementation of the *Siyaphumelela* Project in the School of Engineering at Nelson Mandela University at the beginning of 2018. *Siyaphumelela* ("We Succeed") is a national project initiated in 2014 and funded by the Kresge Foundation, with the overall aim of accelerating evidence-based student success strategies across higher education in South Africa (siyaphumelela.org.za, 2022). At the Nelson Mandela University, *Siyaphumelela* Project funding was used to appoint an academic advisor who also worked as an institutional researcher. I was employed as the academic advisor for the School of Engineering at the time, which contributed to my interest in this specific study. Data were collected by the academic advisor in collaboration with other support units, such as *Emthonjeni* Student Wellness (previously known as the Student Counselling, Career and Development Centre). Through this collaboration, for the first time, *Emthonjeni* Student Wellness was able to administer the LEC, which served as a measure of risk to substantiate the rationale and need for the current case study.

A purposive sampling technique was used for primary data generation. All final-year Civil, Electrical, Industrial, Marine and Mechanical Engineering students registered for a three-year BEngTech degree in 2020 were invited to participate in the study. As noted earlier, this case study incorporated mixed methods (a qualitative and quantitative phase) in order to generate rich data for this particular context. In the qualitative phase of this study, 13 students who had volunteered to participate were interviewed. All BEngTech lecturers and support staff who work with BEngTech students were likewise invited to participate in the study. A total of six lecturers and six support staff volunteered to participate and were interviewed. The qualitative data generated from the semi-structured interviews were analysed using Braun and Clarke's six phases of thematic analysis (2006, 2020).

In the quantitative phase of this study, 66 BEngTech students completed four instruments, primarily two instruments measuring risk (the Kessler Psychological Distress Scale and the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult) and two instruments measuring resilience (the Adult Resilience Measure-Revised and the Academic Resilience Scale). A combination of descriptive (Fisher et al., 2009) and inferential statistics (Allua & Thompson, 2009) was used to analyse the quantitative data.

1.7 ETHICS

Institutional approval for the use of this data was obtained from relevant university officials and ethical approval from the University's institutional ethics committee (ethics approval reference number: H20-EDU-ERE-026).

1.8 SIGNIFICANCE OF THE STUDY

As noted earlier, after extensive literature searches, it appeared that hardly any data and resources about academic resilience exist within South African higher education settings. This case study addresses this knowledge gap and is unique in that it focusses on the perceptions of engineering students, engineering lecturers, and support staff about academic resilience, which is especially important in the context of the new BEngTech degree qualification, which was introduced at South African universities in 2017. Engineering was chosen as the focus of this study because of the existing *Siyaphumelela* Project work conducted in engineering disciplines at Nelson Mandela University and the researcher's own experience working as an academic advisor in the School of Engineering at the University.

1.9 LIMITATIONS AND DELINEATION OF THE STUDY

As discussed earlier, this case study was undertaken to explore the academic resilience of the first cohort of final-year BEngTech students at Nelson Mandela University. As such, the study focussed on BEngTech engineering students, engineering lecturers, and support staff at a single South African university who were directly involved in the newly introduced qualification. While the findings are not generalisable to other contexts and other higher education institutions, they provide useful pointers and examples that can be interrogated and explained within the theoretical and conceptual frameworks used in this study.

1.10 DEFINTIONS OF KEY CONCEPTS

Academic resilience: The ability and capacity of a student to rebound from academic misfortune and excel in their academic life despite difficulties (Martin & Marsh, 2006).

Resilience: An individual's ability to perform well despite adverse circumstances (Theron & Theron, 2013).

Case study: A case study is an empirical, social science, research method used to investigate a contemporary phenomenon (the "case") in depth and within the context of its real-world environment, especially when it is difficult to discern the boundaries between phenomenon and context (Yin, 2018).

Flocking theory: "An indigenous knowledge system of resilience flocking is an accepted social support pathway to encourage positive adaptation in the absence of systemic support services" (Ebersöhn, 2019, p.26).

Socio-ecological approach: An individual's capacity to adapt to challenging circumstances or severe personal adversity is determined by the strength of their social and physical environments (Ungar, 2012). From this interactional perspective, a socio-ecological approach to resilience places a greater emphasis on the social and physical environment as a source of personal growth resources (Ungar, 2012).

1.11 OUTLINE OF CHAPTERS

This first chapter contextualised and described pertinent concepts related to the study. Chapter Two analyses and critiques existing literature about resilience formation, theories, concepts and measures of resilience. In Chapter Three, the research design and methodology are described. Chapter Four reports on the results obtained from the quantitative data, whereas Chapter Five reports on the qualitative findings that were generated. Chapter Six presents a synthesis and explanations of the quantitative and qualitative findings. Conclusions, recommendations, and implications for further research are presented in Chapter Seven.

CHAPTER TWO

THEORETICAL UNDERPINNINGS OF RESILIENCE AND RISK

2.1 INTRODUCTION

The preceding chapter provided an overview of the case study as a whole. A brief review of pertinent research is presented in this chapter in order to provide a general background for the study. This literature review further aims to contextualise the results and findings which follow in Chapters Four and Five, respectively.

In doing so, the chapter starts with the background of some of the barriers and challenges experienced by South African students. This is followed by a brief and chronological history of the development of resilience and risk theories. This section emphasises two conceptual perspectives, namely: Michael Ungar's work on the socio-ecological approach to resilience and Liesl Ebersöhn's work on Flocking, the indigenous psychology of resilience theory, both of which were used to underpin this research study.

Thereafter, a discussion follows on the different seminal measures which have been used to investigate risk and resilience, including those administered in this case study, namely the Kessler Psychological Distress Scale (K10), the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), the Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult (CCSM-A), the Adult Resilience Measure (ARM-R), and the Academic Resilience Scale (ARS-30). The chapter concludes with a discussion of the literature on academic resilience, based on available literature on the perceptions of students, lecturers, and support staff, as these theoretical perceptions relate directly to the empirical objectives of the study.

2.1.1 Barriers and challenges faced by South African students

As mentioned in Chapter One, the following factors are some of the barriers and challenges faced by South African engineering students.

2.1.1.1 The problematic South African school system

Van der Merwe and Maharaj (2018) identify the South African primary and secondary schooling system as a major obstacle to the entry into higher education. They state that "[s]tudents who obtain senior certificates in the South African schooling system cannot be assured to be adequately prepared to meet the demands of tertiary education" (Van der Merwe & Maharaj, 2018, p. 2). This problem has also been noted by many others, and educationists, critics and policy-makers are grappling with the grave social implications thereof for South African society (Davis & O'Regan, 2021; Fleisch, 2008; Govender, 2018; Mouton et al., 2013; Spaull, 2013; Wright, 2012). For example, a leading critical voice in the South African education space, Jonathan Jansen, said, "We need to understand that no country builds a strong education system from Grade 12 to university; you build it by strengthening early childhood education" (Jansen, 2021). Similarly, Jennifer Case, a prominent figure in engineering education, has written on the numerous difficulties which engineering students encounter, emphasising that "many of them experience real difficulty due at least in part to the poor school backgrounds that some of them have come from" (Case, 2006, p. 1).

2.1.1.2 High student dropout rates at South African universities

The CHE announced that it was to be expected for approximately 50% of all students entering institutions of higher education in South Africa for the first time to drop out (CHE, 2013). Likewise, the Mail and Guardian reported that half of the 18% of Grade 12 graduates who registered at university would drop out (Nkosi, 2015). More recently, in an article

published by Fundi Connect, nine reasons why students drop out of South African universities were reported: financial reasons, work and family commitments, not being academically prepared, social life at university, choosing the wrong course, being unhappy with the university, experiencing personal emergencies, inadequate academic support, and the pressure of being a first-generation student. According to the research conducted by Fundi Connect, between 50% and 60% of first-year students dropout of South African universities. These findings are consistent with findings from other research (Staff Reporter, 2021). This percentage corroborates what was reported by the Mail and Guardian in 2015 (Nkosi, 2015).

In engineering specifically, Fisher produced a throughput study for ECSA in 2011 and reported that between 10% and 45% of engineering students completed their degrees in minimum time at various institutions, whereas total completion rates were between 35% and 60% (Fisher, 2011). Subsequently, in his review on the progression and non-completion rates within engineering at a South African university; Pocock (2012) reported that completion rates between 50% and 72% of entering students were common, while dropout in the first year of study was between 15% and 20% on average. In 2018, the Sunday Times Live published an article entitled "Joint effort needed to fix university dropout rate: Engineering students find going toughest of all, with half of them ditching their studies" (Govender, 2018). The timing was perhaps significant as most universities would have introduced the new engineering qualification in 2018. The article also reported on other disciplines with significantly high rates of dropout after six years, namely law (43%), social science (29%) and education (28%) (Govender, 2018).

2.1.1.3 The high cost of engineering programmes at South African universities

In recent times fee estimates for specific courses and programmes at certain institutions are easily accessible online. For instance, at the coastal Nelson Mandela University (a

comprehensive university in the Eastern Cape Province), the first-year fee for a BEngTech degree is approximately R54460.00 in 2022 (Nelson Mandela University, 2022). At the University of the Witwatersrand (a traditional university in the Gauteng Province), a first-year BSc (Engineering) costs R57770.00 on average for the 2022 intake (University of the Witwatersrand, 2022). It appears from the aforementioned that the first year of engineering studies for 2022 could cost R56 115 on average. The above-mentioned fees exclude costs associated with textbooks, residence and living expenses, as well as additional items which are often required in engineering studies (University of the Witwatersrand, 2022).

2.1.1.4 Professional accreditation of engineering programmes by the Engineering Council of South Africa

The previous National Diploma (NDip) was nationally phased out and replaced in 2017 with a BEngTech. The Department of Higher Education and Training (DHET) decided to stop all the National Accredited Technical Education Diploma (NATED) qualifications (National Diplomas and Bachelor of Technology Degrees) and replace them with the Higher Education Qualifications Sub-Framework (HEQSF) approved structures (see Government Gazette 38116). In other words, the decision to move from the NDip to the BEngTech was decided by the DHET and the ECSA had to comply. The BEngTech provides for registration towards a qualification as a professional engineering technologist (Dienga et al., 2022). whereas the NDip allows for registration as a technician. In South Africa, technicians are also trained at Technical Vocational Education and Training (TVET) colleges. Dienga et al. (2022) stipulates that an ECSA accreditation team, comprising some engineering lecturers, visit each university and university of technology which teaches engineering every four years. Moreover, no higher education institutions may teach any engineering course without their engineering programmes being accredited by ECSA (Dienga et al., 2022). In response to these barriers and challenges,

students need to develop resilience, and resilience is understood and studied in relation to the presence of risk.

2.2 CONCEPTUALISING RESILIENCE AND RISK

2.2.1 Theories and theorists of resilience and risk

This section of the literature review has been organised chronologically, highlighting seminal theories and theorists of resilience and risk. Special attention has been paid to the year in which the theory and theorist gained prominence, as can be seen in Figure 2.1 below.

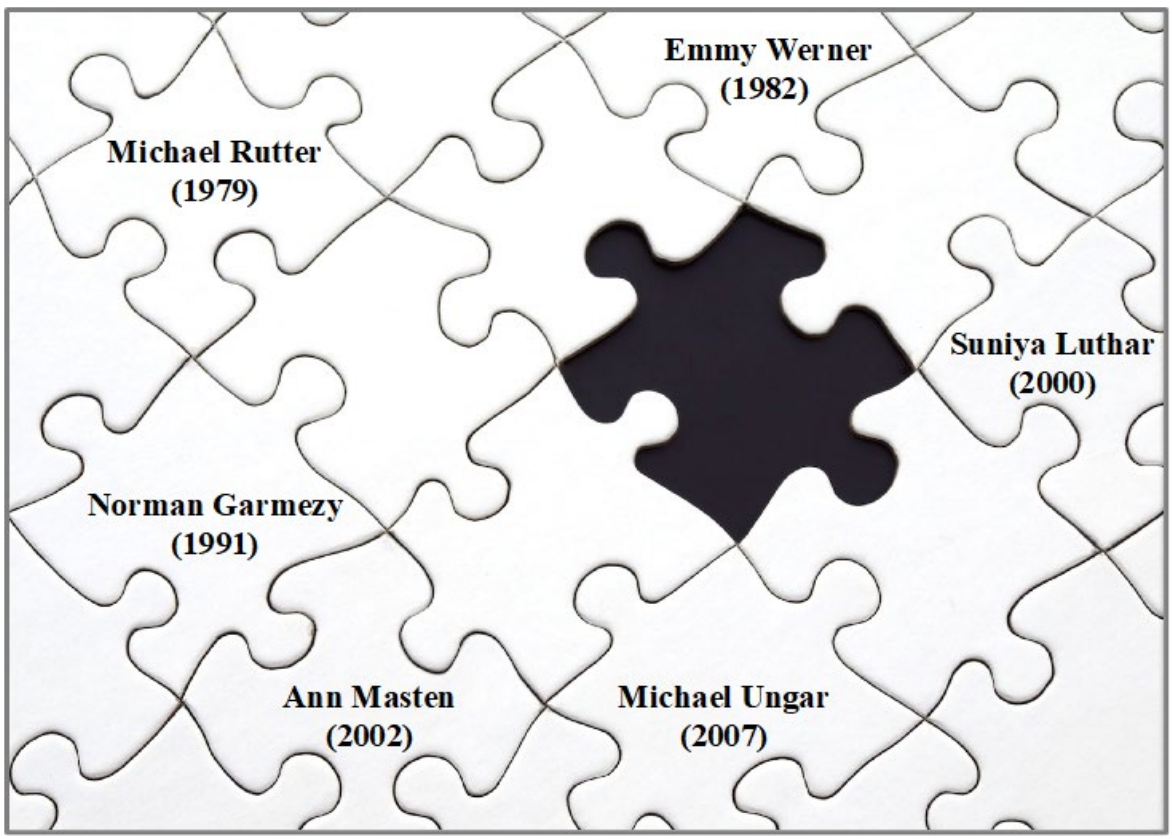

Figure 2.1

Seminal Theories and Theorists of Resilience and Risk

2.2.1.1 Michael Rutter (1979)

Professor of child psychiatry, Michael Rutter (1933–2021), acknowledges individual differences (e.g., temperament, personality, and genetics) in resilience. Rutter's studies reflect his findings that resilience is more than positive mental health and social competence (Rutter, 2006). Rutter defined individuals with resilience as those who have a reasonably positive outcome compared to those who have faced the same serious stressors or adversities (Rutter, 1990). Rutter's Isle of Wight study was a comparative study between children from the Isle of Wight and disadvantaged children from the inner borough of London (Rutter, 1979). The study revealed that the more risks children were exposed to, the greater the possibility that they would experience a psychiatric disorder (Rutter, 1979). These findings indicate that cumulative risks, for instance in the case of children experiencing more than one risk, were associated with poorer outcomes and thus greater risk of developing a psychiatric disorder (Fryers & Brugha, 2013).

Rutter (1979) further investigated the role of child-parent relationships and the impact thereof on psychopathology (also referred to as mental disorders). His findings suggest that children who have a positive child-parent relationship are 50% less likely to experience a psychiatric disorder compared to children who have a negative child-parent relationship (Rutter, 1979). Rutter's study expanded into schools within the Isle of Wight and underprivileged schools from the inner borough in London, with a marked difference between these educational institutions (Rutter, 1979). Data showed that schools with lower rates of delinquent behaviour, academic inefficiency, and behavioural disturbances were associated with schools that have greater classroom management techniques, allow pupils to assume responsibility, emphasise the importance of homework and examinations and maintain a positive learning atmosphere (Rutter, 1979). It was concluded in this study that the schooling environment has a significant influence on a child's wellbeing. Rutter's extensive research

allowed him to establish several principles of resilience (Rutter, 2006, 2007, 2012, 2013). One principle is that resilience is a normal adaptation granted the correct resources (Rutter, 2007). In this case, Rutter debunks any idea of invulnerable individuals. Instead, he links individual differences in resilience to genetic effects that decide a child's susceptibility to environmental changes (Rutter, 2007). Other research studies have identified a range of genes and polymorphisms linked to resilient phenotypes that contribute significantly in resilient responses to trauma and stress (Feder et al., 2009).

Rutter (2007) points out that different risks challenge an individual's capacity for resilience; that an individual can be resilient regarding certain risks but not to all. As a result, an individual displaying resilience may lack resilience when placed in another situation and/or at a different point in time (Rutter, 2007). Rutter (2013) claims that the universal list of risk and protective factors acts as a general guide but does not consider individual differences. Therefore, Rutter (2013) expresses that these factors ought to be better comprehended. For example, not all recognised risk factors act as a risk in every circumstance. Therefore, whether a risk factor may be interpreted as a risk may be dependent on the individual's needs and circumstances (Rutter, 2013). Consequently, one can expect recognised risk factors to have different effects on individuals and be perceived differently by these individuals. However, Rutter (2013) believes that exposure to low-level risks is needed for development and growth. For example, an individual does not attain resistance to infections by avoiding all contact with pathogens (Rutter, 2013). Similar to this concept, avoidance of stress and adversity does not promote resilience; rather, it could increase vulnerability to these stressors (Rutter, 2013). Therefore, it is important for an individual to be exposed to controlled experiences of stress. The list of protective factors put forward by Rutter includes mental features/operations, social relationships and turning-point experiences. Mental features or operations are a key discussion point (Rutter, 2007, 2012). These features, which include determination, self-confidence, sense

of agency, self-reflection, self-control, and planning, assist the individual with control and success at changing events (Shean, 2015). The second factor consists of elements such as a positive family atmosphere and sibling and maternal warmth (Rutter, 2013). These features assist against emotional and behavioural disturbances. The final factor relates to moments in which an individual breaks away from a disadvantaged past and, thus promotes new options for constructive change (Rutter, 2013).

2.2.1.2 Emmy Werner (1982)

Dr Emmy Werner, a developmental psychologist, conducted a longitudinal study that shed light on resilience and provided evidence of children's resiliency to adverse life events (Werner & Smith, 1982). In Werner and Smith's (1982) longitudinal study of 698 infants born in 1955 on the island of Kauai, she defined risks as moderate to severe stress, being born into poverty, having mothers with little formal education, and living in a troubled family environment. Werner and Smith's (1982) study shows that individuals may still possess resilience despite being exposed to one or more of these risks. Werner (1989) therefore also identifies individual, family and community factors that correlated with resilience. All these factors possess their own risk and protective factors.

Werner (1989) proposed that there is a shifting balance at each developmental stage. Thus, her research expresses resilient factors that differ in teenagers, children, toddlers and infants. Resilient teenagers have a positive self-concept, and are more responsible, achievement orientated, and assertive (Werner & Smith, 1982). Resilient children are very active, have fewer bad eating and sleeping habits, are good-natured and easy to deal with (Werner & Smith, 1982). Resilient toddlers display greater alertness, a positive social orientation, greater autonomy, and more advanced communication, locomotive and self-help skills. Resilient infants have many interests, engage in activities and hobbies, relate better to classmates, and possess greater

reasoning and reading skills (Werner & Smith, 1982). In a follow-up study involving the participants of the original longitudinal study, Werner (1989) found that the resilient children, now in adulthood, were highly achievement orientated, pursued tertiary education, were employed full-time, and emphasised their competence and determination as primary tools in dealing with adversities. Werner (1989) and Garmezy (1991) both share an ecological view that focusses on protective factors. From his ecological view of resilience, Garmezy contended that protective factors that influence resilience can be found at individual and familial levels, and levels external to the family (external support factors) (Shean, 2015). Garmezy developed three models of resilience, namely: the compensatory model; the protective vs vulnerability model; and the challenge model (Garmezy, 1984).

Furthermore, Werner (1989) notes that the more stress one experiences, the more protective factors are needed. Werner (1989) concludes that interventions need to address the balance between risk and protective factors at different stages in the individual's development.

2.2.1.3 Norman Garmezy (1991)

Dr Norman Garmezy coined the term 'functional adequacy' and defined it as the preservation of resilient or competent functioning regardless of an interfering emotionality (Garmezy, 1991). As a clinical psychologist, Garmezy (1991) believed that functional adequacy is the benchmark for resilient behaviour. Garmezy defines resilient individuals through their capacity to recover and maintain adaptive behaviour following a stressful event (Garmezy, 1991). Garmezy's (1991) study, 'Project Competence', was conducted in Minnesota and focussed on identifying competence in children of parents who experience schizophrenia (Garmezy, 1987). Garmezy's (1991) study indicated that the absence of a disorder in most children was due to unknown protective factors operating which were not identified at this point in his research.

As his studies progressed, Garmezy (1991) attempted to better understand the protective and risk factors in stress-resistant children. Garmezy (1991) categorised protective factors in his ecological view of resilience: firstly, individual factors within the child (Shean, 2015); secondly, family factors such as warmth and cohesion (Shean, 2015); thirdly, support factors external to the family (Shean, 2015). Garmezy (1991), being well known for his study on competence, identified sex, intelligence quotient (IQ), socio-economic status (SES), and parental competence qualities as factors that modified competence. He found that children with higher IQ scores, higher SES and positive family attributes were more competent and socially engaged. Family cohesion and stability are emphasised in their contribution to competence and stress. The results showed that children from a family with high levels of stability and cohesion were increasingly intelligent, increasingly competent and less probable to become disruptive when faced with high levels of stress (Garmezy et al., 1984). Garmezy (1991) believed that the ratio of low risks and more protective factors links to the child's resilience.

2.2.1.4 Suniya Luthar (2000)

Suniya Luthar, a professor of psychology, stated that resilience consists of two critical components, namely severe adversity and the achievement of positive adaptation (Luthar et al., 2000). An ongoing debate in resilience literature has been whether positive adaptation should be measured internally or externally (Luthar et al., 2000). This debate reflects our dualistic nature. Luthar argues that risk factors and protective factors are not simply polar opposites of the same variable (Luthar et al., 2006). Her research shows that previously stable protective factors, such as higher intelligence, act as a potential risk rather than a protective factor (Luthar, 1991). Luthar's (1991) research shows that individuals with higher intelligence may be more sensitive to issues in their environment. Consequently, this would lead to greater risk. Luthar (2000) supports the need to explore the multidimensional nature of resilience. Similar to

Rutter's (2007) observations, Luthar's (2000) research claims that children can show competence in some domains and lack it in others. She is critical of the unrealistic view of being competent or resilient in all of life's domains (Luthar, 1991). This observation indicates it is inevitable that children will be exposed to adverse events that carry negative effects (Luthar, 1992). Dorfman et al. (2022) found that we tend to narrate our lives in terms of challenges we have faced and setbacks we have overcome. Thus, our human nature allows us to believe that good things may come from these inevitable adverse events.

2.2.1.5 Ann Masten (2002)

Ann Masten, a clinical psychologist and student of Garmezy (1991), conducted research focussed on competence, risk, resilience and human development (Shean, 2015). Masten's (2011) updated definition of resilience reflects the perspective that an individual does not withstand risks but changes to accommodate risks. Masten (2011) believes that resilience is made up of two criteria, namely measurements of positive adaptation and current conditions that threaten to disrupt adaptation. Positive adaptation involves meeting developmental tasks and fundamental human adaptation systems (Masten, 2011). These include the expectations of society in different ages and situations; that is, society expects a child to begin their schooling at six-years of age, and then progress to the next grade at the end of each year. Masten utilises two major approaches used in resilience research. Firstly, the variable-focussed approach examines linkages between individual characteristics, environmental characteristics and experiences. This is an attempt to ascertain what leads to good outcomes on indicators of adaptation during great adversity or risk. This approach takes into account the entire risk group and incorporates the strengths of multivariate statistics (Masten & Reed, 2002). The second approach, the person-focussed approach, identifies and studies individuals who display resilience in an attempt to understand how they differ from those who are not dealing well with

adversities. This approach, which reflects a configurable perspective in viewing resilience in individuals, is also very useful for conducting a longitudinal studying of the diverse lives of resilient individuals. This approach is exemplified by one of the most important longitudinal studies, a study previously mentioned, the Kauai longitudinal study of Werner and Smith (1982). Assets, resources and protective factors go hand in hand with resilience. Assets are the opposite of risks. Their presence has predicted good outcomes in domains of positive adaptation. Resources refer to the social, human and material capital that is often utilised during the adaptation process. Protective factors, which are qualities of an individual, their environment or context that predict better outcomes, stem from assets during adverse events (Masten & Reed, 2002).

Table 2.1 below presents the most commonly listed protective factors against developmental hazards in studies of psychosocial resilience (Masten & Reed, 2002).

Table 2.1

Commonly Listed Factors that Protect against Developmental Hazards

Source	Protective factors
Within the individual	Good cognitive abilities and attentional skills
	Calm temperament in infancy
	Self-efficacy
	Positive outlook on life
	General appeal to others
	Good sense of humour
	Faith and a sense of purpose and meaning in life
	Positive self-perceptions
Within the family	Close relationship with family members
	Organised home environment
	Low discord between parents
	Authoritative parenting styles
	Socio-economic advantage
	Parents with a good education
	Parents involved in their child's education

Source	Protective factors
	Parents with the above-mentioned 'individual protective factors'
Within other relationships	Connections to pro-social and rule-abiding peers
	Close relationships with competent and supportive adults
	Effective schools
	Pro-social organisations
Within the community	Public safety
	Good emergency services
	Good health care availability

These protective factors and other concepts as seen in Table 2.1 above are operationalised in an attempt to identify and explain resilience. Masten et al. (2009) suggest that it is theoretically possible for resources to equalise elevated amounts of risk to result in a resilient outcome.

In a longitudinal study that focussed on the influence of parent quality and intellectual functioning on resilience, Masten (1999) investigated perinatal hazards, parental disadvantage, and psychosocial disadvantage. Data were collected from participants in childhood, then again when the same group was in late adolescence (Masten, 1999). Consequently, Masten (1999) rated competence in three domains: academic achievement, conduct (rule-abiding versus antisocial behaviour) and peer social competence. Low competence was indicated by below-average functioning in at least two of these three domains (Masten, 1999).

Years later, Masten (2015) measured parenting quality and adolescent psychological wellbeing in the participants of the original study. These measures were used to define three groups. Firstly, individuals with adequate competence and high adversity were termed 'resilient', secondly, those with adequate competence and low adversity were termed 'competent', and lastly, those with low competence and high adversity were termed 'maladaptive' (Masten, 2015). Individuals categorised as maladaptive faced the greatest adversities (Masten, 2015). Masten (2015) theorises that children who show an absence of resilience do not have the basic resources or the opportunity to develop adaptive systems.

Initially, in resilience studies, investigators focussed on a single indicator to define risk. It soon became apparent that risk factors co-occur and cumulate overtime (Masten & Reed, 2002). This development in understanding created a shift towards studying cumulative risk (Masten & Reed, 2002). Masten subsequently developed the idea of 'risk gradient' to identify the level of risk (Masten, 2011; Masten et al., 2009). Risk gradients may even be inverted to asset gradients due to risk indicators being risk/asset predictors (Masten, 2011; Masten et al., 2009). It can be concluded that children low on the risk gradient typically have greater assets and advantages such as a high SES, good education, and educated parents (Shean, 2015).

2.2.1.6 Michael Ungar (2007)

Michael Ungar, professor of social work, is the founder of the Resilience Research Centre (RRC) at Dalhousie University in Canada which conducts resilience research in several countries, including South Africa. Ungar et al. (2007) believes resilience includes structures around the individual, the services the individual receives, and the way health knowledge is generated, rather than just a set of individual characteristics. Ungar's (2013) definitions of resilience emphasise the incorporation of both individual and environmental features that congruently contribute to resilience. In his 2007 study, Ungar identified seven tensions of resilience that were deemed relevant in all cultures. However, these tensions are resolved in different culturally specific ways. These tensions include access to material resources, relationships, identity, power and control, social justice, cultural adherence, and cohesion (Ungar et al., 2007). Ungar et al. (2007) found that youth could only resolve these tensions if the appropriate resources were available. These researchers recognised the connection between context, culture and an individual's strengths as the youth attempt to navigate these tensions. In another study, Ungar et al. (2008) declared that resilience is not a foreseeable set of developmental processes and positive outcomes.

In a 2011 study, Ungar (2011) highlighted four factors: decentrality, complexity, atypicality and cultural relativity. Decentrality is about shifting focus from the child to the environment. Ungar (2011) contends that the duty of resilience is wrongfully placed upon the individual in a toxic environment. This argument serves as a critique towards change hypotheses that measure how well an individual can take advantage of their environmental resources. Ungar's (2011) decentrality factor emphasises a particular order of focus: first, there should be an emphasis on social and physical ecology, then a focus on the interaction between the child and environment, and lastly a focus on the child. Ungar's (2011) complexity factor concept is a response to previous efforts of identifying resilience through simple relationships. Ungar (2011) critiques these 'simple relationships' in a manner that expresses the need for complexity to gain a more complete understanding of resilience. Complexity will allow resilience to be understood through specific models that, in turn, will provide a more useful framework for intervention. Atypicality refers to openness to processes that work for the youth but are usually identified as resilience. Ungar (2011) states that one needs to focus more on understanding the functionality of behaviour than on predetermined outcomes. Cultural relativity is the final factor. Ungar (2011) believes that resilience reflects culture. Culture constitutes a community's shared values, beliefs, language, customs, and everyday practices (Ungar, 2011). Programmes and interventions must accommodate and consider the needs of each culture and have awareness of how growth can be facilitated.

The next section brings this review of risk and resilience to a close by introducing the theories that ground the current case study, namely the socio-ecological approach to resilience and an indigenous psychology theory of resilience in Southern Africa commonly known as 'flocking together'.

2.2.2 Socio-ecological approach to resilience

Resilience theory is increasingly adopting a socio-ecological approach (Masten, 2019; Theron, 2019; Ungar, 2012; Van Breda, 2018) in which resilience processes are located in the interactions between the personal, social and structural. The strength of the social and physical environments in which people live determines how resilient they are when faced with challenging circumstances or severe personal adversity (Ungar, 2012). Building on the claims made by Rutter (1987) and Lerner (2006) that the environment plays a key role, an environmental, interactional, and culturally diverse perspective offers an additional pathway in understanding resilience. As resilience can only exist in the presence of a stressor, social risk factors are associated with resilience (Ungar, 2012). As a result, an ecological interpretation of the concept is required that takes into consideration the significance of how people interact with their surroundings. With this understanding of resilience, the conversation about how people can thrive in the face of adversity is expanded to include ideas that social and ecological factors (these include family, culture, school and the community) have just as much of an impact as psychological traits (Ungar, 2012). By adopting an ecological perspective, the individualistic paradigm of resilience is replaced with a more communal and comprehensive one.

Ungar (2008, p. 225) presents a more contextualised culturally relevant definition of resilience:

> In the context of exposure to significant adversity, whether psychological, environmental, or both, resilience is both the capacity of individuals to navigate their way to health-sustaining resources, including opportunities to experience feelings of well-being, and a condition of the individual's family, community and culture to provide these health resources and experiences in culturally meaningful ways.

The intricacy of reciprocal relationships between people and their environments is suggested by an ecological concept of resilience (Ungar, 2012). Resilience depends on an individual's physical and social ecology's ability to promote positive growth when under stress, rather than on their ability to exert personal agency following their recovery from risk exposure (Ungar, 2012). Resources for personal development are found in the physical and social surroundings. Furthermore, this ecological perspective on resilience positions disputes for control of value and resources sustaining growth as a crucial component of resilience research and its real-world applications (Ungar, 2012).

Subsequently, Van Breda (2018) defined resilience as "the multilevel processes that systems engage in to obtain better-than-expected outcomes in the face or wake of adversity" (p. 4). The term 'multilevel' suggests that one should look for a young person's resilience, for example, in the subsystems within their body (including their neurology, immune system, and physical health), in their psyche (emotions, cognitions, aspirations, spirituality), in the relationships around them (family, friends, colleagues, teachers), in the structures in their community (school, clubs, churches, hospitals) and the larger macro-processes of society (culture, faith, legislation, policy) (Van Breda, 2018).

Contemporary resilience theory posits that it is the interactions between these levels of the social ecology that promote resilience (Ungar & Theron, 2020). This ecological approach to resilience has been widely used in resilience studies around the world (Ungar, 2012), including in South Africa. Van Breda and Theron (2018) conducted a systematic review of 61 child and youth resilience studies in South Africa over the period 2009–2017 and found that the resilience enablers could be broadly classified under four ecological layers: personal, relational, structural and spiritual/cultural. Given my interest in the resilience processes of the

final-year engineering students, this ecological approach was adopted as one of the philosophical frameworks for this study.

2.2.3 Flocking together: An indigenous psychology theory of resilience in Southern Africa

When faced with hardship related to inequity, high risk, and vulnerability of indigenous people in post-colonial situations, flocking is highlighted as a socio-ecological reaction (Ebersöhn, 2019). Given a history of restricted resources, lack of access to these limited services, and impoverishment, Flocking has pragmatic origins. The relationship-resourced resilience theory, which offers an indigenous psychology lens, helps us comprehend how generations with Afrocentric ethnic backgrounds choose to support one another's wellness when conditions are at their worst (Ebersöhn, 2019). The population group which experiences hardships most severely is aware of indigenous wisdom. With the use of chances that are made possible by resilience, this indigenous knowledge may be used as a marketable good (Ebersöhn, 2019). The necessity of one person acting alone cannot justify the adversity brought on by injustice. In the same way, it is impossible for a single person to Flock (Ebersöhn, 2019). Flocking serves as a means of achieving resilience and embodies constructive social support. Therefore, both implicit and overt social support occurs during flocking.

Positioned as a contextual and sociocultural supplement to traditional psychology theory, Flocking was developed to serve as an indigenous, Afrocentric, relationship-resourced resilience theory (Ebersöhn, 2019). There are four theoretical propositions regarding flocking (Ebersöhn, 2019):

- Proposition 1: Flocking is a social support pathway to resilience to manage the distribution of social resources to bolster better than expected health and wellbeing outcomes for a collective.

- Proposition 2: Chronic structural constraints in a highly unequal context informed the intergenerational development of flocking as a socio-ecological process to enable the resilience of a collective.
- Proposition 3: Flocking manifests (structurally marginalised) interdependent cultural beliefs and practices regarding adaptation to adversity.
- Proposition 4: Relational access to flocking is enabled or constrained by the presence or absence of culturally salient interdependent socio-emotional competence to maintain culturally valued relationships.

Flocking as a theory is of particular relevance to this study as it considers what enables or constrains resilience, as each of the final-year engineering students had various constraints and enablers of their academic resilience (Ebersöhn, 2019). Yin (2018) contends it is important to acknowledge the preliminary theoretical propositions, based on preliminary fieldwork in the form of literature searches, so as to avoid bias in the case study. However, a limitation of constructing preliminary theory considerations is that the researcher is unable to start as a blank slate (Yin, 2018). Ultimately, both these theories were used in the current case study as one approach (socio-ecological) promoted a relational understanding of resilience in context, whereas the other theory (flocking) focussed specifically on the resilience process, which is the phenomenon of the current case study, as recounted by the participants. They were therefore complementary. The subjective experience of the person is emphasised in both the Socio-Ecological approach to resilience and the Flocking theory, with a specific attention on the person's connection to and context within their social and natural environments (Ungar, 2012).

According to Flocking, the concept of a lonely individual from an African perspective is unfathomable (Ebersöhn, 2019). It could be argued that Flocking is simply “a collective reaction to the collective chronic disturbance of inequality” (Ebersöhn, 2019, p. 205). Due to

historical injustice, wealth inequality, and numerous other factors, there is a huge disparity in resource allocation in South Africa. Students in engineering were also affected by this inequality, according to this study. In order to counter risks and make the best possible use of scarce resources, Flocking can be used as a pathway to resilience (Ebersöhn, 2019).

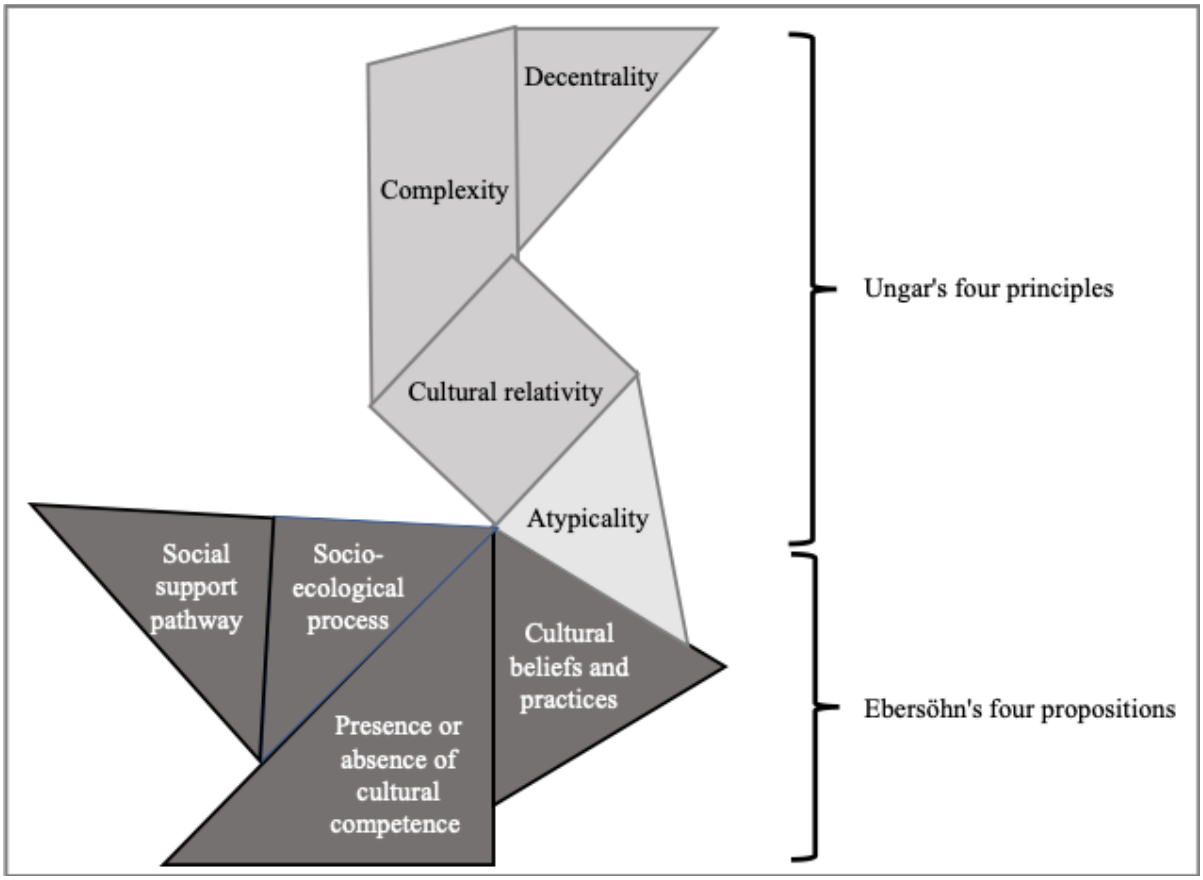

Figure 2.2

Depiction of Conceptual Framework

Figure 2.2 above brings both conceptual positions together graphically. The bird symbolises Flocking, whereas the tangram symbolises resilience from Ungar's perspective. The different sizes of the tangram pieces are further indicative of the inequality which Flocking refers to in proposition 2, as well as "different populations in different contexts for different levels of stress," as asserted by Ungar (Talesnik, 2021). The next section of the literature review will provide an overview of the predominant measures that were used to study resilience and risk.

2.2.4 Measures of resilience and risk

2.2.4.1 Measures of resilience

Since one's experience of stress and trauma is an important factor that has great potential to facilitate growth and development (Cicchetti, 2010), resilience plays a facilitating role in promoting such growth. Resilience, which is broadly defined as "advancing despite adversity" (Rossouw & Rossouw, 2016), cannot be recognised through any specific or recognised set of components (Ungar, 2005). However, there are factors and indicators of adaptive behaviours that are described as evidence supporting resilience (Neenan, 2017). Such factors and indicators form a good basis for understanding the scope and nature of resilience (Ackerman, 2022). Empirical data can be used to quantify resilience by capturing different aspects that make up a resilient individual and by contrasting these dimensions against those of others. This is an interesting point raised by Smith et al. (2008), as it suggests that there are numerous meanings, definitions and interpretations of resilience but many measures of resilience have not targeted them. Ahern et al. (2006) state that measures of resilience generally assess protective factors or resources that involve personal characteristics and coping styles. However, the existing literature on character strengths is spearheaded by Peterson and Seligman (2004). These authors classify six virtues that are made up of 24-character strengths. The six

overarching virtues and the corresponding character strengths are as follows: wisdom and knowledge (curiosity and interest in the world, love of learning, open-mindedness, creativity, perspective), courage (bravery, persistence, honesty and integrity, zest and vitality), humanity (kindness, love, social intelligence), justice (citizenship, fairness, humane leadership), temperance (self-control, prudence, modesty, forgiveness and mercy), and transcendence (appreciation of beauty and excellence, humour and playfulness, gratitude, hope, spirituality). The importance of character strengths in positive psychology is strongly tied to the three pillars of positive psychology. According to Seligman (2003), positive psychology is based on three pillars (i) positive experiences, (ii) positive individual traits, and (iii) positive institutions. Personal character strengths are consistent with the second pillar of positive psychology, namely positive individual traits. It is therefore not surprising that personal character strengths emerged as a theme when students' resilience was being explored in this study. There is a difference between persistence and perseverance, although they are sometimes used interchangeably. Persistence refers to continuing to pursue a course of action in spite of difficulty or opposition. Perseverance, on the other hand, is a commitment and continued action towards reaching a goal. As shown in this study, it was important for students not only to persist but also to persevere.

Wagnilds and Young's Resilience Scale assesses equanimity, perseverance, self-reliance, meaningfulness, and existential aloneness (Fernandesa et al., 2018). The Connor-Davidson Resilience Scale (CD-RISC) assesses characteristics such as self-efficacy, sense of humour, patience, optimism and faith. These 'resilience' measurements provide a summary of resources, characteristics and factors that support positive adaptation (Riopel, 2019). Therefore, it would be more semantically appropriate and accurate to refer to these summations as 'resilience resources' instead of 'measures of resilience' (Smith et al., 2008). This emphasises the complexity of analysing, determining, and identifying resilience. Resilience scales or

measurements are measurement frameworks that record resilience according to a specific definition of this concept (Renschler, 2010). Several measurements of resilience differ in their scope and conceptual understanding of resilience (Windle, 2011).

In the following section, the focus will be on measurements of resilience, their design and application. An overview of the resilience measures which will be focussed on can be seen in Figure 2.3.

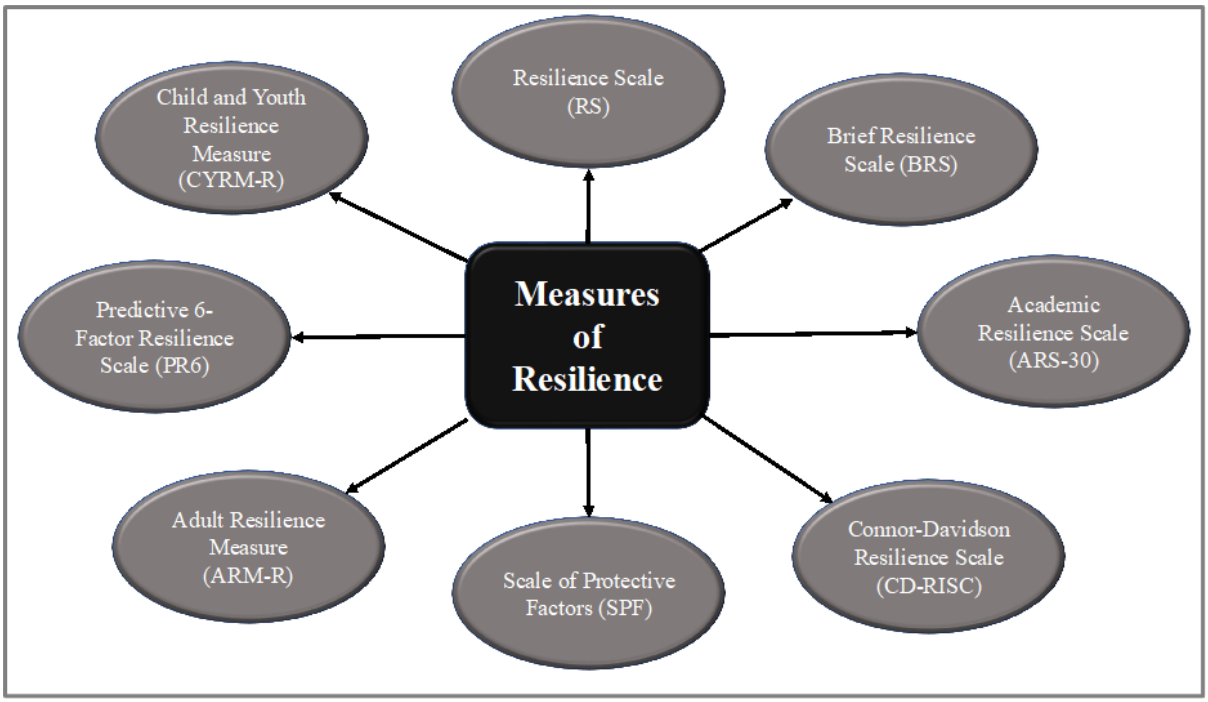

Figure 2.3

Overview of Resilience Measures

2.2.4.2 The Resilience Scale (RS)

The Resilience Scale (RS), one of the oldest measurements of resilience, was developed from a qualitative study that involved 24 elderly women who had demonstrated successful adaptation to traumatic events experienced (Wagnild & Young, 1993). From this, five essential characteristics were identified: (1) purpose, (2) self-reliance, (3) perseverance, (4) existential aloneness, and (5) Equanimity. An exploratory factor analysis by Wagnild and Young (1993)

revealed a 2-factor structure for this scale: 'personal competence' and 'acceptance of life and self'. The personal competence factor constitutes 17 items, while the acceptance of life and self constitutes eight items (Graves et al., 2017). Responses are measured on a 7-point Likert scale with 1 being 'disagree' and 7 being 'agree'. The responses are then summed up and the total score reflects resilience (Graves et al., 2017).

Jardim et al. (2021) investigated the development and psychometric properties of the Resilience Scale among a sample of 2030 Portuguese university students from several Portuguese higher education institutions (Jardim et al., 2021). Out of this sample, 59.8% of students were in the social science field (education and health), 33.1% were in the exact science field (engineering and computer science), and 7.1% were in the transformation industry (Jardim et al., 2021). This study identified a 2-factor structure to be most appropriate: 'self-determination' and 'adaptability' (Jardim et al., 2021). Each of these two factors was comprised of five items (Jardim et al., 2021). Both factors displayed good internal consistency with Cronbach's alpha= 0.8<for both factors, Factor 1: Cronbach's $\alpha = 0.843$; Factor 2: Cronbach's $\alpha = 0.813$ (Jardim et al., 2021). The items were statistically significantly proven to be good indicators for each factor through standardised factor loadings of each item group. Limitations of validity are restricted to the Portuguese sample. Nonetheless, the adapted RS-10 in this study is an appropriate instrument to measure resilience across different educational fields and degree levels (in Portuguese students) (Jardim et al., 2021). As seen above, the RS-25 by Wagnild and Young (1993) has been translated into many languages and adapted to different cultures. These languages and cultures include Chinese (Lei' et al., 2012), Dutch (Portzky et al., 2010), Swedish (Lundman et al. 2007), and Japanese (Nishi et al., 2010). The Swedish version consisted of five factors while the Brazilian version consisted of three factors. It is crucial to examine the psychometric properties of the RS in its translation and adaptation to the South African context (Pretorius, 2022).

2.2.4.3 Child and Youth Resilience Measure (CYRM-R)

The Child and Youth Resilience Measure (CYRM-R) is a 28-item self-report measure developed to assess resilience through culturally grounded experiences among young people between the ages of 11 and 23 (Ungar et al., 2008) (Ungar & Liebenberg, 2005). The CYRM-R is a worldwide measure in that it has over 20 translations with an aim to understand the resilience of diverse populations (Jefferies et al., 2019). This measure can be administered individually or in groups (Resilience Research Centre, 2018) and it takes 5–10 minutes to complete, depending on whether the measure is administered in the participants' native language, their age, and their language comprehension. The items can be directly summed to gain a total score representative of an individual's resilience (Resilience Research Centre, 2018). The factor structure of the CYRM-28 was originally established using a Canadian sample (Van Rensburg et al., 2019). This measure has been validated in several countries such as Canada (Daigneault et al., 2013), South Africa (Van Rensburg et al., 2019), Iran (Zand et al., 2017), and New Zealand (Sanders et al., 2017). In the South African study, different factor structures were established for the CYRM-R in a sample of Sotho speaking South African youth (Van Rensburg et al., 2019). The findings of this study showed that the CYRM-28 factor structure that best suited the South African sample was the three-factor structure that comprises individual, family/relational, and composite context resources (Van Rensburg et al., 2019). Further studies are needed to validate this factor structure for a broader South African sample. Although these validation studies confirm that the CYRM-R is an appropriate measure for assessing resilience, there is a lack of consensus among these countries with regard to the subscales of this measure. A principal component analysis was conducted on a New Zealand sample which yielded a four-factor structure, while other countries such as Canada, South Africa and Iran produced three alternative factor structures (Daigneault et al., 2013; Zahradnik et al., 2010). These variations are interpreted as the result of cultural differences, such as

collectivist cultures in Iran and individualistic cultures in Canada (Zand et al., 2017), which emphasise their aspects of resilience. To enhance the cultural sensitivity of the properties of the CYRM, the Resilience Research Centre (2018) outlines the following four steps in their recommendation of conducting an additional process of contextualisation prior to beginning a study: 1) Convening a local advisory committee; 2) Exploring resilience in the local context; (3) Determining additional items for the measure; 4) Evaluating the items in the measure.

2.2.4.4 The Brief Resilience Scale (BRS)

The BRS was created by Smith et al. (2008) to assess the ability to bounce back from adversity. Interestingly, research conducted by Salisu and Hashim (2017) and Windle et al. (2011) suggest that the BRS is the only scale to capture resilience as an outcome. The BRS is a self-rating questionnaire that consists of six items that relate to an individual's ability to bounce back, three positively worded items (1, 3, and 5) and three negatively worded items (2, 4, and 6) (Salisu & Hashim, 2017; Windle et al., 2011). The score range for these items isfrom 1 (low resilience) to 5 (high resilience) (Salisu & Hashim, 2017; Windle et al., 2011). The negative items are scored in reverse (Salisu & Hashim, 2017; Windle et al., 2011). The mean is calculated by dividing the total sum by the number of questions, and the scores can be interpreted as follows: low resilience has a BRS score of 1.00–2.99, normal resilience has a BRS score of 3.00–4.30, and high resilience has a BRS score of 4.31–5.00 (Smith et al., 2013). Due to the limited validity of the BRS in Asia; Lui and Lim (2022) aimed to evaluate the psychometric properties of the original English BRS to determine its reliability and validity in measuring resilience in undergraduate students at Singaporean universities. This study sampled 1907 undergraduate students in a Singaporean university from the academic years (AY) 2017–2018 (n=839) and 2018–2019 (n=1068) (Lui & Lim, 2022). This sample was further divided into two subdivisions (Lui & Lim, 2022). Sample 1 consisted of AY 2017–2018 students

(AY17–18) and sample 2 consisted of AY 2018–2019 students (AY18–19) (Lui & Lim, 2022). The students were from different academic disciplines, namely engineering, accountancy, hospitality business, health sciences, chemical engineering and information and communication technology (Lui & Lim, 2022). For sample 1, item reliability was 0.98 with a separation index of 7.82, resulting in an item stratum separated value of 10.76 (Lui & Lim, 2022). However, person reliability was at 0.77 with a separation index of 1.84, resulting in person strata separated value of 2.79 (Lui & Lim, 2022). For sample 2, item reliability was at 0.99 with a separation index of 8.63, resulting in an item stratum separated of 11.64 (Lui & Lim, 2022). Person reliability was measured at 0.79, with a separation index of 1.96, resulting in person strata separated value of 2.95 (Lui & Lim, 2022). Both samples support the uni-dimensionality of this scale (Lui & Lim, 2022). In both samples, item reliability and strata separated were of excellent quality, while person reliability and strata separated were of fair quality (Lui & Lim, 2022). The excellent item reliability and strata-separated implied that the samples in this study were large enough to confirm item difficulty ordering and that it will likely be reproduced in other similar samples. However, the fair person reliability suggests a lower probability of observing the same person's ability ordering if this same student sample were given a similar measurement. Both samples expressed minimal item biases for any practical implications. Reported results from both samples provided consistent validity based on the test content, response processes and internal structure. These findings support the BRS as a valid tool to measure the resilience of undergraduates at Singaporean universities. Evaluating the BRS with a large sample of Asian students significantly contributes to the cross-cultural generalisability of the BRS. Smith et al. (2008) intended to use as few items as possible in their scale, but the inclusion of more items would help better target students with higher abilities and improve the distinction of ability levels for future research.

2.2.4.5 The Predictive 6-Factor Resilience Scale (PR6)

The PR6 was created to uncover the cornerstones that create resilience by examining and combining existing models of resilience with neurological models. Erieau (2021) mentions that the PR6 scale consists of six domains that explain factors contributing to an individual's capacity for resilience. These six domains were formed from the expansive nature of characteristics within the construct of resilience, allowing these grouped characteristics to share neurological underpinnings.

These six domains are vision, composure, reasoning, health, tenacity, and collaboration. Each division functions independently but influences other divisions (Jurie, 2018). Table 2.2 tabulates each domain with its intended function.

Table 2.2

Domains of the PR6 and their Functions (Jurie, 2018)

Domain	Function
Vision	Vision includes self-efficacy, sense of purpose, setting goals, and visions of self.
Composure	This domain supports emotional regulation so that the individual can recognise hidden opportunities and solve problems in novel ways.
Reasoning	This domain involves creativity and innovative problem solving.
Health	Having good health provides a strong foundation in the pursuit of one's goals and purpose.
Tenacity	This domain identifies concepts like persistence to be crucial for success. 'Realistic optimism' is another factor emphasised by this domain.
Collaboration	This domain is about embracing our human need to connect with others.

The PR6 considers the differences in resilience between industry, age and gender (Jurie, 2018). Resilience scores from the 16-item PR6 scale showed good internal consistency and confirmed the hypothesis that health hygiene factors have a statistically significant influence on psychological resilience (Rossouw & Rossouw, 2016). To the date of the article by Rossouw and Rossouw (2016), the correlation between health factors and resilience had not been

incorporated into the designs of previous resilience scales. Therefore, what makes the PR6 stand out is its inclusion of the sixth domain, health. Hence, this scale is suggestive of a correlation between health factors that promote neuroplasticity and psychological resilience. The hypothesis of a linkage between health and resilience has become strengthened by evidence of health issues that positively and negatively affect an individual's mood. Health factors such as regular exercise, nutrition and sleep have a facilitating effect on resilience. The survey design of the PR6 was envisioned to be a shorter form of a self-reported questionnaire that can be completed in a few minutes. The 16-item questions provide insight into each of the domains and were rated on a 5-point Likert scale, with 1 being the most unlikely and 5 being the most likely. All of the domains, except for the health domain, had two question items with one of the two questions being scored in reverse. The questions scored in reverse were termed 'negatively scored items', while the traditionally scored items were positive. The health domain consisted of four positively scored items. This survey was administered to professionals sampled for this study (Rossouw & Rossouw, 2016), with an overall sample size of N=204. This overall sample consisted of two groups. The first group, N=128, completed the survey on paper that was handed out and later collected by the facilitator once completed. The second group, N=76, completed this survey online. These two modes of delivery had no significant deviation. First, the negatively scored items were revised in the completion of scoring the surveys. Following this, each pair per domain was summed for the Momentum score. The health domain's four positively scored items were subsequently summed. Then, each domain was averaged to produce a comparable score per domain. The overall resilience score of the PR6 was calculated as an average of each domain, ranging between 0, the lowest resilience, and 1, the highest resilience. There were no statistically significant differences in the overall PR6 scores of the professionals (from healthcare to finances). However, results showed differences on a domain level. In the composure domain, healthcare professionals scored higher. In the health domain,

professionals in the finance industry scored lower. Results showed relationships between these domains. The good internal consistency of this measurement in this study suggests that the PR6 is a valid psychological resilience measurement tool.

2.2.4.6 The Connor-Davidson Resilience Scale (CD-RISC)

The CD-RISC is another well-received measurement of resilience (Riopel, 2019). This scale was developed by both Connor and Davidson (2003) in their experience of working with post-traumatic stress disorder (PTSD) patients because there were not sufficient reputable resilience scales to help them support their patients. The CD-RISC measures different components such as adaptability, ability to deal with stress, ability to maintain focus, ability to manage unpleasant feelings, and ability to face failures and not get discouraged. The five-factor structure of the CD-RISC was derived from Connor's and Davidson's exploratory factorial analysis with a general population (n=577), psychiatric patients (n=43), primary care (n=139), and clinical trial samples (n=69). These five factors are the following:

- Personal competence, high standards, and tenacity
- Trust in one's instincts, tolerance of negative effects, and strengthening effects of stress
- Positive acceptance of change and secure relationships
- Control
- Spirituality

The preliminary analysis of this instrument in the above-mentioned samples supported the CD-RISC's convergent and divergent validity, internal consistency, and test-retest reliability (Mealer et al., 2016). There are three authorised versions of this scale, the CD-RISC-2, CD-RISC-10, and the CD-RISC-25. These shorter versions of the CD-RISC are the result of several attempts to revise the CD-RISC-25 (Riopel, 2019). These attempts were aimed at

making the scale shorter and more reliable (Blanca Mena et al., 2020). The CD-RISC-2 is a shortened version that is more time effective. This version uses item 1, 'Able to adapt to change', and item 8, 'Tend to bounce back after illness or hardship', out of the available 25 items. The CD-RISC-2 has shown to have good internal consistency, good test-retest reliability, and sound psychometric properties, and it expresses a significant correlation with the complete CD-RISC scale which suggests that the CD-RISC-2 is a good representative measurement of the overall scale (Vaishnavi et al., 2007).

The second authorized version, the CD-RISC-10, was developed by Campbell-Sills and Stein (2007) and is comprised of 10 items out of the available 25. Some studies revealed instability in the factor structure which led to the development of the abridged 10-item CD-RISC (Riopel, 2019). The most stable version of the CD-RISC is believed to be the 10-item version that, with the removal of 15 items, best captures the core components of resilience (Riopel, 2019). This scale has been translated into more than 80 languages with limited trivial misunderstandings or discrepancies due to the clear manner in which this measurement was formulated. Nartova et al. (2021) acknowledge that the CD-RISC-10 has some limitations, most of which can be combated with the incorporation of more objective behavioural and demographic variables (Levey et al., 2021; He et al., 2019). Compared to the other two versions of the scale, the CD-RISC-10 is psychometrically superior. Evidence supporting this is derived from confirmatory factor and item analysis (Gonzalez et al., 2015). The factor structure, reliability, and discriminant and predictive validity of the CD-RISC need to be assessed when used in a new context. This is evident from several global studies that used the CD-RISC. Singh and Yu (2010) examined the psychometric properties of the CD-RISC in an Indian context with a sample of 256 students. The original five-factor structure was not confirmed for their study, and an exploratory factor analysis selected a four-factor solution as the most suitable in that context. These four factors were hardiness, optimism, resourcefulness, and purpose (Singh &

Yu, 2010). This study reported the adapted CD-RSC to be a reliable and valid measure. This is evident with the overall Alpha reliability for this study reported at 0.89, exactly the same as in Connor and Davidson (2003) study. The scores in this study statistically significantly express that resilience has a strong positive correlation with life satisfaction (0.23), positive affect (0.67), and four out of the 'big five' personality traits: openness (0.39), extroversion (0.19), agreeableness (0.35) and consciousness (0.20) (Singh, 2010). The remaining scores expressed a negative correlation between resilience and negative affect (-0.26) and one of the 'big five' personality traits, neuroticism (-0.16). This correlation pattern provides evidence of the validity of the CD-RISC amongst Indian students. Another study conducted by Velicokovic et al. (2020) in Sweden the CD-RISC was conducted without using the original five-factor structure.

Based on such findings, we could presume that the factor structure of the CD-RISC would have to be assessed and adapted if this scale were to be used to measure the resilience of engineering students in South Africa (Velicokovic et al., 2020).

2.2.4.7 The Scale of Protective Factors (SPF)

The Scale of Protective Factors (SPF) is a multidimensional measure of protective factors believed to contribute to resilience, based on prior empirical research (Ponce-Garcia et al., 2015). Instead of focussing on components that constitute resilience, the SPF is designed to assess specific social-interpersonal and cognitive-individual protective factors known to be determinants of resilience (Ponce-Garcia et al., 2015). This measurement consists of 942 sampled college students across two institutions and three studies. After an exploratory factor analysis and model reduction, the authors confirmed that a four-factor model with 25 items was the most appropriate for a good model fit (Ponce-Garcia et al., 2015). These four factors are: (i) social support, (ii) social skills, (iii) prioritising and planning behaviour, and (iv) goal

efficiency (Ponce-Garcia et al., 2015). Twenty-four of the original items were retained, with one item being omitted from the 'goal efficiency' subscale (Ponce-Garcia et al., 2015).

The latest SPF-24 consists of a hierarchic structure of two latent variables. The lower-order variable, 'social-interpersonal', includes factors 1 and 2. Factors 3 and 4 are included in the higher-ordered variable, 'cognitive-individual'. The inclusion of these variables is consistent with research regarding protective factors of resilience (Reich et al., 2010). Participants responded to these items through a 7-point scale from 1, 'disagree completely', to 7, 'completely agree'. These responses are summed up on each subscale and for the entire measure (Ponce-Garcia et al., 2015). Results suggest that the factor structure of this scale may bring two significant benefits to the clinical and research communities (Ponce-Garcia et al., 2015). Firstly, this scale may be used as an initial assessment and outcome tool, further enabling researchers to track strengths and deficits in protective factors determining resilience (Ponce-Garcia et al., 2015). Secondly, the subscales allow researchers to isolate specific determinants of resilience to test different independent variables and better assess group differences in resilience (Ponce-Garcia et al., 2015).

To examine the diagnostic function of the SPF-24, clinical criteria were used to identify a subsample of participants who had experienced violent trauma and scored low, moderate or high on an already established resilience scale such as the CD-RISC (Ponce-Garcia et al., 2015). Results show that those who scored low on the CD-RISC scored statistically significantly lower on all four subscales of the SPF in comparison to those who scored moderately and high on the CD-RISC (Ponce-Garcia et al., 2015). The largest difference existed in subscale/factor 3, namely prioritising/planning behaviour. Although the regression analysis provided in Ponce-Garcia et al. (2015) suggests that the SPF assess the same construct as the CD-RISC and RS, results indicate that the SPF-24 uniquely accounts for variance in social support, social skills,

and planning/prioritising behaviour. This significantly shows the SPF-24 is different from the other measures that measure overall resilience. Apart from measuring overall resilience, the SPF-24 enables researchers to understand the unique contributions of specific protective factors in determining overall resilience.

One of the limitations of in the study by Ponce-Garcia et al. (2015) was that the sample was predominantly White. Therefore, the presented results cannot be generalised to other samples, such as in South Africa. Consequently, it is suggested that future research should investigate the validity of the SPF-24 in different sub-populations of South Africa to draw better generalizations of the National population.

It was conclusively shown that the SPF-24 is expected to aid intervention and prevention in improving resilience through identifying strengths and deficits in specific protective factors that determine resilience (Ponce-Garcia et al., 2015).

The last two resilience measures discussed below are the two that were used in the current case study, namely the Adult Resilience Measure and the Academic Resilience Scale.

2.2.4.8 The Adult Resilience Measure (ARM-R)

Originally, the CYRM-R was a 58-item measure developed using mixed-methods data from 11 countries (Ungar & Liebenberg, 2011). The measure was then reduced to 28items (Liebenberg et al., 2012). In 2013, Liebenberg et al. reduced the measurement to 12 items. The Adult Resilience Measure (ARM-28) was adapted from the CYRM-R-28 for an adult population (Liebenberg & Moore, 2018). The ARM-28 is based on the idea that contextually relevant resources, such as physical resources, relational supports and services, are constituents of resilience. These constituents are key processes that scaffold positive outcomes (Liebenberg & Moore, 2018). Additionally, this measure works off the idea that resilience is interactive and

fluctuates overtime (Liebenberg & Moore, 2018). The ARM-28 focusses on the relational, individual and contextual resilience processes aimed at identifying the socio-ecological resilience resources of adults exposed to environmental risk (Liebenberg & Moore, 2018). Clark et al. (2022) applied the ARM to the context of conflict-related sexual violence. This same study conceptualises the ARM-28 as "a 28-item scale that seeks to measure protective resources across individual, relational, and contextual subscales" (Clark et al., 2021, p. 1). Similar to the CYRM, different factor structures were generated for samples from different countries in this study, namely Bosnia and Herzegovina, Colombia and Uganda. Findings demonstrate that significant commonalities and differences exist on the ARM between these mentioned countries that share similar experiences with violence but come from different cultures (Clark et al., 2022). This study suggests that a single factor structure for the ARM-28 is insufficient in capturing the diverse clustering of protective factors linked to each country's particularities (Clark et al., 2022).

2.2.4.9 The Academic Resilience Scale

The Academic Resilience Scale (ARS-30) is a more recently developed multidimensional scale that measures resilience in an academic context. The ARS-30 is unique in the sense that it explores processes in resilience, instead of just focussing on outcomes (Cassidy, 2016). This measurement takes into account students' adaptive cognitive and behavioural responses to academic adversity. The concept of academic resilience refers to a student's ability and capacity to reverse academic misfortune and flourish in their academic life despite facing adversities (Martin & Marsh, 2006). Academic resilience is a significant predictor of a student's ability to cope in university. This is due to the reported positive relationship identified between academic performance and academic achievement (McLafferty et al., 2012). The ARS-30 incorporates the use of vignettes to describe adverse academic events.

Student responses are submitted on a scale from 1, 'likely', to 5, 'unlikely' (Ackerman, 2022). The factor structure of the ARS includes items that fall into the following categories:

- Perseverance
- Reflective and adaptive help-seeking
- Negative affect and emotional response

The best indication of students with high resilience is those who score high on the first two factors (perseverance; reflective and adaptive help-seeking) and low on the final factor (negative affect and emotional response) (Cassidy, 2016). It is theorised that the ARS-30 provides a well-supported conceptualisation of resilience in an academic context (Cassidy, 2016). Therefore, the most appropriate application of the ARS-30 may be in research conducted among university student populations (Cassidy, 2016). Cassidy (2016) incorporates the ARS-30 to measure university students' responses to an authentic, hypothetical vignette portraying adversity in an educational context. The adaptive and non-adaptive cognitive-affective and behavioural responses of students toward their academic adversity are an area of focus in this study by Cassidy (2016). These responses help to capture and conceptualise students' resilience in specific events in relation to an educational context (Romano et al., 2021). The study consisted of a sample of 532 British undergraduate university students, further divided into two groups. The first sub-group (n=321) completed the original version of the ARS-30 vignette. The second sub-group (n=211) completed an alternative version of the ARS-30 to assess discriminant validity. In the original version, the participants were asked to place themselves in the role of the student characterised in the vignette to enable them to experience academic adversity. In the alternative version, participants were asked to envision this academic adversity being experienced by a fellow student. Once exposed to the vignette, the participants responded through a 5-point Likert scale from 'most likely' (1) to 'most unlikely' (5). Items in the ARS-

30 reflect areas (such as self-efficacy and self-regulation), factors, characteristics, and attributes that are commonly associated with resilience. The study reported that the internal retention of these three factors accounts for a total of 42.4% variance in academic resilience scores (Cassidy, 2016). Factor 1 proved to be the most significant, accounting for 27% of the total variance (Cassidy, 2016). Factor 2 accounted for 9.1% while factor 3 accounted for 5.5% (Cassidy, 2016). The internal consistency for this study exceeded levels normally considered acceptable with a Cronbach's alpha of 0.90 (Cassidy, 2016). Concurrent validity was reported at 0.49 while discriminant validity was reported at 0.98 (Cassidy, 2016). The scale's content validity is presented by the generally accepted definitions, factors, constructs, theoretical understandings, and attributes commonly associated with resilience (Cassidy, 2016). In addition, data collection revealed a staggering imbalance of females and males, which introduced a potential bias (Cassidy, 2016). Although this factor proved to be a point of criticism, the imbalance was reported to be representative of how females tend to outnumber males in a variety of university courses.

The degree to which the ARS captures 'bounce backs' from academic adversities needs to be further evaluated. Although it is reported that the ARS-30 scores reflect the capacity to 'bounce back', it cannot be thoroughly established until findings of returning to normal functioning become available. This study by Cassidy (2016) criticises the underrepresentation of males in their study. Studies that address the specific issue of generalisability of the ARS-30 to male students need to be conducted. Despite these points of criticism, the ARS-30 represents a unique measurement of academic resilience in students. The subsequent section of the literature reviews measures of risk.

2.2.5 Measures of risk

Psychological risk refers to the possible occurrence of psychological injury due to exposure to hazards (Riskology, 2021). From a psychological perspective, these hazards include situations or factors that could increase the likelihood of an individual experiencing a stress response which is a physical, mental or emotional reaction (Riskology, 2021). According to Borum (1996), risk assessment refers to probabilistic estimates of a continuous variable, such as violence, based on both person and situation variables. Hanson and Bussiere (1998) elaborates on three approaches to risk assessment:

- A guided clinical approach: An expert's judgement based on verifiable risk factors
- A pure actuarial approach: Predetermined numerical weighting of predictors
- An adjusted actuarial approach: An actuarial prediction which may be modified to take potentially important factors into account

In the following section, I discuss, explain and interpret a variety of psychological risk assessment tools. The first two measures of risk, namely the K10 and DSM CCSM-A, were administered to student engineering participants in this case study. However, an overview of all of the measures of risk reviewed in this chapter can be seen in Figure 2.4 below.

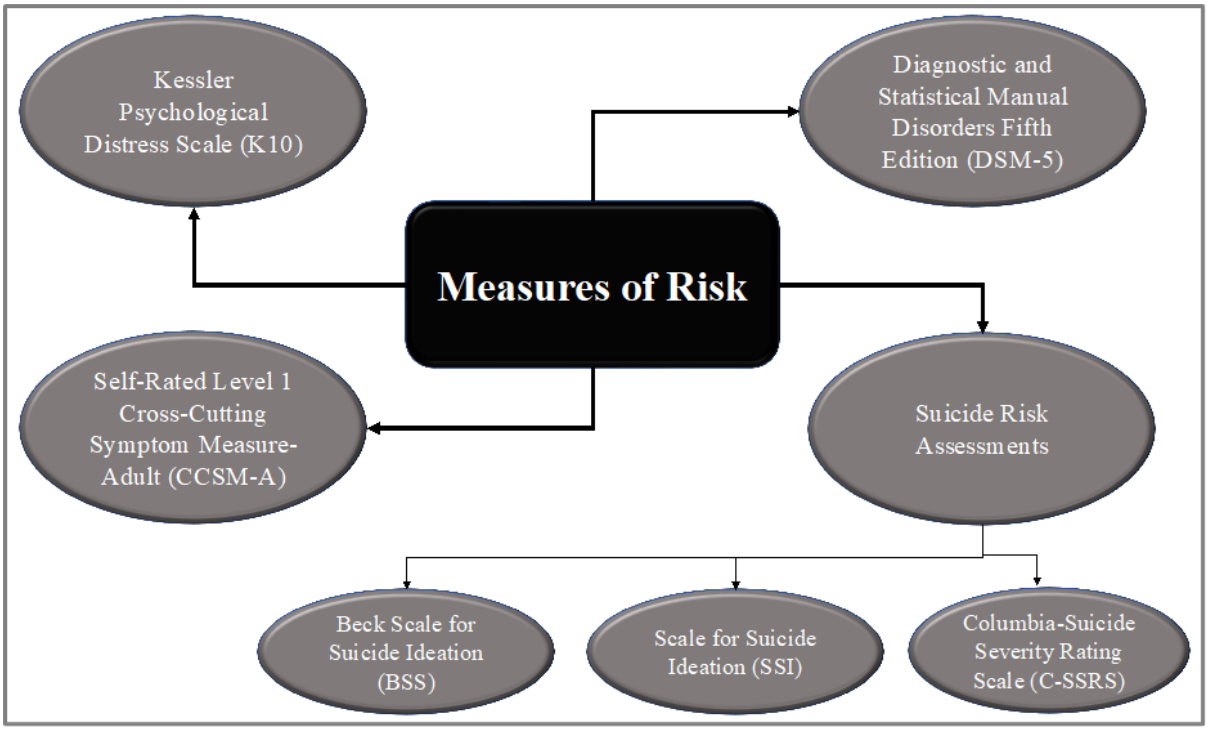

Figure 2.4

Overview of Risk Measures

2.2.6 The Kessler Psychological Distress Scale (K10)

The Kessler Psychological Distress Scale (K10) (Kessler et al., 2002) is a simple and popular self-report measure of psychological distress. The K10 is promoted as a self-report measure to identify the need for treatment. This measure was designed to be used in a general population. Similar to other measures of psychological distress, the items in the K10 focus on anxiety and depression. The K10 comprises 10 question items about emotional states answered on a 5-point scale, where 1= 'none of the time' and 5= 'all of the time'. Scores are then summed up with the maximum score being 50 and the minimum score being 10 (Kessler et al., 2002). The scores may be interpreted as shown in Table 2.3 below.

Table 2.3

Level of Psychological Distress according to K10 Scores (Guidelines, 2022)

K10 Score	Level of psychological distress
10–15	Low
16–21	Moderate
22–29	High
30–50	Very high

Andrews and Slade (2001) aimed to use the National Survey of Mental Health and Well-being conducted in Australia in 1997 to provide normative comparative data on symptoms, disabilities, service utilisation and diagnosis for the range of available K10 scores (Andrews et al., 2001). This was a household survey with a population sample of persons 18 years and older (Andrews et al., 2001). With a response rate of 78%, a total of 10 641 people were interviewed and completed the K10 (Andrews et al., 2001). Results showed that the K10 expressed a mean of 14.2 and a median of 12. Sixty-eight per cent of respondents scored under 15, while 3% scored 30 and above. This resulted in a heavily skewed distribution of 2.2 with the majority of respondents reporting little or no distress (Andrews et al., 2001). This study by Andrews et al. (2001) reports a strong association between the K10 and a current Composite International Diagnostic Interview (CIDI) diagnosis of anxiety and affective disorders. A lesser, but still significant association was made between the K10 and other mental disorder categories (Andrews et al., 2001). This makes it clear that the K10 may serve as a useful clinical tool. However, further research will need to be done to determine whether these cut-off scores are most appropriate for clinical decision-making. The K10 may be used to estimate the needs of a population for community health services (Andrews et al., 2001).

Recently, Chiara et al. (2021) used the K10 to investigate the psychological wellbeing of foreign students in South Korea. They were unable to track response rates due to the Snowball sampling methodology used to send the survey questionnaire to potential participants (Chiara et al., 2021). The participants were foreign students in Korean universities who had been studying for six months or more and had an appropriate understanding of English (Chiara et al., 2021). When they received the survey link, they were requested to disseminate it within their social network to peers and students who met the criteria (Chiara et al., 2021). A total of 261 student questionnaire respondents were recorded from 63 universities in South Korea (Chiara et al., 2021). This study used the K10 to evaluate psychological distress. The K10scores were interpreted as follows: K10 score > 22= 'high distress' and K10score <22= 'low distress' (Chiara et al., 2021). An increased likelihood of psychological 'illness', such as anxiety and depression, was indicated by high K10 scores and vice versa (Chiara et al., 2021). Results reported satisfactory internal reliability at 0.89. Among the international students in this study, 70.5% reported low distress while 29.5% reported high distress. The logistic regression analysis performed in this study used the K-10 scores as outcome variables to examine sociodemographic factors associated with international students' psychological distress levels (Chiara et al., 2021). Factors associated with high levels of psychological distress were students younger than 25 years of age, females, part-time students, self-sponsored students, and students from the Asian and American regions (Chiara et al., 2021).

Another study by Qamar et al. (2014) constituted a sample of 445 medical students in Pakistan. Participants were recruited through non-probability consecutive sampling of students from first to fourth year. Out of the 405-student sample, 115 students were in their first year (28.4%), 82 were in their second year (20.2%), 99 were in their third year (24.4%), and 109 were in their fourth year (26.9%). The sample consisted of 254 males (62.7%) and 151 females (28.4%). The K10 was distributed to these students. Out of the 455 participating students, 405

completed the questionnaire. The K10scores in this study were interpreted as follows: 20–24= 'mild stress', 25–29= 'moderate stress', >30= 'severe stress'. The average stress score was 19.61 with a range from 10 to 43. Out of the 405 participants, 169 students reported experiences of stress. Mild stress was experienced by 81 students (47.92%), moderate stress was experienced by 47 students (27.81), and severe stress was experienced by 41 students (24.26%). Similar to the previous study, females recorded greater stress scores (13%) than males (11.2%). Although student stress was found more frequently in first-year and third-year students, no significant association was found between stress and academic year. An introduction of organised strategies that address academic-related problems may prove helpful for undergraduate medical students in their attempt to overcome stress. Both of these cross-sectional studies made use of the K10 in their psychological distress evaluations.

2.2.7 Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult (CCSM-A)

The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult (CCSM-A) (APA, 2013). The DSM-5 CCSM-A was developed by the American Psychiatric Association (APA) as a trans-diagnostic mental health symptom measure (Gibbons et al., 2021). There are three versions of this measure: the adult, child and parent versions. This instrument assesses significant mental health domains across psychiatric diagnoses. The adult version, which was used in the current case study, includes 23 self-report questions that cover 13 diagnostic domains of psychopathology: depression, anger, mania, anxiety, somatic symptoms, suicide ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviours, dissociation, personality functioning, and substance use (Narrow et al., 2013). Respondents were required to make use of the 5-point response scale to indicate how many of the symptom items had bothered them in the past two

weeks. In most of the domains, a score of 2 or higher is suggestive of clinically relevant mental health problems.

Clinicians may also use this instrument to identify areas of inquiry that may significantly impact an individual's treatment and prognosis (APA, 2013). The acronym DSM XC was used as a synonym for the CCSM by Gibbons et al. (2021). The DSM XC may be a useful tool for clinicians to track changes in an individual's symptom presentation (Gibbons et al., 2021). In the study conducted by Bastiaens and Galus (2017), it was concluded that the DSM XC would be beneficial as a screener to rule out, but not identify mental health problems. These notable findings are restricted to clinical samples. No prior research has evaluated the psychometric properties of the DSM XC on a non-clinical sample (such as students). Therefore, psychometric validation of the DSM XC, in non-clinical samples, is needed to investigate its applicability to non-clinical samples. The DSM XC may benefit a high-risk population that is less likely to seek treatment.

College students show high rates of hazardous substance abuse and mental health issues and rarely seek help or treatment (Gibbons et al., 2021). The findings by Bastiaens and Galus (2017) have been corroborated by South African research by Bantjes et al. (2020). Bravo (2018) evaluates the psychometric properties of the DSM XC with a large and diverse sample of university students who have not pursued treatment. The sample in this study consisted of 7217 students from 10 universities across 10 states in the USA (Bravo, 2018). This study utilised matrix sampling to minimise the burden on participants. Each participant received and completed a set of core measures that focussed on substance usage and the DSM XC (Bravo, 2018). After completion of this stage, participants were issued a random sample of 10 measures that assessed mental health, physical health, and personality constructs (Bravo, 2018). Non-DSM XC measures assessed in this study were depression, anxiety, and stress; fear of negative

evaluation; social interaction anxiety; PTSD; insomnia; suicidality, self-esteem; alcohol use; alcohol misuse; alcohol-related problems; marijuana use; marijuana misuse, marijuana-related problems. Validated instruments were used to assess these constructs outside of the DSM XC (Bravo, 2018). This study by Bravo (2018) recorded the prevalence of potential symptom presentation in each of the domains. The prevalence for the last domain, 'substance use', was presented in a substance-specific manner. The prevalence data are tabulated below in Table 2.4.

Table 2.4

The Prevalence of Potential Symptom Presentations in Different Domains

Domains	Prevalence of potential symptom presentation (%)
Anxiety	27.89
Depression	27.87
Sleep disturbance	25.47
Anger	27.54
Mania	21.91
Personality functioning	20.07
Somatic distress	17.11
Memory	12.09
Dissociation	11.70
Repetitive thoughts and behaviours	10.95
Suicide ideation	7.46
Psychosis	4.00
Alcohol use	32.06
Tobacco use	15.53
Other drug use	14.68

All 13 domains of the DSM XC were significantly positively correlated with each other. Most of these magnitudes were moderately to strongly correlated to each other, expressing good internal validity. Measures of similar constructs and the associations between mental health symptoms and substance use outcomes showed remarkable similarity across the DSM XC and the longer more validated instruments assessed these constructs. This supports the convergent validity of this study by Bravo (2018). The 13 domains of the DSM XC strongly correlated with

other theoretically-relevant constructs, such as PTSD, thus displaying good criterion-related validity.

The results from the Bravo's (2018) study systematic testing of internal, convergent, and criterion-related validity support the utility of the DSM XC in assessing psychopathology amongst college students, in a non-clinical sample (Hurst & Kavanagh, 2017).

The current case study did not collect clinical diagnosis data to determine whether the cut-off scores were valid for a university population. Among university or college student samples, the sensitivity and specificity of the DSM XC needs to be examined to inform its utility as a mental health screener. The current case study did not compare this measure to larger and more comprehensive measures of psychopathology. These comparisons are significant in determining whether researchers may use the instrument to evaluate the psychiatric issues commonly experienced by college students without burdening them unnecessarily through extensive psychological evaluation. Lastly, this measure has no normative data and has not been evaluated by the Standards for Educational and Psychological Testing, which is needed to provide greater empirical validation of the measure.

2.2.8 Suicide risk assessments

A suicide risk assessment is a comprehensive assessment that aims to determine an individual's risk for suicide at a given point in time (PSYCHDB, 2021). However, this assessment cannot predict future events (PSYCHDB, 2021). Such assessments' predictive value in identifying individuals at risk of committing suicide is poor, as is evident from the suicide statistics provided by (PSYCHDB, 2021): 95% of patients identified as 'high risk' do not die by suicide; 'low risk' patients account for 50% of suicide rates;50% of those individuals who have committed suicide presented no prior history of suicide attempts; and notably, in the past 40 years, the accuracy of predicting suicides has shown no improvement.

The prevalence of suicide is comparatively low, which results in many false positives when clinicians assess an individual as at high risk of suicide (Gipson et al., 2015). Risk and protective factors in accordance with suicide risk assessment are listed below (Patterson, 1983; PSYCHDB, 2021): sex (males are at greater risk), age (the risk increases with age), depression, previous attempts (the most significant indicator of suicide risk), alcohol abuse, loss of rational thinking, lack of social support, organised plan, no spouse and sickness. Protective factors in suicide risk assessment include the following: children, social support, religion, good health, and sense of responsibility.

The Beck Scale for Suicide Ideation (BSS) is an evaluation of suicidal thinking that helps to identify individuals at risk (Beck et al., 1979). The questionnaire assesses the intensity and extensiveness of an individual's current plans, attempts, and behaviours to complete suicide (Beck et al., 1979).

Brown (2007) examined the psychometric properties of the Scale for Suicide Ideation (SSI) using a sample of 292 rural high school students in China. This demographic group was identified as one of the largest risk groups for suicide in China (Phillips et al., 2002). The researchers reported that this instrument was adopted because of its well-established reliability and validity in the West, as well as the consistency of measurement across study samples, thus allowing more accurate comparison of data. The SSI is a 19-item instrument that focusses on the current intensity of specific attitudes, behaviours, and plans to commit suicide (Beck et al., 1979). Participants respond to each item on a 3-point scale, ranging from 0 (no ideation) to 2 (strong ideation). Responses are summed to yield a score in the range of 0–38. Some of the characteristics assessed by these items are the wish to die, a desire to make an active or passive suicide attempt, the duration and frequency of suicide ideation, sense of control over making

an attempt, number of deterrents, and amount of actual preparation for a contemplated suicide attempt.

Beck et al. (1979) administered additional measures such as the Beck Hopelessness Scale (BHS) (Beck et al., 1974) and The Trait Anxiety subscale of the State-Trait Anxiety Inventory (STAI) (Spielberger, 1983). The BHS was administered to assess the extent of positive and negative beliefs about the future, and the STAI was administered to assess general feelings of anxiety-proneness. A single item from the World Values Survey (WorldValueSurvey, 2004) is their belief that suicide can be justified. The mean for the SSI was 4.84. Results showed that females have significantly higher SSI scores than males. The SSI reported strong internal reliability (a=0.85.) The moderate positive correlations between the SSI and the BHS, the Trait Anxiety subscale of the STAI, and the item of the World Values Survey, supported the convergent validity of the SSI. In Beck et al. (1974), the full sample, 292, was split into two equal groups to further estimate the ability of the Trait Anxiety subscale and Hopelessness (from the BHS) to predict suicide ideation. The results indicated that, regardless of the Trait Anxiety scores, groups with high hopelessness scores had higher mean suicide ideation scores. In addition, those individuals with suicide ideation and intent had significantly higher mean scores on trait anxiety and a favourable attitude toward suicide than those without suicide ideation or intent. Furthermore, individuals with suicide intent had significantly higher scores on hopelessness than those without suicide intent. These results support the criterion validity of the Scale of Suicide Ideation in a Chinese student context. Generalisability of this study is limited. In addition, this study did not conduct a test-retest reliability assessment to ensure stable results over time. Despite the few limitations, in the Beck et al. (1974) study, the Chinese adapted version of the SSI, may be a reliable and valid instrument for measuring suicide ideation in Chinese student populations.

The Columbia-Suicide Severity Rating Scale (C-SSRS) is used to identify and access individuals at risk of suicide. The C-SSRS was designed to provide definitions of suicide ideation and behaviour and self-injurious behaviour (non-suicidal); to quantify the full spectrum of suicide ideation and behaviour; to distinguish between suicidal and non-suicidal self-injurious behaviour; and to administer a user-friendly format that allows for information integration from multiple sources (Posner, 2011). These core criteria, reviewed by Meyer (2010), are essential for interpreting the utility of such scales that assess suicide-related phenomena. Gipson et al. (2015) examined the predictive validity of the C-SRRS. Additional aims of the study by Gipson et al. (2015) include the examination of the characteristics of adolescents' suicide ideation. The sample constituted 178 adolescents between 13 and 17 years of age who sought emergency psychiatric services at a university hospital. The C-SSRS measures suicide ideation and behaviour and was conducted in the form of a semi-structured interview in the study by Gipson et al. (2015). This measure constitutes a four-factor subscale structure: the severity of ideation, the intensity of ideation, behaviour and lethality. The first subscale, the severity of ideation, is a 6-point scale that ranges from 1 ('wish to be dead') to 5 ('suicide intent'). Individuals who denied suicide ideation receive a zero. The second subscale, intensity of ideation, consists of five items scored in a range of 2 to 25, namely frequency, duration, controllability, deterrents, and reasons for ideation. Only individuals who endorse at least one of the 'severity' subscale items can complete the second subscale. The third subscale, the behaviour scale, investigates interrupted, aborted and legitimate suicide attempts and *non-suicidal self-injurious behaviour.* The results of the study by Gipson et al. (2015) showed that 50.6% of the sample presented the need for psychiatric emergency services with a suicide risk concern from suicide ideation or previous attempt. Approximately 20.2% were seeking psychiatric emergency services because of aggression. Another 36% were seeking these services because of acute or worsening psychiatric conditions such as depression, mania, and

psychotic symptoms. During their index visit, almost a third of the sample reported at least one previous suicide attempt in their lifetime, with 10% making that attempt within the last week. The descriptive data for return visits during a 12-month period after the index visit, showed that 18.5% of the sample had one return visit, 8.4% had two return visits, and 7.8% had three or more return visits. A total of 34.7% of the adolescent sample returned for psychiatric emergency services over those12months. Of this returning sample, 6.7% reported a suicide attempt in the past week.

Gipson et al. (2015) mentions that the C-SSRS scores were significant predictors of suicide attempts at returning psychiatric emergency visits across one year. The intensity scores, within the subgroup of adolescents who reported suicide ideation at the index visits, predicted return psychiatric emergency visits but did not predict suicide attempts at these return visits. The severity scores expressed a trend level significance in predicting suicide attempts. Non-suicidal self-injurious behaviour was noted as a predictor for a psychiatric emergency return visit and a suicide attempt at a return visit. However, suicidal behaviours were not predictive of such outcomes. This indicates that non-suicidal self-injurious behaviour is a greater predictor of suicide attempts than suicidal behaviours.

An exploratory analysis by Gipson et al. (2015) of the intensity subscale indicated that the duration-item may be significant in our understanding of adolescent suicide attempts. In the study by Gipson et al. (2015), 'duration' was the only intensity subscale item that significantly predicted a return visit and reported suicide ideation at the index visit (Gipson et al., 2015, p, 89). Other items in this subscale, such as frequency, controllability, deterrents, and reasons for ideation, were not noted as significant predictors. This study did not find 'suicidal behaviours' nor the severity scale to be predictive of a return visit. The present study provides additional explanations for these differences in findings. Instead of assessing the most severe episode in a

youth's lifetime, this study assessed lifetime and the past weeks' suicidal and non-suicidal self-injurious behaviours. Another explanation is that the youth sampled in this study were not emergency department patients. The sample of this study is restricted was youth from 13 to 17 years of age. Therefore, the findings in this study indicate that this instrument has predictive validity for future suicide attempts in outpatient clinic samples (Posner, 2011). This study has certain limitations. Due to the restricted sample in this study, generalisability is limited. The study found that it was not possible to obtain inter-interviewer reliability data. Another limitation is that the C-SSRS was the only instrument used in this study, thus limiting the inclusion of other influential variables. The C-SSRS should be used in conjunction with other suicide assessment tools to best support clinical decision-making. Lastly, due to the relatively low base of suicide attempts (the primary outcome), the preponderance of 0 scores limited statistical power, thus potentially limiting the researcher's ability to identify significant predictors. The C-SSRS intensity scale and non-suicidal self-injurious behaviour showed predictive validity for suicide attempts at return visits. Results indicate that the duration item is significant to the risk of suicidal behaviour, thus warranting further studies on this aspect.

2.3 PERCEPTIONS OF ACADEMIC RESILIENCE FROM THE LITERATURE

The barriers and challenges discussed at the beginning of this chapter are directly related to many of the issues raised in this section of the literature review. Most of the literature reviewed in this section is derived from North American and Asian sources. South African sources of information in this area of the literature primarily come from websites, indicating that authoritative literature is lacking. There is a dearth of empirical data on the perceptions of academic resilience in African and specifically South African contexts based on the nature and location of the available literature which was reviewed. As a result, the current case study aimed to address this gap in the existing literature.

2.3.1 Literature on students' perceptions of their academic resilience

In the same way that students perceive risks and adversities differently, they also perceive their academic resilience differently. In a study by Carnell et al. (2020), students' perceptions of their adversities were explored through questionnaires that announce their level of satisfaction following their first mid-term examination in a sophomore engineering statics class. This study aimed to discover whether a correlation exists between engineering students' perceptions of academic satisfaction and their academic performance (Carnell et al., 2020). A sample of 95 undergraduate engineering students participated and they were given four weeks to reflect on their performance (Carnell et al., 2020). Following this, a survey with Likert scale questions was handed to the participants to assess their level of satisfaction with their performance (Carnell et al., 2020). 'Satisfaction' rather than 'performance' was used as an indicator of adversity to measure the students' perceptions (Carnell et al., 2020). Accompanying the Likert scale were open-ended questions that allowed for a qualitative assessment of the levels of satisfaction (Carnell et al., 2020). The findings were plotted on a 3x3 grid as seen in Table 2.5 below.

Table 2.5

Student Distribution based on Performance and Satisfaction (Carnell et al., 2020)

		Satisfaction		
		Low	Moderate	High
Performance	High	3	6	22
	Moderate	10	14	9
	Low	18	10	3

Student responses of level of satisfaction were grouped as follows: low satisfaction from those who 'strongly disagree' and 'disagree', moderate satisfaction from 'neutral' responses, and high satisfaction from those who 'strongly agree' and 'agree'. Students who had 'high satisfaction' but 'low performance' and 'low satisfaction' but 'high performance' were labelled 'off diagonals' and were further investigated. Students with greater satisfaction than performance attributed their shortcomings to external factors such as limited time or the structure of the course. It is generalised that these students experience stress and anxiety over factors out of their control which resulted in their poor performance. Students with lower satisfaction than performance focussed more on internal factors within their control. These students placed more responsibility on themselves and expressed a more optimistic tone toward changing their mindsets to improve their performance (Carnell et al., 2020).

In reporting on a South African study by Campbell et al. (2021), the researchers discuss the significance of the mindset of engineering students towards adversity. Students who decided to discontinue their studies were deemed to have a 'fixed mindset' and an inner belief that their intelligence is fixed at birth (Campbell et al., 2021). Their parochial attitude towards themselves increased their vulnerability to academic adversities and it appeared that they were unlikely to overcome them (Campbell et al., 2021). Conversely, students who believed that their intelligence could be improved with effort had a 'growth mindset' and were more susceptible to overcoming academic adversities (Campbell et al., 2021). Several resilience factors were involved in the construction of these students' mindsets (Campbell et al., 2021). Resilience is not an innate trait, but an innate capacity that can be learned and developed by all individuals. Engineering is a competitive and rigorous field of study (Campbell et al., 2021). According to Downs and Eisenberg (2012), the culture of engineering academia is perceived to be highly stressful, as also indicated by the students: "We are always working" and "We are always stressed." Attributing stress as a collective characteristic of engineering students may have

detrimental effects on both current and future students (Downs & Eisenberg, 2012). Due to unmanageable levels of stress and anxiety, students may drop their studies in the belief that they do not fit the student profile suggested by this misleading academic culture (Downs & Eisenberg, 2012). New students may feel the need to adopt feelings of stress and anxiety to identify with other engineering students, thus maintaining and promoting a spurious stress culture. In a study involving college students, the participants felt that stress is the norm, and it was the second most commonly cited reason for students to refrain from seeking treatment for mental health disorders (Downs & Eisenberg, 2012). Other researchers also found that students who were already experiencing high levels of stress and or anxiety, lack of social support, or lack of confidence in their abilities were more susceptible to anxiety disorders (Bantjes et al., 2020; Macgeorge et al., 2005).

Students' experience of engineering stress culture (ESC) was measured through self-reported surveys that capture stress and anxiety (Cross, 2018). These results indicated that 22.4% of students reported moderate to severe stress, 29.9% reported moderate to severe anxiety, and 29.9% had moderate to severe depression (Cross, 2018). Understanding what students perceive as stress and how they identify stress will help with the development and formulation of interventions aimed at mitigating student stress and promoting student recruitment, retention and success (Cross, 2018).

How students perceive learning in relation to their prospective careers is an area of research that is often overlooked. Bennett (2014) conducted a study in Australia involving more than 1 000 first-year engineering students to examine both local (Australian) and international students' perceptions of themselves and their careers. The feedback showed that students gave engineers the following characteristics: ethical conduct, effective communication, creativity, professionalism, orderly management, effective teamwork, intelligence, challenging work, and

high status. The trait of 'orderly management' ranked the highest among local students, whereas the trait of 'intelligence' ranked the highest amongst international students (Bennet, 2014). When the students were asked to compare their attributes to their suggested attributes of an engineer, international students were far less favourable of their attributes and felt deficient in eight out of the nine characteristics (Bennet, 2014). It may seem that these international students have low self-esteem (Bennet, 2014). However, this variance between international and local student perceptions may reflect differences in cultural and educational backgrounds (Bennet, 2014). A relevant example is that 49% of the cohort of students (n=260) were international students who spoke English as a second language (Bennet, 2014). This suggests the need for engineering undergraduate studies to include the development of English language proficiency in their coursework. The area in which international students hold confidence is in intelligence (Bennet, 2014). Importantly, Willingham (2021) reports that intelligence is viewed as 'fixed' in most Western cultures, while Eastern countries have a more malleable view of intelligence.

A few adverse factors faced by engineering students (css_admin, 2019) are discussed below:

Language proficiency. Engineering being a course taught in English will bring challenges for those who do not speak English as a home language or those who have a poor understanding of English (Gerwel Proches et al., 2018). The language barrier may downplay an intelligent student's ability due to their lack of understanding and comprehension (Peled, 2017). The language barrier is extremely relevant and its effects extend beyond the student's comprehension and communication medium (Peled, 2017). The student's self-confidence and sense of self in society becomes challenged (Feinberg et al., 2021). In addition, the constant experience of underachievement resulting in inevitable failure has negative psychological effects on the student (Feinberg et al., 2021). As a result, students may become unmotivated or

even drop out of school. In this American study that measured students' experience and perceptions of ESC, over 75% of the sample population reported that English was their first language (Cross, 2018). The preferred languages of education in South Africa are English and Afrikaans. Statistics recorded in 2018 show that 12.2% of South Africa's population speak Afrikaans as a home language and 8.1% speak English as a home language (Stats, 2018). To translate this into academic context, 78.5% of South Africa's population do not speak either language of learning or teaching as a home language. Language in South Africa ought to be a unifying factor but instead, it is a factor of division.

Faculty shortage. Due to the shortage of engineering staff in educational institutions in India, these institutions are forced to compromise on the quality of education by employing those with bare minimum qualifications (Alva, 2018). In India, there is an acute shortage of academic staff engineering institutions (css_admin, 2019). This problem is not limited to public or private institutions. Reports available showed that India's 23 Indian Institutes of Technology collectively had an academic staff shortage of 34% in March 2018 (Alva, 2018). However, private institutions were better able to deal with this crisis by offering attractive salaries and other facilities to qualified staff that are needed for quality teachers to stay at an institution (Varghese, 2019). According to the South African Institution of Civil Engineering, in 2019 the country lost hundreds of engineers a day due to emigration, thus creating a massive skill shortage (Staff Writer, 2019). In an investigative study on the most difficult skills to find in South Africa, engineering was ranked the highest (Staff Writer, 2020).

High fees and expenses. This adversity correlates with the student's financial situation (css_admin, 2019). This is a determinant heavily influenced by poverty and lower socio-economic status and it is clear that students from disadvantaged backgrounds struggle to complete costly engineering courses due to poor household income (Goodier, 2019).

Demographics of a self-reported survey answered by engineering students in the study by Cross (2018) show that out of a 1050 sample, 3.3% were below middle class, which was the lowest SES rating. Conversely, the highest reported SES was the upper middle class with a sample size of 41.8% (Cross, 2018). Alternative methods such as student loans offer a practical solution to this adversity. However, student loans bring rise to a different crisis in student debt (Hanson, 2021). In 2021, student debt statistics showed that Black Americans owed an average of 25 000 US Dollars more in student debt than White graduates (Hanson, 2021). In addition, four years after graduation, 48% of Black graduates owed 12.5% more than their initial loan (Hanson, 2021).

Lesser exposure to reality and industry interaction. The involvement of industry interaction depends on the institution (css_admin, 2019). Statistics on undergraduate courses show that there is a focus on probability problems that emphasise mathematical aspects rather than on techniques that are useful in practice (Silvia & Aguilar, 2020). Educational institutions need to expose students to examples of engineering principles that are applicable in real life (Gero et al., 2017). Industry interaction helps clarify the expectations and skill sets required of students and helps to prepare them for the real world (Nandi et al., 2015). Conversely, the lack of industry interaction may potentially cause gaps in engineering students' skills and knowledge.

Employability. Difficulties in employment are subject to internal and external influences (Smith, 2018). Foreign-educated engineers pose a threat to locals as they are often willing to work more hours for less pay (Leibbrandt, 2010). In 2016, the manufacturing sector in the US employed over 578000 engineers, the most of any industry (Torpey, 2018). This expresses what is already known, namely that engineering is one of the most competitive fields in the job

market. In South Africa, engineers' positions are among the most difficult to fill due to the scarcity of qualified practitioners and lack of skills (Bengesai & Pocock, 2021).

The new implementation of online distance learning (ODL) has impacted students' perceptions of their academic resilience and adversities (Saidalvi et al., 2021). The constructivism theory (Wang, 2014) shows students act as constructors of knowledge and meaning, suggesting that students construct understanding through their own learning experiences. Since the spread of Covid-19 and the dismissal of face-to-face education, several studies have explored students' perceptions of ODL (Almahasees, 2021). A comparative study by Mathew and Chung (2020) sampled a total of 608 university students throughout Malaysia in an attempt to investigate students' perspectives on ODL during the Covid-19 pandemic. The study reported a mixed reception: some students had a positive perception of ODL, while others had a negative perception due to lack of resources and poor internet connection. Another study, by Sim et al. (2021), investigated factors and challenges of online learning with a sample of 156 students in the Malaysian state of Sarawak and reported a moderate to high level of acceptance of ODL. The main factors that facilitated online learning included enthusiasm, self-efficacy, satisfaction and enhancement of English language skills (Sim et al., 2021). On the other hand, perceived challenges of online learning were the speed of teaching, the delivery of learning material, and students' attitude, struggles and stress.

A study involving 360 Ghanaian international students reported that students perceived online learning as beneficial (Demuyakor, 2020). The majority strongly supported the effectiveness of online learning and were satisfied with the learning resources used online (Demuyakor, 2020). A study of 184 university students in Delhi reported that students experienced a sense of freedom and felt connected to their teachers, literally and figuratively

(Khan et al., 2020). It was noted that online learning allowed for more flexibility which benefited students with different learning styles.

However, in this primary study of diploma engineering students' perceptions of online distance learning by Saidalvi et al. (2021), the student's expectations of educational decisions regarding the ODL were reported as shown in Table 2.6.

Table 2.6

Engineering Students' Expectations on Educational Decisions regarding ODL (Aminabibi et al., 2021)

Expectations of ODL in the future	Number of students in agreement (n)	Percentage of students in agreement (%)
ODL should not be continued in the future.	60	23.3
ODL helps shape me into a better person.	16	6.2
Lecturers should be more considerate with students.	10	3.9
ODL should be improved.	46	17.6
ODL should help me get good grades.	45	17.5
Students should be prepared for ODL in the future.	10	3.9
Physical classes should be brought back.	28	10.9
ODL helps improve understanding of learning material.	8	3.1
I believe that ODL can be an effective form of learning in the future.	15	5.8

In the study by Saidalvi et al. (2021), students perceived ODL as ineffective, difficult to adapt, and frustrating. Consequently, these students have been forewarned that ODL may cause them to withdraw from their studies. Factors that affect dropout rates in traditional classes may similarly affect dropout rates in online learning. However, online learning has brought a new barrage of academic adversities that threaten students' academic resilience, for example, unfavourable home learning environments, lack of computer literacy, technical issues, lack of

resources, lack of understanding and the students' ability to adapt to this new learning environment (Song, 2004).

It is important to note that online learning is perceived differently by students, which may cause conflict in the discussion of the way forward (Saidalvi et al., 2021). As a result of this mixed reception, studies conducted may produce incongruent results. For instance, Saidalvi et al. (2021), concluded that Malaysia was ready to move towards ODL because the majority of the students had their gadgets needed for online learning. Conversely, Yeoh (2020) concluded that Malaysia was not ready for the implementation of virtual education as most students in rural areas didnot have their phones and experienced difficulty with online learning. The main subject of contrast in these conclusions is the availability of technological resources which acts as the main determinant of the implementation of ODL.

Although several studies have been conducted on the topic of engineering students' resilience and adversities, capturing students' perceptions has been a neglected area of research (Bennett, 2014). This section of the literature review reflected findings on students' perceptions in several domains of academia. Influential factors such as students' mindsets, academic performance, academic satisfaction, and adversities have been reported through the lens of engineering students with the ultimate aim to better understand and document their perceptions. In the following section, the literature on lecturers' perceptions is discussed.

2.3.2 Literature on lecturers' perceptions of students' academic resilience

As in the case of engineering students, there is a high level of competition when an academic applies for a position as an engineering lecturer. The University of Zululand (2022) explains that the generic requirements for the position of engineering lecturer in South Africa relate to ability, competence, interest, engagement, responsibility, willingness, knowledge, and

qualifications. Engineering lecturers are furthermore expected to conduct classes that involve a mix of lectures, class presentations, hands-on activities, and case studies (Mitchell, 2022).

Certain skills are crucial for engineering students to succeed (Samavedham & Ragupathi, 2012): potential employers have reported effective communication skills to one be of the main skills sought after alongside excellent technical knowledge (Stiller & Johnson, 2004). Kassim and Ali (2010) explain that besides being able to communicate effectively, an engineer should be able to deliver a presentation. This view concurs with Dlaska's (1999) earlier assertion that students must be taught to achieve communication competence as the ability to conduct presentations is a crucial skill. The Malaysia Pahang University has consequently made it compulsory for engineering students to complete a final year project (FYP) assessment before graduating (Radzuan & Sarjit, 2010). In this assessment, students must conduct their research and present their findings in an oral presentation (Radzuan & Sarjit, 2010).

Although Radzuan & Sarjit (2010) focus on the challenges faced by engineering lecturers who supervise students' FYP assessments, lecturers' perceptions of their challenges may indirectly reflect on student adversities or inadequacies. In their study, Radzuan & Sarjit (2010) aimed to understand the challenges faced by engineering educators during their evaluation of students' FYP presentations (FYP). A sample of six lecturers was used for this study, labelled from 'lecturer 1' to 'lecturer 6'. English was the language medium used for the FYP assessment, as it is one of the commonest means of communication in engineering and all over the world (Shrestha et al., 2015). As a result, the language barrier acted as an adverse factor for the non-native English-speaking students involved in this study, giving rise to feelings of second language anxiety and difficulty in comprehension The engineering lecturers considered this adverse factor by creating rubrics that outlined key principles that may have

helped students better prepare for their presentation. Quigley (1998) emphasises how the provision of clear guidance and detailed grading criteria improve students' preparation which should translate into their performance.

All lecturers in the study by Martin et al. (2005) were in favour of the hypothesis that an effective FYP presentation is determined by good communication skills and good technical knowledge. Neglecting one of these two components proved to be detrimental to the effectiveness of the presentation. All lecturers explained how they perceive students' ability to communicate in the required language medium. Lecturer 5 stated that students with limited technical knowledge struggled more with their oral delivery (Martin et al., 2005). Lecturer 2 highlighted that civil engineering students' speaking ability needed to be improved upon (Martin et al., 2005). Lecturer 6 contended that having greater technical knowledge will boost confidence in presentation (Martin et al., 2005). Lecturer 3 reported that students' high level of anxiety reflected their lack of preparation (Martin et al., 2005). Each of the lecturers' opinions were personalised to fit their perceptions of the students' assessment (Martin et al., 2005). Most lecturers claimed that the Malayan students' inability to answer follow-up questions was due to low English proficiency (Martin et al., 2005). Consequently, this shortcoming increased students' anxiety during their presentation which resulted in their receiving marks that did not accurately represent their technical knowledge. The lecturers made several suggestions to improve students' FYP presentations in English. Lecturer 6 stated: "Lecturers should have mock presentations for the students to enhance students' self-confidence..." (Martin et al., 2005). Lecturer 4 suggested that students need to take the FYP assessment more seriously by emphasising the significance and formality of this presentation (Martin et al., 2005). The third suggestion, also made by lecturer 4, was the timing of these presentations (Martin et al., 2005). However, lecturer 6 believed that students had had ample time and that it was more of an attitudinal issue (Martin et al., 2005). The final suggestion was that students should be given

positive feedback and compliments early in their presentation in an attempt to raise their self-confidence and promote inner belief (Martin et al., 2005).

The interview data from the study by Martin et al. (2005) suggests that lecturers need to focus more on assisting students with their oral technical skills. This study shows that oral communication skills are a core component of effective engineering education (Martin et al., 2005). Engineering educators are given a responsibility to equip students with technical knowledge, and the role of English and communications lecturers is becoming more relevant in enhancing engineering students' communication skills.

In Kenya, Khajeha (2017) investigated whether lecturers' characteristics influenced the academic achievement of engineering students. The data collected in this study emanated from a sample of 828 engineering students and 42 engineering lecturers (Khajeha, 2017). The data on students' academic performance in engineering diploma examinations from 2010 to 2014 was retrieved from the Kenya National Examination Council (Khajeha, 2017). The examination results were disappointing, with 56% or 462 of the 828 examinees failing over the investigated period (Khajeha, 2017). The student data was accompanied by data investigating lecturers' characteristics, namely; age, experience and qualifications (Khajeha, 2017). It was recorded to respond to the null hypothesis: "Lecturer characteristics have no significant influence on students' academic achievement in engineering courses" (Khajeha, 2017). The sampled lecturers were identified as 'qualified' as they possessed the necessary qualifications and experience (Khajeha, 2017). However, the students' results did not reflect the credibility of the lecturers. The findings in this study were similar to those of Rivkins et al. (2014), which found no supporting evidence that having higher qualifications, such as a master's degree, improves teaching skills. This is because the curriculum taught by the lecturers is constant and does not change, despite their higher qualifications (Kimani et al., 2013). Studies conducted in different

fields of engineering reported inconsistent results. Despite this incongruence, the Kenyan study noted that the trend in students' academic achievement has not changed and, therefore, favours the null hypothesis (Khajeha, 2017).

The same study encourages lecturers to make better use of their characteristics to promote engineering (Radzuan & Sarjit, 2010). Lecturers can only perform their duties when given the appropriate resources such as textbooks and instructional materials. This same concept is also applicable tostudents. In an interview, (Khajeha, 2017) reported having a shortage of 90 teaching staff in different engineering courses. This increased the workload of the lecturers with some of them having reported working double the stipulated policy of 18 weekly working hours (Khajeha, 2017). In addition, these lecturers also reported having larger classes (Khajeha, 2017). Overloading lecturers limits their time for preparation and limits their interaction with students. As a result, they may prioritise the completion of the syllabus and neglect other important areas such as revision, delivery of content, creating an understanding, and individual feedback (Khajeha, 2017). Such challenges imposed on lecturers influence their perceptions regardingwhat is important and what takes priority. Consequently, they may view student adversities as inconsequential, and simply downplay them (Khajeha, 2017). This does not mean that having a greater presence of lecturers in an institution will necessarily guarantee performance (Khajeha, 2017) because lecturers' efficiency in their performance may also be negatively affected by low remuneration, limited teaching resources and disruptive student behaviour (Khajeha, 2017).

Lecturers play a pivotal role in providing effective student learning experiences. Allie et al. (2009) explain how exploring different learning theories can help improve students' learning capacity. Two of the learning theories they highlight are the 'acquisition perspective' and the 'participation perspectives'. The acquisition perspective views learning as the

acquisition of knowledge, which also suggests that learning has a limit or end point (Allie et al., 2009). Although the acquisition perspective has dominated the educational field for decades, the participation perspective is gaining significance (Allie et al., 2009).

The participation perspective describes learning as an ongoing process of participation, becoming a member of a community, and establishing an identity within that community (Brown et al., 1989). This 'community' does not necessarily mean the workplace communities of engineers, but the classroom environment in which activities should replicate those practical and design activities that students will need to engage in within the engineering field. Case et al. (2002) found that meaningful activity is a central determinant in identifying whether the students' learning experience is productive or not. The classroom should provide a range of 'workplace identities' that students could adopt as engineers (Case et al., 2002). Significantly, students come from diverse backgrounds and bring with them a range of different identities (Case et al., 2002). For success, students must develop a workplace identity that is congruent with the identities they already carry (Case et al., 2002).

Case et al. (2002) illustrate how educators can implement a 'participation perspective' of student learning into their teachings. Since tacit knowledge is more difficult to capture and share, another author, Jacobs (2007), worked towards improving the lecturer's ability to bring tacit knowledge and understanding of their engineering field into overt and explicit teachings. Jacobs (2007) did this in her engineering faculty by establishing a collaborative partnership between academic development practitioners and engineering lecturers. This partnership planned teaching materials that would help make engineering courses more explicit to the students. The lecturers reported that this partnership brought about a deeper awareness and allowed them to view their discipline from an 'outsider' perspective, the same as how a novice student would (Jacobs, 2007). This new awareness was then applied to classroom practices such

as 'team teaching' and 'peer classroom observations' (Jacobs, 2007). The academic development practitioners would see these classroom practices through an objective lens and relay them to the engineering lecturers, who found it helpful in trying to understand how explicit teachings of a disciplinary discourse could be put into practice for the benefit of students (Jacobs, 2007).

Holtman and Marshall (2008) reported on a collaborative partnership which was formed with the lecturers working closely with academic development practitioners in teaching a course. Learning activities were made explicit in various physical, verbal, geographical, and mathematical representations that make up the disciplinary discourse (Holtman & Marshall, 2008). The focus on explicit learning allowed students to develop identities through their participation in the class community (Holtman & Marshall, 2008).

Case et al. (2007) redeveloped a first-year introductory course in chemical engineering following the 'participation perspective' as used by the two studies mentioned. This approach centralises students' need to be actively involved in developing their ability to use the chemical engineering discourse (complex representations, tools, and activities of chemical engineering) (Airey & Linder, 2008). Lecturers supported this approach by being more interactive, getting to know the students, hosting small meetings in an attempt to formulate a community, having tutors assist, and promoting students in having email conversations with a practising engineer to help facilitate their developing identities as engineers. Implementing changes in the manner in which lecturers teach engineering modules may improve how students learn or process information in South Africa, essentially through incorporating a wider perspective of learning. Ultimately, the wider the range of useful perspectives, the better lecturerscan understand students, their needs, and their learning styles. Therefore, lecturers should try to develop

approaches that improve student learning in engineering to produce competent and confident graduates (Airey & Linder, 2008).

The development of new approaches to improve student learning in engineering to nurture skilled graduates became more challenging with the breakout of the Covid-19 pandemic, which brought significant changes to the education system worldwide. The changes in students' routines, class materials, academic calendars, and overall learning experiences have been drastic. Online learning has been offered as a solution to the disruption of students' traditional learning experiences. However, the implementation of this forced alternative has brought new adversities into play: online learning may disrupt learning patterns, especially with practical courses where students have to understand practical learning material without directly experiencing it (Martin & Marsh, 2006). Therefore, academic resilience is emphasised in the task of students adapting to this new learning process (Martin & Marsh, 2006).

Significantly, several internal and external factors influence a student's academic resilience. I will focus on the external influence of social support and its investigated relationship with academic resilience. Sarafino and Smith (2014) explain that social support relates to care, comfort, esteem, and assistance. It consists of perceived social support and received social support. Received social support relates to actions providing support and service (Sarafino & Smith, 2014). Perceived social support is the subjective interpretation of the level of social support felt by the individual and is a greater determinant of successful adaptability. Pidgeon (2014) found that students who displayed high levels of resilience had a high level of perceived social support. The relationship between perceived social support and academic resilience was tested in several studies (Baltaci, 2015; Gelfand, 1998; Permatasari, 2021; Yavuz, 2016).

Permatasari et al. (2021) sampled 291 out of an estimated 1350 active cadets. Data were collected using questionnaires, a demographic form, and 2 Likert scale models to measure academic resilience and perceived social support. Reliability in this study was measured using Cronbach's Alpha. The data captured is represented in Table 2.7 below:

Table 2.7 displays aspects of a simple linear regression test conducted to determine the contribution of perceived social support toward academic resilience.

Table 2.7

Linear Aggression Test (Permatasari et al., 2021)

Variables	N	R	R^2	Significance
Perceived social support Academic resilience	291	0.847	0.718	.000

The linear aggression test shows that the correlation index (R) value of perceived social support for academic resilience was 0.847, which indicated a positive correlation between perceived social support and students' academic resilience. The results shown in Table 2.7 indicate that perceived social support had a 71.8% contribution to academic resilience. Teacher support makes up 16.6% of this contribution, second to family support at 42.4%, and last, with 12.8% of the contribution is peer support. Therefore, it can be concluded that lecturers' support and assistance is a contributing factor in the development of a student's academic resilience. The support and assistance of lecturers may be a more significant contributory factor to some students than others. Devlin (2010) highlighted that students with a lower socio-economic status (LSES) are encumbered by challenges brought by their LSES. Similar to previous discussions, Devlin (2010) proposed that tacit expectations of students and the language used in the university discourse may pose a greater challenge to students with LSES. Zacharias (2010) acknowledges that identifying LSES students may be a challenge for lecturers due to an

overlap between LSES and other categories of disadvantage, such as rural location and being the first in the family to attend university.

Devlin et al. (2012) provide recommendations on how to proactively meet the needs of LSES students. The practical guidelines for educators on how to effectively facilitate learning of students from LSES backgrounds are the following:

Know and respect your students.

Sympathise with LSES students, embrace and integrate their diversity, and enable contributions of their knowledge to other students' learning.

Offer students variety and flexibility.

Offer variety in teaching and learning strategies while upholding academic standards.

Communicate using accessible language, and clarify expectations.

Speak and write in simple language to ensure that students understand the concepts being taught.

Scaffold your students' learning.

Take a step-by-step approach to allow students to build knowledge on what they already bring to higher education.

Be available and approachable.

Be available and approachable so that students can make use of your expertise and guidance to improve their learning and performance. Warren (2002) adds that students need to be guided to "develop the critical and communicative skills and conceptual repertoires that will enable them to deal with academic tasks" (Warren, 2002, p. 87).

Be a reflective lecturer.

Act on your reflections and take feedback from students to improve your teaching practices.

In summary, this research explores the perceptions of engineering lecturers toward vast domains in the engineering discourse.

2.3.3 Literature on support staff perceptions

Support staff differs from teachers in that they are not qualified educators. The New South Wales Government (2021) touches on the role of support staff ('student support officers'). Student support officers work in schools to help improve the wellbeing and learning outcomes of students. In addition, they support students' development in their social and emotional skills through programmes and strategies that build resilience, positive relationships and coping skills (New South Wales Government, 2021). Student support officers may have qualifications in social work, youth work and other disciplines relating to community service (New South Wales Government, 2021).

Dhillon et al. (2006) report that the increase in student diversity has brought about the need for additional support to be made available for the academic and personal development of students. Universities need to develop more flexible programmes to better manage students with different needs (Dhillon et al., 2006). Lea and Farbus (2000) argue that student support services need to be motivated by concerns for student development to be effective. Hill et al. (2013) found that the quality of lecturers and student support systems is one of the most influential factors in the provision of quality education. This is most prevalent in higher education institutions with part-time students, full-time students, local students, international students, students with disabilities, students with caring responsibilities, and students involved

in distance learning (Avramidis & Skidmore, 2004; Rahman, 2002). The relevance of student support stems from issues such as student dropout rates, students' mental health (Bantjes et al., 2020; Bantjes et al., 2021; McCain & Evans, 2022), and the impact of student diversity on students' university experience.

In an investigative study, Tinto (1975) found that students who do not relate socially, academically and emotionally to the institutional culture are more susceptible to dropping out. Most student support services recommend that students should become involved and integrated with campus life. Mallette and Cabrera (1991) detected greater persistence in those students who became more integrated with campus life. Astin (1984) proposes that the effectiveness of an educational practice may be forecasted by the practice's capacity to increase students' involvement. Juillerat (1995) reported that students who actively participate in their learning experience display greater satisfaction than those less involved. As a result, students integrated with campus life are less inclined to drop out.

The transition to university is a stressful one for many students. Stallman (2016) revealed that 60% of Australian students sampled reported clinical levels of stress while at university. The American College Health Association conducted an annual survey of an estimated 90 000 students across 141 institutions (Association, 2012). This survey revealed that 32% of students reported feeling overwhelming anxiety, 24% reported feeling hopeless, and 16% reported feeling depressed. Bahadir-Yilmaz and Oz (2015) state that the general lens through which students' mental health is viewed usually emphasises anxiety, distress, and depression, while little regard is given to the resilience students may develop in response to these psychological challenges. The development and changes within the academic and formal staff, which play a role in embedding structures and processes that enhance students' resilience,

are also emphasised by Bahadir-Yilmaz and Oz (2015). Therefore, formal staff development is essential for support staff to function as effective agents of change.

Brewer et al. (2021), who conducted a study involving university staff from three Australian universities, used a multi-case study approach to investigate changes in staff members' understanding of resilience and new skills and knowledge obtained after taking part in this programme. The recruited participants consisted of 52 academic and administrative staff members given their ability to promote co-curricular change (Brewer et al., 2021). Eighty-three per cent of the participants were female, 92% of whom held leadership positions (Brewer et al., 2021). The study investigated academic staff from a wide range of disciplines including psychology, nursing, occupational therapy, education, sports science, and creative industries (Brewer et al., 2021). This study reported that no clear differences emerged regarding the discipline of these participants and that these findings were representative of the general higher education staff population (Brewer et al., 2021).

The staff programme consisted of a face-to-face workshop, peer coaching and mentoring (Brewer et al., 2021). Semi-structured interviews were conducted before and after the programme by experienced qualitative research assistants, with no prior relationship with the participants to minimise coercion and socially desirable responses (Brewer et al., 2021). Pre-programme interviews investigated participants' knowledge and understanding of resilience and its relation to higher education students through open-ended questions (Brewer et al., 2021). The post-programme interview assessed the impact of the programme by re-examining participants' knowledge and understanding of resilience (sense-making) (Brewer et al., 2021). To gain a holistic understanding of participants' understanding, an inductive approach was used in the data analysis (Brewer et al., 2021). Prior to the programme, participants understood resilience to be a skill or fixed personality trait (Brewer et al., 2021).

After the programme, participants instead described resilience as a process, rather than a skill or fixed trait (Brewer et al., 2021). More nuanced conceptualisations were brought forward after the programme encapsulated challenges and adversities as an ordinary aspect of life (Brewer et al., 2021). In addition, these conceptualisations mentioned a range of factors that support resilience. The study showed that the shift in the university staff's conceptualisation of resilience was linked to their acknowledgement of the role that they play in supporting and enhancing student resilience (Brewer et al., 2021). These new perspectives allowed participants to encourage direct (changes in learning programmes/curriculum) and indirect (influencing others) changes to local (changes to their operations/unit) and global (changes to the institutional curriculum) operations (Brewer et al., 2021). Indirect approaches to enhancing students' resilience included role modelling, clarifying expectations, developing a sense of belonging, and encouraging help-seeking (Brewer et al., 2021). Participants taking on the approach of 'role modelling' may demonstrate and discuss resilience strategies that may be utilised by students in their prospective careers. In addition, participants believed that clearly articulating their expectations regarding student responsibility, behaviour, and independent learning may increase students' awareness and focus on creating a personal strategy for success (Brewer et al., 2021).

Furthermore, staff centred their focus on students' sense of belonging to further enhance their resilience (Brewer et al., 2021). This entailed student representatives who relayed feedback to staff on course-related issues, the conduction of university social events, utilisation of group interactive activities, and the introduction of mentor programmes. Participants emphasised an increase in staff commitment to building relationships with students to create a comfort zone in which the students can seek support (Brewer et al., 2021). Participants describing global-level changes (changes to the curriculum) formed coalitions with other colleagues in their area of work to develop and implement changes (Brewer et al., 2021).

Substantially, this development began with implementations in the first year of study in an attempt to scaffold resilience strategies into the curriculum. Staff lunch forums were organised to discuss issues regarding resilience and debate plans for curricula change. The indirect process of influencing others had a positive impact on engaging with colleagues and getting them actively involved in embedding resilience-enhancing strategies into the courses (Brewer et al., 2021). This led to staff suggestions of up scaling the skills of staff members who supervise students (Brewer et al., 2021). The motive for this approach was to establish a clear understanding of resilience among student supervisors and how they can support students through their daily challenges and academic adversities. Participants faced issues with university bureaucracy such as insufficient time and heavy workload (Kinman & Wray, 2020) and an already 'packed' curriculum and university processes stifling innovative change (Lasakova et al., 2017). Despite these burdensome but surmountable challenges, the staff leadership programme produced a successful range of innovations aimed at supporting student resilience.

Significantly, the diverse and growing student population has made it more difficult to manage and understand different aspects of student life (Audin & Davy, 2003). McInnis et al. (2000, pg. 50) provide a list of support services that students make use of, namely "child care, financial aid, pastoral care, English language support services, counselling services, health services, library support service, employment service, study skills assistance, student union club, sports facilities and catering services". Universities may utilise these services, but they might not be fully effective or accessible. Therefore, discrepancies have been identified in student support systems. McInnis et al. (2000) point out a discrepancy between support services recognised as important by students and the most frequently used services. McInnis et al. (2000) identified the most desirable forms of support to be employment services, learning support, counselling services and facilities that cater for students' academic, emotional and self-

development needs. In contrast, the student cafe and library were among the most frequently used services. Students may struggle to access important services because they might be scheduled at a time that clashes with their timetables (McInnis et al., 2000). In addition, this discrepancy may be caused by the poor quality of these services or the lack of support staff (McInnis et al., 2000).

University life brings about major changes to new students' learning experiences. Owen (2002) argues that when students enter such a new environment, they need guidance and direction. This will provide emotional and academic support to students. However, personal tutors may not be as effective in some universities as they might take the role too lightly or lack the characteristics needed for the role. Lea and Farbus (2000) found high variance in identifying the amount of time personal tutors spent with tutees. This high variance exposes the inconsistency and wavering nature of tutors. These authors advise that the discrepancy between students' needs and the capacity of personal tutors to support these needs should be addressed to increase the satisfaction of both parties.

Kelley-Hall (2010) states that the primary aim of student support services is to "enhance academically disadvantaged students' opportunities for developmental involvement in their educational experience and create academic opportunities for these students" (p. 2). Academically disadvantaged students are identified to be ethnic minorities, have disabilities, are of low socio-economic status, and are first-generation university students. However, access to student support should not be exclusive. Trust (2010) speaks from the US perspective on how the gap in educational achievement acts as a powerful barrier to disadvantaged groups obtaining economic and social success. Morrison (1973) writes that the US federal government has defined disadvantaged students as meeting one or more of the following criteria:

- Students with inadequate high school preparation;

- Students who receive benefits from vocational rehabilitation programmes;
- Students who live in government-provided houses for the poor;
- Students with a low level of English comprehension;
- Students whose cultural heritage is not represented or taken into account by the traditional curriculum of the education system.

In addition to the above-mentioned points related to disadvantaged students, support staff face certain challenges, such as assisting students with low student motivation, ineffective study skills, and poor reading comprehension and writing skills. Tinto (2009) reports academic preparation to be the most significant factor prior to entering university. Support staff can combat student adversities by implementing a study-skill workshop that includes study methods, time management, setting goals, and improving note- and test-taking skills (Saunders, 2020).

The theoretical findings from these studies are being practically tested by educational institutions all across the globe. In Canada, the University of Windsor's engineering faculty has taken on the e-learning approach (Windsor, 2022). In accordance with this, Windsor University's Engineering Student Support Services provide virtual support for students tutoring, counselling, writing support and more (Windsor, 2022). According to the University website, "The Engineering Student Support Services Centre is your one-stop shop for academic and wellness support" (Windsor, 2022). The following services are provided:

WINONE First-year Office

This programme focusses on promoting a positive learning experience and environment for first-year engineering students (Windsor, 2022). This is done by stimulating students' interests to improve retention, developing communication strategies, promoting life skills and

responsibility, assisting students with the difficulty of transitioning from high school to university, and establishing identifiable resources and administrative presence to provide first-years with direction, referrals, and advice (Windsor, 2022).

Engineering International Support Office

The Engineering International Support Office offers international students a wide range of services such as immigration advising and workshops, transition support on matters such as social, personal, health, and wellbeing, referral to services on and off campus, and social and cultural events (Windsor, 2022).

Engineering Communication Support:

The engineering faculty offers this service to all engineering students, from first-year to doctorate level. This service provides instruction and guidance on:

- Grammar and punctuation
- Sentence structure
- Constructing strong engineering arguments
- Writing concisely
- Finding, evaluating, and integrating research
- Citing and referencing
- Oral presentations page design and formatting

Engineering Counselling Centre:

The staff of the Student Counselling Centre helps students with skills such as stress management, emotional regulation, and relationship building. The staff assists with stressors

outside of the classroom such as identity issues, sleeping problems, adjusting to a new city, and balancing academic and personal lives (Windsor, 2022).

Co-operative education and career advising:

This programme works with students to help them develop their job-searching skills, find appropriate placement, and set career goals (Windsor, 2022).

Outreach:

The engineering outreach programme invites elementary and secondary students and teachers to learn more about engineering and the vast career opportunities. This includes visiting laboratory facilities and industry tours and visits (Windsor, 2022).

WINONE tutorials:

This service offers mentoring advice and one-on-one assistance with course content from senior engineering students (Windsor, 2022).

In South Africa, the University of Cape Town (UCT) has implemented the Academic Support Programme for Engineering in Cape Town (ASPECT), which provides academic support to first-year engineering students who struggle to cope (UCT, 2022). The programme allows more time for students to focus on their core first-year courses by spreading a four-year course over five years (UCT, 2022). At UCT, each engineering department has a five-year curriculum designed for those students who seek assistance from ASPECT (UCT, 2022). In such students' second year, ASPECT will provide additional tutorials, counselling, and non-academic support (UCT, 2022). In addition, ASPECT will monitor and advise students while they work towards completing their degree (UCT, 2022).

At Stellenbosch University (SU), the Engineering Students' Council takes on a supportive role by allowing students to express any concerns and taking these concerns seriously (Council, 2018). SU implemented the engineering faculty's support programme for students in the second semester of 2019 (Council, 2018). The support programme is made up of different elements. The Dean's Period programme is offered by the dean and vice-deans. Typical topics covered are the following: keys to success in engineering studies, time management and study methods, information about the engineering profession, academic success strategies, test and examination-writing strategies, and an overview of each engineering programme offered by the university.

According to the SU website, in 2022 the University also offers student advice and psycho-social support. Students seeking advice services can navigate them at the students' support portal. This support service includes one-on-one sessions with an educational psychologist (Stellenbosch University, 2022). An educational psychologist ensures regular visits to the engineering faculty, allowing students to consult with them privately (Stellenbosch University, 2022). Appointments with the educational psychologist can be made through support staff. Another initiative of the psycho-social support services is to improve students' retention, especially among first-generation university students (Stellenbosch University, 2022). This includes conducting social events aimed at helping students to get to know each other, thus forming social networks whereby they can support one another (Stellenbosch University, 2022). Facilitated group learning sessions, another innovation offered for each first-year module, create a collaborative environment guided by active learning. Teaching assistants are present to assist groups who experience any uncertainties or confusion. If lockdown measures do not allow face-to-face interaction, this will be offered on their online platform (Stellenbosch University, 2022).

With new challenges brought by the 21st century, universities are expanding their operations to the personal domains of students' lives. This case study explored the perceptions, attitudes, influence, and understanding of support staff on students' academic resilience. Regardless of the discipline, support staff plays a significant role in developing, sustaining and promoting a learning environment that provides an opportunity to enhance student resilience on a local and global scale.

2.5 CHAPTER SUMMARY

As part of this chapter, I presented the barriers and challenges faced by South African students, more specifically the barriers and challenges faced by South African engineering students within the South African school system, the high student dropout rates at South African universities, the high cost of engineering programmes at South African universities and the professional accreditation of engineering programmes by the Engineering Council of South Africa.

I have provided a chronological presentation of the development of resilience and risk over the past 100 years by looking at the work of theorists of resilience and risk, these include Michael Rutter (1979), Emmy Werner (1982), Norman Garmezy (1991), Suniya Luthar (2000), Ann Masten (2002), and (Michael Ungar (2007). I also provided a discussion on the theoretical and conceptual foundations for the study, which are Michael Ungar's work on the socio-ecological approach to resilience and Liesl Ebersöhn's indigenous psychology of resilience theory.

I have discussed, in detail, the measures which have been used to investigate risk and resilience, including those administered in this case study; the Resilience Scale (RS), the Child and Youth Resilience Measure (CYRM-R), the Brief Resilience Scale (BRS), the Predictive 6-

Factor Resilience Scale (PR6), the Connor-Davidson Resilience Scale (CD-RISC), the Scale of Protective Factors (SPF), the Adult Resilience Measure (ARM-R), and the Academic Resilience Scale. As well as reviewing relevant literature drawing on the South African higher education context, theories and measures of resilience and risk were further reviewed.

The risk was measured using the Kessler Psychological Distress Scale (K10), the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) Self-Rated Level 1 Cross-Cutting Symptom Measure-Adult (CCSM-A) and the Suicide risk assessments. In addition, the chapter summarised existing literature on student, lecturer, and support staff perceptions of academic resilience. The research methodology will be discussed in the next chapter.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

In the previous chapter, I presented a review of the various pertinent theoretical and literature perspectives needed to understand academic resilience. In this chapter, I explain the research paradigm underpinning this study, the research design followed, and the data collection and generation methods, as well as instruments that I utilised.

3.2 RESEARCH PARADIGM

Research paradigms and theoretical perspectives inform any research process. A paradigm is a specific way of thinking that construes the nature of the world, the individual's place in it and the span of conceivable relationships to that world and its segments (Guba & Lincoln, 1994). Creswell (2009) indicates that a researcher's paradigmatic worldview is influenced by a number of factors, including their disciplinary area, past research experience, and the types of beliefs they hold. In this study, theoretical perspectives are relevant because I used more than one theoretical framework to contextualise my study. A theoretical perspective is developed as a result of the theories that exist in relation to the phenomena being studied (Unisa Open Learning Project, 2021).

This study, which sought to investigate perceptions about academic resilience in the context of higher education, is situated in an interpretivist paradigm, in theoretical perspectives grounded in positive psychology; it followed an exploratory case study design and used a mixed-methods approach to data generation and analysis.

Hesse-Biber (2017) notes that "researchers working from interpretive traditions value experiences and perspectives as important sources of knowledge" (p. 23). By drawing on the voices of engineering students, engineering lecturers and support staff, personalised 'meaning-making' responses were generated. This argument is based on existing empirical studies on the topic of resilience and addresses the methodological limitations of more traditional research about academic resilience.

I initially experienced a seeming tension between my interpretivist worldview and my chosen mixed-methods methodology. Webb (2010) noted a similar tension in her doctoral research study and resolved this by grounding her interpretivist paradigmatic approach in the work of Lathar (2006), who advocates for working across paradigms "in the hope that more interesting and useful ways of knowing will emerge" (Lathar, 2006, p. 53). McChesney and Aldridge (2019) also argue that an interpretivist stance can be adopted in mixed-methods research. Following these studies, I decided to adopt an interpretivist paradigm for this mixed-methods study in an attempt to move away "from binary methods-paradigm associations and assumptions" (McChesney & Aldridge, 2019, p. 225).

3.3 RESEARCH DESIGN: EXPLORATORY CASE STUDY

The research design is one of the most important elements to contribute to the integrity of any scientific study. The research strategy or design informs the research process and outlines all the steps in the research process, guiding the way in which the research will be carried out (Verschuren & Doorewaard, 2010). The choice of research strategy should ultimately enable the researcher to make valid observations (Verschuren & Doorewaard, 2010). According to Rule and John (2011), a case study is a "systematic and in-depth investigation of a particular instance in its context in order to generate knowledge" (p. 4). The 'case' or unit of analysis may be an individual or a collective (Rule & John, 2011; Yin, 2018). In this study, the unit of analysis

was the first cohort of final-year BEngTech students at Nelson Mandela University, while the focus within the study is academic resilience in higher education.

This study made use of an exploratory case study research design, which is appropriate for answering 'what' questions (Yin, 2018). An exploratory case study examines situations that might not been explored previously (Rule & John, 2011). It may also include situations for which no theoretical framework has been developed (Rule & John, 2011). The benefit of an exploratory case study research design is that it allows for rich data-gathering (Patton, 2002; Rule & John, 2011). Case studies are typically known for using purely qualitative methods. However, recent South African research has shown that "cases can transcend the typical qualitative–quantitative schism and become increasingly characterised by a mixed methods approach" (Laher et al., 2019, p. 10). A mixed-methods approach entails the collection and analysis of both qualitative and quantitative data, and thereafter integrating the findings and drawing conclusions within a single study (Tashakkori & Creswell, 2007).

3.3.1 The axiological position: Value-bound

While the research is meant to be guided by the most appropriate paradigms, theories and design strategies, it is also important to note the values that informed those preferences. The axiological position of a study refers to the way values are applied to determine the integrity of the research. When the research process is guided by a level of transparency, this affords the researcher the opportunity to account for the measures taken to successfully conduct the study. When embarking on a research study it is important to understand how to systematically distinguish among the various paradigms, methods and research designs. Applying this skill is fundamental in conducting research that contributes to the creation of knowledge especially in under-researched areas. It is therefore important for the research question to be complemented by an appropriate paradigm in order to guide the process of the study. The search for knowledge

in research through elements such as validity and trustworthiness can be viewed as issues of values embedded in axiology (Viega, 2016). The function and position of values in the research process are important in influencing the relationship among the ontology, epistemology, paradigm, methodology and methods (Zaidi & Larsen, 2018). This level of responsibility and accountability towards the ethical nature of research influences the essence of qualitative research methods. According to Zaidi and Larsen (2018), an astute reflexive researcher pays careful attention to describing their research paradigm in relation to the study, and also in describing the philosophy informing the process. The axiological position of the research process is paramount in guiding the overall ethical progression of the study. It is therefore important for the researcher to observe and apply the ethical elements throughout this process. When ethical considerations are applied systematically to the development of the research, the integrity of the study becomes inherent.

Thus, the following paragraphs will elucidate the considerations taken towards the theoretical underpinnings of the current research.

3.3.2 The ontological position: Realist

The realist ontology emphasises that reality exists independent of the human mind regardless of whether it is comprehendible or experiential (Levers, 2013). This philosophical position introduces the understanding that research phenomena under study are always subject to and exist within various context specific conditions. The significance attached to the specific phenomenon under study is therefore directly related to how the philosophy of relativism creates knowledge. Smith (2008) explains that relativism can be understood through two different categories, namely, (i) normative, ethical, or moral relativism and (ii) cognitive or epistemological relativism. These categories are used interchangeably to ague the distinction between them to illustrate their application. Smith (2008) further suggests that what is accepted

as morally correct or incorrect depends on the given societal context and can therefore not be held as universal ethical and moral limitations.

Relativism as an ontological position is appreciated across academic disciplines and fields. The theory of relativism appears to be applied according to how the specific discipline creates, critiques, and deliberates knowledge. One of the criticisms that arise from the perspective of the political and ethical theory is the notion that a lack of moral restraint opens the possibility of relativists always defending dominant political powers because of a tolerance of certain morals and not others (Callaway, 2015). This critique is somewhat problematic especially when relativism holds that scientific inquiry needs to be framed in a manner through which researcher responsibility is guided by factors such as cultural, societal, or time-specific constraints. The extent to which relativism guides the process of research is also related to the integrity and therefore the axiology of the phenomenon under study. In conceptualising the research, I felt that situating and contextualising the current research on the academic resilience of engineering students would promote the transparency of the study to remain close to the axiological tenets.

3.3.3 The epistemological position: Social constructivism

The processes of the engineering students are fundamentally relational, and in order to explore the meanings behind these relations, the constructivist theory was used to inform epistemological elements of the study. Constructivism as a learning or meaning-making theory provides an explanation of the nature of knowledge and how people learn through interacting (Ultanir, 2012). Constructivism has been associated with the history of theorising knowledge and early childhood learning within the discipline of psychology. The endeavour to construct knowledge through relational practices has been criticised for the manner in which interpretations of data lack any critical interest or the ability to critique the very accounts

produced (Schwandt, 1994). Knowledge is comprised of the constructions created through one's interactions, thus blurring the line between researchers and participants, therefore challenging objectivity (Zaidi & Larsen, 2018). This shortfall was addressed through thorough documentation of the research axiology followed throughout the process of the current case study and by applying social constructivism to understand the contextual phenomenon of data that was generated.

3.4 SAMPLING AND SETTING

3.4.1 Sampling

A purposive sampling technique was used for all three respondent groups. For the first sample, final-year students who were registered for a three-year BEngTech degree in civil, electrical, industrial, marine, or mechanical engineering were invited to participate in the study. The justification for this sample choice was that existing institutional data demonstrated increased retention amongst students who were in their first year of BEngTech studies in 2018. The sample was recruited from the first cohort of final-year undergraduate students for the new BEngTech degree, who were concluding their studies in 2020. An email was sent to all 66 final-year BEngTech students, inviting them to a virtual information session that I facilitated. A total of 31 responded to the invitation and attended the information session. In the session, potential participants were briefed about the aims and objectives of the study and given the opportunity to ask questions prior to volunteering to participate. Following the virtual information session, I emailed the Research Participant Information Sheet for Engineering Students (Appendix F) to the students who expressed interest in participating.

For the second sample, academic staff members who lectured in the BEngTech programme and support staff who worked with the BEngTech student group were invited to

participate in the study. These participants were recruited by means of an email message that included the respective written Research Participant Information Sheets (Appendix G and H). The recruitment e-mail, explaining the purpose of the study, was sent to 21 potential participants. Subsequently, six academic staff and six support staff volunteered to participate.

3.4.2 Setting: Description of the case

The setting where the study was conducted is the Nelson Mandela University (NMU) in the Eastern Cape of South Africa. NMU is a comprehensive university focussing on both academic and vocational training. It came into existence following the amalgamation in 2005 of a technikon and traditional academic universities. The first step of the merger occurred in 2004, with the incorporation of Vista Port Elizabeth (Vista PE) by the University of Port Elizabeth (UPE). This was followed by the merger of Port Elizabeth Technikon (PE Technikon) and UPE on 1 January 2005. It is through the merger of the PE Technikon, UPE and Vista PE that academic and vocational training streams, which were previously distinct, merged into the course portfolio of Nelson Mandela Metropolitan University (NMMU), a comprehensive university offering both vocational and academic training. Before the merger, engineering courses were offered only at the PE Technikon and not at UPE. The vocational technikon courses were certificate and diploma courses, but not degree courses. After the merger, many of the diploma courses were re-curriculated into degree courses. The NMMU changed its name to Nelson Mandela University on 20 July 2017. As an extended part of this process, the new BEngTech degree was created. NMU accepted its first cohort of first-year BEngTech students for admission and registration in 2018.

3.5 DATA GENERATION METHODS

3.5.1 Pilot study

To ensure that the research would be contextually relevant, a local advisory committee, composed of selected members of the broader university community, was established and consulted (Resilience Research Centre, 2018). The committee consisted of five staff members: two from the Faculty of Education, one from the Department of Psychology, one from Academic Development, and one from the Unit for Statistical Consultation (USC). All of them, with the exception of the statistician from the USC, were selected as they served on the panel for the research proposal defence of the current case study in 2020. After reviewing my proposal and instruments the committee provided their input during a combined online focus group meeting convened by me at a time that was convenient for everyone. This was done in accordance with what is recommended by the Resilience Research Centre (2018). The members of the committee provided insightful information and suggestions that I used to refine the design and instruments used in this study. It was recommended that certain demographic variables be added to the questionnaire at the beginning of the link which would be sent out to student participants. The statistician further recommended that the demographic questions and risk and resilience measures all be sent out via one questionnaire link.

Separate pilot studies were conducted among students and staff. A small group of six students and three staff participants was invited to participate in a pilot study (De Vos et al., 2011) prior to the study in order to test and validate the instruments and administration procedures. The staff and student participants included in the pilot study were excluded from the data collection and generation processes that followed. The pilot study included the contextualisation of the ARM-R (Resilience Research Centre, 2018) through the following steps:

- convening a local advisory committee,
- exploring resilience in the local context,
- determining additional items for the measure, and
- evaluating the items in the measure (Resilience Research Centre, 2018).

3.5.2 Quantitative data generation

Given the nature and requirements of exploratory case study research (Yin, 2018) and the chosen mixed-method methodology, both quantitative and qualitative methods were employed in two sequential phases to generate data, as discussed below.

3.5.2.1 Measures

In this study, instruments refer to the actual tools used to collect data (e.g., interview schedules, assessment scales), whereas measures refer to the contents of the instruments. In accordance with previous resilience studies (Sanders et al., 2013; Sanders et al., 2017), the measures used in this study focussed specifically on demographic variables; risk, specifically individual risk (internalising and externalising dimensions) and contextual risk; and resilience. Four instruments were used to generate quantitative data, namely a self-designed demographics questionnaire, the K10 (Kessler et al., 2002), the ARM-R (Resilience Research Centre, 2018), and the ARS-30 (Cassidy, 2016).

3.5.2.2 Demographic variables

Data on age, gender and ethnicity had been collected in previous resilience studies (Sanders et al., 2017) and provided important context to this study. It is useful to note the demographic profile from which the sample was drawn as it illustrates the characteristics of the overall population. At NMU institutional data already existed on these various demographic variables. In 2020, NMU had a total of 29 503 enrolled students (Office for Institutional

Planning [OIP], 2019). The student demographic profile in terms of population group was as follows: African (71%), White (15%), Coloured (13%), and Indian (1%) (OIP, 2019). The majority of NMU students (46%) were IsiXhosa-speaking, followed by English (30%), Afrikaans (13%) other official South African languages (7%) and other languages (4%) (OIP, 2019). Female students made up 53% of the student body in 2019; male students made up 47% (OIP, 2019).

3.5.2.3 Risk

Individual risk

Internalising dimensions of risk were assessed by using the K10 (Kessler et al., 2002). The K10 is a five-point Likert scale psychodiagnostic tool that asks 10 questions in order to screen for anxiety and depression (Appendix L). Aspects of externalising risk were captured via the DSM-5 Self-Rated Level 1 CCSM-A (APA, 2013). The DSM-5 CCSM-A (Appendix M) is a five-point Likert scale emerging instrument that consists of 23 questions and measures the following 13 mental health domains: depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviours, dissociation, personality functioning, and substance use (APA, 2013).

Contextual risk

Pre-existing institutional data collected as part of the *Siyaphumelela* Project in the School of Engineering was used to establish contextual risk. Permission was obtained from NMU to use the existing institutional data, specifically the results of the Learning Enhancement Checklist (LEC). The LEC is an institutional measure developed by *Emthonjeni* Student Wellness (previously known as the Student Counselling, Career and Development Centre). A statistically representative sample (n=380) of the 2020 final-year BEngTech students completed

the LEC during their first year in 2018 as part of the Siyaphumelela Project. These students self-reported difficulties in the following domains: lectures, tests and examinations, time management, study management, financial problems, current personal/emotional problems, facilities, feelings about self, accommodation, course/programme choice, module content, student life, and language. Table 3.1 below presents a summary of the LEC Results.

Table 3.1

Summary Table of LEC Results

Item	Percentage
Difficulty with managing their time	55%
Experiencing test or exam anxiety	49%
Coming from a disadvantaged family	48%
Feeling underprepared when they first started their university studies	45%
Feeling anxious or worried	39%
Experienced domestic violence, relationship difficulties and traumatic events	30%
Experienced bereavement	27%
Not having anyone to share their problems with	20%
Have depressive feelings	20%
Having problems with substance abuse	4%

3.5.2.4 Resilience

The ARM-R (Resilience Research Centre, 2018) and the ARS-30 (Cassidy, 2016) were administered as instruments of resilience. Some of the items on the ARS-30 were reverse scored. Consideration was given to the applicability of these non-South African instruments (Canadian and British) within a South African context (Laher & Cockcroft, 2013). Despite the fact that these instruments had not previously been used in South Africa, both the ARM-R (Appendix N) and ARS-30 (Appendix O) were found to produce valid and reliable data when used in other contexts internationally (Cassidy, 2016; Clark et al., 2022). The ARM-R manual provided four steps to contextualise the ARM-R for another population before administration

in order "to enhance the culturally sensitive properties" of the instruments (Resilience Research Centre, 2018, p. 8).

3.5.3 Qualitative data generation

3.5.3.1 Semi-structured interviews

DeJonckheere and Vaughn (2019) suggest that "the overall purpose of using semi-structured interviews for data generation is to gather information from key informants who have personal experiences, attitudes, perceptions and beliefs related to the topic of interest" (p. 2). Three semi-structured interview schedules were developed, one for engineering students (see Appendix P), one for engineering lecturers (see Appendix Q), and one for support staff (see Appendix R). Questions were formulated around the following topics: educational history/background, risk factors, protective factors, protective/risk factor relationships, and the resilience process. These questions were informed by an interview protocol used by Morales (2008) in a study focussing on academic resilience.

Interviews were conducted virtually via the Zoom meetings and MS Teams videotelephony software platforms due to the outbreak of the Covid-19 pandemic in 2020 and the resultant impossibility of conducting interviews in person and face to face. All interviews were recorded, with the prior consent of the participants.

3.5.3.2 Memoing (Research journal)

Memoing is a process of journaling and is encouraged in the process of conducting qualitative research. Birks et al. (2008) explain that memo writing "enables meaning to be extracted from the data, permit the researcher to maintain momentum, aid in mapping of research activities and facilitate communication in the research team" (p. 74). They further state that "memos can help to clarify thinking on a research topic, provide a mechanism for the

articulation of assumptions and subjective perspectives about the area of research, and facilitate the development of the study design" (p. 69). Memo writing was employed to assist with recording ideas for reflection, to clarify meanings contained in the data and to facilitate reflexivity during the research process. Written notes concerning the planning, observations, thoughts, assumptions, and reflections of the researcher were recorded in a memoing (research) journal. Memo writing was used throughout the research process to highlight the impact of subjective experiences on the generation and analysis of the data.

3.6 DATA ANALYSIS

3.6.1 Quantitative data analysis

The quantitative data were analysed through two kinds of statistical singular correct here namely descriptive statistics (Fisher & Marshall, 2009) and inferential statistics (Allua & Thompson, 2009). The descriptive and inferential statistics generated by the sample of final-year BEngTech students were presented. Descriptive statistics were generated from each of the instruments that were administered, these include the Kessler Psychological Distress Scale (K10), the DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure-A (CCSM-A), the Adult Resilience Measure-Revised (ARM-R), and the Academic Resilience Scale (ARS-30). The frequency of admission and academic support information were also presented. Inferential statistical methods were used to assess whether there is a statistically significant relationship between the categorical variables in this study; these were perseverance, negative affect, reflection help-seeking, academic resilience, personal resilience, relational resilience, resilience, and distress. In terms of correlation, the non-parametric Mann-Whitney test was conducted.

3.6.2 Qualitative data analysis

Interviews were conducted with the three sample groups until data saturation was reached. The qualitative data generated from the interviews were analysed using the six phases of thematic analysis identified by Braun and Clarke (2006): (i) Familiarising yourself with the data, (ii) generating initial codes, (iii) searching for themes, (iv) reviewing themes, (v) defining and naming themes, and (vi) producing the report. The thematic analysis allowed me to engage with the transcripts from the interviews in a reflexive (Shaw, 2010) and reflective (Braun & Clarke, 2006, 2021) manner. Furthermore, thematic analysis enabled the inductive generation of codes and themes (Braun & Clarke, 2006). The use of an inductive approach enabled me to draw out themes and patterns to categorise the data during the research process. Finally, the findings gained from both the quantitative and qualitative analyses were synthesised. An independent coder, registered with the Health Professions Council of South Africa (HPCSA) in the research psychology category, was used.

After I had collected quantitative data and generated qualitative data, I analysed both data sets (numerical and textual), and integrated the findings to draw conclusions. Both methods allowed me to answer the research questions set out in Chapter One. The mixed-methods approach further allowed me to make use of two types of sampling procedures, data collection and generation procedures (instruments and interviews), data analysis (statistical and thematic), and then to draw both objective and subjective conclusions (Creswell & Plano Clark, 2018).

3.6.3 Trustworthiness

Naturalistic investigators Lincoln and Guba (1985) advise that credibility (internal validity), transferability (external validity), dependability (reliability) and confirmability (objectivity) should all be addressed in order to produce a trustworthy qualitative study. In the past, there has been general concern that case study research lacks rigour (Yin, 2018).

Nowell et al. (2017) suggest means of establishing Lincoln and Guba's (1985) criteria for trustworthiness during each phase of thematic analysis (Braun & Clarke, 2006). Across the iterative phases of thematic analysis, the following criteria for trustworthiness were of particular significance in the current case study: prolonged engagement with the data, triangulating different data generation modes (literature and interviews), researcher triangulation (themes and subthemes vetted by an independent co-coder), triangulation of data generated by various research methods, audit trail of code generation and thick descriptions of context through memoing (reflexive journaling), and member checking (Nowell et al., 2017). To facilitate member checking, each participant was provided via email with a password-protected document containing a transcript of their interview for their review and approval. In this manner, participants were given an opportunity to omit anything or to request a preference if they did not wish to be quoted on anything specific. No requests for omission were received and all participants agreed that their interviews could be used as recorded and that they could be quoted as reflected in the transcription.

Furthermore, by memoing, a thick description of the local context was developed to allow for some level of transferability in terms of what was known about the perceptions of the participants regarding academic resilience. According to Lincoln and Guba (1985), a thick description of the local context ensures that "judgments about the degree of fit or similarity may be made by others who may wish to apply all or part of the findings elsewhere" (p. 19). Finally, memoing as a strategy was used throughout the study and was beneficial for practising reflexivity as the researcher while maintaining a clear audit trail of the research process (Birks et al., 2008). Table 3.2 below presents a summary of the research design and process described above.

Table 3.2

Summary of Research Questions, Objectives, Methods, and Analysis

Research questions	Aim/objectives	Data generation methods and instruments	Data analysis methods
What explains the academic resilience of the first cohort of final-year BEngTech students at NMU?	To explore the academic resilience of the first cohort of final-year BEngTech students at NMU	Quantitative and qualitative as listed below	Quantitative and qualitative as listed below
How can the academic resilience of engineering students be contextualised within South African higher education?	To contextualise the academic resilience of engineering students in South African higher education	Demographic data K10 DSM-5 Self-Rated Level 1 CCSM-A LEC ARM-R ARS-30	Thematic analysis Descriptive and inferential statistics
What perceptions do engineering students have of their academic resilience?	To examine the perceptions of engineering students regarding the personal and the socio-ecological enablers and constraints of their academic resilience	Semi-structured interviews using semi-structured interview schedule, via Zoom Memoing (Research journal).	Thematic analysis.
What perceptions do engineering lecturers have of the academic resilience of engineering students?	To identify the perceptions of engineering lecturers about the personal and the socio-ecological reasons for the academic resilience of engineering students	Semi-structured interviews using semi-structured interview schedule, via Zoom Memoing (Research journal)	Thematic analysis
What perceptions do support staff have of the academic resilience	To explore the perceptions of support staff about the personal and the socio-	Semi-structured interviews using a semi-structured interview schedule, via Zoom	Thematic analysis

Research questions	Aim/objectives	Data generation methods and instruments	Data analysis methods
of engineering students?	ecological reasons for the academic resilience of engineering students	Memoing (Research journal).	

3.7 ETHICAL CONSIDERATIONS

An application was made to the Nelson Mandela University Research Ethics Committee: Human (REC-H) to obtain institutional ethical clearance prior to the commencement of this research study. Approval was granted on 28 August 2020, and the ethics approval reference number is H20-EDU-ERE-026 (Appendix A). Upon receiving REC-H approval, institutional permission to interview staff and students was obtained from the Deputy Vice-Chancellor: Research, Innovation and Internationalisation (Appendix B), the Executive Dean of the Faculty of Engineering, the Built Environment and Technology (Appendix C), the Director of School for the School of Engineering (Appendix D), as well as the Director of School for the School of Civil Engineering and the Built Environment (Appendix E).

Both written and oral information was provided to participants via recruitment e-mails and a virtual information session prior to participation. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time, without giving any reason or experiencing negative consequences. Participants were assured of confidentiality and were assigned pseudonyms during data analysis to ensure anonymity.

Student participants were informed of the potential foreseeable risks and/or benefits associated with their participation. There was a medium risk that discussing their personal and socio-ecological enablers and constraints of their academic resilience could have resulted in feelings of embarrassment for the engineering students. Furthermore, the study might have evoked discomfort, which could have led to feelings of psychological distress or vulnerability.

A few safety measures were implemented to mitigate against the aforementioned foreseeable risk. Firstly, emotionally containment was to be provided by myself, a registered HPCSA clinical psychologist, in the exact moment of distress. Participants were made aware that pre-arranged counselling was available if warranted thereafter. One student participant reported feeling unsettled following their interview and was subsequently referred to an independent HPCSA-registered clinical psychologist for six online counselling sessions. The online counselling was provided at no cost to the participant, as I made use of my East and South African-German Centre of Excellence for Educational Research Methodologies and Management (CERM-ESA) PhD Scholarship research funding to cover the costs. Secondly, positive psychological language was used wherever possible to avoid the language of marginalisation or social exclusion. Lastly, motivational and projective interviewing techniques could be utilised as available remedial measures if necessary – however, there was no need. With regard to the benefits of participation, it was likely that participants had potentially benefited from gaining increased awareness of their own personal and socio-ecological enablers and constraints of their academic resilience.

Written informed consent was obtained electronically from all participants before interviews commenced for data to be used for degree and research publication purposes as well as for individual interviews to be recorded (on Zoom and MS Teams) and transcribed for analysis (Appendices I, J and K). Interviews were transcribed by a third-party transcription service. The statistician, co-coder and transcription service provider all signed confidentiality agreements prior to their involvement in the study. Three paper copies of data were stored securely in a locked cabinet, in a private office, at the NMU Faculty of Education. Electronic data were saved as password-protected files on iCloud and Google Drive, and backed up on Microsoft OneDrive.

3.8 CHAPTER SUMMARY

In this chapter, I explained the study's paradigmatic placement as an interpretive study, which followed an exploratory case study design and used a mixed-methods approach to data generation and analysis, with the goal of examining perceptions about academic resilience in the context of higher education. It is situated in an interpretivist paradigm, in theoretical perspectives rooted in positive psychology. An exploratory case study research design and mixed-methods research approach were used, which allowed for rich data-gathering. This might be used to respond to "what" inquiries. An advantage of an exploratory case study research approach is that it enables thorough data collection. A purposive sampling technique was used for all three respondent groups. The setting where the study was conducted is the Nelson Mandela University in the Eastern Cape of South Africa. Due to the nature, needs, and mixed-method technique of the exploratory case study research, both quantitative and qualitative methodologies were used in both respective phases to gather data in this study. All ethical considerations were followed accordingly. In the next chapter, I will report on the statistical analyses of the quantitative data collected and in Chapter Five, I will report on the analysis of the qualitative data.

CHAPTER FOUR

QUANTITATIVE RESULTS

4.1 INTRODUCTION

The previous chapter (Chapter Three) provided a description of the philosophical underpinning that informed this study, and an explanation of the case study research design that was followed. It also presented an overview of the mixed methods used to generate the data and how the instruments were administered, scored, and interpreted. In this chapter, the findings from the descriptive and inferential statistics generated by the sample of final-year BEngTech students are presented. Descriptive statistics were generated from each of the instruments that were administered, namely the Kessler Psychological Distress Scale (K10), the DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure-A (CCSM-A), the Adult Resilience Measure-Revised (ARM-R), and the Academic Resilience Scale (ARS-30). The frequency of admission and academic support information are also presented. Inferential statistical methods were used to assess whether there is a statistically significant relationship between perseverance, negative affect, reflection help-seeking, academic resilience, personal resilience, relational resilience, resilience, and distress scores generated by the sample.

4.2 SAMPLE AND DESCRIPTIVE STATISTICS RESULTS

The following section describes the demographic and other descriptive statistics of the sample, and the descriptive statistics generated by the instruments used in this study.

4.2.1 Statistical Sample

In 2020, Nelson Mandela University had a total of 29 503 enrolled students (Office for Institutional Planning). Of these, 455 were enrolled in the School of Engineering, with 296 of these enrolled for a BEngTech degree (Lourens et al., 2018). Of this number, 66 were enrolled in their final year of study at the beginning of 2020 and 36 graduated at the end of 2020 (Nelson Mandela University Management Information Unit, 2022). Approximately 30 engineering lecturing staff teach courses in the BEngTech degree curriculum, and nine support staff interact with BEngTech students as part of their curricular and co-curricular study programme. The sample groups for the qualitative phase of this study therefore represents 36% of the population of all graduated BEngTech students in 2020 at Nelson Mandela University; 20% of the lecturing staff and 66.7% of the support staff who work with BEngTech students. For the quantitative phase of this study, the instruments were started 66 times by respondents but only 47 students completed all four instruments. Therefore, the sample groups for the quantitative phase of this study represent 74.6% of the population of all graduated BEngTech students in 2020 at Nelson Mandela University.

4.2.2 Descriptive Statistics

The sample consisted of 66 final-year BEngTech students (mean age 23.3 years, SD = 3,02). All 66 final-year students completed the demographic information as well as the Kessler Psychological Distress Scale (K10) (Kessler et al., 2002). Thereafter, a subgroup of 59 final-year students completed the DSM Self-Rated Level 1 CCSM-A (American Psychiatric Association, APA, 2013); 53 completed the ARM-R (Resilience Research Centre, 2018); and 47 completed the ARS-30 (Cassidy, 2016).

Seventy-six per cent of the sample Ninety-two per cent of the sample were South African citizens, and 8% were international students. Their racial composition was ‘Black’

(61%), 'White' (24%) and 'Coloured' (15%). The largest group of respondents spoke Xhosa as their home language (43%), followed by Afrikaans and English (both 29%). Only one respondent reported living with a diagnosable mental disorder at the time of completion. None of the respondents reported to be living with a disability.

The sample was largely made up of mechanical engineering students (35%), followed by civil (32%), electrical (26%), industrial (6%), and marine engineering (2%) respondents. Most of the respondents (65%) indicated that they had attended the How2@Mandela orientation programme at the beginning of their academic journey. However, less than 50% indicated that they had attended subject-specific tutoring sessions (44%), while less than 25% indicated that they had attended the academic success strategy workshops (24%) throughout their years of study. Most of the sample indicated that Nelson Mandela University was their first choice of tertiary institution (71%), and their first choice of academic programme (86%), and that they had not been required to write an admission test (82%). Admission tests are required when students do not directly meet admission requirements for a specific academic course. Universities in South Africa make use of an Admission Point Score (APS) system, where each subject completed in the final year of high school is assigned an APS. These points are accumulated, and based on the number of APSs needed for a particular degree or course, it ultimately determines whether applicants meet the entry requirements. Most of the students reported that they obtained 70-79% for mathematics (38%) and a third of the sample (33%) obtained 60-69% for physical science during their Grade 12 year (final year) of secondary education. Half of the sample (50%) identified as being first generation university students, meaning that they are the first in their families ever to go to university. With regard to funding, many of the students were supported by the National Student Financial Aid Scheme (NSFAS) of the South African government (41%). While an equal distribution reported being supported by their parents or family (17%) and a bursary from a public organisation (17%), the minority

of the students reported being self-funded (11%). The School of Engineering's Meal-A-Day project, which provides one meal a day to financially struggling students, served 21% of the sample.

4.3 MEASUREMENT ITEMS

As mentioned earlier in this chapter, the K10, the DSM-5 Self-Rated Level 1 CCSM-A, the ARM-R, and the ARS-30 were administered. Frequency distributions for the measurement items in the questionnaire for these scales are presented in this section.

4.3.1 Kessler Psychological Distress Scale (K10) Items (n=66)

The respondents' responses for the K10 items are summarised in Table 4.1.

Table 4.1

Frequency Distribution – Kessler Psychological Distress Scale (K10) (N=66)

Psychological distress	None of the time		A little of the time		Some of the time		Most of the time		All of the time	
So restless you could not sit still?	38	58%	17	26%	9	14%	2	3%	0	0%
Worthless?	41	62%	13	20%	9	14%	2	3%	1	2%
So sad that nothing could cheer you up?	37	56%	13	20%	12	18%	3	5%	1	2%
So nervous that nothing could calm you down?	36	55%	12	18%	14	21%	3	5%	1	2%
Hopeless?	31	47%	17	26%	13	20%	4	6%	1	2%
Depressed?	27	41%	15	23%	17	26%	5	8%	2	3%
Restless or fidgety?	17	26%	18	27%	21	32%	9	14%	1	2%
Tired out for no good reason?	12	18%	18	27%	21	32%	14	21%	1	2%
Nervous?	9	14%	21	32%	19	29%	13	20%	4	6%
That everything was an effort?	9	14%	20	30%	16	24%	16	24%	5	8%

Table 4.1 indicates that the majority of the sample responded none/a little of the time to the first seven items reported in Table 4.1 (ranging from 53% to 83%) and the largest proportion (ranging from 44% to 46%) to the other three items in the scale.

4.3.2 DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure-A (CCSM-A)

The DSM-5 Self-Rated Level 1 CCSM-A was completed by 59 respondents. The responses to the CSSM-A items are summarised in Table 4.2.

Table 4.2

Frequency Distributions – DSM-5 CCSM-A – Severity of the Symptoms (N=59)

Symptoms	None		Slight		Mild		Moderate		Severe	
Hearing things other people couldn't hear, such as voices even when no one was around?	51	86%	6	10%	1	2%	1	2%	0	0%
Using any of the following medicines on your own, that is, without a doctor's prescription, in greater amounts or longer than prescribed e.g., painkillers (like Vicodin), stimulants (like Ritalin or Adderall), sedatives or tranquilisers?	52	88%	5	9%	1	2%	1	2%	0	0%
Feeling that someone could hear your thoughts, or that you could hear what another person was thinking?	51	86%	4	7%	3	5%	1	2%	0	0%
Drinking at least four drinks of any kind of alcohol in a single day?	44	75%	10	17%	4	7%	0	0%	1	2%
Smoking any cigarettes, a cigar, or pipe, or using snuff or chewing tobacco?	49	83%	4	7%	0	0%	3	5%	3	5%
Feeling that your illnesses are not being taken seriously enough?	42	71%	10	17%	4	7%	3	5%	0	0%
Thoughts of actually hurting yourself?	50	85%	1	2%	3	5%	5	9%	0	0%
Problems with memory (e.g., learning new information) or with location (e.g., finding your way home)?	32	54%	15	25%	9	15%	3	5%	0	0%
Unpleasant thoughts, urges, or images that repeatedly enter your mind?	35	59%	11	19%	7	12%	6	10%	0	0%
Not knowing who you really are or what you want out of life?	31	53%	14	24%	8	14%	3	5%	3	5%

Symptoms	None		Slight		Mild		Moderate		Severe	
Feeling detached or distant from yourself, your body, your physical surroundings, or your memories?	30	51%	15	25%	6	10%	7	12%	1	2%
Unexplained aches and pains (e.g., head, back, joints, abdomen, legs)?	28	48%	17	29%	4	7%	7	12%	3	5%
Feeling driven to perform certain behaviours or mental acts over and over again?	38	64%	6	10%	10	17%	5	9%	0	0%
Feeling panic or being frightened?	24	41%	20	34%	7	12%	6	10%	2	3%
Feeling more irritated, grouchy, or angry than usual?	18	31%	25	42%	9	15%	5	9%	2	3%
Problems with sleep that affected your sleep quality overall?	24	41%	17	29%	13	22%	4	7%	1	2%
Not feeling close to other people or enjoying your relationships with them?	26	44%	15	25%	11	19%	4	7%	3	5%
Feeling down, depressed, or hopeless?	23	39%	17	29%	13	22%	5	9%	1	2%
Sleeping less than usual, but still have a lot of energy?	11	19%	27	46%	9	15%	11	19%	1	2%
Feeling nervous, anxious, frightened, worried, or on edge?	20	34%	18	31%	9	15%	10	17%	2	3%
Little interest or pleasure in doing things?	9	15%	21	36%	22	37%	5	9%	2	3%
Avoiding situations that make you anxious?	18	31%	12	20%	17	29%	9	15%	3	5%
Starting lots more projects than usual or doing more risky things than usual?	12	20%	16	27%	16	27%	7	12%	8	14%

Based on what is presented in Table 4.2, the majority of the sample responded none/slight to all the items (ranging from 51% to 97%) with the last item in Table 4.2 being the only exception with the largest proportion (48%) responding none/slight. Therefore, it can be

concluded that the majority of the students experienced slight symptoms at most according to their assessment of their mental health.

Table 4.3 presents the level of severity that respondents reported experiencing for the various domains of the DSM-5 CCSM-A.

Table 4.3

Frequency Distributions – DSM-5 CCSM-A – Severity of the Domains (N=59)

Domains	None		Slight		Mild		Moderate		Severe	
Psychosis	47	80%	8	14%	3	5%	1	2%	0	0%
Suicidal ideation	50	85%	1	2%	3	5%	5	9%	0	0%
Substance use	36	61%	12	20%	4	7%	3	5%	4	7%
Memory	32	54%	15	25%	9	15%	3	5%	0	0%
Dissociation	30	51%	15	25%	6	10%	7	12%	1	2%
Somatic symptoms	28	48%	16	27%	4	7%	8	14%	3	5%
Anger	18	31%	25	42%	9	15%	5	9%	2	3%
Sleep problems	24	41%	17	29%	13	22%	4	7%	1	2%
Repetitive thoughts and behaviours'	27	46%	12	20%	12	20%	8	14%	0	0%
Personality functioning	21	36%	17	29%	12	20%	4	7%	5	9%
Depression	7	12%	19	32%	23	39%	8	14%	2	3%
Anxiety	11	19%	14	24%	12	20%	17	29%	5	9%
Mania	4	7%	17	29%	15	25%	15	25%	8	14%

With reference to Table 4.3, it was found that the majority of the sample (ranging between 64% and 93%) responded none/slight for the first ten domains listed. the largest proportion responded none/slight for depression (44%) and anxiety (42%). For mania, the largest proportion of the sample (39%) responded moderate/severe. A key conclusion is that anxiety and mania are the only symptoms for which more than 30% of the sample responded moderate/severe.

4.3.3 Adult Resilience Measure-Revised (ARM-R)

The ARM-R was completed by 53 respondents, as previously stated. Table 4.4 presents frequency distributions for the AMR-R Relational (adult resilience) items.

Table 4.4

Frequency Distributions – Adult Resilience – Relational (N=53)

	Not at all		A little		Somewhat		Quite a bit		A lot	
I feel secure when I am with my family/partner	1	2%	3	6%	1	2%	8	15%	40	76%
My family/partner stands by me when times are hard (for example, when I am ill or in trouble)	1	2%	2	4%	6	11%	13	25%	31	59%
I like my family's/partner's culture and the way my family celebrates things (like holidays or learning about my culture)	2	4%	4	8%	4	8%	8	15%	35	66%
If I am hungry, I can usually get enough food to eat	1	2%	3	6%	7	13%	13	25%	29	55%
My family is supportive towards me	2	4%	2	4%	8	15%	7	13%	34	64%
My family knows a lot about me (for example, who my friends are, what I like to do)	3	6%	6	12%	8	15%	12	23%	24	45%
I talk to my family/partner about how I feel (for example, when I am sad or concerned)	11	21%	4	8%	7	13%	16	30%	15	28%

Table 4.4 shows that the majority of the sample (ranging between 59% and 91%) responded Quite a lot/A lot to all the items. Therefore, it can be concluded that most of the students in this study reported having a supportive family and feeling secure with their family or partners, which aids in their relational resilience. Table 4.5 presents frequency distributions for the Personal (adult resilience) items.

Table 4.5

Frequency Distributions – Adult Resilience – Personal (N=53)

	Not at all		A little		Somewhat		Quite a bit		A lot	
I get along with people around me	0	0%	2	4%	5	9%	26	49%	20	38%
Getting and improving qualifications or skills is important to me	0	0%	2	4%	5	9%	13	25%	33	62%
I know how to behave in different social situations (such as at work, home, or other public places)	0	0%	3	6%	6	11%	12	23%	32	60%
I have opportunities to show others that I can act responsibly	0	0%	4	8%	5	9%	14	26%	30	57%
People like to spend time with me	1	2%	7	13%	9	17%	21	40%	15	28%
I am treated fairly in my community	4	8%	2	4%	12	23%	14	26%	21	40%
My friends care about me when times are hard (for example, when I am ill or in trouble)	5	9%	4	8%	10	19%	13	25%	21	40%
I have opportunities to apply my abilities in life (like using skills, working at a job, or caring for others)	3	6%	6	11%	11	21%	13	25%	20	38%
I feel supported by my friends	3	6%	8	15%	11	21%	17	32%	14	26%
I feel that I belong in my community	2	4%	12	23%	11	21%	14	26%	14	26%

Table 4.5 shows that the majority of the students (ranging between 53% and 90%) responded Quite a lot/A lot to all the items, indicating that most of the students in this study show a great sense of community and belonging. It can be concluded that most of the students in this study reported having a great personal resilience.

4.3.4 Academic Resilience Scale (ARS-30)

As previously mentioned, the ARS-30 had a total of 47 respondents. As stated in Chapter Three, the ARS-30 provides a hypothetical situation at the very beginning and respondents are asked to imagine that they are in the situation and then describe how they would react by answering the questions. The ARS-30 has three sub-scales. What follows are three

separate descriptive tables, one for each sub-scale: Perseverance, Reflection, and Negative Affect.

Table 4.6 presents the frequency distributions for Perseverance (Adult resilience). The Perseverance scale consists of ten positive items and four negative items. The positive items are sorted in descending sequence and the negative items in ascending sequence on the percentage strongly agree/agree.

Table 4.6

Frequency Distributions – Academic Resilience – Perseverance (N=47)

	Strongly agree		**Agree**		**Neutral**		**Disagree**		**Strongly disagree**	
I would keep trying	36	77%	7	15%	2	4%	1	2%	1	2%
I would work harder	32	68%	11	23%	1	2%	2	4%	1	2%
I would use the feedback to improve my work	38	81%	4	9%	2	4%	2	4%	1	2%
I would look forward to showing that I can improve my grades	31	66%	9	19%	6	13%	0	0%	1	2%
I would not change my long-term goals and ambitions	35	75%	5	11%	3	6%	3	6%	1	2%
I would use the situation to motivate myself	30	64%	9	19%	4	9%	2	4%	2	4%
I would try to think of new solutions	25	53%	13	28%	6	13%	1	2%	2	4%
I would do my best to stop thinking negative thoughts	24	51%	9	19%	10	21%	2	4%	2	4%
I would see the situation as temporary	22	47%	10	21%	10	21%	2	4%	3	6%
I would see the situation as a challenge	18	38%	11	23%	13	28%	2	4%	3	6%
I would just give up	1	2%	0	0%	2	4%	6	13%	38	81%
I would blame the tutor	2	4%	2	4%	2	4%	7	15%	34	72%
I would change my career plans	3	6%	3	6%	2	4%	9	19%	30	64%
I would not accept the tutors' feedback	9	19%	2	4%	4	9%	9	19%	23	50%

Table 4.6 reflects that most of the sample (ranging between 62% and 92%) responded Strongly agree/Agree to the positive items. In addition, most of the sample (ranging between

68% and 94%) responded Disagree/Strongly disagree to the negative items. Therefore, it can be concluded that students in this study reported having a great sense of perseverance. Table 4.7 presents frequency distributions for the reflection (adult resilience) items.

Table 4.7

Frequency Distributions – Academic Resilience – Reflection (N=47)

	Strongly agree		**Agree**		**Neutral**		**Disagree**		**Strongly disagree**	
I would use my past successes to help motivate myself	36	77%	7	145 %	1	2%	2	4%	1	2%
I would give myself encouragement	28	60%	14	30%	3	6%	1	2%	1	2%
I would set my own goals for achievement	27	57%	15	32%	3	6%	0	0%	2	4%
I would try to think more about my strengths and weaknesses to help me work better	27	57%	12	26%	4	9%	3	6%	1	2%
I would try different ways to study	25	53%	12	26%	6	13%	3	6%	1	2%
I would start to monitor and evaluate my achievements and effort	19	40%	17	36%	7	15%	0	0%	4	9%
I would seek encouragement from my family and friends	19	40%	14	30%	6	13%	7	15%	1	2%
I would seek help from my tutors	24	51%	8	17%	10	21%	2	4%	3	6%
I would start to self-impose rewards and punishments depending on my performance	6	13%	9	19%	11	23%	9	19%	12	26%

As shown in Table 4.7, for seven out of the eight Reflection items, the majority (ranging between 68% and 91%) responded Strongly agree/Agree. The only exception is the last item in Table 4.7, where the largest proportion (45%) responded Disagree/Strongly disagree to the item 'I would start to self-impose rewards and punishments depending on my performance'. Therefore, it can be concluded that the students in this study positively reflected on their past experiences and used their experiences to mould their positive behaviour going forward. Table 4.8 presents frequency distributions for the negative affect (adult resilience) items.

Table 4.8

Frequency Distributions – Academic Resilience – Negative Affect (N=47)

	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
I would begin to think my chances of success at university were poor	3	6%	2	4%	9	19%	11	23%	22	47%
I would begin to think my chances of getting the job I want were poor	1	2%	4	9%	11	23%	11	23%	20	43%
I would feel like everything was ruined and was going wrong	1	2%	7	15%	8	17%	14	30%	17	36%
I would probably get depressed	4	9%	5	11%	10	21%	13	28%	15	32%
I would probably get annoyed	4	9%	9	19%	16	34%	6	13%	12	26%
I would be very disappointed	13	28%	12	26%	9	19%	6	13%	7	15%

For the first four items in Table 4.8 the majority of the sample (ranging between 60% and 70%) responded Disagree/Strongly disagree. For the item 'I would probably get annoyed' the largest proportion (38%) responded Disagree/Strongly disagree and for the item 'I would be very disappointed' the majority (54%) responded Strongly agree/Agree. The mostly negative responses to the negative affect items indicate that the students in this study do not tend to have feelings of emotional distress regarding their academic resilience.

4.4 RELIABILITY OF THE SCALE SCORES

Table 4.9 below presents statistics to measure the reliability of the scores for each scale in this study.

Table 4.9

Reliability of the Scores for the Scales

Scale	n	Cronbach's alpha
Kessler Psychological Distress	66	0.94
DSM-5 CCSM-A		
Severity of the symptoms	59	0.92
Severity of the domains	59	0.88
Adult Resilience		
Relational resilience	53	0.87
Personal resilience	53	0.88
Adult resilience overall	53	0.77
Academic Resilience		
Perseverance*	47	0.72
Reflection	47	0.89
Negative affect#	47	0.74
Academic resilience overall	47	0.60

Items omitted to significantly improve the reliability of a score:

* Item 'I would change my career plans' omitted from the scale

Item 'I would stop myself from panicking' omitted from the scale

Table 4.9 indicates that all the scores have good (alpha > 0.70) to excellent (alpha > 0.80) reliability except for academic resilience, which has acceptable reliability (alpha > 0.50).

4.5 DESCRIPTIVE STATISTICS FOR THE SCORES

4.5.1 Admission Point Scores (APS)

Table 4.10 presents central tendency and dispersion statistics for APS.

Table 4.10

Central Tendency and Dispersion: APS when Applied (N = 66)

	Mean	S.D.	Minimum	Quartile 1	Median	Quartile 3	Maximum
APS	11.09	6.04	1.00	7.00	11.00	14.75	22.00
Maths APS	2.68	1.04	1.00	2.00	3.00	3.00	5.00
Physical Science APS	3.24	1.08	1.00	2.25	3.00	4.00	5.00

As shown in Table 4.10, the observed mean APS when applied was M =11.09. This indicates that students acquired an APS of 11 APS on average when they applied for admission. Furthermore, the observed mean M = 2.68 for Maths APS when applied indicates that students on average acquired slightly less than 3 Maths APS. Similarly, the observed mean M = 3.24 for Physical Science APS when applied indicates that on average students acquired slightly more than 3 Physical Science APS. Table 4.11 presents the frequency distribution for APS.

Table 4.11

Frequency Distribution – APS when Applied Score

			Cumulative	
30	3	5%		
31	1	2%	4	6%
32	3	5%	7	11%
33	1	2%	8	12%
34	7	11%	15	23%
35	3	5%	18	27%
36	9	14%	27	41%
37	2	3%	29	44%
38	4	6%	33	50%
39	3	5%	36	55%
40	5	8%	41	62%
41	5	8%	46	70%
42	7	11%	53	80%
43	3	5%	56	85%
44	4	6%	60	91%
45	1	2%	61	92%
46	1	2%	62	94%
47	3	5%	65	98%
48	0	0	65	98%
49	0	0	65	98%
>49	1	2%	66	100%
Total	66	100%		

As reported in Table 4.11 above, 27% of the participants scored below 36 points, the minimum APS for acceptance into the BEngTech programme at the university. These students were possibly accepted because they fell within the testing band and were subsequently accepted after performing well in the admissions test. Table 4.12 presents the frequency distribution for Maths APS.

Table 4.12

Frequency Distribution – Maths APS when Applied

			Cumulative	
4 (50-59%)	9	14%		
5 (60-69%)	19	29%	28	42%
6 (70-79%)	25	38%	53	80%
7 (80-89%)	10	15%	63	95%
8 (90-100%)	3	5%	66	100%
Total	66	100%		

The minimum Maths APS required for admission is 5 (60-69%). Table 12 indicates that the majority (58%) of the sample scored a mathematics APS of 6, 7 or 8 when they applied for admission, which is more than the minimum required to be accepted. Table 4.13 presents the frequency distribution for Physical Science APS.

Table 4.13

Frequency Distribution – Physical Science APS

			Cumulative	
3 (40-49%)	3	5%		
4 (50-59%)	14	21%	17	26%
5 (60-69%)	22	33%	39	59%
6 (70-79%)	18	27%	57	86%
7 (80-89%)	9	14%	66	100%
Total	66	100%		

The minimum Physical Science APS for admission is 4 (50-59%). Table 4.13 indicates that the majority (74%) of the sample scored a Physical Science APS of 5, 6 or 7 when they applied, which is more than the minimum required to be accepted.

4.5.2 Scales

Table 4.14.a presents central tendency and dispersion statistics for the scales and Table 4.14.b presents 95% confidence intervals for the mean values in Table 4.14.a.

Table 4.14.a

Central Tendency and Dispersion Statistics for the Scales

Scale	n	Mean	S.D.	Minimum	Quartile 1	Median	Quartile 3	Maximum
Kessler Distress Score	66	28.30	21.03	0.00	10.00	21.25	47.50	85.00
DSM-5 CCSM-A								
Severity of symptoms	59	21.28	15.35	0.00	9.79	15.22	32.61	56.52
Severity of domains	59	26.92	17.17	0.00	13.46	23.08	37.50	67.31
Academic Resilience								
Perseverance	47	67.80	12.69	26.92	63.46	71.15	76.92	84.62
Reflection help-seeking	47	76.65	19.84	0.00	68.06	77.78	93.06	100.00
Negative affect	47	36.17	20.47	0,00	18.75	33.33	50.00	79.17
Academic resilience	47	63.87	11.18	27.68	60.27	65.18	71.88	79.46
Adult resilience								
Perseverance	53	78.77	21.47	3.57	71.43	85.71	92.86	100.00
Reflection help-seeking	53	74.10	18.85	32.50	62.50	75.00	87.50	100.00
Negative affect	53	76.03	18.03	25.00	67.65	79.41	89.71	100.00

Table 4.14.b

95% Confidence Intervals for the Scales

Scale	n	Mean	S.D.	95% Lo	95% Hi
Kessler Distress Score	66	28.30	21.03	23.13	33.47
DSM-5 CCSM-A					
Severity of symptoms	59	21.28	15.35	17.28	25.28
Severity of domains	59	26.92	17.17	22.45	31.40
Academic Resilience					
Perseverance	47	67.80	12.69	64.07	71.52
Reflection help-seeking	47	76.65	19.84	70.83	82.48
Negative affect	47	36.17	20.47	30.16	42.18
Academic resilience	47	63.87	11.18	60.58	67.15
Adult Resilience					
Relational resilience	53	78.77	21.47	72.86	84.69
Personal resilience	53	74.10	18.85	68.91	79.30
Adult resilience	53	76.03	18.03	71.06	81.00

The K10 raw scores are in the range from 10 to 50. In this study the Kessler raw scores were transformed into percentages, e.g., a 10 raw score transformed to 0%, 30 to 50% and 50 to 100%. The interpretation intervals for the Kessler scores in the range 0% to 100% are as follows (Andrews & Slade, 2001; Kessler et al., 2002):

- Score less than 25: Well
- Score between 25 and 35: Mild mental disorder
- Score between 35 and 50: Moderate mental disorder
- Score between 50 and 100: Severe mental disorder

As reported in Tables 4.14.a and 4.14.b, the mean Kessler Distress Score was M =28.30 in the 95% confidence interval (95%CI) 23.13 to 33.47, suggesting that participants on average have mild mental disorder.

For the DSM-5 CCSM-A scales, raw scores are in the range from 1 to 5. The raw scores were converted to percentages, 0% representing the minimum of 1 for the scale and 100% the maximum of 5 for the scale. The interpretation intervals for the DSM-5 CCSM-A scales are as follows:

- Score less than 25: Low
- Score between 25 and 75: Moderate
- Score above 75: High

As reported in Tables 4.14.a and 4.14.b, the observed mean for Severity of Symptoms was M = 21.28 in the 95%CI 17.28 to 25.28, suggesting that participants on average had a low severity of symptoms; the observed mean for Severity of Domains was M = 26.92 in the (95%CI) 22.45 to 31.40, suggesting that participants on average had a moderate severity of domains.

For the academic and adult resilience scales, raw scores are also in the range from 1 to 5. The raw scores were converted to percentages, 0% representing the minimum of 1 for the scale and 100% the maximum of 5 for the scale. The interpretation intervals for the resilience scales are as follows:

- Score less than 25: Low
- Score between 25 and 75: Moderate
- Score above 75: High

As reported in Table 4.14.a and 4.14.b, the observed mean for Perseverance was M = 67.80 in the 95%CI 64.07 to 71.52, suggesting that participants on average had a moderate sense of perseverance. The observed mean for reflection help-seeking was M =76.65 in the 95%CI 70.83 to 82.48, suggesting that participants on average had a high level of reflection help-seeking. The observed mean for negative affect was M =36.17 in the 95%CI 30.16 to 42.18, suggesting that participants on average had a moderate level of negative affect. The observed mean for academic resilience was M =63.87 in the 95%CI 60.58 to 67.15, suggesting that participants on average had a moderate level of academic resilience.

As reported in Tables 4.14.a and 4.14.b, the observed mean for relational resilience was M = 78.77% in the 95%CI 72.86 to 84.69, suggesting that participants on average had a high sense of relational resilience. The observed mean for personal resilience was M = 74.10% in the 95%CI 68.91 to 79.30, suggesting that participants on average had a moderate to high sense of personal resilience. The observed mean for adult resilience was M = 76.03% in the 95%CI 71.06 to 81.00, suggesting that participants on average had a moderate to high sense of adult resilience. Table 4.15 presents the frequency distribution for the Kessler Distress category.

Table 4.15

Frequency Distribution – Kessler Distress Category

			Cumulative	
Well	38	58%		
Mild	7	11%	45	68%
Moderate	5	8%	50	76%
Severe	16	24%	66	100%
Total	66	100%		

As reported in Table 4.15, the majority (58%) of the sample were in the Well category, although a notable almost one out of four (24%) of the respondents was in the Severe category. Table 4.16.1 presents frequency distributions for the DSM-5 CCSM-A Scales.

Table 4.16.a

Frequency Distributions: DSM-5 CCSM-A Scales

	Severity of the Symptoms		**Severity of the Domains**	
Very low: 0.00 to 19.99	36	61%	24	41%
Low: 20.00 to 39.99	13	22%	21	36%
Moderate:40.00 to 60.00	10	17%	11	19%
High: 60.01 to 80.00	0	0%	3	5%
Very high: 80.01 to 100.00	0	0%	0	0%
Total	59	100%	59	100%

In Table 4.16.a, the majority (61%) indicated a very low severity of symptoms and the majority (77%) indicated a very low or low severity of the domains. Table 4.16.b presents frequency distributions for the DSM-5 CCSM-A domains.

Table 4.16.b

Frequency Distributions: DSM-5 CCSM-A Domain Categories (N = 59)

	None/Slight		Mild/Moderate/Severe	
Depression	26	44%	33	56%
Anger	43	73%	16	27%
Mania	21	36%	38	64%
Anxiety	25	42%	34	58%
Somatic symptoms	44	75%	15	25%
Suicidal ideation	51	86%	8	14%
Psychosis	55	93%	4	7%
Sleep problems	41	69%	18	31%
Memory	47	80%	12	20%
Repetitive thoughts and behaviours	39	66%	20	34%
Dissociation	45	76%	14	24%
Personality functioning	38	64%	21	36%
Substance use	48	81%	11	19%

According to Table 4.16.b, the majority of the participants in the sample reported to have experienced none or slight distress in relation to all the domains, with the exception of Depression, Mania and Anxiety, while the majority of the participants in the sample reported to have experienced Mild/Moderate/Severe distress in the domains of depression, mania and anxiety. Table 4.17 presents the frequency distribution for the adult and academic resilience scales.

Table 4.17

Frequency Distributions: Adult and Academic Resilience Scales

	Very Low 0.00 to 19.99		Low 20.00 to 39.99		Middle 40.00 to 60.00		High 60.01 to 80.00		Very High 80.01 to 100.00		Total	
Personal Resilience:												
Relational resilience	2	4%	2	4%	2	4%	14	26%	33	62%	53	100%
Personal resilience	0	0%	3	6%	9	17%	18	34%	23	43%	53	100%
Adult resilience	0	0%	3	6%	5	9%	20	38%	25	47%	53	100%
Academic Resilience:												
Perseverance	0	0%	2	4%	9	19%	29	62%	7	15%	47	100%
Reflection help-seeking	1	2%	1	2%	5	11%	18	38%	22	47%	47	100%
Negative affect	12	26%	15	32%	14	30%	6	13%	0	0%	47	100%
Academic resilience	0	0%	2	4%	10	21%	35	74%	0	0%	47	100%

As shown in Table 4.17, the majority of the participants in the sample reported to have experienced high to very high resilience with regard to relational resilience (88%), personal resilience (77%), adult resilience (85%), perseverance (77%) and reflection help-seeking (85%). Most participants (95%) indicated that they had experienced middle to high resilience in relation to academic resilience. The majority (58%) of the sample reported that they had experienced very low to low resilience with regard to negative affect.

4.6 INFERENTIAL RESULTS

4.6.1 Relationships between the scales

Table 4.18 presents the Pearson correlation coefficients that were used to recognise and analyse the strength and direction of the relationships between the scales. Correlations with

absolute value greater than or equal to 0.30 are deemed significant according to the recognised guidelines (Gravetter & Wallnau, 2009) and are in bold in Table 4.18.

Table 4.18

Pearson Product Moment Correlations for the Scales

		Academic Resilience				Adult Resilience			Kessler
		Perseverance	**Negative Affect**	**Reflection**	**Academic Resilience**	**Personal Resilience**	**Relational Resilience**	**Adult Resilience**	**Psychological Distress**
Academic Resilience	Perseverance	-	-.225	**.749**	**.845**	.096	.139	.128	**-.341**
	Negative affect	-.225	-	-.229	.133	-.299	-.071	-.218	**.481**
	Reflection	**.749**	-.229	-	**.878**	.118	.233	.188	-.265
	Academic resilience	**.845**	.133	**.878**	-	.017	.198	.109	-.154
Adult Resilience	Personal resilience	.096	-.299	.118	.017	-	.632	.925	**-.472**
	Relational resilience	.139	-.071	.233	.198	.632	-	.879	-.295
	Resilience	.128	-.218	.188	.109	.925	.879	-	**-.435**
DSM-5 CCSM-A	Symptoms	-.249	**.471**	-.212	-.067	**.445**	**-.338**	**-.440**	**.894**
	Domains	-.233	**.445**	-.213	-.070	**-.443**	**-.347**	**-.443**	**.875**
	Depression	**-.464**	**-.507**	**-.540**	-.215	-.162	**.392**	-.014	**.558**
	Anger	**-.398**	**-.395**	**-.452**	**-.412**	-.205	**.610**	-.029	**.625**
	Mania	.097	088	.094	-.130	-.174	.151	-.132	**.336**
	Anxiety	-.204	**-.311**	-.285	-.079	**-.355**	.243	-.074	**.600**
	Somatic symptoms	**-.376**	**-.429**	**-.453**	-.208	-.127	**.398**	.001	**.694**
	Suicidal ideation	-.205	-.183	-.174	-.053	-.129	.194	.032	**.499**
	Psychosis	-.259	-.260		-.172	-.057	.170	-.020	**.541**
	Sleep problems	**-.368**	**-.288**	**-.337**	-.032	-.025	.232	.122	**.463**
	Memory	-.238	-.201	-.209	-.108	-.155	.112	-.087	**.515**
	Repetitive thoughts and behaviours	-.197	**-.388**	**-.333**	-.193	-.170	.299	-.027	**.577**
	Dissociation	**-.351**	**-.388**	**-.392**	**-.338**	-.283	.299	-.183	**.572**
	Personality functioning	**-.441**	**-.509**	**-.520**	-.292	-.215	**.316**	-.096	**.670**

	Academic Resilience				Adult Resilience			Kessler
	Perseverance	**Negative Affect**	**Reflection**	**Academic Resilience**	**Personal Resilience**	**Relational Resilience**	**Adult Resilience**	**Psychological Distress**
Substance use	-.264	-.232	**-.307**	-.203	**-.337**	**.370**	-.126	**.404**

The results in Table 4.18 are summarised according to the scales (values in parentheses are correlations):

Academic Resilience:

- *Perseverance:*
  - Positively correlated with Reflection (.749) and Academic Resilience (.845).
  - Negatively correlated with Kessler Psychological Distress (-.341) and the DSM-5 CCSM-A scales: Depression (-.464), Anger (-.398), Somatic Symptoms (-.376), Sleep Problems (-.368), Dissociation (-.351) and Personality Functioning (-.441).
- *Negative Affect:*
  - Positively correlated with Kessler Psychological Distress (-.481) and the DSM-5 CCSM-A scales: Symptoms (.471) and Domains (.445).
  - Negatively correlated with the DSM-5 CCSM-A scales: Depression (-.507), Anger (-.395), Anxiety (-311), Somatic symptoms (-.429), Sleep problems (-.288), Repetitive thoughts and behaviours (-.388), Dissociation (-.388), and Personality functioning (-.509).
- *Reflection:*
  - Positively correlated with Perseverance (.749) and Academic resilience (.878).

- Negatively correlated with the DSM-5 CCSM-A scales: Depression (-.540), Anger (-.452), Somatic symptoms (-.453), Sleep problems (-.337), Repetitive thoughts and behaviours (-.333), Dissociation (-.392), Personality functioning (-.520), and Substance Use (-.307).

- *Academic Resilience:*

  - Positively correlated with Academic Resilience (.845) and Reflection (.878).
  - Negatively correlated with DSM-5 CCSM-A scales: Anger (-.412) and Dissociation (-.338).

Adult Resilience

- *Personal Resilience:*

  - Positively correlated with DSM-5 CCSM-A Symptoms (.445).
  - Negatively correlated with Kessler Psychological Distress scale (-.472); and with the DSM-5 CCSM-A scales: Domains (-.443), Anxiety (-.355), and Substance use (-.337).

- *Relational Resilience:*

  - Positively correlated with the DSM-5 CCSM-A scales: Depression (.392), Anger (.610), Somatic symptoms (.398), Personality functioning (.316), and Substance use (.370).
  - Negatively correlated with the DSM-5 CCSM-A scales: Symptoms (-.338) and Domains (-.347).

- *Adult Resilience:*

  - Negatively correlated with Kessler Psychological Distress scale (-.435); and with the DSM-5 CCSM-A scales: Symptoms (-.440) and Domains (-.443).

Kessler Psychological Distress:

- Positively correlated with Negative Affect (.481) and with the DSM-5 CCSM-A scales: Symptoms (.894), Domains (.875), Depression (.558), Anger (.625), Mania (.336), Anxiety (.600), Somatic symptoms (.694), Suicidal ideation (.499), Psychosis (.541), Sleep problems (.463), Memory (.515), Repetitive thoughts and behaviours (.577), Dissociation (.572), Personality functioning (.670), and Substance use (.404).
- Negatively correlated with Perseverance (-.341) and Personal resilience (-.472).

4.6.2 Relationships between demographic variables and the scales

Chi² tests of independence were conducted to determine the significance of the relationships between the demographic variables and the scales. The significant results are reported in this sub-section. Table 4.19 presents statistics for the relationship between the Home Language and the scale measuring Memory.

Table 4.19

Contingency Table – Home Language and Memory

	Memory					
Home Language	None/Slight		Mild/Moderate/Severe		Total	
Afrikaans	12	86%	2	14%	14	100%
English	13	100%	0	0%	13	100%
Xhosa	10	63%	6	38%	16	100%
Total	35	81%	8	19%	43	100%

Chi² (d.f. = 2, n = 43) = 6.92; p = .031; V = 0.40 Medium

As shown in Table 4.19, a significantly larger proportion (38%) of Xhosa students experience Mild/Moderate/Severe problems related to Memory compared to the Afrikaans (14%) and English (0%) students. Table 4.20 presents the relationship between home language

and personal resilience. Table 4.20 indicates that a significantly larger proportion of English students (100%) experience higher (>60) levels of personal resilience compared to Afrikaans (86%) and Xhosa (58%) students.

Table 4.21 presents statistics for the relationship between gender and somatic symptoms.

Table 4.21

Contingency Table – Gender and Somatic Symptoms

	Somatic Symptoms					
Gender	None/Slight		Mild/Moderate/Severe		Total	
Male	37	84%	7	16%	44	100%
Female	7	50%	7	50%	14	100%
Total	44	76%	14	24%	58	100%

Chi² (d.f. = 1, n = 58) = 6.74; p = .009; V = 0.34 Medium

Table 4.21 indicates that a significantly larger proportion (50%) of female students experience mild/moderate/severe problems related to Somatic Symptoms compared to the male students (16%). Table 4.22 presents statistics for the relationship between the age category and personal resilience.

Table 4.22

Contingency Table – Age Category and Personal Resilience

	Personal Resilience					
Age Category	<=60		>60		Total	
20-24	7	17%	35	83%	42	100%
25+	5	45%	6	55%	11	100%
Total	12	23%	41	77%	53	100%

Chi² (d.f. = 1, n = 53) = 4.12; p = .042; V = 0.28 Small

Table 4.22 indicates that a significantly larger proportion of students in the 20-24 age category (83%) experience personal resilience compared to students in the 25+ age category (55%). Table 4.23 presents statistics for the relationship between the age category and adult resilience.

Table 4.23

Contingency Table – Age Category and Adult Resilience

	Adult Resilience					
Age Category	<=60		>60		Total	
20-24	4	10%	38	90%	42	100%
25+	4	36%	7	64%	11	100%
Total	8	15%	45	85%	53	100%

Chi^2 (d.f. = 1, n = 53) = 4.90; p = .027; V = 0.30 Medium

Table 4.23 indicates that a significantly larger proportion of students in the 20-24 age category (90%) experience higher levels of adult resilience compared to students in the 25+ age category (64%).

4.6.3 Inferential results for academic point system

Table 4.24 presents statistics for the relationship between Maths APS when applied and anger.

Table 4.24

Contingency Table – Maths APS when Applied and Anger

	Anger					
Maths APS when applied	None/Slight		Mild/Moderate/Severe		Total	
50-69%	19	73%	7	27%	26	100%
70-79%	12	57%	9	43%	21	100%
80-100%	12	100%	0	0%	12	100%
Total	43	73%	16	27%	59	100%

Chi² (d.f. = 2, n = 59) = 7.10; p = .029; V = 0.35 Medium

Table 4.24 indicates that a significantly larger proportion (43%) of students with 70-79% Maths APS experience mild/moderate anger compared to the 50-69% and 80-100% groups (27% and 0% respectively).

Table 4.25 presents statistics for the relationship between Physical Science APS when applied and suicidal ideation.

Table 4.25

Contingency Table – Physical Science APS when Applied and Suicidal Ideation

	Suicidal Ideation					
Physical Science APS when applied	None/Slight		Mild/Moderate/Severe		Total	
40-59%	15	100%	0	0%	15	100%
60-69%	15	71%	6	29%	21	100%
70-89%	21	91%	2	9%	23	100%
Total	51	86%	8	14%	59	100%

Chi² (d.f. = 2, n = 59) = 6.85; p = .032; V = 0.34 Medium

Table 4.25 indicates that a significantly larger proportion (29%) of students with 60-69% Physical Science APS experience mild/moderate suicidal ideation compared to the 40-59% and 70-89% groups (0% and 9% respectively).

4.6.4 Inferential results for the Kessler Distress Scale

The inferential results below present the statistically significant relationships between the Kessler Distress category and the other scales categorised. Table 4.26 presents statistics for the relationship between the Kessler Distress category and depression.

Table 4.26

Contingency Table – Kessler Distress Category and Depression

	Depression					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	24	60%	16	40%	40	100%
Moderate/Severe	2	11%	17	89%	19	100%
Total	26	44%	33	56%	59	100%

Chi^2 (d.f. = 1, n = 59) = 12.79; $p < .0005$; V = 0.47 Medium

Table 4.26 indicates that a significantly larger proportion (89%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe depression compared to the well/mild group (40%). Table 4.27 presents statistics for the relationship between the Kessler Distress category and anger.

Table 4.27

Contingency Table – Kessler Distress Category and Anger

	Anger					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	36	90%	4	10%	40	100%
Moderate/Severe	7	37%	12	63%	19	100%
Total	43	73%	16	27%	59	100%

Chi^2 (d.f. = 1, n = 59) = 18.42; $p < .0005$; V = 0.56 Large

Table 4.27 indicates that a significantly larger proportion (63%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe anger compared to the well/mild group (10%). Table 4.28 presents statistics for the relationship between the Kessler Distress category and anxiety.

Table 4.28

Contingency Table – Kessler Distress Category and Anxiety

	Anxiety					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	23	58%	17	43%	40	100%
Moderate/Severe	2	11%	17	89%	19	100%
Total	25	42%	34	58%	59	100%

Chi^2 (d.f. = 1, n = 59) = 11.64; $p = .001$; V = 0.44 Medium

Table 4.28 indicates that a significantly larger proportion (89%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe anxiety compared to the well/mild group (43%). Table 4.29 presents statistics for the relationship between the Kessler Distress category and somatic symptoms.

Table 4.29

Contingency Table – Kessler Distress Category and Somatic Symptoms

	Somatic Symptoms					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	36	90%	4	10%	40	100%
Moderate/Severe	8	42%	11	58%	19	100%
Total	44	75%	15	25%	59	100%

Chi^2 (d.f. = 1, n = 59) = 15.58; $p < .0005$; V = 0.51 Large

Table 4.29 indicates that a significantly larger proportion (58%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe somatic symptoms compared to the well/mild group (10%).

Table 4.30 presents statistics for the relationship between the Kessler Distress category and suicidal ideation.

Table 4.30

Contingency Table – Kessler Distress Category and Suicidal Ideation

	Suicidal Ideation					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	39	98%	1	3%	40	100%
Moderate/Severe	12	63%	7	37%	19	100%
Total	51	86%	8	14%	59	100%

Chi^2 (d.f. = 1, n = 59) = 12.96; $p < .0005$; V = 0.47 Medium

Table 4.30 indicates that a significantly larger proportion (37%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe suicidal ideation compared to the well/mild group (3%).

Table 4.31 presents statistics for the relationship between the Kessler Distress category and sleep problems.

Table 4.31

Contingency Table – Kessler Distress Category and Sleep Problems

	Sleep Problems					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	33	83%	7	18%	40	100%
Moderate/Severe	8	42%	11	58%	19	100%
Total	41	69%	18	31%	59	100%

Chi^2 (d.f. = 1, n = 59) = 9.91; p = .002; V = 0.41 Medium

Table 4.31 indicates that a significantly larger proportion (58%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe sleep problems compared to the well/mild group (18%). Table 4.32 presents statistics for the relationship between the Kessler Distress category and memory.

Table 4.32

Contingency Table – Kessler Distress Category and Memory

	Memory					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	38	95%	2	5%	40	100%
Moderate/Severe	9	47%	10	53%	19	100%
Total	47	80%	12	20%	59	100%

Chi^2 (d.f. = 1, n = 59) = 18.04; p < .0005; V = 0.55 Large

Table 4.32 indicates that a significantly larger proportion (53%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe memory compared to the well/mild group (5%).

Table 4.33 presents statistics for the relationship between the Kessler Distress category and repetitive thoughts and behaviours.

Table 4.33

Contingency Table – Kessler Distress Category and Repetitive Thoughts and Behaviours

	Repetitive Thoughts and Behaviours					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	34	85%	6	15%	40	100%
Moderate/Severe	5	26%	14	74%	19	100%
Total	39	66%	20	34%	59	100%

Chi^2 (d.f. = 1, n = 59) = 19.80; $p < .0005$; V = 0.58 Large

Table 4.33 indicates a significantly larger proportion (74%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe repetitive thoughts and behaviours compared to the well/mild group (15%).

Table 4.34 presents statistics for the relationship between the Kessler Distress category and dissociation.

Table 4.34

Contingency Table – Kessler Distress Category and Dissociation

	Dissociation					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	37	93%	3	8%	40	100%
Moderate/Severe	8	42%	11	58%	19	100%
Total	45	76%	14	24%	59	100%

Chi^2 (d.f. = 1, n = 59) = 18.08; $p < .0005$; V = 0.55 Large

Table 4.34 indicates that a significantly larger proportion (58%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe dissociation compared to the well/mild group (8%).

Table 4.35 presents statistics for the relationship between the Kessler Distress category and personality functioning.

Table 4.35

Contingency Table – Kessler Distress Category and Personality Functioning

	Personality Functioning					
Kessler Distress Category	None/Slight		Mild/Moderate/Severe		Total	
Well/Mild	34	85%	6	15%	40	100%
Moderate/Severe	4	21%	15	79%	19	100%
Total	38	64%	21	36%	59	100%

Chi^2 (d.f. = 1, n = 59) = 22.98; p < .0005; V = 0.62 Large

Table 4.35 indicates that a significantly larger proportion (79%) of students who experienced moderate/severe symptoms on the Kessler Distress category experienced mild/moderate/severe personality functioning compared to the well/mild group (15%).

Table 4.36 presents statistics for the relationship between the Kessler Distress category and personal resilience.

Table 4.36

Contingency Table – Kessler Distress Category and Personal Resilience

	Personal Resilience					
Kessler Distress Category	<=60		>60		Total	
Well/Mild	5	14%	30	86%	35	100%
Moderate/Severe	7	39%	11	61%	18	100%
Total	12	23%	41	77%	53	100%

Chi^2 (d.f. = 1, n = 53) = 4.11; p = .043; V = 0.28 Small

Table 4.36 indicates that a significantly larger proportion (86%) of students who experienced well/mild symptoms on the Kessler Distress category experienced greater personal resilience compared to the moderate/severe group (61%).

The inferential results below present whether a statistically significant relationship exists between the categorised variables and scales. Table 4.37 presents statistics for the relationship between those students who wrote the CAAR admissions test and somatic symptoms.

Table 4.37

Contingency Table – Wrote CAAR Admissions Test and Somatic Symptoms

	Somatic Symptoms					
Wrote CAAR Admissions Test	None/Slight		Mild/Moderate/Severe		Total	
Yes	11	100%	0	0%	11	100%
No	33	69%	15	31%	48	100%
Total	44	75%	15	25%	59	100%

Chi^2 (d.f. = 1, n = 59) = 4.61; p = .032; V = 0.28 Small

Table 4.37 indicates that a significantly larger proportion (100%) of students who wrote the CAAR admissions test experienced no/slight somatic symptoms compared to those who did not the CAAR admissions test (69%).

Table 4.38 presents statistics for the relationship between those students who were accepted for the first choice of academic programme and anxiety.

Table 4.38

Contingency Table – Accepted for First Choice of Academic Programme and Anxiety

	Anxiety					
Accepted for First Choice of Academic Programme	None/Slight		Mild/Moderate/Severe		Total	
Yes	19	37%	32	63%	51	100%
No	6	75%	2	25%	8	100%
Total	25	42%	34	58%	59	100%

Chi^2 (d.f. = 1, n = 59) = 4.03; p = .045; V = 0.26 Small

Table 4.38 indicates that a significantly larger proportion (63%) of students who were accepted for the first choice of academic programme experienced mild/moderate/severe anxiety compared to those who were not accepted for the first choice of academic programme (25%).

Tables 4.39 to 4.49 present statistics for the significant relationships between students categorised based on whether NMU was their When it is used as an adjective it must be hyphenated. university and DSM-5 CCSM-A variables.

Table 4.39

Contingency Table – NMU First-Choice University and Depression

	Depression					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	23	58%	17	43%	40	100%
No	3	16%	16	84%	19	100%
Total	26	44%	33	56%	59	100%

Chi^2 (d.f. = 1, n = 59) = 9.09; p = .003; V = 0.39 Medium

Table 4.39 indicates that a significantly smaller proportion (43%) of students who indicated NMU as their first-choice university experienced mild/moderate/severe depression compared to those who did not indicate NMU as their first-choice university (84%).

Table 4.40

Contingency Table – NMU First-Choice University and Anger

	Anger					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	34	85%	6	15%	40	100%
No	9	47%	10	53%	19	100%
Total	43	73%	16	27%	59	100%

Chi^2 (d.f. = 1, n = 59) = 9.23; p = .002; V = 0.40 Medium

Table 4.40 indicates that a significantly larger proportion (85%) of students who indicated NMU as their first-choice university experienced no/slight anger compared to those who did not indicate NMU as their first-choice university (47%).

Table 4.41

Contingency Table – NMU First-Choice University and Somatic Symptoms

	Somatic Symptoms					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	35	88%	5	13%	40	100%
No	9	47%	10	53%	19	100%
Total	44	75%	15	25%	59	100%

Chi^2 (d.f. = 1, n = 59) = 10.94; p = .001; V = 0.43 Medium

Table 4.41 indicates that a significantly larger proportion (88%) of students who indicated NMU as their first-choice university experienced no/slight somatic symptoms compared to those who did not indicate NMU as their first-choice university (47%).

Table 4.42

Contingency Table – NMU First Choice University and Suicidal Ideation

	Suicidal Ideation					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	37	93%	3	8%	40	100%
No	14	74%	5	26%	19	100%
Total	51	86%	8	14%	59	100%

Chi^2 (d.f. = 1, n = 59) = 3.89; p = .049; V = 0.26 Small

Table 4.42 indicates that a significantly larger proportion (93%) of students who indicated NMU as their first-choice university experienced no/slight suicidal ideation compared to those who did not indicate NMU as their first-choice university (74%).

Table 4.43 presents statistics for the relationship between those students who indicated NMU as their first-choice university and memory.

Table 4.43

Contingency Table - NMU First-Choice University and Memory

	Memory					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	35	88%	5	13%	40	100%
No	12	63%	7	37%	19	100%
Total	47	80%	12	20%	59	100%

Chi² (d.f. = 1, n = 59) = 4.71; p = .030; V = 0.28 Small

Table 4.43 indicates that a significantly larger proportion (88%) of students who indicated NMU as their first-choice university experienced no/slight memory compared to those who did not indicate NMU as their first-choice university (63%).

Table 4.44

Contingency Table – NMU First-Choice University and Repetitive Thoughts and Behaviours

	Repetitive Thoughts and Behaviours					
NMU First Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	30	75%	10	25%	40	100%
No	9	47%	10	53%	19	100%
Total	39	66%	20	34%	59	100%

Chi² (d.f. = 1, n = 59) = 4.39; p = .036; V = 0.27 Small

Table 4.44 indicates that a significantly larger proportion (75%) of students who indicated NMU as their first-choice university experienced no/slight repetitive thoughts and behaviours compared to those who did not indicate NMU as their first-choice university (47%).

Table 4.45

Contingency Table – NMU First-Choice University and Dissociation

	Dissociation					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	36	90%	4	10%	40	100%
No	9	47%	10	53%	19	100%
Total	45	76%	14	24%	59	100%

Chi^2 (d.f. = 1, n = 59) = 12.94; $p < .0005$; V = 0.47 Medium

Table 4.45 indicates that a significantly larger proportion (90%) of students who indicated NMU as their first-choice university experienced no/slight dissociation compared to those who did not indicate NMU as their first-choice university (47%).

Table 4.46

Contingency Table – NMU First-Choice University and Personality Functioning

	Personality Functioning					
NMU First-Choice University	None/Slight		Mild/Moderate/Severe		Total	
Yes	30	75%	10	25%	40	100%
No	8	42%	11	58%	19	100%
Total	38	64%	21	36%	59	100%

Chi^2 (d.f. = 1, n = 59) = 6.08; $p = .014$; V = 0.32 Medium

Table 4.46 indicates that a significantly larger proportion (75%) of students who indicated NMU as their first-choice university experienced no/slight personality functioning compared to those who did not indicate NMU as their first-choice university (42%).

Table 4.47

Contingency Table – NMU First-Choice University and Kessler Distress Category

	Kessler Distress Category					
NMU First-Choice University	Well/Mild		Moderate/Severe		Total	
Yes	37	79%	10	21%	47	100%
No	8	42%	11	58%	19	100%
Total	45	68%	21	32%	66	100%

Chi^2 (d.f. = 1, n = 66) = 8.36; p = .004; V = 0.36 Medium

Table 4.47 indicates that a significantly larger proportion (79%) of students who indicated NMU as their first-choice university experienced well/mild symptoms on the Kessler Distress category compared to those who did not indicate NMU as their first-choice university (42%).

Table 4.48

Contingency Table – NMU First-Choice University and DSM-5 CCSM-A Severity of the Symptoms

	DSM-5 CCSM-A Severity of the Symptoms							
NMU First-Choice University	Lower 0.00 to 9.78		Middle 9.79 to 32.61		Higher 32.62 to 100.00		Total	
Yes	14	35%	21	53%	5	13%	40	100%
No	1	5%	8	42%	10	53%	19	100%
Total	15	25%	29	49%	15	25%	59	100%

Chi^2 (d.f. = 2, n = 59) = 11.25; p = .004; V = 0.42 Medium

Table 4.48 indicates that a significantly larger proportion (53%) of students who indicated that NMU was not their first-choice university experienced moderate DSM-5 CCSM-A severity of the symptoms (9.79 to 32.61) compared to those who indicated NMU as their first-choice university (13%).

Table 4.49

Contingency Table – NMU First-Choice University and DSM-5 CCSM-A Severity of the Domains

NMU First-Choice University	DSM-5 CCSM-A Severity of the Domains							
	Lower 0.00 to 13.45		Middle 13.46 to 37.50		Higher 37.51 to 100.00		Total	
Yes	11	28%	25	63%	4	10%	40	100%
No	1	5%	7	37%	11	58%	19	100%
Total	12	20%	32	54%	15	25%	59	100%

Chi² (d.f. = 2, n = 59) = 14.26; p = .001; V = 0.47 Medium

Table 4.49 indicates that a significantly smaller proportion (10%) of students who indicated NMU as their first-choice university experienced 37.51 to 100.00 on the DSM-5 CCSM-A severity of the domains compared to those who did not indicate NMU as their first-choice university (58%).

Tables 4.50 to 4.52 present statistics for the relationship between students categorised based on whether they attended the How2@Mandela orientation programme and DSM-5 CCSM-A and resilience variables.

Table 4.50

Contingency Table - Attend How2@Mandela Orientation Programme and Substance Use

Attend How2@Mandela Orientation Programme	Substance Use					
	None/Slight		Mild/Moderate/Severe		Total	
Yes	35	90%	4	10%	39	100%
No	13	65%	7	35%	20	100%
Total	48	81%	11	19%	59	100%

Chi² (d.f. = 1, n = 59) = 5.34; p = .021; V = 0.30 Medium

Table 4.50 indicates that a significantly larger proportion (90%) of students who attended the How2@Mandela orientation programme experienced no/slight substance use compared to those who did not attend the How2@Mandela orientation programme (65%).

Table 4.51

Contingency Table – Attend How2@Mandela Orientation Programme and Personal Resilience

Attend How2@Mandela Orientation Programme	**Personal Resilience**					
	<=60		>60		Total	
Yes	5	14%	30	86%	35	100%
No	7	39%	11	61%	18	100%
Total	12	23%	41	77%	53	100%

Chi² (d.f. = 1, n = 53) = 4.11; p = .043; V = 0.28 Small

Table 4.51 indicates that a significantly larger proportion (86%) of students who attended the How2@Mandela orientation programme experienced higher levels of personal resilience compared to those who did not attend the programme (61%).

Table 4.52

Contingency Table – Attend How2@Mandela Orientation Programme and Adult Resilience

Attend How2@Mandela Orientation Programme	**Adult Resilience**					
	<=60		>60		Total	
Yes	1	3%	34	97%	35	100%
No	7	39%	11	61%	18	100%
Total	8	15%	45	85%	53	100%

Chi² (d.f. = 1, n = 53) = 12.04; p = .001; V = 0.48 Medium

Table 4.52 indicates that a significantly larger proportion (97%) of students who attended the How2@Mandela orientation programme experienced higher levels of adult resilience compared to those who did not attend the programme (61%).

Tables 4.53 to 4.56 present statistics for the relationship between students based on whether they attended any academic success strategy workshops and DSM-5 CCSM-A variables.

Table 4.53

Contingency Table – Attend Any Academic Success Strategy Workshops and Depression

Attend any Academic Success Strategy Workshops	**Depression**					
	None/Slight		Mild/Moderate/Severe		Total	
Yes	10	67%	5	33%	15	100%
No	16	36%	28	64%	44	100%
Total	26	44%	33	56%	59	100%

Chi^2 (d.f. = 1, n = 59) = 4.17; p = .041; V = 0.27 Small

Table 4.53 indicates that a significantly larger proportion (67%) of students who attended any academic success strategy workshops experienced no/slight depression compared to the those who did not attend any of these workshops (36%).

Table 4.54

Contingency Table – Attend Any Academic Success Strategy Workshops and Anger

Attend any Academic Success Strategy Workshops	**Anger**					
	None/Slight		Mild/Moderate/Severe		Total	
Yes	14	93%	1	7%	15	100%
No	29	66%	15	34%	44	100%
Total	43	73%	16	27%	59	100%

Chi^2 (d.f. = 1, n = 59) = 4.26; p = .039; V = 0.27 Small

Table 4.54 indicates that a significantly larger proportion (93%) of students who attended any academic success strategy workshops experienced no/slight anger compared to the those who did not attend any of these workshops (66%).

Table 4.55

Contingency Table – Attend Any Academic Success Strategy Workshops and Sleep Problems

Attend any Academic Success Strategy Workshops	**Sleep Problems**					
	None/Slight		Mild/Moderate/Severe		Total	
Yes	14	93%	1	7%	15	100%
No	27	61%	17	39%	44	100%
Total	41	69%	18	31%	59	100%

Chi^2 (d.f. = 1, n = 59) = 5.39; p = .020; V = 0.30 Medium

Table 4.55 indicates that a significantly larger proportion (93%) of students who attended any academic success strategy workshops experienced no/slight sleep problems compared to the those who did not attend any of these workshops (61%).

Table 4.56 presents statistics for the relationship between students categorised based on whether they attended any subject-specific tutoring session and perseverance.

Table 4.56

Contingency Table – Attend Any Subject-Specific Tutoring Session and Perseverance

Attend any Subject-Specific Tutoring Session	**Perseverance**					
	<=60		>60		Total	
Yes	2	9%	21	91%	23	100%
No	9	38%	15	63%	24	100%
Total	11	23%	36	77%	47	100%

Chi^2 (d.f. = 1, n = 47) = 5.44; p = .020; V = 0.34 Medium

Table 4.56 indicates that a significantly larger proportion (91%) of students who attended any subject-specific tutoring session experienced greater perseverance compared to the those who did not attend these tutoring sessions (63%).

Tables 4.57 to 4.59 present statistics for the relationship between students categorised based on whether they benefitted from the Meal-A-Day project and resilience variables.

Table 4.57

Contingency Table – Benefit from Meal-A-Day Project and Relational Resilience

	Relational Resilience					
Benefit from Meal-A-Day Project	<=60		>60		Total	
Yes	5	50%	5	50%	10	100%
No	1	2%	42	98%	43	100%
Total	6	11%	47	89%	53	100%

Chi^2 (d.f. = 1, n = 53) = 18.37; $p < .0005$; V = 0.59 Large

Table 4.57 indicates that a significantly larger proportion (98%) of students who did not benefit from the Meal-A-Day project experienced higher levels of relational resilience compared to the those who did benefit from the project (50%).

Table 4.58

Contingency Table – Benefit from Meal-A-Day Project and Personal Resilience

	Personal Resilience					
Benefit from Meal-A-Day Project	<=60		>60		Total	
Yes	5	50%	5	50%	10	100%
No	7	16%	36	84%	43	100%
Total	12	23%	41	77%	53	100%

Chi^2 (d.f. = 1, n = 53) = 5.27; $p = .022$; V = 0.32 Medium

Table 4.58 indicates that a significantly larger proportion (84%) of students who did not benefit from the Meal-A-Day project experienced higher levels of personal resilience compared to those who did benefit from the project (50%).

Table 4.59

Contingency Table – Benefit from Meal-A-Day Project and Adult Resilience

	Adult Resilience					
Benefit from Meal-A-Day Project	<=60		>60		Total	
Yes	5	50%	5	50%	10	100%
No	3	7%	40	93%	43	100%
Total	8	15%	45	85%	53	100%

Chi^2 (d.f. = 1, n = 53) = 11.72; p = .001; V = 0.47 Medium

Table 4.59 indicates that a significantly larger proportion (93%) of students who did not benefit from the Meal-A-Day project experienced greater adult resilience compared to the those who did benefit from the project (50%).

Table 4.60 presents statistics for the relationship between the Branch of Engineering and mania.

Table 4.60

Contingency Table – Branch of Engineering and Mania

	Mania					
Branch of Engineering	None/Slight		Mild/Moderate/Severe		Total	
Civil	7	33%	14	67%	21	100%
Electrical	1	8%	12	92%	13	100%
Marine	0	0%	1	100%	1	100%
Mechanical	13	62%	8	38%	21	100%
Total	21	38%	35	63%	56	100%

Chi^2 (d.f. = 3, n = 56) = 11.02; p = .012; V = 0.44 Medium

Table 4.60 indicates that a significantly larger proportion (62%) of students studying mechanical engineering experienced no/slight mania compared to marine, electrical and civil engineering (0%, 8% and 33% respectively).

Table 4.61 presents statistics for the relationship between the branch of engineering and sleep problems.

Table 4.61

Contingency Table – Branch of Engineering and Sleep Problems

	Sleep Problems					
Branch of Engineering	None/Slight		Mild/Moderate/Severe		Total	
Civil	17	81%	4	19%	21	100%
Electrical	11	85%	2	15%	13	100%
Marine	1	100%	0	0%	1	100%
Mechanical	10	48%	11	52%	21	100%
Total	39	70%	17	30%	56	100%

Chi^2 (d.f. = 3, n = 56) = 7.90; p = .048; V = 0.38 Medium

Table 4.61 indicates that a significantly smaller proportion (48%) of students studying mechanical engineering experienced no/slight sleep problems compared to marine, electrical and civil engineering (100%, 85% and 81% respectively).

Table 4.62 presents statistics for the relationship between Kessler Distress category and the DSM-5 CCSM-A severity of the symptoms.

Table 4.62

Contingency Table – Kessler Distress Category And DSM-5 CCSM-A Severity of the Symptoms

Kessler Distress Category	DSM-5 CCSM-A Severity of the Symptoms							
	Lower 0.00 to 9.78		Middle 9.79 to 32.61		Higher 32.62 to 100.00		Total	
Well/Mild	15	38%	24	60%	1	3%	40	100%
Moderate/Severe	0	0%	5	26%	14	74%	19	100%
Total	15	25%	29	49%	15	25%	59	100%

Chi^2 (d.f. = 2, n = 59) = 31.30; $p < .0005$; V = 0.69 Large

Table 4.62 indicates that a significantly larger proportion (74%) of students in the moderate/severe Kessler Distress category were in the higher category of theDSM-5 CCSM-A severity of the symptoms scale compared to those in the well/mild category of the on the Kessler Distress category (3%). Table 4.63 presents statistics for the relationship between Kessler Distress category and the DSM-5 CCSM-A severity of the domains.

Table 4.63

Contingency Table – Kessler Distress Category and DSM-5 CCSM-A Severity of the Domains

Kessler Distress Category	DSM-5 CCSM-A Severity of the Domains							
	Lower 0.00 to 13.45		Middle 13.46 to 37.50		Higher 37.51 to 100.00		Total	
Well/Mild	12	30%	26	65%	2	5%	40	100%
Moderate/Severe	0	0%	6	32%	13	68%	19	100%
Total	12	20%	32	54%	15	25%	59	100%

Chi^2 (d.f. = 2, n = 59) = 24.99; $p < .0005$; V = 0.62 Large

Table 4.63 indicates that a significantly larger proportion (65%) of students in the well/mild Kessler Distress category experienced moderate/severe scores for DSM-5 CCSM-A severity of the domains compared to those who were in the moderate/severe Kessler Distress category (3%).

4.7 CHAPTER SUMMARY

In this chapter I examined the data collected through the quantitative methods employed in this study. A sample of 66 final-year BEngTech students at NMU participated in the study. Of these, 47 students completed all four instruments. I used the K10, DSM-5 Self-Rated Level 1 CCSM-A, ARM-R, and the ARS-30 instruments in this study.

Based on the results interpreted above, I can confirm that the students in this sample experienced minimal symptoms in relation to their mental health. I can also conclude that anxiety and mania are the only symptoms for which more than 30% of the sample responded moderate/severe symptoms. It can be concluded that most of the students in this study reported having a supportive family and feeling secure with their family or partners, which aids in their relational resilience. Students in this study showed a great sense of community and belonging. It can be concluded that most of the students in this study reported having a great personal resilience. It can be concluded that students in this study reported having a great sense of perseverance and they positively reflected on their past experiences and used their experiences to mould their positive behaviour going forward. They did not tend to have feelings of emotional distress regarding their academic resilience. Students achieved above the minimum acquired APS for both mathematics and physical science. The minimum APS for acceptance into the BEngTech programmes at the university are 36 points. In this study, only 27% of the students scored below 36 points, and were accepted into the programme. Therefore, it can be confirmed that these students were possibly accepted for achieving a score within the testing band and due to their exceptional performance in the admissions test.

For the academic resilience scale, it is evident that there is a moderate range of academic resilience for negative affect; there is a high range for perseverance and a very high range of academic resilience for reflection help-seeking and academic resilience. For the DSM-5 CCSM-A scales, most of the participants in the sample reported to have experienced mild/moderate/severe distress in the domains of depression, mania, and anxiety. Most of the participants in the sample reported to have experienced high to very high resilience with regard to relational resilience, personal resilience, adult resilience, perseverance, and reflection help-seeking. Most participants indicated that they had experienced middle to high resilience in relation to academic resilience. Most of the sample reported that they had experienced very low to low resilience with regard to negative affect.

Inferential statistical methods were used to assess whether there is a statistically significant relationship between the categorical variables in this study. In terms of correlation, the non-parametric Mann-Whitney test was conducted. I can conclude that the Xhosa students experienced mild/moderate/severe problems related to memory compared to the Afrikaans (14%) and English (0%) students. I can conclude that the English students (100%) experienced higher (>60) levels of personal resilience compared to Afrikaans (86%) and Xhosa (58%) students. I can further conclude that the female students experienced mild/moderate/severe problems related to somatic symptoms compared to the 16% of the male students. It was evident that students in the 20-24 age category displayed personal resilience compared to students in the 25+ age category. Students in the 20-24 age category experienced adult resilience compared to students in the 25+ age category. Students experienced no/slight anger related to maths APS when applied compared to the minimum who experienced mild/moderate/severe anger. The students experienced no/slight suicidal ideation related to physical science APS when applied compared to the minimum who experienced mild/moderate/severe anger. The students experienced mild/moderate/severe depression on the Kessler Distress category compared to the

minimum who experienced none/slight depression. The students experienced no/slight anger on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe anger.

Furthermore, I can conclude that students experienced mild/moderate/severe anxiety on the Kessler Distress category compared to the minimum who experienced No/Slight anxiety. The students experienced no/slight somatic symptoms on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe somatic symptoms. The students experienced no/slight suicidal ideation on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe suicidal ideation. It was further evident that the students experienced no/slight sleep problems on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe sleep problems. The students experienced no/slight memory on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe memory. I can conclude that students experienced no/slight repetitive thoughts and behaviours on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe repetitive thoughts and behaviours. I can conclude that students experienced no/slight dissociation on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe dissociation. The students experienced no/slight personality functioning on the Kessler Distress category compared to the minimum who experienced mild/moderate/severe personality functioning. The students experienced mild/moderate/severe personal resilience on the Kessler Distress category compared to the minimum who experienced no/slight personal resilience. I can conclude that students experienced no/slight somatic symptoms on the CAAR admissions test compared to the minimum who experienced mild/moderate/severe somatic symptoms. Students experienced mild/moderate/severe anxiety when accepted for first choice of academic programme compared to the minimum who experienced no/slight anxiety.

Moreover, I can conclude that the students who indicated NMU as their first-choice university experienced mild/moderate/severe depression compared to the minimum who experienced no/slight depression. The students who indicated NMU as their first-choice university experienced no/slight anger compared to the minimum who experienced mild/moderate/severe anger. I can conclude that students who indicated NMU as their first-choice university experienced no/slight somatic symptoms compared to the minimum who experienced mild/moderate/severe somatic symptoms. I can conclude that students who indicated NMU as their first-choice university experienced no/slight suicidal ideation compared to the minimum who experienced mild/moderate/severe suicidal ideation. The students who indicated NMU as their first-choice university experienced no/slight memory compared to the minimum who experienced mild/moderate/severe memory. A further conclusion is that the students who indicated NMU as their first-choice university experienced no/slight repetitive thoughts and behaviours compared to the minimum who experienced mild/moderate/severe repetitive thoughts and behaviours. The students who indicated NMU as their first-choice university experienced no/slight dissociation compared to the minimum who experienced mild/moderate/severe dissociation. The students who indicated NMU as their first-choice university experienced no/slight personality functioning compared to the minimum who experienced mild/moderate/severe personality functioning. The students who indicated NMU as their first-choice university also noted none/slight on the Kessler Distress category and indicated NMU as their first-choice university compared to the minimum who specified mild/moderate/severe on the Kessler Distress category. It can be concluded that students who indicated NMU as their first-choice university presented 'middle' severity of the symptoms on the DSM-5 CCSM-A. I can conclude that the students who indicated that they had attended the How2@Mandela orientation programme experienced no/slight substance use compared to the minimum who experienced mild/moderate/severe substance use and that those who attended

the How2@Mandela orientation programme experienced personal resilience compared to those students who did not attend. Students furthermore experienced adult resilience when attending the How2@Mandela orientation programme compared to those students who did not attend. I can conclude that students who indicated that they had attended any academic success strategy workshops experienced no/slight depression compared to the minimum who experienced mild/moderate/severe depression. It is evident that the students who indicated that they had attended any academic success strategy workshops experienced no/slight anger compared to the minimum who experienced mild/moderate/severe anger. Likewise, the students who indicated that they had attended any academic success strategy workshops experienced no/slight sleep problems compared to the minimum who experienced mild/moderate/severe sleep problems. The students who attended any subject-specific tutoring sessions experienced perseverance compared to those students who did not attend. The students experienced relational resilience if they did not benefit from the Meal-A-Day project compared to those students who did benefit. Those students who did not benefit from the Meal-A-Day project experienced personal resilience compared to those students who did benefit. I can conclude that students experienced adult resilience if they did not benefit from the Meal-A-Day project compared to those students who did benefit. It can be concluded that students experienced mild/moderate/severe mania when studying a branch of engineering compared to the minimum who experienced none/slight mania. The students experienced no/slight sleep problems when studying a branch of engineering compared to the minimum who experienced mild/moderate/severe sleep problems. The students who performed well/mild on the Kessler Distress category presented with 'middle' severity of the symptoms on the DSM-5 CCSM-A.

Based on the results provided above I can confirm the probability of belonging to a particular categorical group of one variable is affected by the other variable. These results will be further interpreted in order to address the first objective of this study, namely to contextualise

the academic resilience of engineering students in South African higher education. In the next chapter, I will report on the qualitative findings that emerged from the interviews conducted with the engineering students and staff members at one South African university.

CHAPTER FIVE

QUALITATIVE FINDINGS

5.1 INTRODUCTION

This chapter reports on the qualitative findings generated in the study. Qualitative data were derived from the semi-structured interviews which were conducted with the three sample groups, namely the engineering students, engineering lecturers and the support staff. The data were analysed using thematic analysis. Qualitative data generation and analysis took place until data saturation was reached. Qualitative data analysis was supported through the use of memoing. The reflective notes I took during the research process were essential in acquiring new knowledge and generating the findings presented in this chapter. Thus, memoing was used as a data generation method in conjunction with other sources of documentation, such as the interview transcripts and field notes, to report on the findings of the study (Birks et al., 2008) as shown in this chapter.

These findings relate to objectives number two (to examine the perceptions of engineering students regarding the personal and the socio-ecological enablers and constraints of their academic resilience), three (to identify the perceptions of engineering lecturers about the personal and the socio-ecological reasons for the academic resilience of engineering students), and four (to explore the perceptions of support staff about the personal and the socio-ecological reasons for the academic resilience of engineering students). In short, this chapter describes the demographic makeup of the participants and presents what they perceive to be the personal and socio-economic reasons and constraints affecting the academic resilience of engineering students.

The demographic data of each group of participants are provided after which the 'perceptions' data generated and analysed thematically per respective sample group are presented. The demographic data and the themes which emerged from the interviews with the engineering students are presented first, followed by the themes generated during the interviews with the engineering lecturers and the support staff.

5.2 PARTICIPANT PROFILES

The participant profiles of the students, lecturers and advisors are presented below.

5.2.1 Participant profiles: Engineering students

Six of the participants self-identified as Black African, three identified as Coloured (an official term used in South Africa for population classification, denoting a person of mixed race), three identified as White, and one identified as Indian. The age of the participants ranged from 21 to 28 years, and the mean age was 23.5 years. The sample consisted of four civil engineering students, four electrical engineering students, two industrial engineering students, two marine engineering students and one mechanical engineering student. With regard to nationality, four students were international students while the other nine were South African.

All the participants self-identified as cisgender: 10 of the participants self-identified as being male while the remaining three self-identified as being female. Participants were given the opportunity to volunteer other gender identifications. This is important as it has been demonstrated that social isolation (McCallum & McLaren, 2011) and the stigma resulting from being same-sex sexual (Hatzenbuehler et al., 2020) and transgender (Singh, 2013) adversely affect the psychological wellbeing and academic achievement of sexually and gender diverse youth (Kosciw et al., 2018). The demographic information of the student participants is summarised in Table 5.1.

Table 5.1

Summary of Demographic Information of Student Participants

#	Pseudonyms	Age (in 2020)	Sex	Race	Nationality; Home language	Qualification enrolled for in 2018
1.	André	25	Male	White	South African; Afrikaans	Industrial Engineering
2.	Anele	22	Female	Black	South African; isiXhosa	Electrical Engineering
3.	Gavin	23	Male	Black	Zimbabwean; Shona	Civil Engineering
4.	Tafadzwa	22	Male	Black	Ugandan; Luganda	Civil Engineering
5.	Jason	23	Male	Coloured	South African; English	Electrical Engineering
6.	Katlego	22	Male	Black	South African; Sepedi	Industrial Engineering
7.	Naledi	22	Female	Black	South African; isiZulu	Electrical Engineering
8.	Randy	28	Male	Coloured	South African; English	Civil Engineering
9.	Taj	23	Male	Indian	Indian; English	Civil Engineering
10.	Beauty	24	Female	Black	Zimbabwean; Shona	Electrical Engineering
11.	Lucien	28	Male	Coloured	South African; English	Marine Engineering
12.	William	21	Male	White	South African; English	Marine Engineering
13.	Jack	22	Male	White	South African; English	Mechanical Engineering

5.2.2 Participant profiles: Engineering lecturers

Two of the lecturers taught in the Department of Industrial Engineering, two were from the Department of Electrical Engineering, one was from the Department of Civil Engineering, and one from the Department of Mechanical Engineering. Two held the academic rank of associate professor, two were lecturers and two were in institutional leadership positions as heads of department. The six academic staff interviewed had cumulative experience of approximately 143 years in academia with an additional 49 years of industry experience. The demographic information of the engineering lecturers is summarised in Table 5.2.

Table 5.2

Summary of Demographic Information of the Engineering Lecturers

#	Pseudonyms	Sex	Race	Position; Organisational unit	Summary of experience
1.	Arno	Male	White	Principal Lecturer; Department of Mechanical Engineering	Industry – 4 years Academia – 29 years
2.	Finn	Male	White	Associate Professor; Department of Electrical Engineering	Academia – 30 years
3.	Susan	Female	White	Lecturer; Department of Civil Engineering	Industry – 19 years Academia – 8 years
4.	Blanca	Female	White	Associate Professor and Head of Department; Department of Industrial Engineering	Industry – 7 years Academia – 25 years
5.	Koos	Male	White	Lecturer; Department of Industrial Engineering	Industry – 10 years Academia – 13 years
6.	Dawie	Male	White	Director of School;	Industry – 9 years

#	Pseudonyms	Sex	Race	Position; Organisational unit	Summary of experience
				Department of Electrical Engineering	Academia – 38 years

5.2.3 Participant profiles: Support staff

The third and final sample group to be interviewed was that of support staff. The majority (66,7%) of the support staff interviewed worked within the Learning and Teaching Collaborative for Success. The remaining two worked for the Meal Management System and the School of Engineering respectively. With regard to the nature of support provided, half of the sample provided informational support of an academic nature whereas the other half provided engineering students with varying degrees of personal and relationship support. Table 5.3 provides a summary of the support staff participants' information.

Table 5.3

Summary of Demographic Information of Support Staff Participants

#	Pseudonyms	Sex	Race	Position; Organisational unit	Nature of support
1.	Siphokazi	Female	Black	Academic Advisor; School of Engineering	Academic and course information
2.	Annelize	Female	Coloured	Senior Learning Developer; Learning and Teaching Collaborative for Success	Academic and relational support
3.	Thabo	Male	Black	Student Success Coach; Learning and Teaching Collaborative for Success	Academic and course information
4.	Veronique	Female	Coloured	Meal Management Administrator; Meal Management System	Meal assistance, queries related to financial assistance

#	Pseudonyms	Sex	Race	Position; Organisational unit	Nature of support
5.	Faith	Female	Coloured	Student Counsellor; Learning and Teaching Collaborative for Success	Personal, relational, and academic support
6.	Wendy	Female	White	Learning and Teaching Collaborative for Success	Academic and course information

5.3 EMERGENT THEMES

As noted earlier, the themes which emerged from the interviews with the engineering students are presented first, followed by the themes generated during the interviews with the engineering lecturers and then those from the support staff.

5.3.1 Student interview data

The student participants were asked about their educational history and background, experiences as an engineering student, challenges they encountered while pursuing an engineering qualification, their resilience processes and their readiness for the world of work. The aim of these questions was to understand engineering students' perceptions of their academic resilience.

5.3.2 Themes which emerged from the interviews with the engineering students

The section is organised according to three core acknowledgements, namely (i) that these participants possess inherent assets, character strengths and resilience; (ii) that young people should be assisted when asking for help and have the necessary resources made available to them; and (iii) that social inclusion is key to a sense of belonging and subsequent retention in higher education. The three main foci mentioned above translate directly to the following four themes that were generated from the student data in this study, namely (i) personal

character strengths; dealing with adversity, perseverance and withstanding adversity (ii) access to guidance, resources, and information; (iii) educational history and background, and (iv) a sense of belonging and social connection. These aspects are discussed below.

5.3.2.1 Personal character strengths, dealing with adversity, perseverance and withstanding adversity

Personal character strengths

Personal character strengths were a common theme that arose from the findings of the study. Personal character strengths usually refer to an individual's expression of their positive moral traits, which is an indication of their strength (Coghlan & Filo, 2016). Anele speaks about being hard-working and valuing how organised she is: "*Yeah, I'm hard-working. Honestly, I don't give up. Like many people would say I'm like OCD, but I feel like I organised my plan*." Similarly, Gavin describes how his work ethic and being hard-working enabled him to surpass expectations by passing even when he was expected to fail: "*I work very, very hard to actually manage to pass because … I was supposed to fail. But I managed to get some distinctions, and especially in … in computers*." As seen in many of the responses from participants, both Gavin and Anele reflected on their industrious behaviour and resilient nature.

Most participants spoke of their trait of being hard-working and their self-determination throughout their studies and reported similar responses to those of Anele and Gavin. The trait of self-determination is one that relates to that of hard work. Linde (2020) states that the traits of self-awareness and self-determination displayed by the participants in the study highlight their resilience as individuals. Self-determination often requires an individual to be and remain focussed (Lechuga & Lechuga, 2012). In addition, Randy reflected on his growth and personal strengths by echoing:

> *I've really grown as an individual, no longer so shy. I don't really care what people think anymore. So, I've grown in that aspect, so it will be easy for me now. And given my previous work experience and all that to enter into the work environment, because I feel comfortable.*

Reflecting on his growth as an individual over the past few years as Randy transitioned from his work environment to his studies, he emphasised that his previous work experience had been beneficial. Interestingly, André shared similar sentiments regarding his growth from his prior work experience: *"... so that was one thing that boosted my confidence. It was really a challenge working there as the shy guy as a receptionist*." André further expressed how he dealt with this challenge when he stated that: "*I think the most important thing is the motivation because there has to be something you can fall back on if times get challenging because you definitely gonna get tested*." Both André and Randy reflected on how the work environment had allowed them to grow as individuals from being shy, introverted men to more confident in their work and abilities. They felt that the challenges they faced in the working environment tested their resilience and in the same way allowed them to build experience.

However, for Naledi it was more a relational character strength. She described how being forthcoming and taking the first step to engage with others seems to have stood her in good stead:

> *Being outspoken, I think that is the major one which helped a lot ... I would speak, ask, talk, try and make friends everywhere I go. Greet someone, smile with them. Trying to be friendly and create that friendship. Greet lectures, like, after [a lecture] say hi, bye to them.*

Some participants used their strong personality characteristics as a way of building rapport with staff and those around them. Interestingly André added:

> *And I must say that with industrial engineering, that is what it's all about. You have to engage with people. If you don't you can get nowhere fast because you can't do everything on your own. That's one thing that I learned, especially now [that I am beginning to work in the industry] you have to ask questions, get some background on the process and you have people on your side. Contacts that is gonna help you get your idea, make your idea, put your idea out there and make it real.*

André reflected on his communication skills as a personal strength that had developed as a result of being exposed to different challenges. He mentioned how he utilises his communication skills to relate to and understand others. He further emphasised the importance of relationships and how it will help one's career and work environment to be more stimulating and progressive at the end of the day.

Furthermore, Gavin proudly alluded to "*being able to work under pressure*" and explained that this personal characteristic had enabled him to persevere in his very complex and demanding studies a towards his degree. Beauty referred to her personal character strength that goes hand in hand with her resilience as an individual:

> *I am a person who does not give up so easily, and when I tell myself that I need to fight, besides passion because at some point it's not all about passion, but it's about achieving what you want. It's about just achieving what it is about taking whatever that is coming to you. So, I'm so determined to the point that I can fight in it.*

Based on her response, her passion and determination to succeed in life through the completion of this degree is evident. This is similar to Randy's response:

> *Uhm, in even when I'm working with physical work, I'm always pushing like I'm pushing to get done. I have the goal in my mind and I'm only focussed on that goal and achieving that goal. Anything else that comes you just have to soldier through, you know, so I don't know where that comes from. I think my parents have a similar work ethic. That definitely impacts my resilience, the work ethic. So, my upbringing. That's the only thing I can really think of.*

Randy and Beauty shared similar sentiments in their response as it comes down to picking themselves up when they have fallen behind, and continuing to work hard. According to Randy, these are traits that have been passed down from his parents. Katlego explained his approach: *"[W]hat I would be keeping is my ability to keep on adapting*." This comment suggests that Katlego is able to adjust to the different challenges and events that have arisen in his path, thus shedding light on his resilience as an individual and his ability to withstand any negative circumstance. Jack speaks of his commitment as a strength that helped him through his degree studies:

> *I would definitely say my dedication. Uhm my I would say my good work ethic and, and it feels weird to talk about this stuff. I think just, just my drive to get things done and do it as best as I can.*

He also alluded to his ambition to not only complete a job but to do it well, and his attention to detail.

Dealing with adversity

These students, who were close to the end of their final year of what is known to be one of the most complex degrees, emphasised that they had faced many challenges, ranging from academic struggles to personal difficulties. Transitioning from high school to university can be a challenging and complex experience for first-year students, particularly for international students, first-generation students and students from low-income households (Gayles & Baker, 2015). Beauty compared the difference in academic structure between her home country and South Africa:

> *The academic structure of South Africa and the academic structure of Zimbabwe is actually a different thing because in South Africa we you guys, you learn physical science. But in Zimbabwe we learn physics, but in terms of technology we are actually far much behind. So, I struggled with computers compared to the guys that were here, so I feel like at some point the University has to look at where it has to look at our background and see how they can help us. Because yes, tutors might help us, but then at some point they also need to accommodate everyone.*

Transitioning to online learning can be difficult for first-year university students, who are hampered by the digital divide (Hedding et al., 2020). Due to the digital divide between the two countries, Beauty was not fortunate enough to learn and adapt to the use of computers compared to her South African classmates. Despite Nelson Mandela University's attempts to assist students transition to online learning, the presence of a digital divide continues to be a significant barrier for some students (Hedding et al., 2020). The digital divide refers to the disparity between individuals, households, businesses, and geographical areas at various socio-economic levels in terms of their access to information and communication technologies and their use of the internet for a variety of purposes (Van Dijk, 2006). This led to Beauty falling

behind and struggling with what seems to be a basic skill for some. She felt that tutors should be trained to accommodate students like her in the future. Katlego also noted one of his major challenges:

> *I could say one big challenge is keeping up with deadlines. Especially 'cause the workload is extremely different from what we had in high school so moving from a light workload to a full workload on a daily basis was quite a challenge and it takes a lot of time to adapt to it.*

Katlego struggled to adapt to the increase in workload when entering university. However, he did not allow this to affect his ability to succeed and perform well at university. Another challenge, particularly shared by the international students, was the language barrier, as Beauty explained:

> *Interacting with people was a bit challenging to me, and even speaking or asking lecturers was a big challenge to me. It's actually me who created a barrier, not that other environments created a barrier for me. I would say it was number one it was language and because they get home in Zimbabwe we do, we do write English. During exams like English, it's a … it's a requirement, but then you would find out that I can pass English, but then I am not able to speak it fluently, so that's what that was. The biggest barrier that I had initially, but then when I tend to meet people I met Naledi [fellow student] and Naledi is the one who actually taught me how to speak fluently …*

Engaging with people was a difficult task for Beauty at first as she was not as fluent in English as her peers. However, after she befriended a fellow student from South Africa that helped her with English, to the point where she was able to comfortably communicate in the

language and proceeded to work as tutor, she could build confidence and improve her English. Tafadzwa shared the same experience with regard to experiencing a language barrier:

> *Also, the language, the accents, 'cause uhm, two years ago we wouldn't be able to have this meeting. Sure, and … and … in hindsight, it's … it's weird to say now, 'cause of course I understand what people are saying. But before I never used to understand the accents, I remember the person who helped me. Uhm … register when I came had a coloured accent I needed, it took me like I think two to three weeks. Every other time I was getting it wrong. Whatever they were saying and also … Directions, you know – someone tells you 'Take up.' I take a left, take a right.*

This often-caused miscommunication between Tafadzwa and those he was communicating with. Jason reflected on the different challenges he experienced as an engineering student who was living at home, where there are external factors that affected his day-to-day activities. He could not prioritise his studies like his peers as he had the burden of seeing to family responsibilities:

> *Uhm, I understand … uhm. Maybe if I have to compare myself and my situation and circumstances to other engineering students and what also especially this year proved itself to be true now. The fact that I, I live from … I live at home and I'm studying at NMU. I have other influences also affecting my studies. Things that maybe someone from Johannesburg living in at res in PE, studying engineering, they won't be facing because at the same time I am living with my family, I can't see them. And also, you know when you live at home, there are certain responsibilities that you have to take on …*

The external influences affecting his studies included not having a favourable environment to study in. Jason described the responsibilities that he possessed as a male child in his household: "*Ja, you have to take your grandpa to hospital for the medication, or your mother sends you the shop you have to whatever. You know we have other responsibilities*." Sixty-seven per cent of the students reported that they had felt stress during the Covid-19 pandemic, indicating that anxiety levels would have increased for students due to the pandemic (Al-Kumaim et al., 2021). Being a student generally comes with stress and anxiety, however the lockdown as a result of Covid-19 had amplified stressors for most students (Al-Kumaim et al., 2021). Students like Jason had to adjust to the new norm of studying online while juggling their other commitments:

> *Yeah, and especially now during lockdown I could see people that's usually like on the ball. Uhm, like my colleagues now, they had to like study at home. They are. Those factors that's always been there affecting me started affecting them, where their families didn't like respect their study time, they didn't understand because like I said earlier, they didn't experience with the University life before, so they didn't understand that actually have to study now. You can't afford to be distracted now by anything you have to like just focus and study and be strong here now on this one particular thing. You can't afford them moving around here by you asking you questions the whole time.*

Navigating the new student life in light of Covid-19 was an adjustment for all (Cheng et al., 2021). Students particularly found it difficult to maintain a healthy balance between home and student life. Evidently, Jason struggled to create that balance in his own life. Being a first-generation university student in his family meant that they were not familiar with the routine of a student, and this affected Jason's study time.

Perseverance and withstanding adversity

When asked about their challenges and how they had overcome them, students highlighted their resilience. Lucien described how he had groomed himself to remain steadfast when faced with any form of adversity:

> *Just not taking no for an answer … Like if I feel like okay now this thing, I can't do it, to something like just find a way to do it. Get some help you know. Watch some YouTube videos, get some support. Try and get this thing going. Even though it seems like now I can't do this thing or something, just find a way, come up with a way, try and get through it. Try and solve the problem.*

Lucien described himself as a problem solver who always finds the solution to challenges, even if it means using a trial-and-error approach. On the other hand, William explained how his resilience had developed over the years:

> *I suppose it's all to do with experience, you know? Cause I mean, first-year comes along and you know, there's some new stuff there, but it's not that hard, but since it is harder, you gotta work a bit harder to overcome those challenges, so that builds on a bit of resilience. Then as the years go on, I suppose as the experiences get harder and you learn to overcome the challenges that come with those new experiences. It then builds onto your resilience as well. So, the harder the experience, the more your resilience compounds, if I can put it that way.*

He found that he had acquired his resilience over the years and after being faced with challenging situations that made him stronger and able to bounce back.

Jason emphasised that he felt giving up was not an option when he was confronted by a difficult situation:

> *I knew that giving up was not an option, you understand, so ... I did not come as soon as a negative thought came, or I'm feeling despondent, as soon as I something inside of me tells me giving up is not an option. All you have to do is you must just be patient until you think things will get better soon, you understand. So yeah, I wouldn't say I ever wanted to give up, but when I felt despondent, I knew that giving up was not an option. I have to be strong.*

Jason taught himself to be strong and see the hardships through until better days came along.

Similarly, the thought of giving up was not an option for Gavin:

> *In my case no, they didn't. I didn't get to a point where I wanted to give up, but every time I didn't [things] were getting tough. They actually give me more energy to ... to work hard, because I knew that this was the only way I don't have another way out, so this was the only way and I had to make sure it works.*

Apart from all the challenges Gavin faced as an international student, this did not deter him from continuing. Instead, he persevered through all the challenges. He felt as though giving up was not an option. Furthermore, not completing his qualification was also not an option – to the extent that he used the challenges he faced to motivate himself to perform well and to rise above his circumstances.

When faced with a difficult situation Naledi reminds herself of her past and how she needs to work hard to not return to her past, therefore her positive mindset helps her stay focussed even when she finds herself in a dark space:

> *Knowing where I come from and knowing that I definitely don't wanna go back and now I know where I'm going, like you know I have, you know we all have dreams like I know what I want to be like where I want to be in future but. Looking at my background is the one which was like you need to work. Don't even dare try to say this is it. It won't be it until you have that degree. Rather struggle when you have the paper in your hand and now is you don't get job, but then you know what should have tried and done your part. For me the most is just knowing where I'm coming from and who I am with right now. I need to do it. It gives me that everyday push. I need to keep on.*

Naledi stated that she overcomes her challenging situations by maintaining a positive mindset and reminding herself of what she is working towards and what her end goal is at the end of the day. Having a positive mindset allows one to minimise negative thinking and to feel good; it can change the way the mind works (Schrock, 2021). Naledi spoke of her persevering nature and how she will push through finishing her degree despite any challenges that may come her way: "*I had a drive that nothing can erase. I even told myself that even if it takes me 10 years on my own, I'm gonna get this 3-year degree*."

Echoing Naledi's determination, Lucien said:

> *Don't give up. Whatever happens, don't give up. Even if you fail one test doesn't mean you're going to fail the module, just keep working. And if you don't know, ask questions … But ask questions if you don't know and don't give up.*

Giving up as a result of facing a difficult situation is not an option for Naledi and Lucien. They openly spoke about pushing through any adversity and seeking the bright side of any seemingly negative situation.

5.3.2.2 Access to guidance, resources and information

For each of the participants there were protective factors and social resources which helped buffer them from some of the challenges they described. Anele experienced the relationship with her lecturers as a protective factor: "*Lecturers give you, like, personal contacts, email. Talk to me whenever we have a problem with this, just communication*." Gavin expressed similar sentiments but for him it was his relationship with one lecturer that helped him: "*She helped me a lot to be able to stay after this point."* Taj, an international male civil engineering student, expressed his overall sense of support from his particular engineering department as follows: "*You could go there with a problem and someone was there to fix it, help you out … there was a more humane factor to it*." The support from the academic and support staff played a significant role in the lives of the students. Jack expanded on this aspect:

> *I think lecturer some of the lecturers we had saw the drive in some of us students and so they went the extra mile for us, if I can say that. But that they wouldn't for the other students, but the effort, the effort that we put in kind of helped us in good stead.*

From the perceptions of these participants, it appears that a person-centred and student-centred department is protective.

Katlego, on the other hand, spoke about formalised peer-related support and the importance of connecting with a senior student as a resource: "*The only thing from the*

university that was a starting point was the how to, the How2 Buddy Programme." Jack commented in a similar vein:

> *Uhm, ja I, I did attend the uhm, I think it was called the How2 Programme and in 2019 I myself was a, they called us a, How2 Buddy. I … I think … I think for me, I just enjoy being around people, so I had a really good time … Uhm, I think for some modules, our tutoring sessions that we had were really beneficial.*

The How2 Buddy Programme Katlego and Jack referred to is the university's first year academic orientation programme (now called First-Year Success@Mandela) which is an informational and relational resource provided to all first-year university students. Many of the participants mentioned joining this programme in their first year and praised how it had helped them familiarise themselves with the university space and initiate friendships. Following the intensive orientation period at the beginning of the year, the orientation leader (referred to as the How2/First-Year Success Buddy) is tasked to further guide the first year through the first semester.

Moreover, Anele and Katlego mentioned the university resources that they regularly utilised: "*Physical resources … actually did use them more, especially the labs and library*." Similarly, Jason stated that the software that was made available on the computers in the labs had assisted him when completing assignments:

> *Uhm, yes. There they are like softwares that from the university and industry have in common. So, uhm, when it comes to things like that. University is like exposing us to some of the equipment in software we might use in industry. So yeah, university is like doing a huge part in preparing us for industry.*

An additional resource provided by the university was the orientation programme mentioned by William:

> *Uh, the orientation programme. I did attend that was pretty much the extent of the university resources that I made use of. Most of the rest of it was just, you know, sticking together with other students and you know, sort of finding our way out as we went along.*

William also mentioned the importance of peer friendships that formed a by-product of attending the orientation programme. He was able to lean on his peers and navigate the unknown and new journey together. Adding to this, Tafadzwa stated:

> *I think I would count the people in the university as a resource. Students, yeah and just … uhm. And now. I don't know, I wouldn't look back on the time when ... when maybe I went counselling or like. I talked to someone and it was so inspirational that it turned a new leaf in my life.*

Tafadzwa made a significant statement when referring to the students at the university as resources. Many of the students mentioned how valuable their peer relationships were throughout their studies in terms of support. He further mentioned an additional resource provided by the university – one utilised by many of the students in this study. Katlego also mentioned making use of the student counselling services:

> *I would say what was available is student counselling, specially for the mental health side of things. But apart from that I haven't … I haven't necessarily used any support from the varsity system. Uh, mainly because like I said, I have been living [on my own], literally my whole life. Just me being there for myself and me doing things for myself, me solving problems by myself. So, yeah, if I were to say*

> *support in of any form I ... I would most probably have gotten it from my friends. And yeah, everything was just up to me.*

Katlego commented that he knew student counselling was there as an option if he needed it. He knew it was available but it was not a support system or resource that he personally made use of. However, when he needed support, he leaned on his friends who were always there for him. Beauty mentioned that she had made use of the resource but felt it had not helped her; instead she attended the Women in Engineering Leadership Association (WELA) programme provided by the School of Engineering which aims to empower and develop young female engineering students in what is regarded as a male-dominated profession:

> *Yes, I would say uhm, OK. Student counselling. I've been there, but. I wouldn't say it has helped me a lot because I've been there quite a few times, but WELA, it did help me because with WELA you tend to engage with different people and you also learn a lot from them because they would tell you their experience from the industry and at some point, those people, they give you ...*

The fact that engineering students have different needs demonstrates the need for more individualised support for them. One of the ways to accomplish this is to provide students with both university and external support. Attending the WELA programme allowed Beauty to network with different people who had been exposed to work in the industry and allowed her to find confidence in her abilities. Beauty described a more informal peer support by saying that "*having a friend from South Africa that helped you with the English enough to transition with the language ... built confidence*." She went on to explain:

> *So, with lab orientation they would make sure that we get familiarised with everything that we are supposed to do like to study, but they would teach us all*

the lab they will give us ideas about the lab equipment that we use and it's something.

In the first year the department organised lab orientation that was seen as an addition to the How2 Buddy Programme. This gave students access to the equipment to familiarise themselves with course material and lab equipment. In the same breath Beauty stated: *"... and also through tutoring and having to tutor in English, that also made you more confident*". As final-year students, the participants were eligible to apply for student assistant positions as mentors, tutors, orientation leaders and marking assistants. At times these positions are advertised and other times through an entrepreneurial spirit, students actively approach academic and support staff to create such roles for themselves. Two instances of this entrepreneurial spirit can be seen in the stories of Beauty and Gavin. Beauty communicated the motivation behind her entrepreneurial drive by saying: "*I was waiting to raise my money for accommodation. I never had a chance to hold a book to study. So, at some point lecturers don't understand that we come from different backgrounds.*" Again, Beauty highlighted that it is imperative to view protective factors from a student-centred perspective first. Gavin similarly shared how he had to work as a student to sustain himself so that he could maintain his focus on his studies: "*Now I had to find the money to put food on my table to actually be able to concentrate at the same time*." He further explained how he did this: "*I would help the lecturer with marking so if you can imagine marking more than 120 scripts and then you have an assignment that is due. You have a test that is due*." Another participant who tutored and that could relate to Beauty and Gavin was Tafadzwa, who expressed the following sentiments: "*You know, the money wasn't coming in as they wanted. So yeah, I fixed the problem.*" The experience of these three international students demonstrate how social and economic deprivation can threaten the attainment of fundamental human needs such as food and shelter. Clearly, Beauty, Gavin and Tafadzwa needed to rely on their own resources in order to care for their basic living

needs. Beauty, Gavin, and Tafadzwa's ability to manage difficult situations in university is evidence of their ability to use their strengths.

5.3.2.3 Educational history and background

When asked about their educational history and background, the student participants described their transition from high school to university. Ultimately, students shared their experiences about the challenges they had encountered. Beauty commented: "*Honestly speaking, and I know a lot of people would say that a university life is easy, but compared to what I've experienced, I think university life is much more difficult compared to high school life*." Naledi shared similar sentiments:

> *From high school we were taught a lot of things like we had an idea, but I went to a normal school. You know, not those private schools where there are extra benefits. So, when I got here it was kind of a challenge …*

Both Beauty and Naledi experienced challenges in their transition to university. However, for Naledi, one of the resources offered by the university, the How2 Buddy Programme, assisted her in her transition from high school to university. Narrowing down the challenges that were experienced, Anele explained the difference between high school and university that he had found challenging:

> *So, I felt that the difference between high school and university is work. And like no one. No one is like running after you, you have to take responsibility for your work, you have to be responsible. That's … that was a big difference.*

From the perspectives of Beauty and Naledi, it is possible to understand that students' backgrounds shape how they transition through university. Sharing his transition experience,

Tafadzwa said that he had found that high school was more challenging than his transition to university:

> *Well, my experience – and I always tell people this – is that I feel like my A levels [Uganda Advanced Certificate of Education] were the worst educational experience I had in my life. Yeah, but then most people will say that university is way harder than high school. And of course, I agree, you know. Yeah. But then for me, I feel like I had the hardest time education wise was my A levels. Yes.*

Jason shared the same experiences – he felt that his lifestyle had changed completely as a result of the transition: "Yeah it was. It was quite a challenge. So, I had to actually put a lot of time into studying and … uhm, change my whole lifestyle that goes back here." Jason admitted that he needed to allocate more time to studying as compared to high school and this shifted his priorities. He went on:

> *You're it was like it was really a significant difference in terms of, for me in high school. I don't know. It didn't seem like a requirement for me to put much time into my studies. Uhm, for me to pass like it took, uh, didn't take much effort. To get the pass mark and at that time I wasn't really interested in getting the best mark, so coming first top in my class. So uhm, a pass was all I actually wanted and it didn't take much for me to get the pass mark. When I got to university, it was like totally, totally different, like I had to change my whole experience academically. I had to change my approach. It was absolutely different.*

Jason explained that during his high school career he was naturally smart and received good results without much effort; however, this changed drastically when he entered university as he found he needed to put in double the effort to keep his head above water. Lucien who

transitioned from high school to university 10 years earlier, explained how he had approached the transition differently as an older, more mature, student:

> *Okay, at that time, leaving high school, I wasn't really like focussed, or I didn't really have a clear goal, to be honest. But like after leaving university and like seeing okay, being there, it was kind of like a wasted opportunity I just told myself, look here, find something. What do you like? and then focus on that one thing. Don't worry about lots of other things. Instead, just focus on that one thing and then start from the basics and then work your way up again and then, that really helped me, you know, find like a goal, or determine what I wanted to do and where I wanted to be.*

When comparing his two educational experiences, Tafadzwa found that his high school experience was most challenging and it is clear that this shaped his attitude when it came to transitioning to university as he had already been through a difficult experience. He further mentioned his university experience in Uganda and compared it to his university experience in South Africa:

> *Uhm, in Uganda it was different. The university experience was different. Makerere is a good university, but it doesn't have so many of the resources that I'm I, we had, we have here. There's no free wi-fi, you know what? So, it was kind of difficult, but then coming to SA and to NMU, it was way better and like there were just way more resources and learning was why. More simplified than I had ever experienced before.*

Tafadzwa joyfully described his experience at NMU as a delight compared to what he had previously been exposed to. The university was better equipped to assist students with the

transition and in this way made the transition for him as smooth as possible. Some students showed a sense of individualisation of responsibility as they felt they had to take on more than necessary responsibility, and some of that responsibility could be buffered by protective factors from the university (for instance, in Tafadzwa's case). Student participants indicated that past university experiences have a significant impact on how they approach their current educational experience. Students provided a range of responses when asked about where they see themselves after completing their degree. Some indicated that they would seek job opportunities and, in this way, build on their experience in the industry, while others felt they needed to pursue postgraduate studies before entering the working world. André commented:

> *So, for me I want to get into industry as fast as possible, but I would like to do further studies in the future. So why I say that is I feel like hearing stuff from the lecturers. If you have some work experiences it's actually going to help you to make the qualification or the honours and so on actually easier.*

Some students shared similar sentiments to André. Naledi had the following to say on this matter:

> *I wanted to study further, but because of funding I won't be able to do so. I'm hoping to find a job, maybe work for a year or two, because this honours is not part time. I think I heard, so it's like full time, so I would need full time and I won't be able to work while studying.*

Students' aspirations are also shaped by transitions in university. How they perceive their abilities, however, is also impacted by home responsibilities and finances. Although some students prefer to build on their experience first or to continue with postgraduate studies

immediately after their degree, others like Naledi do not have the freedom or luxury to do so and are forced to find a job and pursue postgraduate studies part-time.

5.3.2.4 Sense of belonging and social connection

In terms of the participants' ages, it is clear that they are all young adults. Erikson found that each developmental stage was characterised by a particular psychological crisis: for individuals aged 18 to 40 years, the psychological crisis was termed 'intimacy versus isolation'. The focus here is on establishing meaningful relationships. Erikson's theory is directly related to the theory of Positive Youth Development (Pittman et al., 2003). Some of the participants mentioned their significant others and the protective function those relationships played in buffering them against adverse events. For Naledi, it was a sense of connection among female engineering students provided by a specific extra-curricular programme and short learning programme (WELA) that made a difference: "*We're introduced as female engineers in particular [to] WELA.*"

Gavin felt that his relationship with an academic staff member is what stood out for him. He captured the essence of the relationship by saying, "*Mrs [X], the lecturer. Yeah, she's just been a mother to me.*" André had the following to say about how he felt inspired by his partner, "*She's this huge motivation for me. So that's also what I've used to feed that fire in me*", whereas Taj described how the relationship with his friends had grown and the meaning that held for him: "*I was lucky to find a group of friends who are basically family at this point.*" Similarly, William felt comfortable navigating his studies with the close friendships he had built: *"... sticking together with other students and you know, sort of finding our way out as we went along.*"

Conversely, other participants referred to the feelings of loneliness associated with moving to a new country or province and feeling excluded, both socially and economically. Katlego spoke about having to rely on himself and remaining intrinsically motivated: "*All my life I've practically been doing things for myself. Always been my biggest supporter. I've always been my own motivation.*" Tafadzwa from Zimbabwe could relate to this situation: "*I was alone, so there was that whole thing you know, like you, you are away from home …"* Thus, they had to navigate a new course and country on their own. Notions that are related to a sense of belonging and social connection are social inclusion and exclusion. Anele said, "*They just didn't like ask us. They just asked only white people*." Randy captured his feelings of exclusion when he said, "[*Y]ou don't necessarily feel like you belong there. You really think, what is this person thinking. Do they really want me here now?*" Social inclusion has been defined as "the promotion of equity and access to valued social resources that have historically been denied to oppressed people" (Riemer et al., 2020, p. 160). In contrast, social exclusion occurs when individuals are denied the chance to participate equally with others (Fraser, 2009; van Bergen et al., 2019). Naledi, too, spoke of her difficulties with connecting: "*Like such diverse people so it made it awkward, when I try and speak this one is Xhosa, [and] this one speaks Afrikaans*." Two participants revealed how they had to actively seek inclusion. André stated, "*You have to engage with people. If you don't, you can't get anywhere fast because you can't do everything on your own*." Anele echoed this view: "*You have to ask for help*", thus alluding to their having to work towards a sense of belonging and connection with peers and staff.

In addition, Beauty expressed the following sentiments concerning her experience of feeling excluded as an international student: "*It was a bit tough for me to even ask questions in class because I remember when we studied, I was the only international student from Zimbabwe*." She further expressed feeling excluded due to her gender: "*Especially female*

ladies, I would actually say especially females. It has a lot of pressure on us." In relation to this issue, Beauty referred to gender dominance among students:

> *When you go into the engineering field as a lady, already people think that it's a male-dominated field. So, you go. You go in with like a two mind of working as much as harder as them so you would end up maybe working like two times extra. So, then it actually gives us a lot of pressure and even stress on us.*

Beauty felt that she needed to outperform her male counterparts because if she was performing well academically, it would provide her with a sense of credibility and feeling of equality if she constantly did more and tried to keep up with her male peers. It appeared that every female participant in the study felt a sense of separation from their male peers, an indication of a larger issue with gender in engineering education. This state of affairs concurs with an earlier report in the *Mail and Guardian* revealing that engineering was a traditionally male-dominated field, with only 10% of South African engineers being female (Willemse, 2012). Beauty added that she felt she had more to offer but was not given the space or opportunity for her voice to be heard:

> *And I had to explain to the students and then they were telling me that I was actually explaining it way better than him. Not that I'm comparing them, but then at some point I could stand and then watch them explaining everything and then when there is a challenge and they feel like I need to engage. Then I would engage because they were not giving me room to engage with other students, and I felt that was a challenge and it's still going to be a challenge to some of the students. When our female students are not given enough credit to give their own point of views and their own way and to express their own way of thinking.*

Thus, her challenge was not being taken seriously and her knowledge and expertise were doubted simply due to her gender. Feeling unheard is just one challenge, and it is not unique to Beauty's experience. To name only a few, gender-related challenges have been documented in South Africa (Kanakana et al., 2017), Kenya (Madara & Cherotich, 2016), and Sweden (Silfver et al., 2021).

Some students, such as Taj, made use of the counselling services offered by the university: "Uh, the student counselling did help me or that I visited them once, but ... It was very helpful. They helped me pull me back, put myself back together." Taj had the following to say about his therapeutic experience: "I don't remember her name but the lady … uhm, helped me so much that I managed to pull myself together after that." Another student who made use of this service was Naledi:

> *I also went for counselling. It also had a lot of impact. I went for mentoring. It did help me a lot. I went for tutoring. It helped me a lot. I attended WELA … It helped me in terms of my inner strength, self-esteem, and self-concept. You know in that sense because they all offered different support throughout my career.*

Besides going for counselling, Naledi also immersed herself in mentoring, keeping herself occupied with tutoring and attending the WELA programme. The combination of the resources allowed for personal growth and development. However, Anele's experience was quite the opposite to that described by Naledi and Taj. She mentioned how she struggled to find assistance: "*It's like professional, like cold*." She added, "*I feel like if I have a problem I have to go somewhere. I have to be able to go somewhere. There has to be a solution somewhere*." Anele felt as though the counselling services may not have worked for her, as she did not receive the support she had hoped for.

5.3.3 Lecturing staff data

The lecturing staff members who lectured in the BEngTech programme and participated in the study were asked about the shift in the type of engineering student enrolled at NMU since the inception of the new programme, the resilience processes of engineering students, the qualities they had observed in the engineering students and whether the mental health of the engineering students had been impacted. These questions were asked in order to gain the perceptions of engineering lecturers regarding the academic resilience of engineering students.

5.3.4 Themes that emerged from the interviews with the engineering lecturers

The following six overarching themes were generated from the interviews conducted with the engineering lecturers: (i) changes in lecturer and student engagement, (ii) impact of curriculum on students' mental health, (iii) referral of university resources, (iv) factors that enabled engineering students to persist with their studies, (v) factors that constrained engineering students from persisting with their studies, and (vi) advice for future engineering students.

5.3.4.1 Changes in lecturer and student engagement

When the lecturers were asked whether they had detected a shift in the type of engineering student enrolled at NMU since the inception of the new programme, some lecturers indicated that they had seen a shift, while others said they had not noticed any shift in students enrolled into the new programme. Koos responded:

> *Yes, I think there is … There is definitely a difference in the calibre of student that we do get … What I'm trying to say is that, uhm, even though the entry requirements for the BEngTech as a qualification has increased compared to the*

> *diploma student, it just appears that the student takes a lot longer to adapt these days as compared to what a diploma student would have taken to adapt. Uhm, the other marked significance or difference is the diploma student always knew he's going to have a year to sort of find his feet in industry because he's got to do in-service training, where with these, the BEngTech student they don't have that opportunity. It's three years of ... of coursework, and then you hope that you get an opportunity in industry and you are almost eligible for permanent work immediately, but you haven't had an opportunity to prove yourself and ... and certainly I think, the thing that sort of maybe stands out for me is, I think a diploma student was quicker on his feet to adapt and getting into his studies and understanding what was expected as opposed to the BEngTech students.*

Koos confirmed differences in the calibre of students that were currently enrolled in the new engineering programme at NMU. According to Koos's experience, the students who were enrolled in the diploma programme in the past were fortunate to have a year of practical training that equipped them for the working world, whereas the current students enrolled in the BEngTech programme were not as fortunate and lacked the practical training upon graduation. Furthermore, they did not have access to employment opportunities as compared to diploma students in the past. Dawie confirmed Koos's experience:

> *The aim always of the national diploma was to prepare graduates for industry in a ... at a level of a technician which is, uhm, well, you've got theoretical understanding of your discipline, but also a fairly high practical understanding and by the time you leave your qualification, uh, you would also had some, one years of work integrated learning, it's been a number of name changes. It was*

> *called experiential training, but the latest name is integrated learning or workplace learning.*

Thus, the previous programme had equipped students more for the working environment and allowed them to experience a more well-rounded understanding of the theoretical aspect. Another lecturer, Susan, spoke of the type of training students receive at their high school which ultimately affects their readiness for the program. In addition, the types of students who enrol in the programme differ from year to year. Some years students are academically strong and other years students require more time and attention from lecturers:

> *Got a lot to do with how the school is treating students, Uhm, it's a lot to do with, they're not thinking for themselves. I think the workload is so much that the students get taught like, uhm, like little robots … I did notice that in previous years with the diploma some year you've got a good strong, you know group and then next year you've got lazy children or children that are not lazy but just don't kind of catch it on and need more time, you know, so really it does, it does vary and I think … the pandemic might be affecting the students' willingness or ability to engage with the content and to make links across the different modules, and that might also then make it harder for yourselves or academics.*

Susan added that the Covid-19 pandemic played a significant role in the lack of engagement from students, which further complicates the course:

> *Uhm, and then it becomes a problem because our group is too big and we cannot spoon feed. So, then we kind of lose some students, and … and then they fall behind, because the volume of work is so much and they again don't have the*

openness to come to you and tell you what the problem is even though you ask many times.

In addition, the lecture rooms are filled with many students. Students inevitably tend to fade into the background and avoid being noticed by the lecturer. This leads to them shying away from asking follow up questions as they fear being seen as incompetent in the eyes of their peers and lecturer. Susan added that she made herself available outside of her working hours in order to assist students. She had gone as far as providing her personal WhatsApp number to students to give them students access to her:

I mean, my students had my cell number and I've got a WhatsApp group for them. And so, with the Covid that's actually become a little bit better. So, somebody asks a question. And then I answer or I get a question from somebody and I will immediately put it on the WhatsApp group and I answer on the WhatsApp group because I know not everybody is willing to ask. But it ja, so … so it's actually made it a bit better in the Covid times, because it seems like the students don't want to ask in front of the students.

Susan explained that students found it easier to ask questions virtually as opposed to doing so in person. Arno shared similar sentiments as Susan regarding the use of WhatsApp and emphasised that making use of an online platform had increased the communication between himself and students.

I shared my … my cell number and WhatsApp and had a group with WhatsApp. And I had a group on teams with them, and all of a sudden communications … I realised communication for the students are much easier and I asked … they were then more willing to ask questions and engage with me. Where in the past I

> *actually didn't allow them to engage 'cause I just ignored them … I think this whole lockdown thing taught me that you know, I could communicate better with the students, because there is a big demand from … from their side. A fear sometimes if I can call it that, an uncertainty of what they must do and just by communicating better, I think I opened up the channels much better for myself and for them.*

By extending their availability to the students via WhatsApp the lecturers helped to improve the online learning environment for all concerned as they were able to communicate with students frequently.

5.3.4.2 Impact of curriculum on students' mental health

A complex degree programme such as engineering with a content-heavy curriculum can have an impact on the mental health of the enrolled students. Finn, one of the lecturers, had the following to say:

> *I think the isolation, having to work more online, so having to quarantine and the fear potentially of them or their family. Fear and sometimes just stress, when members have died of their family and or friends. Those three things together put a lot of stress on them. It is much harder for them to work online. It's much harder for the staff as well.*

Finn suggested that having to adapt to an online working environment, together with having to cope with the fear and stress associated Covid-19, contributed to an increase in anxiety levels. Finn added that it had been an adjustment for both staff and students to adapt to working from home. Adding to this Blanca, mentioned that students were required to work

more and create a productive working environment independently without having the lecturer dictate in a classroom:

> *Look, I think it certainly much more are expected from students. You know it's not just a matter of them coming to class and maybe sitting in a class and working on a few questions and handing it in. They're supposed to work on their own now they've got to coordinate. Uhm … you know online to work with other groups a lot more is expected with online learning, and I think that causes a lot of stress and also not, you know, not that human contact and … and you know you're basically working with strangers you've … you've never seen them because and you know they might not even you might not have met them, they've certainly not seen us. So, I think all of that really contributes to … to their stress and … and to the sort of the … the challenges you know, because I think it becomes, you know, very stressful to log on. You've got to speak up. You've got to talk to people you don't really know.*

Therefore, the curriculum, coupled with the new way of learning, became a challenge on its own. Students became anxious when navigating the new resources used for online learning; moreover, the lack of human interaction increased the challenge. Koos agreed that this state of affairs had an impact on students' mental health:

> *I think from a mental health perspective I think it's very taxing on students, especially when you're a youngster far from home having to adjust to a qualification that is taxing where, you know, the adjustment to the online space is very taxing you not actually getting in contact with the lecturer other than in the virtual space. Uhm, all you get is pretty much a set of instructions and you're unsure. I, I think that certainly that has put a lot of strain on a lot of our students,*

> *and certainly from the issues and the queries and things that you deal with in the online space? Uhm, not stuff I would have dealt with necessarily in the past. It certainly has, I think taken a, I wouldn't say a toll on the student, but it certainly has put a lot more pressure and strain on the student.*

Furthermore, it became evident that the new online learning environment together with the curriculum can place a strain on students, especially those who come from diverse backgrounds and who know that much depends on the success they produce from their studies. Koos referred to the effect of time management on lecturers' mental health:

> *Let's just leave it at time management from a lecturer perspective is certainly also taxing on the mental health, uhm, because certainly the hours have gotten a lot longer. It's not just office hours anymore because of the online space you always available and certainly the student has that expectation that you're always available. So that is certainly from a mental health perspective led to this online fatigue you were referring to earlier.*

In Koos's experience, lecturers were working longer hours than before and this had not only put a strain on their mental health but had also impinged on family and leisure time. As lecturers have made themselves available beyond what was previously seen as office hours, students had also begun to expect them to be available at all times.

5.3.4.3 Referral of university resources

Lecturers referred students to a range of resources provided by the university. These referrals helped students to improve their mental capacity or their use of technological devices. One lecturer in particular, Blanca, referred students to the faculty learning developer and success coach: "*Ja, if there's any problem with the student I refer them to [the learning*

developer] and to [success coach] but [the learning developer] is really the first sort of first port of call". Dawie also referred students to the faculty success coach as he felt that students needed advice and this would best be provided by a professional:

> *I've tried to refer a lot of them to success coaches simply to say that you know, you know there are people who are far better qualified and experienced to give you advice on this, I can tell you things perhaps to help you, but I would rather you, you got the right help. So, our particular success coaches played a bigger, bigger role for us, the university as a whole has done the, the side of talking, referring a lot of students and make them a lot more aware of what student counselling is and things like that. But I think in our discipline particularly making use of our success coaches are probably one of the, the biggest factor, the biggest sort of resources that I've tried to use.*

Similarly, Arno referred students to professionals at student counselling for matters which he felt where beyond the scope of his expertise as a trained engineer. He also went on to highlight the role of stigma among engineering students and the challenge of getting them to accept their vulnerability and express their personal and emotional difficulties:

> *Yes, yes, especially student counselling. I realised I can't on a social level assist all students with their social problems that I just, I don't have the tools to do that. And as a matter of fact, as an engineer, sometimes I think I might be more destructive than anything else. So, if the student has social, social kind of problems I definitely refer them to student counselling … I haven't had many … 'cause engineering students are scared to talk about their feelings … They don't want to talk about their feelings. It's not cool to be an engineer with feelings. You know those we, we still in that mould, but I've, I realise it's a challenge, but I'm*

definitely [there] for them. But I don't try to be a socialist or a psychiatrist or psychologist with them, I don't have that, I don't have any of those tools.

At a more practical level, Arno referred students to university resources that could assist them with acquiring practical work experience and even employment at eNtsa, which is an engagement institute within the School of Engineering:

I definitely try refer them to eNtsa as well. If there are, I have a lot of emails that come to me, guys that wanted, they send their CVs to me and if I don't have a placement for them, then I will send them to eNtsa. Definitely, eNtsa is a huge resource, for us, massive hey, just look at who Danie has employed at eNtsa over the years. 90, 90% I suppose, I don't know, I don't have the figures, don't quote me that, but 90% of the people that work there were our ex-students.

On the other hand, Susan did not personally refer students; instead she sought the assistance of the secretary or interdepartmental staff to assist students, particularly students who needed food:

You know what? No, I, I actually didn't refer to them personally. I would rather go and speak to our secretary that would, would then speak to our other or our class rep. or then refer them to the interdepartmental people, that is available then to help them to go to the food centre.

Furthermore, of her own volition, Susan supported students by providing them with groceries:

Well, our department has actually sometimes approached a student, but I, I and then we, we would actually buy groceries for them. But we as lecturers we will go

> *and we'll talk to our secretary who has got a very good relationship because the student with the students, because that's their first port of call when they came to the office anyway, so they know Ms [Y] and she's a wonderful person and she just gets along with everybody. So, she's a good person because I think it's very important that you as a lecturer actually, don't get involved in the personal life of a student, and I don't want them to look at me as, oh, that's the person that helped me with this or that or to feel shy in class or anything like that. So, I we can help identify and we can help in the background, but I don't want to help like face to face.*

Susan chose to access the relevant students through the secretary as she felt that as a lecturer, she did not want to become too involved in the students' personal lives as this might cause them to feel uncomfortable towards her in the classroom setting. Therefore, she was protecting them from feeling shy or ashamed of their reality. Instead, she would identify the students and assist them without their knowledge. Koos was the only lecturer who reported that he only referred students to the IT department:

> *The only people I refer students to directly is IT services because in the online space they need help with IT services. And especially when you deal with Moodle, that sometimes is temperamental. Helpdesk is probably the biggest referring factor that I as lecturer do.*

This was done because students sometimes experiences difficulties with navigating the online space upon the transition to online learning.

5.3.4.4 Factors that enabled engineering students to persist with their studies

Students are driven by different personal reasons to persist with their studies, especially after being faced with adversity. Koos stated that:

> *… the student, the graduate, the type of graduate, graduated student that we prepare for industry always finds a space to go and work, and that's a message I always try and get across to, to the students to say that is your motivation. And I think certainly the three that is now graduated, uhm, maybe the motivation from their perspective may be understood that perspective a bit better than the rest, but, certainly that I think is the motivation.*

Koos believed that students are motivated by the possibility that after the course they would not find it difficult to get employment opportunities. He described the characteristics displayed by those who had graduated from the programme and had found employment:

> *André stood out because he's 26, 27. He's more mature, he spent time after finishing school doing a few things and he had clarity as to what needed to be done and certainly that's motivated him because he knew this is what I wanted to do. Uhm, he was very hardworking student and it's the same for Miss [September] as well. She was very dedicated, very hardworking. She had clear objectives as to what she wanted to achieve, and again that made her very successful student … even from a first-year perspective they were very clear as to where they wanted to be, what they needed to do in order to get the results that they wanted to achieve and that is why they are the first three graduates.*

With that being said, the students need to be mature in their thinking and must have mapped out their goal and how they are going to achieve it. This would entail a change in

behaviour and lifestyle to consistently work towards the end goal. Furthermore, Finn suggested that most students who are accepted into the programme do not have a passion for the career:

> *Let me start with something else if I might, most of the diploma students, it was not, it was not their first choice to do electrical engineering, and I mean most it would be 90%. So those students, start on the back foot. So, for those students, they don't have a feel for electricity or electrical engineering. Or maybe any engineering. And they have to come to terms with that. Because it's their only chance to get a degree and to get a profession. So, for some of those they are determined just to get the piece of paper that is as much as their aspirations rise to, but for others, particularly those that I can spend more time with, they start to. Enjoy it, they start to understand the problem and the joy of being able to achieve something.*

Based on his experience, students are forced to push through the degree and do well because it is their only chance at success, of breaking generational boundaries and finding employment. However, this was not the case for all students, as some students often begin to find their place in the career and enjoy what they are exposed to. Susan similarly commented that in her experience, students are driven and motivated to perform well once they have discovered their role within their career and within society:

> *I think the minute you had a student that applied to be an engineer that got had the academic qualification and got into the course the minute they start realising what important role they are going to play in society one day, I think they automatically start seeing the importance of the career ... So, I think once the students started realising these things on their role, they're going to play actually*

understand the importance of the career they have chosen, which motivates them to study a bit harder and do what they need to do.

As Dawie pointed out, role models are essential in motivating students to persist in their studies and perform well:

I think plays a big role, if students are, are not given a good example or a lecturer speaks down to them and doesn't you know, doesn't treat them as a person. I think that has a large degree and how successful they're going to be, their outcomes.

Dawie emphasised that students feed off the way they are guided and are influenced by their lecturers and this ultimately affects their success rate.

5.3.4.5 Factors that constrained engineering students from persisting with their studies

When asked if lecturers noticed any factors that constrained students from persisting with their studies, lecturers had the following to say:

So, I think he's decided it was just too hard. And of course, many of them are married with children by that stage, so that's another issue … Uhm, so having other responsibilities or shifting priorities depending on their phase of life.

Finn noted that there are different factors that affect students' progress, such as the different phases in life that they find themselves in. Additional responsibility, outside of one's academic life can contribute towards an individual's stress and anxiety, which affects their ability to persist with their studies. Arno suggested that it was due to the financial costs associated with studying engineering (as mentioned in Chapter One): "*I'm going to tell you now straight, it's a financial thing. I think that's become a lot better since the NESFAS and the free*

education." On the other hand, Dawie mentioned that students do not persist with their studies due to an initial lack of interest in the course:

> *To my mind, the biggest, probably the biggest, the biggest reason why that type of person might fall out in that is that engineering was not really their calling. Uhm, you know it's you can see it sometimes at the beginning of a year, beginning of a new group of students. Some of them have simply wanted to go and study to get away from the situation that the environment that they're in and what I mean by that is, it could be poor environment, it could be a family situation, they just want to get away, so they study anything.*

As previously mentioned, some students pursue studies in engineering in order to break generational trauma and they view it as their ticket out of the environment in which they grew up.

5.3.4.6 Advice for future engineering students

Lecturers provided future engineering students with useful advice that can help them further their studies. Dawie proposed that students should adapt to the university environment and learn how to work independently:

> *I think one of the things that all of our students and irrespective, as first second or whatever year, they have to develop the ability to learn for themselves, further. It's a big shift from school where in school you're more taught and told exactly do this do that but we actually need to take them that step further now to a certain degree, these new GAs of ours, one of the one of the graduate attributes, is independent … but it's developed the ability to do independent learning and that's something we are trying to from day one and I'm, I'm I would like to encourage*

> *students to do, is learn how to teach yourself. So, learn how to find out more information for yourself.*

Essentially, students should adapt to independent learning from the start of their degree and immerse themselves in the theory. This includes enquiring about topics that are interesting or difficult to comprehend, and content they enjoy learning about. In addition to this, Finn advises students to consistently familiarise themselves with the content of the course material which will help them understand the material better and allow them to be of one mind with the lecturer:

> *My advice is always you must understand the work. That's what they have to aim at. Now, usually those who understand the work will get a lower mark. And that's because they cannot work at the same speed to just put down*

Koos's advice to students was that they have to make sure that they will enjoy the career they are about to pursue:

> *You gotta enjoy what you're doing. I think that that's probably the first thing, you gotta find enjoyment in what you're doing, and I know that's not always easy cause students are not always clear as to what it is that they want to be. Uhm, but find enjoyment in what you're doing, I think it's the important thing, that that will make the journey a little bit easier if you, if you enjoy what you're doing then, then certainly it's a motivation to keep doing it. But then secondly, I would say that don't be satisfied with what you've achieved today try and improve on it the next day, so you gotta keep working hard and keep working at it.*

According to Koos, once the student finds enjoyment in their studies, the journey would become easier for them. He added that students who consistently work hard to achieve their

goals will succeed. Blanca's advice to students was that they should work hard, be committed and read their course material:

> *You know, I would say to them. You are here now, you need to focus, you know engineering is not an easy course, it's a lot of time, and you've got to do your work, you've got to do the work. The module guide tells you exactly how much work you have to spend on which section. You know how many hours will go for tests? How many hours will be on self-study and all of that? Believe it, do it and read. Just read the instructions. Just follow just follow simple basic instructions. Uhm, ja, and you, you know you have to be sure as soon as you can be, you want to study engineering and you know, mind that that's what you want to do then you've put it put in the commitment, because it is a big commitment.*

Along similar lines, Arno put emphasis on commitment and urged all future engineering students to make the necessary sacrifices by prioritising their studies:

> *... you have to sacrifice. I don't think students that when the get there think that, all the effort they have to put in to pass to be successful in engineering. And I don't think they realise what it is. I always tell them, when I speak to the first years, guys, this is a commitment, but I can see in my eyes, they don't really believe it. But I mean to you have to be committed for three years. You're gonna have to buckle down and don't see the girlfriend for five hours a day, but maybe twice a week.*

Students received sound advice from Susan:

> *Always trying to keep a balance in your life. You know, even though the academia is hard, you can so easily you know get drowned by what you don't know and why*

> *it's so difficult and everything you still have to do that you stop living, you know. So, when you when you enjoy yourself, you have a good time. And when you work you study … be inquisitive, you know, don't wait for somebody else to give you something. If you've finished all your work, look into what do you need to do next, read ahead and ask questions.*

It appeared from the responses that students should aim to maintain a healthy balance between their personal and academic life. This includes creating time for leisure activities which will help them stay sane. Susan emphasised the importance of showing an interest in course material, working ahead and asking questions when feeling overwhelmed or stuck with a topic.

5.3.5 Support staff data

The support staff who worked with the BEngTech students and participated in the study were asked about the kind of support offered to engineering students, the shift in the type of engineering student enrolled at NMU since the inception of the new programme, the resilience processes of students, students' readiness for the working world, the qualities they had observed in the engineering students and whether the mental health of the engineering students had been impacted. These questions were asked in order to gain the perceptions of support staff with regard to the academic resilience of engineering students.

5.3.6 Themes which emerged from the interviews with the support staff

Six overarching themes were generated from the interviews conducted with the support staff: (i) success is dependent on effort, (ii) students' mental health, (iii) perseverance is key, (iv) aid and resources: financial aid and student counselling, (v) the double-edged sword of

Covid-19, and (vi) personalised support. These themes are discussed in the sub-sections that follow.

5.3.6.1 Success is dependent on effort

When asked what they thought helped students to succeed, the support staff had various responses regarding the students' success. Veronique said that a successful student is a student that asks for help:

> *I feel like a successful student knows who to ask, what to do, you know, and I think that's the sort of community that we need to create at the universities. You know, we really need to encourage students to, to ask the right people and to almost like get the right answers and that's how you ... I think that's how you survive. University is just basically asking and I feel like if more ... people to help you out you can't do it alone.*

Based on Veronique's experience, students will succeed when they ask questions, both in an academic setting when they need assistance with coursework and while engaging with course material, as well as when they need help on a personal level. She emphasised that the university community needs to assist students by providing them with answers or proper referrals in order that they can receive the help they need. In addition, Siphokazi stated that those students who manage their time correctly will succeed as opposed to those who do not:

> *I think it would be just too ... Time management, time management. And uhm, time management, pre-reading and this is this word pre-experiential learning or existential learning. One of those things and. I think it's, I think it's between those two, yeah.*

In Siphokazi's experience, those students who thoroughly prepare for class and try to understand the course material within a greater context will succeed as opposed to those who do not.

5.3.6.2 Students' mental health

Veronique mentioned that the transition to online learning brought about many challenges for students which affected their mental health. This includes not having a favourable environment to study and work in. She reflected on her own experience as a student and a mother, when she too found it challenging to provide aftercare for her child because she needed to make time for studies. A common issue many students faced was having to adapt to communicating with lecturers and support staff via email. Although there were students who easily adapted to the new learning environment, this was not the case for all:

> *Since like, if you have to think about it. Uhm, have to sit with a whole array of issues. If you just think working from home is challenging with kids and challenging with noisy environments, slow Internet. All that sort of thing and then you think you have to study like that. How do you do that? If I have to think about how I have to arrange? Uhm, people to look after my child? Or, you know, to get out of the house in order to study? And where I have to sit. That's, that's a mission. How do they have to? You know, if you think about students that are in the rural areas, how they have to adjust. I mean, how do you? How do you contact your lecturers if you don't have proper facilities? You know what I'm saying, so, I'm sure that has an impact on some students, and then there's some students that actually love it, like for instance with the long-distance thing. In the whole, it helps that lectures on can be recorded. You can go back in your own time. You know that's wonderful for me so. You know, so I think some of them are battling And,*

and being challenged in more physically and mentally and just emotionally, so. I mean, I think there's some this. I think there's a lot of benefits in this.

Thabo added that the combination of challenges students faced increased their stressors. When students enrol in the programme, they tend not to inform counsellors of their mental health history until they are no longer able to cope on their own and they need the services:

Yeah, I think it's a combination of like there are students that come from very challenging backgrounds. Uhm, and then they come into university. Some of them might have even had been attending these type of sessions before, and then they enrol into our programmes and maybe they don't let the counselling department are aware of the history. Ah. Some obviously it would be an impact of the curriculum in itself because I spoke of an, of an environment that is sometimes very foreign to our students and because they would at certain times feel that, the curriculum or and the space itself is not created for people who are like themselves. So that that does then create certain emotional challenges for students and as well you do know that our engineering is one of the most credible ones in the in the country. So that on its own has a certain amount of pressure in our students and how they need to perform and … Yeah, so I think compilation of factors.

Students' mental health is affected by the academic pressure of the difficult course, as well as the pressure to do well to obtain the qualification. Adding to that is their own individual background and experiences that could influence their help-seeking behaviour. Attending university in itself could trigger pressure or anxiety. Faith further mentioned:

So in in my last presentation at the National Student Counselling I actually presented on the dealing with disability and I was, I was the voice of the student and I got her permission. I got two of them. I got their permission to quote them. Because we needed to take the voice of the students and in her words, she said it's like riding in the dark and your headlights are off and I need the institution to put my headlights on. It was powerful and so she, she would guide me in understanding how she felt and I think this is about being person-centred and being student-centred. So, when it came to mental health, they had to teach me how they experienced it and then I had to communicate back so I would go to the lecturer and I would say. This is what's happening, you know, can I bring the student in. Or can I speak on behalf of the student? Or will you speak to the student afterwards? So, there was a lot of liaison and partnership building between student and lecturer, but most of the lecturers were very open and they would often pick up on the issues. So, we had a … it was diagnosis of bipolar. Okay, and so when this person with bipolar was affected by bipolar, was reading about the student who was battling with dyslexia. Something actually clicked for that student as well, because he hadn't realised the pressures that he was experiencing and that he was saying I can't. I can't do things in in in long essays. Understood things in chunks that lecturer breaks up the question, or if I can answer in small in smaller chunks. It is more palatable for me because that's how my brain works, specially with the medication, so they were teaching us a lot. They were teaching us a lot about. But the process of working with students they taught me they taught me so. Mental health was, you know? Diagnosis like bipolar depression, anxiety, dyslexia.

Faith assisted students by presenting their struggles to lecturers and broader staff. These enabled lecturers to better understand students and their daily struggles. She explained how students suffered both mental and physical illnesses, which took a toll on their academic career:

> *Then we had some with physical illnesses we. We physically they couldn't sit long because of what was lupus an and they had multiple … this one girl had multiple shared like four different physical diagnosis so it was it was kind of a cycle not just the body. And it was the emotions and it was the mind and everything was being affected by these circumstances. So, they needed close monitoring.*

Siphokazi had experiences that were similar to Faith's. She confirmed that many students suffered from underlying mental illness and that it was the academic pressures that amplified students' mental health. For a long time, students had suppressed their issues and managed to get away with not expressing their mental concerns. However, the transition to university had intensified what was already present:

> *On 80% average, not average, but yeah, yeah, 80% of the students. I think they came. With it and it was underlining, and the curriculum, for instance, brought that out or exposed that. And so, I think most of … And, and the … or they were able to suppress that. But now coming to university with all the pressure and not having the support system that you had before your parents are not there, their teachers are not there to understand you. Now really exposes and actually amplifies it, or magnifies it to a point that you do not recognise it. And I think that's the case with most students where they have underlying traumas … So, I think yeah, many people, many more students do come with it. And then the curriculum just exposes it, what's already been there.*

Moreover, Siphokazi sympathised with students who face adversity to the point where it affects them mentally. She highlighted the importance of support for students in order to help them persevere through these adversities:

> *The fact that they go through so much mentally and they diagnosed with so many mental illnesses that they go through so many dilemmas and the support for them will be vital. Well, I think their support will help not eliminate but just try and put to tone down the number of, maybe suicide, drop out, depression, anxiety and all of that stuff within the engineering students.*

Siphokazi believed that with the right support the suicide, dropout, anxiety and depression rates of engineering students would decrease drastically.

5.3.6.3 Persistence is key

Thabo commented that those students who were self-driven and worked towards achieving great results were the students who pushed themselves through all the challenges they faced:

> *I think, and in my experience, you find that engineering students who are uhm, in most cases, the students that even in high school, who are very self-driven. In terms of achieving excellence, and ... Even I'd say I'm just talking from my interaction with students like they all almost wanted to stand out in terms of achievements. You know they, they believe in their achievements. They believe in the importance of being the best at what you do. Yeah. And I think, what then? Makes them continue sometimes that somehow someway the ones that are able to go through. They do get reminded of their ability to, to persist and their ability to want to stand out, their ability to want to achieve. I think most times is just that*

> *particular reminder that sometimes lack, because sometimes there's which barrier. Uhm, sometimes it's like cultural barrier that they actually forget that they actually have the capacity so. Uhm, I think most of the time the students that generally do have the capacity, but they actually forget that they have that capacity. So, as soon as they reminded of that or they put in a corner where they have to come back to who they are. I think they then like persevere and persist through those areas and ...*

Thabo emphasised that the students who were enrolled in the engineering programme or students who are attracted to engineering are naturally driven individuals. However, due to doubt, language and cultural barriers, they tend to lose touch with their own drive. Thabo emphasised that there are resources in the university system, such as student counselling or tutors or mentors that also enable them to persist. Students are highly capable of achieving great things and becoming top students in their class. However, all they need is a reminder of their ability or a nudge in the right direction to help them realise their worth and to keep them on track, thus creating an atmosphere for them to persevere through tough times. Siphokazi added:

> *They are the first maybe child study a degree and all. Maybe there's that their parents did go to these universities or what, but they didn't make it in life and they are the ticket to, to the other side of the of life. So, I think for the most students we need, that that's what keeps them ... I think that's one thing that I can give to engineering students is that they very persistent. They, they push forward; they I won't say resilient but they really persistent. They whatever challenges they come their way. I've seen that they push through it, so yeah.*

Some of the students are first-generation university students in their family to reach this milestone, and they are driven However, Siphokazi mentioned factors that constrain engineering students from persisting with their studies:

> *Yes, so uhm, also with I think the pressure that goes with it and sometimes I feel like it's too much. You know we some of us come from like a background whereby if you're not reaching that point, you have that pressure from your family. When will I win with this? ...You know? And also, the fact that as I've said, the first generations where they get to the point whereby it's like how long am I gonna let my parents suffer? Yeah, I, I think it's also close with like academics getting into some ...*

The overwhelming pressure that is coupled with the engineering course tends to hold students back. Students often question their abilities when faced with adversity.

5.3.6.4 Aid and resources

The issue of aid emerged from many of the interviews in which participants touched on the idea that students require some kind of support or aid to enable their resilience and/or that the lack thereof could constrain their resilience.

Financial aid and student counselling

Often students were referred to the support staff who participated in this study based on their various needs. Veronique mentioned that most of the students who were referred to her had initially made financial enquiries:

> *Uhm? I sometimes refer back to like [student success coach]. I've never really refer to, well, I have. In the past, I think to [senior learning developer], but*

> *[student success coach] is the contact person now and I also [used to] refer also to you, but that will be more on a level of ja, I think I've, I've done very minimal to student counselling because look, a lot of mine is about, financially related.*

Veronique, on the other hand, recounted referring students mainly for financial support: "You know they need money or they don't have money, and I've never actually thought of referring them to student counselling or whatever, so I've actually only referred more for financial." Both Veronique and Siphokazi referred students for counselling as they saw fit:

> *... we call it the internal student counselling. Yes, uhm, there was so many instances that we really I really did refer students to student counselling and at first most of them I didn't think that they were going to take it, but I think maybe because of the lockdown and what it exposed in the mental health sector. Or side of things. I think it that's the one thing that they took with open arms like I would have. I'll see emails from psychologist saying no, we've noted this person is coming consistently*

Notably, students were not keen to attend counselling sessions or some thought they did not need counselling. However, Siphokazi found that after attending one session, students were consistent in attending their sessions, which ultimately meant that these referrals were useful for the mental health of students.

Student counselling offers free psychological services to students registered at the university. It has been mentioned as one of the important, sought-after resources in the School of Engineering. As Annelize said, "*Emthonjeni, student counselling is a very important point of the referral.*" Siphokazi, as an academic advisor, recalled referring students mainly for

psychological services and meal assistance: "*I did those referrals but the one main that stood out was the psychological side with the food parcels*."

Thabo also stressed the students' reluctance to attend psychological services: "You do find that students don't use the counselling referrals as much, you know, because of the stigmatisation that is with you attending counselling that you know you can't handle your own problems." Faith expressed similar sentiments but added the faculty's tactical solution to the stigmatisation:

> *I had many male students, and plus the stigma of counselling student counselling has now changed its name, the department or the engineering faculty had been asking me for many years to change the name. They said that 'counselling' puts the students off … And finally, student counselling as a whole decided that it was time to do that and reinvent themselves … so that they could be more attractive to the student.*

They further found that students were in need of food parcels and made the necessary arrangements:

> *And there was a meal campaign that they opted for, for instance, the meal a day getting money that actually I'm getting a food parcel and at that time the only thing that I can do is refer it to Thabo who's heading that but for me I would have assumed that the first point is just to get food for now and then we focus on getting all the admin for meal a day and whatnot.*

It was found that student needs mainly involved financial assistance, food parcels and counselling services.

5.3.6.5 The double-edged sword of Covid-19

Veronique captured the issues related to the double-edged sword of Covid-19 by referring to mixed emotions:

> *I think some students like the whole long-distance thing, and I think some students are finding it hard. Uhm, I think there's mixed emotions to be honest with you. I think some students like myself are privileged enough to work in environments that are ok to study in. You know, good for studying where other students, I mean, sjoe. Since like, if you have to think about it … uhm, have to sit with a whole array of issues. If you just think working from home is challenging with kids and challenging with noisy environments, slow Internet. All that sort of thing and then you think you have to study like that. How do you do that? If I have to think about how I have to arrange? Uhm, people to look after my child? Or, you know, to get out of the house in order to study? And where I have to sit. That's a mission. How do they have to? You know, if you think about students that are in the rural areas, how they have to adjust. I mean, how do you? How do you contact your lecturers if you don't have proper facilities? You know what I'm saying. So, I'm sure that has an impact on some students, and then there's some students that actually love it, like for instance with the long-distance thing. In the whole, it helps that lectures can be recorded. You can go back in your own time. You know that's wonderful for me so, you know, so I think some of them are battling.*

Wendy shared similar sentiments regarding the impact of the home environment on a student's ability to adapt to the change to online learning:

> *… there's just been so much change, and I mean human beings don't, many don't cope well with change to begin with, you know, there's just been so much change and there all you know all these sort of the scary thing happening in the world and having to go online and you not, you not [set] up and you're in a home environment that's maybe not conducive or supportive of you doing your best academically. Uhm, and you not and you don't have the right resources either.*

Wendy described struggling with feeling disconnected from the students in a world of online connection: "I feel I find it very hard to, uhm, to speak to students like I would normally through an email, but there's just no personal contact." Siphokazi shared similar sentiments, but she also pinpointed the pitfalls of online support during the pandemic:

> *It was frustrating, to be honest. It was really frustrating. I think we everyone would say no one expected it. Uhm, no one had the guidelines on what to do and what not to do. Yeah, so you were just thinking at the top of your head … we communicated via email so whatever I said by email could come back, to bite me even though it was intentionally to help. So, I think that was the one way you even if you wanted to support students, it's not the same as having the student come to your office, and click, listen, let me quickly do this for you now … so I think for me personally was getting boundaries [as] my experience this is the year where I literally had to learn boundaries [in supporting students] ….*

Wendy pointed out how the pandemic had predisposed students to developing poor coping mechanisms as a constraint towards their resilience:

> *I think with what happened last year with Covid and many students being at home for a long time. You sort of developed bad habits and getting back into that sort*

[of] routine that you need for university was very difficult. But also, you have, as I said you've got, you know the, the psychological impact of the pandemic, that we're also living through, you know, and people cope differently, so you know many also, you know did not have good coping mechanisms.

Wendy went on to describe the poor coping mechanisms in more detail:

You know they're bad coping mechanisms and avoiding and procrastination and ja and just uhm, making bad decisions that didn't, that didn't help their academic studies or lead to academic success, ja … those bad habits … that students developed because they've now spent so much time sort of off and at home. Social media. Being on your phone being connected, you know, Netflix, YouTube a lot of students [say this] when you asking them.

5.3.6.6 Personalised support

Thabo believed that it is necessary to take a personalised approach with the engineering students compared to approaches towards students in other programmes:

I would think that in some aspects yes, they do require like a different type of support. Basically, because I think even the different approaches that happen in the classroom would tell you that these students need more support or not even necessarily more different type of approach. For example, you'll find that just making a general example of IT student: I teach students most of the times likely to be in an enclosed environment together because they constantly in computer labs, you know they're able to ask each other and … But it's what I'm trying to say is the environment is closed and it requires them to be present there and then. Engineering students sometimes have to do projects on their own, and the

majority that they meet is like in this large lecture halls, you know. So, because of that, I think ...

Thabo was of the opinion that the students need more close-range support: "There needs to be a more intimate interaction … I think students generally face similar problems like financial problems, nutritional. Yeah, but when it comes to the core content, I do think they would benefit from like maybe smaller groups." Faith mentioned a similar approach she took with her students as she relayed her feedback from them:

Currently my students will say to me, 'Just [when I] speak to you, I always feel better. I feel special. I feel important but you took the time to talk to me', and so, just that one-on-one space that we would allow or the small-group approach that we used to use made a big difference.'

Annelize used an integral approach in describing her thoughts on both Covid-19, the student, and the personalised support approach (centralisation) while looking at students prior and during the Covid-19 pandemic:

I must say in the work of the support, and I do think your 2019 student is different from your 2018 student. Your 2020 student with Covid is different from a 2019 student, so it requires a bit of centralisation [overall]. Hopefully [based on] remote working, hopefully the learning leg of the Collab [Learning and Teaching Collaborative for Success] would be able to take the idea further in how we really look at support for the engineering, but also for the Nelson Mandela University…

Access to the correct type of support such as group or peer interaction can allow students to rely on each other and create a peer support system that could work for them in the qualification instead of relying on themselves.

Siphokazi reflected on her experience in supporting student. She argued that there was no correct or wrong way to support students. She used the trial-and-error method with each student who needed her support when trying to solve their problems. At times, her advice would help, or it would not:

> *Uhm, no one had the guidelines on what to do and what not to do. Yeah, so you were just thinking at the top of your head and finding out maybe 10 steps later that oh, goodness. I shouldn't have done that. I should have done it this way instead of that way, but I think for me and also for other people in disappointed because the learning curve to the learning not curve but a learning opportunity or learning process whereby you honestly had to really dig deep and uhm, always being mindful of how you doing 'cause everything that you do is recorded first and foremost. Uhm, we, we communicated via email so whatever I said by email could come back, to bite me even though it was intentionally to help. So, I think that was the one way you even if you wanted to support students, it's not the same as having the student come to your office and click, listen, let me quickly do this for you now. Whatever you say, it's plastered. It's going to be sent to the other students that other students, like ... no, you did this for this person. Now you need to do it for me and you, like, the circumstances are not the same.*

She admitted that the previous manner of supporting students does not fit in with the new online space. She reflected on when she felt that she did good or when she went the extra mile for students, it may not have been her best decision at the time and she later learnt that the hard way:

> *You see, and so I think for me personally was getting boundaries. As my experience. Like this is the year where I literally had to learn boundaries in*

support in supporting students because I think one if there's another academic advisor that will come after me.

Reflecting on the process, Siphokazi commented that it was a frustrating time for her. Yet she admitted that she had learnt a lot through the process, especially to be mindful and to set boundaries at an early stage.

Veronique in particular pointed out that students make use of the opportunities provided by the university and she cautioned that these resources should not be wasted. She also advised students to take responsibility for their work and what they had signed up for:

Uhm, ja I think okay. Firstly, I think it's very important as a student. I think it's very important to know to use the opportunities that are given to you at the university, I, I think the university gives us a lot of lot of opportunities and that we shouldn't take it for granted. And that if I was like maybe younger than to, to gather and to ask questions and to make sure I know where I'm heading and the direction that I want to go and not to waste the opportunities that are given to, to you. Uhm, also do not just to take responsibility. As well as a student … and also don't just assume that all these things are going to be handed to you because …

Veronique commented that taking responsibility for their work entails making sure that they understand the bigger picture, such as finances. It also includes being respectful and mature about the next phases of one's life and to enquire about the journey ahead. She emphasised that students should not be dependent on their parents for everything:

You have to grow up. You have to ask questions. You have to be polite and you have to ... Ja, you have to get the information that you need to know, so definitely. Uhm, ja, you can't be reliant in on your parents to figure out everything for you.

> *But also, yeah, so it's very important that you know, where you stand financially and what course you doing 'cause it's the first thing some students don't even know what they studying.*

Veronique stressed that students should study the course requirements and know what the financial implications will be for the decisions they make. Similarly, Siphokazi proposed that students should take the time to research the programme they wish to apply for before they submit an application. It is not advisable to enter a programme purely based on good results, family expectations or because the school or teachers pressurised you:

> *Uhm, I think it's not ... take lightly the intensity of the programme and, and also to ... This sounds cliche to know your way. And the reason being, I found many students who are engineers who got into engineering solely because of good marks. And solely because at their school it was the next thing or in their family. It was their next thing. It was not something that they really took time to research with a character wise. It fit me also ... Ask for help and also is that create a community within yourselves. Uhm, to help one another, 'cause I've normally found that each person wanted to be on their own, or if they were together, it was the blind leading the blind.*

As previously mentioned, Siphokazi too emphasised that students should ask for help when they need it and offer help when they are able to provide it. By providing others with help they will create a sense of support and community among the students. She also advised that students should make use of the support systems that are available to them. This will minimise the feeling of isolation:

Make use of the support that is available. And also, even with the tutoring and mentoring make use of that there are like WELA, your other organisations that they make use of that uhm, create network, uhm, I think when you creating network it makes it much easier to get through there and not feel alone. Which is one thing that I've identified with so many engineers.

In addition, Thabo proposed that students should become acquainted with lecturers, but on a professional level:

My advice would be #1. Make your lecturer your best friend. Uhm? I know it's not easy and I know our lecturers have different personalities and some like, I'm not really friendly. Not that they not good in their job, but like they just and more friendly but like always be the one that makes the effort to create that relationship like no matter how hard it is because that is the one way that you're gonna make your university life much smoother, you know, and friendship. I'm not saying the teacher's pet, I just mean there must be a constant flow of information between you and your lecturer. And always make sure that that happens at whatever cost.

Thabo emphasised the relational component between student and lecturer. This will allow for clear communication and understanding of each other and the course content. Faith suggested that students should find a senior student who has already experienced the course and is willing to take them under their wing:

And my advice to them was find a second-year student who can show you the ropes. That's why I believe in the Buddy programme and the orientation programme because peer-to-peer advice is brilliant because they're speaking from, from experience. When we speak with sound like a mother, like a parent,

now that's giving advice and parental advice like you know you don't really know what you're talking about. And so, what I have done myself is my students who battled and were able to break through.

5.3.7 Summary of qualitative findings

A summary of the core thematic findings for each participant group and an overall summary of the qualitative findings follows below.

Personal character strengths were a common theme that emerged from the findings of the study. Students in this study presented with hardworking and self-determination traits which had sustained through their studies. Students reflected on their growth as individuals and how they had managed to overcome challenges over the year, which made them stronger individuals overall. This highlighted their resilience as individuals and their ability to withstand any negative circumstances in their path. Students dealt with many challenges ranging from academic struggles to personal struggles, the transition from high school to university for first-year students being one of them. This applied especially to students from low-income households, first-generation students and international students.

It was clear that support from the academic and support staff played a significant role in the lives of the students. University resources such as technical support and devices helped students complete their academic tasks. Additional resources provided by the university, such as student counselling services, were important for students' mental health.

There were opposing views with regard to students' transition to university. Some students experienced an easy transition as the institution was more prepared to support students with the shift, and as a result, they had a smoother transition. However, others experienced some difficulty due to external factors such as lack of financial support. A sense of belonging

and social connection among students and being able to navigate the academic hurdles with peers were found to be significant. Notably, each female student in the study felt a sense of separation from her male peers. This reflects an important issue with regard to gender in engineering education.

Lecturers differed in their opinions on the profile of the engineering student enrolled for the new BEngTech in comparison with the previous national diploma qualification. However, lecturers highlighted that those students who had enrolled in the diploma programme in the past were fortunate to receive a year of practical training that prepared them for the working world, while contemporary BEngTech students are not so fortunate and will graduate without the practical training. Lecturers had gone beyond their scope of teaching and provided additional support to students in various forms, such as making themselves available on online platforms to increase the communication between them and students and buying groceries for students. Lecturers supported students by providing referrals to assist students in improving their mental health and technological skills. According to lecturers, students are motivated to continue their education for a variety of personal reasons. Lecturers noted that how students respond to adversity and their success is influenced by a variety of factors, including their present stage of life. Lecturers noted that additional responsibilities outside of one's academic life might add to a person's stress and anxiety, affecting their ability to continue their studies. Lecturers proposed that students should adopt an independent learning style and try to enjoy the work they are doing.

Support staff believed that student success was dependent on the students' ability to acknowledge when they need help and their willingness to seek assistance when they cannot cope on their own. They also felt that the students' time management was a key factor in working towards their goals. They acknowledged that students' mental health was affected by

the transition to online learning during the pandemic. However, counselling support was provided to help students in order to cope with their increased stressors. Common issues arose during the online learning transition: one major issue was communication between students and lectures via online platforms. Support staff played a crucial role in that they helped facilitate communication between students and lectures. Support staff noted that the academic strain of a challenging course, as well as the pressure to do well in order to get the qualification, affected students' mental health.

Both lecturers and support staff agreed that students who were self-motivated and worked hard to achieve excellent outcomes were the ones who persevered. Support staff noted that some of the challenges students encountered were self-doubt, language and cultural barriers, and lack of motivation. They assisted with the procurement of counselling support for students. Support staff believed that when it comes to academics, engineering students require a different approach than students in other programmes. They were of the opinion that having access to the right kind of support, such as group or peer contact, will allow students to rely on one another and form a peer support system that will help them succeed in their qualifications rather than relying solely on themselves.

5.4 CHAPTER SUMMARY

This chapter reported on the qualitative themes which emerged from the semi-structured interviews conducted with the three different sample groups, namely engineering students, engineering lecturers and support staff. As seen in Chapter Three, themes emerged through thematic analysis and these interviews were used to address objectives two, three and four of the current case study. The purpose in this chapter was to argue that the perspectives of the three sample groups can provide insight into the academic resilience of engineering students.

Significantly, there seems to have been a disconnect between how engineering students perceive their academic resilience and how engineering lecturers and support staff perceive it. As there was less acknowledgment of the engineering students' inherent characteristics, the engineering lecturers and support staff tended to convey a deficit narrative. However, in the eyes of the engineering students, their academic resilience is fostered alongside engineering lecturers and support staff, not apart from them. By aligning the quantitative and qualitative methods with the study objectives, I discuss the findings in the next chapter, Chapter Six, within the theoretical framework provided in the literature review (Chapter Two).

CHAPTER SIX

DISCUSSION

6.1 INTRODUCTION

This chapter provides a detailed synthesis and discussion of the findings from the three sets of data collected in this study: the literature review (presented in Chapter Two), the quantitative data (presented in Chapter Four) and the qualitative data (presented in Chapter Five). The study followed a mixed-method approach which allowed for an interpretation and analysis of the data as an interpretivist, meaning-making, process. I analysed the results collected by means of both qualitative and quantitative methods in order to provide a better understanding of the research problem and to validate it via multiple theories and data collection methods. The aim of using triangulation was to avoid any potential biases that may arise in relation to the population in the study and that may arise as a result of using any single type of method. Triangulation and the use of mixed methods further made it possible to extract common themes from both the qualitative and the quantitative data sets. This chapter discusses these key themes and findings as extracted from the synthesis.

As mentioned in Chapter Two, Ungar's approach was used as a framework as his socio-ecological approach to resilience posits a complex interaction between individuals and their social environments (Ungar, 2011). The other theory I drew on is Ebersöhn's Flocking Theory (2019) on an indigenous psychology of resilience. In this chapter, I avoid the reductionism of simplified explanations of the complex and multi-systemic processes related to wellbeing in the face of adversity by using this triad of perceptual concentration on understanding and analysing the socio-ecological enablers (Ungar, 2015).

I interpreted the data from the existing literature reviewed in Chapter Two, as well as the quantitative and qualitative data presented in Chapter Four and Five respectively. The quantitative data were collected through questionnaires, and the qualitative data were generated through online interviews.

Tables 6.1 and 6.2 summarise the findings of the quantitative and qualitative data generated in this study. Each of the themes and sub-themes will be elaborated on further in this chapter, concluding with a summary of the most salient findings under each theme.

Table 6.1

Themes Developed Based on the Theoretical Frameworks used in this Study

	Ungar's Socio-Ecological Approach	Ebersöhn's Flocking Theory	Other Theorists and Researchers
Theme 1: Personal character strengths and wellbeing	Resilience can be viewed as more than just an assortment of individual characteristics.	Compared with adult service providers, young people themselves place a lesser emphasis on personal characteristics.	Peterson and Seligman (2004) mention 24-character strengths, including hope, gratitude, spirituality, forgiveness, and persistence.
Theme 2: Factors that enabled and constrained engineering students' academic resilience	Resilience is the ability to access resources that support wellbeing, while being delivered and experienced as culturally meaningful.	Requires the provision of social resources to enable a collective to become more resilient.	The ability to adapt positively in the face of severe adversity is an indicator of resilience (Luthar & Cicchetti, 2000).
Theme 3: Relational and socio-ecological support	Nurturing factors, such as student support, are more influential than inherent factors, such as personal character strengths.	It emphasises the need for the creative use of resources when offering support.	An important component of adult resilience involves contextually relevant resources, such as physical resources, relational support, and services (Liebenberg & Moore, 2018).
Theme 4: Transition to university	Emphasises the interaction between the student and the socio-ecological environment.	Since the Flocking Theory was not developed based on a student population, there is no correspondence with the Flocking Theory.	Transitional experiences can cause psychological vulnerability, which can impact learning outcomes (McGowan & Kagee, 2013). It has been shown that students' social connectedness is critical to their effective transition to higher education (Pym et al., 2011).

	Ungar's Socio-Ecological Approach	**Ebersöhn's Flocking Theory**	**Other Theorists and Researchers**
Theme 5: Sense of belonging and social connection	Multiple systems interact to form complex triads (family, peers, community) that enhance individual growth and mitigate against exposure to risk.	Flocking represents an existential commitment to connection, which can be seen as a reflection of relationship resilience. Flocking is well suited to this theme since a lonely individual is unfathomable from an African perspective.	There is a direct correlation between a student's sense of belonging and his or her motivation to succeed academically (Skaalvik & Skaalvik, 2011; Won et al., 2011). There is a strong connection between belonging and resilience (Grüttner, 2019). A student's sense of social connectedness can have a significant impact on his or her ability to adjust successfully to a new environment during a particularly critical developmental period (Costen et al., 2013).
Theme 6: Assistance and resources	Developing a student's motivation, temperament, and special talents in an adequately resourced environment will contribute to his or her success.	Nutrition and food support were identified as potential interventions based on the specific South African context.	As documented by Rutter (2007), resilience occurs when resources are allocated appropriately.

The themes and subthemes developed using quantitative data that were generated are reported in Table 6.2. The sources of these data are also presented in the table. There are cross-referenced hyperlinks in the following table to enhance its presentation. For access to the cross-referenced section in the preceding chapter, please click on the bolded page number (for example "**115**").

Table 6.2

Themes and Subthemes Developed Using Quantitative and Qualitative Data and Reported on as per Data Generation Method and Source

Data sets	Quantitative data	Qualitative data		
	Overall (see p. **115**)	Students (see p. **172**)	Lecturers (see p. **197**)	Support Staff (see p. **213**)
Theme 1: Personal character strengths and wellbeing	Students presented strong perseverance characteristics when attending subject-specific tutoring sessions.	Sub-theme 1: Personal character strengths of hope, gratitude, spirituality, forgiveness, persistence, and perseverance emerged. Sub-theme 3: Perseverance and withstanding adversity emerged strongly.	Sub-theme 8: Lecturers reported that the curriculum has an impact on students' mental health.	Sub-theme 14: Persistence emerged as key. Sub-theme 13: Support staff noted the significance of students' mental health.
Theme 2: Factors that enabled and constrained engineering students' academic resilience	Reflection, help seeking, and perseverance enabled students' academic resilience. Psychological distress and negative affect constrained students' academic resilience.	Sub-theme 2: Students reported having to deal with adversity, such as adapting in a new country, transitioning to online learning, and adapting to increasing workload, language barriers, and family commitments.	Sub-theme 9: Factors that constrained engineering students from persisting with their studies: responsibilities related to phase of life of the student, and first-generation students. Sub-theme 10: Factors that enabled engineering students to persist with	Sub-theme 15: Support staff spoke about the double-edged sword of COVID-19. Sub-theme 12: Support staff said that success is dependent on effort.

Data sets	Quantitative data	Qualitative data		
			their studies: motivation, maturity, passion, and role modelling.	
	Students who put in the extra time and effort to attend additional support programmes and workshops performed well overall.		Sub-theme 7: Lecturers noted changes in lecturer and student engagement since the introduction of the BEngTech degree.	
Theme 3: Relational and socio-ecological support	Students who attended curricular and extra-curricular workshops provided by the university reported fewer difficulties with depression, anger and sleep problems.	Sub-theme 6: Students reported that they had access to institutional guidance, resources, and information support.		Sub-theme 16: Support staff reported that it was important to design personalised support for students.
Theme 4: Transition to university	More resilient students tend to self-identity anxiety and attend orientation, peer support and academic success strategy workshops. It has been found that students who are admitted to university with higher mathematics and physical	Sub-theme 4: Students spoke of their educational history and background prior to entering university.		

Data sets	Quantitative data	Qualitative data		
	science admissions points tend to be more academically resilient in their engineering studies.			
Theme 5: Sense of belonging and social connection	Confirmed that the student participants in this study demonstrated a sense of belonging and community.	Sub-theme 5: Students reported feeling a sense of belonging and social connection because of faculty-specific and institutional initiatives and peer relations that they developed during their studies.		
Theme 6: Assistance and resources	Not measured by the quantitative instruments used in this study.		Sub-theme 11: Lecturers noted that they could refer students to university resources.	Sub-theme 17: Support staff mentioned that they could refer students to aid/resources.

6.2 INTERPRETING THE DATA GENERATED IN THIS STUDY

I used Michael Ungar's work on the Socio-Ecological approach to resilience and Liesl Ebersöhn's Flocking's work on the indigenous psychology of resilience theory extensively as the conceptual framework for this study. As noted earlier, in the next section, I will discuss in more detail Table 6.2 above which is a summary of the three data sets in this study.

6.3 SYNTHESIS OF RESEARCH ANALYSIS

In this section the six themes that have been established from this study are elaborated on and discussed in greater detail.

6.3.1 Theme 1: Personal character strengths and wellbeing

Ungar et al. (2007) argues that resilience goes beyond individual characteristics. He theorises this as the socio-ecological approach to resilience. He states that depending on the socio-ecological context of the individual, their personal strengths influence behaviours related to adaptive outcomes when they are faced with adverse circumstances (Ungar, 2012). Ebersöhn found that young people place less emphasis on personal characteristics when speaking of their own resilience. The existing literature on character strengths is spearheaded by Peterson and Seligman (2004), who amongst their personal character strengths emphasise five of the six character strengths mentioned in this study: hope, gratitude, spirituality, forgiveness, and persistence. The only character strength that emerged from the quantitative instruments, that Peterson and Seligman (2004) do not mention, was perseverance. The qualitative data confirmed this. For example, one of the students, Lucien, described hope ("*I decided to study further in hopes that I would get a better job one day*") and another student, Jack, described gratitude ("*I look back now and I'm grateful that I did put in the effort*"). In addition, another student, Naledi, also expressed spirituality as one of her personal character strengths: "*Being a*

Christian and reading my Bible on a daily basis and praying about anything really helps me a lot. It enhances my faith." Support staff member, Faith, made the following observation regarding the mental health and wellbeing of the engineering students that had been referred to her: "*GBV [gender-based violence] was a huge factor … Yeah, yes, now forgiveness was huge*." Persistence was also found to be a crucial character strength. There is a difference between persistence and perseverance, although they are sometimes used interchangeably. Persistence refers to continuing to pursue a course of action despite difficulty or opposition. Perseverance, on the other hand, is a commitment and continued action towards reaching a goal. For example, one of the support staff, Annelize, mentioned that to "*persevere in this thing that I set out for myself*" is important.

It is therefore important for students not only to persist but also to persevere. The quantitative data showed that students presented strong perseverance characteristics when attending subject-specific tutoring sessions. However, the qualitative instruments used in this study do not focus on character strengths in measuring resilience, yet thought leaders and theorists of positive psychology, like Peterson and Seligman (2004), strongly emphasise character strengths. There is a discrepancy between positive psychology and the accepted measures and what is actually currently used in clinical psychology practice to determine levels of resilience.

The three sets of data together show that there is an agreement between what thought leaders and theorists of resilience say and what staff and students think about personal character strengths. The major findings related to this theme are that the following character strengths were cited most often in this study: hope, gratitude, spirituality, forgiveness, persistence, and perseverance. Ungar and Ebersöhn emphasise socio-ecological and relational factors in their theoretical frameworks which do not foreground personal character strengths as key to

resilience formation. However, this study found that students and staff consistently mention character strengths when they speak about resilience.

6.3.2 Theme 2: Factors that enabled and constrained engineering students' academic resilience

Ungar et al. (2007) identifies resilience as both the ability of individuals to access social, psychological, cultural, and physical resources that support their wellbeing, and the ability to negotiate for these resources to be provided and experienced in culturally meaningful ways, both as an individual and as a collective. Similarly, Ebersöhn's Flocking Theory (2019) proposes that social resources must be provided to enable a collective, such as engineering students, to become more resilient. In addition, Luthar and Cicchetti (2000) state that the ability to adapt positively in the face of severe adversity is an indicator of resilience.

The quantitative data confirmed that the student participants' ability to reflect, seek help and persevere enabled their academic resilience, and that psychological distress and negative affect constrained their academic resilience. The data also confirmed that those students who put in the extra time and effort to attend additional support programmes and workshops performed well overall.

On the other hand, the qualitative data from the student perceptions confirmed that students experienced adversity such as adapting in a new country, transitioning to online learning, adapting to an increasing workload, language barriers, and family commitments.

The qualitative data from the lecturers' perceptions confirmed that factors that constrained engineering students from persisting with their studies included responsibilities related to the phase of life of the student at the time of data collection (for example, marital status or parenting responsibilities) and students who were first generation students. Data from

lecturers confirmed that factors that enabled engineering students' resilience included motivation, their level of maturity, their passion for their degree and work, and having a role model in their lives. The data confirmed that lecturers increasingly follow a more student-centred approach to teaching including their use of technology and social media which is necessitated by the requirements of the new BEngTech degree and the recent shift to online teaching.

In addition, the qualitative data from the support staff's perceptions confirmed that COVID-19 played a significant role in creating challenges for students to persist. They also reported that an individual student's success is dependent on the amount of effort they put into their work. This was corroborated by the students.

A major finding related to this theme is that the quantitative results paint a more positive picture of the students' resilience and perseverance, whereas the qualitative findings paint a picture of a harsher reality of adapting to the university and engineering-specific obstacles which they had to overcome while managing personal and environmental related stress, which was exacerbated by COVID-19. One way of interpreting this discrepancy is that individuals are prone to impression management when responding to psychometric instruments (Riemer & Shavitt, 2011) and thus respond more favourably.

Probably the most salient and unexpected finding of the study is that there is a significant discrepancy between what students and staff perceived about academic resilience. Staff perceptions tended to focus on deficit thinking, whereas students tended to focus on more positive factors. For example, staff and students also reported different issues when prompted to speak about student resilience. While students discussed how they had grown as individuals and had overcome challenges throughout the years, staff members did not mention these aspects. Staff, on the other hand, focussed on issues like self-doubt and lack of interest and

motivation, which students did not mention. It would therefore seem that staff and student perceptions of academic resilience differ significantly and that these two groups understand and interpret student resilience in different ways. Unpacking this matter in future studies could guide the way to designing better support systems for engineering and other professional degree students.

6.3.3 Theme 3: Relational and socio-ecological support

Ungar et al. (2007) argues that nurturing factors, such as student support, are more influential than inherent factors, including personal character strengths, such as those discussed in the first theme. Ebersöhn's Flocking Theory (2019) aligns with Ungar et al. (2007) as it emphasises the need for the creative use of resources when offering support to individuals. Other literature in this area expands on the work of Ungar and theorises that the resilience of adults, such as the student population, can be attributed to contextually relevant resources, such as physical resources, relational support, and other support services (Liebenberg & Moore, 2018).

The quantitative data confirmed that those students who attended university-provided curricular and extra-curricular workshops reported fewer problems with depression, anger, and sleep. Likewise, the qualitative data from students confirmed that they had access to institutional guidance, resources, information support, as well as peer support during their studies. However, despite the available support, students reported that they could have made use of more support programmes which they suggested should be introduced earlier in their study programme.

The qualitative data from the support staff confirmed that it was important to design personalised support for students. For example, Faith said that "[*engineering] students were*

more class-bound" and therefore in need of support in alternative delivery methods when they are receptive to it and available to receive it.

A major finding related to this theme is that the earlier appropriate and personalised support systems are introduced by the institution, the higher the likelihood of students' academic resilience.

6.3.4 Theme 4: Transition to university

Ungar (2012) proposes that resilience should be assessed both as a quality of interaction between the student and the student's socio-ecological environment, as well as the ability of the student to access what is necessary for their sustainable wellbeing. There is no correspondence between the Flocking Theory (Ebersöhn, 2019) and this theme, since Ebersöhn's Flocking Theory as Ebersöhn et al.'s (2022) work on academic flocking remains focussed on school-going youth after COVID-19. Therefore, this study contributes new knowledge to the field by applying Ebersöhn's Flocking Theory (2019) to university students. It is my view that there is significant scope to apply Ebersöhn's Flocking Theory to academic resilience studies amongst university students – and that it would be meaningful – but this aspect would need to be further researched in future studies. According to McGowan and Kagee (2013), the transitional experience of new students often leads to high levels of psychosocial vulnerability, which can negatively impact their educational performance. Other literature in this area confirms that social connectedness has been shown to be a critical factor in enabling students' effective transition to higher education (Pym et al., 2011).

The quantitative data aligned with Ungar's (2012) socio-ecological approach to resilience. It showed that student participants who attended the university orientation programmes and academic and peer support workshops experienced significantly greater resilience than those who did not attend. Students also reported positively on their past

experiences and said they used these experiences to mould their positive behaviour going forward. The qualitative data corroborated the quantitative results in how students spoke of their educational history and background. Students mentioned that having previous work experience and previous experience of changing educational institutions had contributed to an easier transitional experience to their engineering studies.

The quantitative data significantly confirmed that students in the 20–24 age category scored higher on the Personal and Adult Resilience factors, compared to older students in the 25+ age category. This could imply that older, more mature students (25+ years) might require a different approach to institutional support than younger students (20–24 years), possibly because of their different dynamics related to their life stage and experience. Older students may be more reticent to access support programmes which are designed for younger, more entry-level students. This may suggest that younger students are better able to adapt and transition well into the university setting, despite possible academic and personal challenges. Further research is needed on this in future studies.

The quantitative data also confirmed that students who were accepted for their first choice of study course and at their first choice of university experienced higher levels of anxiety than students who were not. This could indicate that they are more invested in their choice of programme and institution and have higher expectations of themselves when accepted for their first choice, compared to students who compromise on their choice of programme and institution. This aspect also needs further research in future studies. The quantitative data found that psychological distress manifests differently amongst student participants in the different fields of engineering (such as marine and industrial).

The major finding related to this theme is that student participants generally reported high levels of resilience. Students were able to transition better if they had adequate institutional and relational support.

6.3.5 Theme 5: Sense of belonging and social connection

Ungar (2012) emphasises that the interaction between complex triads (family, peers, and community) forms micro-level systems in which they can exchange resources in a way that enhances individual growth and resilience, and mitigates against risk exposure. Ebersöhn's Flocking Theory (2019) posits that relational resilience can be seen as a reflection of an individual's existential commitment to connection. This resonates well with the African philosophy of Ubuntu which Ebersöhn aimed to deconstruct with her Flocking Theory (Panyane, 2019). In South Africa, many students are the first generation to attend university and therefore their parents and siblings lack the guidance and preparation to help them adjust to university (McMillan, 2014; Mitchall & Jaeger, 2018). Of the student participants in this study, 50% identified as first-generation university students.

Costen et al. (2013) also note that social connectedness is an internal sense of belonging, which can affect a student's ability to successfully adjust to a new environment during a critical developmental period. Skaalvik and Skaalvik (2011) and Won et al. (2011) submit that a student's sense of belonging is directly linked to their academic motivation: students who have a stronger sense of belonging in a university environment will be more motivated to succeed in their studies and will fare better academically. A strong link can therefore be drawn between belonging and resilience. For example, Grüttner (2019) posits that the more students feel socially accepted at their university, the more likely they are to experience a greater sense of belonging, which ultimately influences student retention and throughput.

The qualitative data showed that student participants tended to provide comfort and support to one another, which can create a sense of belonging and connection among individuals who experience similar social and academic challenges. It is therefore crucial that university management and staff understand the complex dynamics that foster a sense of belonging in undergraduate university students, since such insights can help to improve students' academic success while at university, and by extension their post-university professional success. It will also help to improve the wellness and quality of life experiences of university students.

The major finding of this theme is that, despite adverse circumstances, students who are resilient often make meaningful and empowering connections and therefore are more likely to achieve positive outcomes in their academic studies. It is acknowledged, though, that the student participants who volunteered to participate in this study would likely have been adept at forging social bonds and connections and as a result would have volunteered to participate in a research study. Students who do not have strong skills and abilities in this regard would likely not have volunteered to participate in a study such as this. It is therefore relevant to acknowledge that studies such as this are likely to reflect one side of the relational spectrum and not the other.

6.3.6 Theme 6: Assistance and resources

Ungar (2012) says motivation, temperament, and special talents of a student will contribute to the success of the development process in an adequately resourced environment. Ungar does not specify specific interventions that could enhance student resilience. Ebersöhn (2019), on the other hand, identified nutrition and food support as possible interventions given the specifically South African context of her work. Many students at South African universities come from poverty-stricken backgrounds (Stats SA, 2019) and many struggle with meeting their basic personal needs such as nutrition and food (Wegerif & Adeniyi, 2019). Masten's

(2015) study in the USA, and a global study by Gostelow et al. (2015) further emphasised food as a basic need and resource among children, which could affect resilience. Sarafino and Smith (2014) maintain that social support encompasses care, comfort, value, and assistance, and Rutter (2007) confirms that resilience occurs when resources are provided appropriately.

At the university where this study was conducted food support is provided through the Meal-A-Day project. Quantitative data showed that student participants who accessed the Meal-A-Day project performed better than those who did not. Qualitative data supported this – for example, one student mentioned that he relied heavily on institutional food support because in addition to funding his studies, he was also supporting his family in another country. It is, however, acknowledged that student participants that reported that they did not access institutional food support may not have needed it. Thus, additional conclusions about the relationship between resilience and food and nutritional support cannot be drawn and further research investigating this is suggested.

Other resources were also mentioned by staff and student participants during interviews. For example, it was noted that physical resources such as specialised computer laboratories and the library (which was a specific challenge during the pandemic lockdown), human or relational resources such as family, friends, and like-minded fellow students were of great assistance to many of the student participants.

The major finding under this theme is that academic resilience can be enhanced through the provision of adequate and appropriate assistance and resources, including those that are personal, informational, and relational in nature.

6.3.7 Further findings

Another significant and unexpected finding of this broader study relates to the wellbeing and resilience of staff members. There is often an underestimation of the wellbeing of lecturers and academics, as well as support staff, when discussing mental health in higher education (Pieters et al., 2022, Van Niekerk & Van Gent, 2021, Whittet, 2020). During my interviews with the different sample groups, I observed that students were most likely more engaged in their interviews as they were answering subjectively, whereas the staff were answering based on observation. Further studies need to be conducted about the wellbeing and resilience of university staff and should be viewed in conjunction with data about student resilience, because staff would be better skilled and capacitated to support students if their own wellbeing and resilience are prioritised within a university. Moreover, staff were clearly overwhelmed by many other responsibilities, resulting in rushed interviews, since the interviews were conducted during the COVID-19 pandemic. Though the intent of the study was not to study the wellbeing and resilience of university staff, the study found this aspect was a significant challenge about which a paucity of knowledge and data exists. Further research on the relationship between staff wellbeing and the impact thereof on the on academic resilience of students within the South African higher education context is therefore warranted.

6.4 CHAPTER SUMMARY

In this chapter, I presented a synthesis of the data that emerged from the three data sets, according to themes, and reported the major findings of the study. I started off by interpreting the data generated in this study by linking it to the work of Michael Ungar's Socio-Ecological approach to resilience and Liesl Ebersöhn's Flocking's work on the indigenous psychology of resilience theory to conceptually frame the study. I then proceeded to provide a synthesis of the analysis by elaborating in detail on the six themes that have been established from this study;

Personal character strengths and wellbeing, Factors that enabled and constrained engineering students' academic resilience, Relational and socio-ecological support, Transition to university, Sense of belonging and social connection and Assistance and resources, respectively. In the final chapter, I present my conclusions, describe the limitations of the study, and make recommendations based on my findings relating to three major areas, namely (i) extracurricular support, (ii) improved relations between higher education and engineering industries, and (iii) research. Finally, I offer suggestions for further studies on this topic.

CHAPTER SEVEN

CONCLUSION AND IMPLICATIONS OF THE STUDY

7.1 INTRODUCTION

This study aimed to explore the academic resilience of the first cohort of final-year students studying towards the BEngTech degree at NMU. It is subsequently argued that (i) university students' academic resilience has not been adequately studied within the context of South African engineering education, (ii) that the perceptions and abilities of university students regarding academic resilience are poorly understood by empirical research, and (iii) that if the problem is better understood then better support mechanisms can be designed to help students deal with adversity. This group is the first of the BEngTech degree cohorts to graduate from NMU since the degree was introduced in 2018. The study is a case study that combines both qualitative and quantitative methods. The benefit of this design is that it provides a better understanding of the research problem and increases the validity of the study. It also allows for the avoidance of any potential biases that may arise through the data generation process. In this final chapter, I draw conclusions about the study in answer to the original research question, point out the limitations of the study, and make recommendations based on the findings.

7.2 SYNOPSIS OF THE STUDY

The study set out four objectives, namely a literature review, quantitative data collection by means of questionnaires and qualitative data generation through interviews with engineering students, lecturers, and support staff. These objectives were met by analysis of the three data sets that were generated. The following section contains cross-referenced hyperlinks to enhance

the presentation of the synopsis. Please click on the bolded page number (for example "**242**") to access the cross-referenced section in the preceding chapter.

The first objective was to contextualise the academic resilience of engineering students in South African higher education. This was done through a literature review presented in Chapter Two. North American and Asian sources dominate the literature on academic resilience. There is a gap in theorising academic resilience within the South African context. The only indigenous South African theory on resilience is that of Ebersöhn, which was used as part of the theoretical framework for this study.

The second objective was to examine the perceptions of engineering students regarding the personal and socio-ecological enablers and constraints of their academic resilience. As mentioned above, this was done through semi-structured interviews with engineering students as reported in Chapter Five. A major finding was that transitioning from high school to university can be challenging for students from low-income households, first-generation students, and international students. The study also found that female participants felt separated from their male counterparts.

The third objective was to identify the perceptions of engineering lecturers about the personal and the socio-ecological reasons for the academic resilience of engineering students. Semi-structured interviews were used, which are described in Chapter Five. Among the major findings were that lecturers provided additional support to students outside their scope of teaching, for example by using online platforms to facilitate communication. According to the lecturers, students who enrolled in the diploma programme in the past were privileged to receive a year of practical training which prepared them for their future careers, whereas current BEngTech degree students did not receive this practical training and graduated without it.

The fourth objective was to explore the perceptions of the university support staff about both the personal and the socio-ecological reasons for the academic resilience of engineering students. This was accomplished through semi-structured interviews (presented in Chapter Five). Support staff who participated in this study noted that students who acknowledge that they require assistance and seek such assistance are likely to be more resilient than those who do not. This was one of the major findings that could be drawn from the study.

Through triangulation and a synthesis of the three data sets used in this study, six main themes emerged, with rich data about perceptions of resilience among engineering students as well as teaching and support staff. The first theme was related to personal character strengths and wellbeing (please see page **244** in Chapter Six). The most significant ones that emerged from all sets of data were hope, gratitude, spirituality, forgiveness, persistence, and perseverance. The second theme was associated with factors that enabled and constrained engineering students' academic resilience (please see page **246** in Chapter Six). The most significant constraining factors that emerged were responsibilities related to the phase of life of the student participants, and of first-generation students. The most pertinent enabling factors to emerge were motivation, maturity, passion, and role modelling. The third theme, relational and socio-ecological support (please see page **248** in Chapter Six), was related to students having access to a range of institutional guidance, resources, and information support. The fourth theme encompassed the transition to university (please see page **249** in Chapter Six) and the role of the student participants' educational history and background prior to entering university. The fifth theme was a sense of belonging and social connection (please see page **251** in Chapter Six) due to faculty-specific and institutional initiatives and peer relations that student participants developed during their studies. The sixth and final theme was assistance and resources (please see page **252** in Chapter Six) which entailed the kinds of referrals made by lecturing and support staff to support engineering students' academic resilience.

7.3 CONCLUSIONS OF THE STUDY

The overall research question that guided this study was What explains the academic resilience of the first cohort of final-year Bachelor of Engineering Technology (BEngTech) students at Nelson Mandela University?

Having concluded this study, based on the three data sets, the following can in summary be posited as conclusions reached by this study:

- There is a dearth of empirical data regarding academic resilience in African and specifically South African contexts.
- Another neglected area of research is how students perceive their university training in relation to their future careers.
- Hardly any research has examined the relationship between language and resilience formation from either of the conceptual perspectives examined in this study.

From the quantitative data obtained in this study, the following conclusions were drawn:

- Student participants in this study demonstrated high levels of resilience, which was expected since they were in their final year of study and had persevered to complete their course of study.
- Higher levels of anxiety are experienced by students who are accepted for their first choice of academic programme, in this case engineering, and those who are accepted at their first choice of university.
- Students who display resilience often self-identity anxiety and in response attend orientation, peer support and academic success strategy workshops presented by their university.

- Students who have the ability to study and learn in their home language tend to display more academic resilience and successfully complete their studies.
- Female students tend to somatise psychological distress more than males. This aspect should be considered in the context of the gender distribution in engineering more generally with there being more males than females.
- Students entering university with higher mathematics and physical sciences admission points tend to be more academically resilient in their engineering studies.
- Different branches of engineering (e.g. civil, electrical) tend to manifest different symptoms of psychological distress. Students who are able to self-identify and seek help tend to be more academically resilient.

From the qualitative data obtained in this study, the following conclusions were drawn:

- A discrepancy exists between the accepted measures of resilience in positive psychology and those measures that are being used in clinical psychology practice to access resilience.
- A methodological conclusion is that the quantitative results provide a more positive picture of the students' resilience and perseverance, whereas the qualitative findings convey a harsher picture of the students' lives.
- The transition to engineering studies was made easier by previous work experience and previous experience of changing educational institutions. Students can also transition more smoothly in the presence of adequate institutional and relational support.
- Academic resilience is more likely to occur if the institution introduces appropriate and personalised support systems early.

- Personalised approaches should take into account age differentials, since the study indicated that older students might need different support, and that they may be reluctant to access existing support for younger students.
- In academic research among university students, Ebersöhn's Flocking Theory has never been applied as a framework.

In addition, the following two observations can be made:

- When comparing student and staff perceptions about student resilience, it emerged that there is a discrepancy between how staff and students perceive academic resilience. This was an unexpected finding and needs further investigation in future studies.
- Even though this study focussed on student academic resilience, it emerged that the wellbeing of university staff has an impact on student resilience. This matter also needs further investigation in future studies.

7.4 LIMITATIONS OF THE STUDY

This study is not without limitations. It is important to note that, as pointed out in Chapter One, the results and findings of this case study cannot be generalised to other contexts and institutions of higher learning and further comparative studies would need to be conducted to confirm that these findings are also relevant to other universities where engineering is taught. It would be especially valuable to compare the resilience of engineering students at various universities in South Africa and at Technical and Vocational Education and Training (TVET) colleges where courses are taught that are similar to engineering with an emphasis on mathematics and physics.

Another limitation of this study relates to the sample of the study, namely the small number of students and lecturers who were interviewed. It is acknowledged that a bigger sample

may have resulted in more or different data. Moreover, when examining the demographics of the sample, it becomes apparent that there are fewer female experiences and voices than male. This does, however, reflect the more general demographical reality that engineering professions and engineering courses are still male-dominant. It is, however, acknowledged that great strides have been made in Science, Technology, Engineering, and Mathematics (STEM) disciplines to attract and retain female students. It is suggested that future studies increase the sample size of the study as well as the demographics of the sample, or that comparative studies should be conducted comparing perceptions of male and female students and staff, as this may provide significant insights into the different needs and resilience factors of the diverse university staff and student populations.

Since this study did not focus on specific student case studies, staff were only able to share their perceptions of students from a broader perspective. Their observations were based on many years of experience of student behaviour, which allowed them to comment on both positives and negatives, successes and failures, from a more comprehensive birds'-eye perspective.

Staff members did not talk about themselves, as the engineering students did. Their perceptions of the students might have predisposed them to focus challenges and problem identification rather than approaching the interviews with a more strengths-based, solution-focused approach. Students, on the other hand, spoke about themselves and their own experiences and understanding of their own resilience. In addition, I interviewed the students at the end of their studies, in their last year, when they had essentially come to realise that they had persevered. I suspect that this would be different from what I may find if I were to interview current first-year students who do not yet know how they will overcome the academic and

socio-ecological challenges they might experience. Such a comparative study may be a significant next step.

Another possible limitation may be linked to language: all interviews were conducted in English, even though most of the participants were not native English speakers. This could be a limiting factor in the sense that participants may not have expressed themselves as accurately as they could perhaps have done in their home language.

7.5 RECOMMENDATIONS

Based on the findings and conclusions of this study, the following three categories of recommendations can be made:

(i) Extracurricular support;

(ii) Advancing collaboration between higher education and engineering industries;

(iii) Research.

7.5.1 Extracurricular support

7.5.1.1 Enhanced interaction between students and industry

Both the staff and the students in this study noted that the curriculum is loaded with foundational disciplinary modules (mathematics and physics) which are often taught by staff outside of the School of Engineering during the first year. This may heighten feelings of isolation and disconnect among first-year engineering students as they reported feeling that they cannot see how the first year of study informs the rest of the curriculum. This only becomes clearer when they are in their final year and can look back and make sense of the curriculum retrospectively. It is therefore recommended that the universities and colleges that train engineers consider a more integrated engineering curriculum.

As mentioned in Chapter Two, South African engineering students face a variety of challenges and barriers (one of which is professional accreditation) that can be addressed through earlier interactions with the relevant professional bodies which could advise students through mentorship. This suggestion is based on the fact that the student participants reported that they would perform better if they had a better understanding of how their study content relates to their careers. This is especially significant as the new BEngTech degree does not have a service-learning component, something that was noted by the lecturers as a positive aspect of the diploma course. One of the strengths of the previous NDip qualification was that all students were required to engage in a year-long in-service training programme that they were required to complete prior to obtaining their qualification. This programme was phased out when the BEngTech degree was introduced and staff members have subsequently consistently identified this as a challenge and disadvantage of the new qualification.

These points of connection between students and industry could be facilitated through the student chapters of the various senior bodies that represent distinct branches of engineering, such as civil, industrial, electrical, marine, and mechanical. For example, the student chapter of the South African Institution of Mechanical Engineering (SAIMechE) could meet and be mentored by members of the broader SAIMechE. Similarly, other senior bodies such as the South African Institution of Civil Engineering (SAICE) for civil engineering, the South African Journal of Industrial Engineering (SAIIE) for industrial engineering, and the South African Institute of Electrical Engineers (SAIEE) for electrical engineering also have student chapters.

It is important to note that since student chapters are mainly run by senior students, the chapter would be responsible for ensuring that there are events involving members of the broader professional body and not only students. This could further expose engineering students to more practical and real-life examples of engineering problems and scenarios from an early

stage in their studies and help students from rural and disadvantaged backgrounds relate to what they are being taught in class.

7.5.1.2 Improved promotion and communication of support available in the university

Regarding extracurricular academic, personal, and socio-ecological support, a number of student participants reported not being aware of some of the support that was available to them. It is recommended that the various student support departments collaborate to break down the silos and create awareness of the full component of support available to students.

7.5.1.3 Language support and interventions

One other important extracurricular recommendation is linked to English language proficiency (ELP). Most of the engineering students who participated in this study are not native English speakers, so they find it difficult to comprehend the technical language used in engineering. ELP was also identified as a concern in a recent study by Stander et al. (2022), which investigated the relationship between ELP and academic performance among engineering students at a TVET college. The academic language developer position at the university where this case study was conducted has been vacant for two years. It is recommended that the university develop a bilingual tutoring programme and student peer support specifically aimed at ELP in the School of Engineering. Furthermore, a discipline-specific translingual dictionary could be developed where specific core engineering concepts are translated into African languages that are spoken by most of students at this institution.

7.5.2 Advancing collaboration between higher education and engineering industries

It appears that integration and collaboration between higher education policymakers and engineering industry stakeholders are a priority for the new degree course. That the new BEngTech qualification requires such collaboration is evident from the fact that the higher

education system has an obligation to prepare students for the workplace and industry as well as to award qualifications that are relevant to the workplace. As mentioned earlier in this study, unlike previous cohorts of engineering students, these participants did not have a year of experiential learning. It is difficult to gauge how successfully BEngTech graduates integrated into the industry at the time this research was conducted as the first cohort received their qualifications after data generation for this study had been completed. Nevertheless, lecturers who participated in this study reported that they anticipated students would have difficulty in finding employment without prior experience or experiential learning, unlike previous cohorts. According to the students interviewed, those who found vacation work within the industry during their studies had a good chance of returning to those particular factories after graduation. It is recommended that universities could consider expanding their graduate placement and work-integrated learning (WIL) services to include students such as these new BEngTech students who would like to obtain industry experience when it is not required as part of their qualification requirements.

It is therefore recommended that schools and faculties of engineering foster relationships with industries where students could participate in job shadowing. Industries and universities can engage in simulation training opportunities where workplace shadowing or WIL is not an option but where students can access simulation facilities to supplement their theoretical learning. For example, the Eastern Cape, where this study is situated, is a hub of motor industries. Elsewhere in the country, there might be opportunities for inter-institutional exchanges between different institutions in different parts of the country, to allow students the opportunity to job shadow in a variety of contexts. It is recommended that representatives of the DHET and the ECSA collaborate with engineering schools and faculties more frequently to discuss entrepreneurship education and plan the broader employability of BEngTech and TVET graduates more intentionally. This may be of particular significance to engineering students at

TVET colleges who qualified with a particular trade and may want to start their own small businesses after obtaining their qualification.

In the study, engineering lecturers consistently noted that the relationship between higher education and ECSA is a challenge as they feel there is a gap between what they have to work with in universities to train students and what ECSA expects as a part of their audits and assessment processes. An ECSA audit is a process whereby ECSA visits universities that train engineers every four years to check compliance with industry standards and to ensure that the ECSA graduate attributes are taught and assessed properly in the various engineering qualifications. This also occurs in other disciplines, such as the health professions. The Health Professions Council of South Africa audits universities that train health professionals such as psychologists. Lecturers stated that there is tension between ECSA's expectations and what higher education can deliver. There seems to be a persistent perception among lecturers that ECSA administrators do not understand the challenges and dynamics at universities and that the individuals who conduct the assessments and audits are often part-time or contract employees of ECSA and therefore may not have the relevant influence to affect change. It is recommended that the improvement of the relationship between higher education and ECSA should be prioritised as the present situation is likely to continue to impact the quality of students delivered by universities and the employment readiness of graduates for industry. The BEngTech disconnection with industry, as already discussed, is one example of a problem that emerged from this disconnect.

7.5.3 Research

This was a small study conducted at one South African university. As mentioned before, several possibilities for future study emerged from this small study. For example:

- This study could be replicated with a larger sample across more South African universities.
- Further research is needed to understand the relationship between resilience and food and nutritional support.
- The resilience of male and female engineering students could be researched as a comparative study.
- There is a need for further research to investigate why students who are accepted into their first choice of course and university experience higher levels of anxiety than those who are not.
- More research is needed to understand why younger students performed better with regard to the Personal and Adult Resilience factors, as well as on how support ought to differ between younger and older, more mature, students.
- In order to determine whether first-year students demonstrate resilience and how their perceptions of their academic resilience differ from those of their senior counterparts (such as the final years who participated in this study), a replication or similar study should be conducted with current first-year students.
- The application of Ebersöhn's Flocking Theory (2019) to academic research studies among university students has significant scope and resonance, However, this will need to be further explored in future studies.

Further research is also necessary regarding the relationship between resilience and language in engineering disciplines. Several staff members and students who participated in the study who do not speak English as their first language were previously discussed as a limitation in the data generation process. However, language proficiency in this study refers to more than just the use of the home language; it includes the use of technical and non-technical language, and communicative (everyday) language. This is evident in the difficulty engineering students

reported in grasping technical terminology and computer programming language (for example, C and C++ in civil engineering). South African accents and dialects also made it difficult for international students to use communicative language in South Africa. Therefore, future studies should study the gap in the literature regarding language accessibility for international students and technical language support for engineering students. It is also important to explore language and resilience formation in future studies, as noted earlier.

This research was not aimed at researching pandemic conditions as ethical approval for the study was received prior to the outbreak of Covid-19 and the implementation of restrictions by the national government of South Africa. I did not ask specific questions regarding the effect that the Covid-19 pandemic may have had on staff and students. However, since data collection and generation took place amid the pandemic, some of the responses were naturally influenced by pandemic conditions at the time, such as transitioning to online learning and the lack of social interaction. Several important aspects of online learning, teaching, and student support have been examined in a recent study by Van Staden and Naidoo (2022). These authors, however, do not differentiate between the needs of different disciplines and professions. For instance, how are the needs different for students who need access to laboratory and specialised training spaces and equipment, i.e., engineering? These factors fall outside of the scope of this study but I recommend further investigation of the pandemic's influence on students' resilience, especially students like engineers, who require face-to-face or hands-on work, on campus and in laboratories, workshops and technical spaces, and within the industry.

As mentioned earlier, this case study can also be applied to TVET colleges since it is not only universities in South Africa that train engineers. Notably, most engineering and related professions are trained at TVET colleges. Following the results and findings of this study, it is recommended for future research that a replication of this study is done at TVET colleges that

teach engineering courses. As with engineering, other disciplines, such as nursing, also have two routes to becoming a professional, namely through university or the relevant college education. Further studies on students' various entries into these professions are therefore warranted considering this study's possible wider applicability to other disciplines.

7.6 ASSOCIATED CONCLUSIONS

Higher education is an extremely challenging space to be in, given that underprepared students come from the country's poor schooling system, with large and growing classes. Other key challenges are how to manage the socio-economic problems of students, under-resourced university systems, concerns about the wellness of university staff, the great number of staff leaving academia, and the problem that universities are losing senior staff without replacing them with others who can work at the equivalent level. Although these factors are external to this specific study, the experience gained during the process suggests that further studies should be conducted regarding the pressures on university staff, the conditions under which they perform their tasks, and their resilience in the face of these issues, as these directly influence the quality of their work and the support they can provide students. Moreover, the wellbeing of the lecturing/academic and support staff is often overlooked when thinking more broadly about mental health in higher education and education in general.

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Appendix A: Ethics Approval Letter

NELSON MANDELA
UNIVERSITY

PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa mandela.ac.za

Chairperson: Research Ethics Committee (Human)
Tel: +27 (0)41 504 2347
sharlene.govender@mandela.ac.za

NHREC registration nr: REC-042508-025

Ref: [H20-EDU-ERE-026] / Approval]

28 August 2020

Prof P Webb
Faculty: Education

Dear Prof Webb

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

PRP: Prof P Webb
PI: Mr C Mapaling

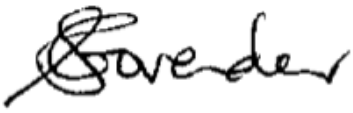
Your above-entitled application served at the Research Ethics Committee (Human) (*24 June 2020*) for approval. The study is classified as a medium risk study. The ethics clearance reference number is **H20-EDU-ERE-026** and approval is subject to the following conditions:

1. The immediate completion and return of the attached acknowledgement to Imtiaz.Khan@mandela.ac.za, the date of receipt of such returned acknowledgement determining the final date of approval for the study where after data collection may commence.
2. Approval for data collection is for 1 calendar year from date of receipt of above mentioned acknowledgement.
3. The submission of an annual progress report by the PRP on the data collection activities of the study (form RECH-004 available on Research Ethics Committee (Human) portal) by 15 November this year for studies approved/extended in the period October of the previous year up to and including September of this year, or 15 November next year for studies approved/extended after September this year.
4. In the event of a requirement to extend the period of data collection (i.e. for a period in excess of 1 calendar year from date of approval), completion of an extension request is required (form RECH-005 available on Research Ethics Committee (Human) portal)
5. In the event of any changes made to the study (excluding extension of the study), completion of an amendments form is required (form RECH-006 available on Research Ethics Committee (Human) portal).
6. Immediate submission (and possible discontinuation of the study in the case of serious events) of the relevant report to RECH (form RECH-007 available on Research Ethics Committee (Human) portal) in the event of any unanticipated problems, serious incidents or adverse events observed during the course of the study.
7. Immediate submission of a Study Termination Report to RECH (form RECH-008 available on Research Ethics Committee (Human) portal) upon expected or unexpected closure/termination of study.
8. Immediate submission of a Study Exception Report of RECH (form RECH-009 available on Research Ethics Committee (Human) portal) in the event of any study deviations, violations and/or exceptions.
9. Acknowledgement that the study could be subjected to passive and/or active monitoring without prior notice at the discretion of Research Ethics Committee (Human).

Please quote the ethics clearance reference number in all correspondence and enquiries related to the study. For speedy processing of email queries (to be directed to Imtiaz.Khan@mandela.ac.za), it is recommended that the ethics clearance reference number together with an indication of the query appear in the subject line of the email.

We wish you well with the study.

Yours sincerely



Dr S Govender
Chairperson: Research Ethics Committee (Human)

Cc: Department of Research Development
Faculty Manager: Education

Appendix 1: Acknowledgement of conditions for ethical approval

Appendix B: Institutional Permissions

NELSON MANDELA UNIVERSITY

1 September 2020

Dr Thandi Mgwebi

Deputy Vice-Chancellor (DVC): Research, Innovation and Internationalisation

Nelson Mandela University

P.O. Box 77000

PORT ELIZABETH

6000

Dear Dr Mgwebi

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University. The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University.

Final-year BEngTech students and engineering lecturers at Nelson Mandela University will be sampled using a purposive sampling technique. BEngTech students and engineering lecturers who volunteer to participate in this study will be interviewed to obtain a deeper understanding of their perspectives on academic resilience. The Faculty will be provided with a summary report on the findings from the study. A detailed account of the objectives and methodology of the study can be found as an Appendix attached to this request.

Ethics clearance from the Faculty of Education and the Nelson Mandela University Research Ethics Committee: Human (REC-H) will be sought for this study. I wish to emphasise

that all the data gathered will be treated as highly confidential and collected, handled and stored in accordance with professional and ethical standards. In addition, pseudonyms will be used in reporting on and the storing of the qualitative data.

In terms of the research ethics approval process, the proposed study requires the approval of institutional gatekeepers, therefore this letter requesting your approval. If you approve of this study, I would like to request your permission to interview the Nelson Mandela University final-year BEngTech students and lecturers, as well as the various engineering heads of department as outlined above to complete the analysis and report.

The primary responsible person for this study will be Prof. Paul Webb. I, Curwyn Mapaling, will be the principal investigator, and Dr Belinda du Plooy will be the co-investigator. Should you have any specific questions about the study you may contact me and I will be willing to provide you with further details. I hope that this meets with your approval so that I may continue with the study.

Yours sincerely

Curwyn Mapaling (Principal investigator): PhD Candidate: Faculty of Education

Email address: curwyn.mapaling@gmail.com, Mobile: 076 178 6670

Prof. Paul Webb (Primary responsible person): Emeritus Professor: Faculty of Education

Email address: Paul.Webb@mandela.ac.za, Work: 041 504 4966 / 041 504 4310

Dr Belinda du Plooy (Co-investigator): Senior Manager: Engagement

Email address: Belinda.duPlooy@mandela.ac.za, Work: 041 504 3083

NELSON MANDELA
UNIVERSITY

Office of DVC Research Innovation and Internationalization
Room 1706, Main Building
NMU South Campus
Tel. +27 (0)41 504 2016/7
Thandi.Mgwebi@mandela.ac.za
04 Septmber 2020

(Institutional permission for conducting research)
[H20-EDU-ERE-026]

Dear Mr C Mapaling

TITLE: ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

I **Dr T Mgwebi DVC: Research Innovation and Internationalisation** grant permission for the above-mentioned study and will act in the capacity as gatekeeper for this institutional study.

Dr T Mgwebi
DVC Research Innovation and Internationalization

Change the World

PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa

Appendix C: Institutional Permissions

NELSON MANDELA UNIVERSITY

1 September 2020

Professor Barend van Wyk

Executive Dean: Engineering, the Built Environment and Technology

Nelson Mandela University

P.O. Box 77000

PORT ELIZABETH

6000

Dear Prof. Van Wyk

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University. The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University.

Final-year BEngTech students and engineering lecturers at Nelson Mandela University will be sampled using a purposive sampling technique. BEngTech students and engineering lecturers who volunteer to participate in this study will be interviewed to obtain a deeper understanding of their perspectives on academic resilience. The Faculty will be provided with a summary report on the findings from the study. A detailed account of the objectives and methodology of the study can be found as an Appendix attached to this request.

Ethics clearance from the Faculty of Education and the Nelson Mandela University Research Ethics Committee: Human (REC-H) will be sought for this study. I wish to emphasise that all the data gathered will be treated as highly confidential and collected, handled and stored in accordance with professional and ethical standards. In addition, pseudonyms will be used in reporting on and the storing of the qualitative data.

In terms of the research ethics approval process, the proposed study requires the approval of institutional gatekeepers, therefore this letter requesting your approval. If you approve of this study, I would like to request your permission to interview the Nelson Mandela University final-year BEngTech students and lecturers, as well as the various engineering heads of department as outlined above to complete the analysis and report.

The primary responsible person for this study will be Prof. Paul Webb. I, Curwyn Mapaling, will be the principal investigator, and Dr Belinda du Plooy will be the co-investigator. Should you have any specific questions about the study you may contact me and I will be willing to provide you with further details. I hope that this meets with your approval so that I may continue with the study.

Yours sincerely

Curwyn Mapaling (Principal investigator): PhD Candidate: Faculty of Education

Email address: curwyn.mapaling@gmail.com, Mobile: 076 178 6670

Prof. Paul Webb (Primary responsible person): Emeritus Professor: Faculty of Education

Email address: Paul.Webb@mandela.ac.za, Work: 041 504 4966 / 041 504 4310

Dr Belinda du Plooy (Co-investigator): Senior Manager: Engagement

Email address: Belinda.duPlooy@mandela.ac.za, Work: 041 504 3083

Dear Mr. Mapaling,

Permission is granted to proceed with the interviews.

Kind regards

Barend J van Wyk [Ph.D., PrEng, PrTechEng, SMIEEE, MSAIMC]
Executive Dean | Professor
Faculty of Engineering, the Built Environment, and Technology
Nelson Mandela University | Summerstrand Campus North
Room C252 | Tel: +27 (0)41 504 3955 | Alternative e-mail: vanwykb@ieee.org
[Quoted text hidden]

Appendix D: Institutional Permissions

NELSON MANDELA UNIVERSITY

1 September 2020

Mr Alan Roberts

Director of School: Engineering

Nelson Mandela University

P.O. Box 77000

PORT ELIZABETH

6000

Dear Mr Roberts

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University. The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University.

Final-year BEngTech students and engineering lecturers at Nelson Mandela University will be sampled using a purposive sampling technique. BEngTech students and engineering lecturers who volunteer to participate in this study will be interviewed to obtain a deeper understanding of their perspectives on academic resilience. The School will be provided with a summary report on the findings from the study. A detailed account of the objectives and methodology of the study can be found as an Appendix attached to this request.

Ethics clearance from the Faculty of Education and the Nelson Mandela University Research Ethics Committee: Human (REC-H) will be sought for this study. I wish to emphasise that all the data gathered will be treated as highly confidential and collected, handled and stored in accordance with professional and ethical standards. In addition, pseudonyms will be used in reporting on and the storing of the qualitative data.

In terms of the research ethics approval process, the proposed study requires the approval of institutional gatekeepers, therefore this letter requesting your approval. If you approve of this study, I would like to request your permission to interview the Nelson Mandela University final-year BEngTech students and lecturers, as well as the various engineering heads of department as outlined above to complete the analysis and report.

The primary responsible person for this study will be Prof. Paul Webb. I, Curwyn Mapaling, will be the principal investigator, and Dr Belinda du Plooy will be the co-investigator. Should you have any specific questions about the study you may contact me and I will be willing to provide you with further details. I hope that this meets with your approval so that I may continue with the study.

Yours sincerely

Curwyn Mapaling (Principal investigator): PhD Candidate: Faculty of Education

Email address: curwyn.mapaling@gmail.com, Mobile: 076 178 6670

Prof. Paul Webb (Primary responsible person): Emeritus Professor: Faculty of Education

Email address: Paul.Webb@mandela.ac.za, Work: 041 504 4966 / 041 504 4310

Dr Belinda du Plooy (Co-investigator): Senior Manager: Engagement

Email address: Belinda.duPlooy@mandela.ac.za, Work: 041 504 3083

Dear Curwyn

I have read through the request that you sent to me regarding permission to interview staff and students in the School of Engineering and collect data pertaining to your research.

I hereby grant you permission to do so within the prescribed guidelines of the university.

Regards
Alan Roberts
Director: School of Engineering
[Quoted text hidden]

Appendix E: Institutional Permissions

NELSON MANDELA UNIVERSITY

1 September 2020

Professor Gerrit Crafford

Acting Director of School: Civil Engineering and the Built Environment

Nelson Mandela University

P.O. Box 77000

PORT ELIZABETH

6000

Dear Prof. Crafford

ACADEMIC RESILIENCE OF ENGINEERING STUDENTS: A CASE STUDY

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University. The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University.

Final-year BEngTech students and engineering lecturers at Nelson Mandela University will be sampled using a purposive sampling technique. BEngTech students and engineering lecturers who volunteer to participate in this study will be interviewed to obtain a deeper understanding of their perspectives on academic resilience. The School will be provided with a summary report on the findings from the study. A detailed account of the objectives and methodology of the study can be found as an Appendix attached to this request.

Ethics clearance from the Faculty of Education and the Nelson Mandela University Research Ethics Committee: Human (REC-H) will be sought for this study. I wish to emphasise that all the data gathered will be treated as highly confidential and collected, handled and stored in accordance with professional and ethical standards. In addition, pseudonyms will be used in reporting on and the storing of the qualitative data.

In terms of the research ethics approval process, the proposed study requires the approval of institutional gatekeepers, therefore this letter requesting your approval. If you approve of this study, I would like to request your permission to interview the Nelson Mandela University final-year BEngTech students and lecturers, as well as the various engineering heads of department as outlined above to complete the analysis and report.

The primary responsible person for this study will be Prof. Paul Webb. I, Curwyn Mapaling, will be the principal investigator, and Dr Belinda du Plooy will be the co-investigator. Should you have any specific questions about the study you may contact me and I will be willing to provide you with further details. I hope that this meets with your approval so that I may continue with the study.

Yours sincerely

Curwyn Mapaling (Principal investigator): PhD Candidate: Faculty of Education

Email address: curwyn.mapaling@gmail.com, Mobile: 076 178 6670

Prof. Paul Webb (Primary responsible person): Emeritus Professor: Faculty of Education

Email address: Paul.Webb@mandela.ac.za, Work: 041 504 4966 / 041 504 4310

Dr Belinda du Plooy (Co-investigator): Senior Manager: Engagement

Email address: Belinda.duPlooy@mandela.ac.za, Work: 041 504 3083

Dear Curwyn,

You are very lucky to have such a distinguished supervision team.

Sure, I will serve as gatekeeper for your study. You have my permission to request interviews with Civil Engineering final-year BEngTech students, the lecturers and the Head of Department (HoD).

I have included the acting HoD of Civil Engineering, Mrs Chenda Accone, and her secretary, Mrs Lizelle Pienaar, into this email. I am sure Lizelle will be able to assist you with interviewee contact details.

Good luck with your study and feel free to contact me if you have any queries.

Keep safe.

Gerrit J. Crafford
Professor: Department of Quantity Surveying
Acting Director of School: School of the Built Environment and Civil Engineering

Mobile: +27 (0) 82 263 0442
Zoom Personal Meeting Room: https://mandela.zoom.us/j/3567610623
[Quoted text hidden]

Appendix F: Research Participant Information Sheet for Engineering Students

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

You are invited to participate in this research study which is titled Academic Resilience of Engineering Students: A Case Study. Before you decide to participate, it is important for you to understand why the research is being conducted and what it will entail.

1. Who will be doing the study and what is it about?

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University.

The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University. The study will be further guided by a primary research question which is as follows:

- What explains the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University?

2. Why have I been recruited?

I would like to speak with final-year Bachelor of Engineering Technology (BEngTech) students who completed their first year in 2018. You are a final-year student in one of the

BEngTech disciplines (Civil, Electrical, Industrial, Marine, Mechanical) and as such you have been invited to participate.

I aim to do semi-structured interviews with approximately 15 BEngTech students.

3. What will happen to me if I participate?

Your involvement in the study would be to participate in a semi-structured interview where we discuss academic resilience in relation to the following:

- Educational history/background
- Risk factors and protective factors
- Protective/risk factor relationships
- Resilience process

The semi-structured interview will probably last from 1 hour to 1 hour and 30 minutes depending on how much time you have available, and how much information you want to share. I will record the interviews with your permission. The recordings will be transcribed and you will be offered a copy of the transcript to keep.

It is up to you to decide whether or not to participate. You do not have to give your real name. If you do decide to participate you will be given this information sheet to keep. You will also be asked to sign a consent form and will be provided with a copy of this too.

If you decide to participate, you are still free to withdraw from the study at any time and without needing to give a reason.

4. If I want to participate, what will happen next?

If you decide you might want to participate in this study, an interview time will be arranged with you. The interview will be held virtually so as to not inconvenience you.

I will explain what the research is about, what will be involved in the interview process and can also answer any questions you might have. You can then decide if you want to go ahead with the interview and we can arrange a suitable time. The interview will take place virtually via the Zoom meetings or MS Teams videotelephony software platforms, either during a free period or during lunch hour.

Appendix G: Research Participant Information Sheet for Engineering Lecturers

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

You are invited to participate in this research study which is titled Academic Resilience of Engineering Students: A Case Study. Before you decide to participate, it is important for you to understand why the research is being conducted and what it will entail.

1. Who will be doing the study and what is it about?

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University.

The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University. The study will be further guided by a primary research question which is as follows:

- What explains the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University?

2. Why have I been recruited?

I would like to speak with engineering lecturers who have been involved with teaching the cohort of Bachelor of Engineering Technology (BEngTech) students who completed their

first year in 2018. You are a lecturer in one of the BEngTech disciplines (Civil, Electrical, Industrial, Marine, Mechanical) and as such you have been invited to participate.

I aim to do semi-structured interviews with at least five BEngTech lecturers (one from each engineering department) as well as the various heads of department.

3. What will happen to me if I participate?

Your involvement in the study would be to participate in a semi-structured interview where we discuss the academic resilience of engineering students in relation to the following:

- Educational history/background
- Risk factors and protective factors
- Protective/risk factor relationships
- Resilience process

The semi-structured interview will probably last from 1 hour to 1 hour and 30 minutes depending on how much time you have available, and how much information you want to share. I will record the interviews with your permission. The recordings will be transcribed and you will be offered a copy of the transcript to keep.

It is up to you to decide whether or not to participate. If you do decide to participate you will be given this information sheet to keep. You will also be asked to sign a consent form and will be provided with a copy of this too.

If you decide to participate, you are still free to withdraw from the study at any time and without needing to give a reason.

4. If I want to participate, what will happen next?

If you decide you might want to participate in this study, an interview time will be arranged with you. The interview will be held virtually so as to not inconvenience you.

I will explain what the research is about, what will be involved in the interview process and can also answer any questions you might have. You can then decide if you want to go ahead with the interview and we can arrange a suitable time. The interview will take place virtually via the Zoom meetings or MS Teams videotelephony software platforms, either during a free period or during lunch hour.

Appendix H: Research Participant Information Sheet for Student Support Staff

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

You are invited to participate in this research study which is titled Academic Resilience of Engineering Students: A Case Study. Before you decide to participate, it is important for you to understand why the research is being conducted and what it will entail.

1. Who will be doing the study and what is it about?

My name is Curwyn Mapaling and I am a PhD candidate in the Faculty of Education at the Nelson Mandela University. I am being supervised on this study by Prof. Paul Webb, who is an Emeritus Professor in the Faculty of Education at the Nelson Mandela University, and Dr Belinda du Plooy, who is the Senior Manager of Engagement at the Nelson Mandela University.

The proposed study aims to investigate the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University. The study will be further guided by a primary research question which is as follows:

- What explains the academic resilience of the final-year Bachelor of Engineering Technology (BEngTech) students at the Nelson Mandela University?

2. Why have I been recruited?

I would like to speak with student support staff who have been involved with supporting the cohort of Bachelor of Engineering Technology (BEngTech) students who completed their first year in 2018. You are a member of one of the units or departments (Siyaphumelela Project,

Learning and Teaching Collaborative for Success [LT Collab]) that provides support to students and as such you have been invited to participate.

I aim to do semi-structured interviews with at least six student support staff members.

3. What will happen to me if I participate?

Your involvement in the study would be to participate in a semi-structured interview where we discuss the academic resilience of engineering students in relation to the following:

- Educational history/background
- Risk factors and protective factors
- Protective/risk factor relationships
- Resilience process

The semi-structured interview will probably last from 1 hour to 1 hour and 30 minutes depending on how much time you have available, and how much information you want to share. I will record the interviews with your permission. The recordings will be transcribed and you will be offered a copy of the transcript to keep.

It is up to you to decide whether or not to participate. If you do decide to participate you will be given this information sheet to keep. You will also be asked to sign a consent form and will be provided with a copy of this too.

If you decide to participate, you are still free to withdraw from the study at any time and without needing to give a reason.

4. If I want to participate, what will happen next?

If you decide you might want to participate in this study, an interview time will be arranged with you. The interview will be held virtually so as to not inconvenience you.

I will explain what the research is about, what will be involved in the interview process and can also answer any questions you might have. You can then decide if you want to go ahead with the interview and we can arrange a suitable time. The interview will take place virtually via the Zoom meetings or MS Teams videotelephony software platforms.

Appendix I: Research Participant Consent Form for Engineering Students

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

Researchers/Investigators:

- Curwyn Mapaling, PhD Candidate, Faculty of Education, Nelson Mandela University. Curwyn.Mapaling@gmail.com
- Prof. Paul Webb, Emeritus Professor, Faculty of Education, Nelson Mandela University. Paul.Webb@mandela.ac.za
- Dr Belinda du Plooy, Senior Manager, Engagement, Nelson Mandela University. Belinda.duPlooy@mandela.ac.za

Participant Instructions:

Please read the Participant Information Sheet. If you are interested in participating in this study and have read the 14 statements below and are happy to participate, please indicate this by placing your initials next to each statement you agree with and by signing the agreement below.

Statements	Initials
1. I have read the Participant Information Sheet and the nature and purpose of the research study has been explained to me. I understand and voluntarily agree to participate in the study.	
2. I volunteer to participate in a semi-structured interview.	

	Statements	**Initials**
3.	I understand the purpose of the research study and my involvement in it.	
4.	I understand that I may withdraw from the research study at any stage and that this will not affect my status as an engineering student now or in the future.	
5.	I understand that information gained during the study will be published and shared with key stakeholders such as the School of Engineering, and the School of Civil Engineering and the Built Environment. However, I will not be identified and my personal results and identity will remain confidential and anonymous. My identity will not be revealed in any discussion, description or scientific publications by the researchers/investigators.	
6.	I understand that my participation in this study may evoke feelings of discomfort which may in turn make me feel distressed or vulnerable. Should this occur, I am aware that I can terminate the interview at any point. Furthermore, I am aware that I will have the opportunity to express my discomfort or distress at which point the situation will be contained. I will be referred for further psychological assistance if necessary.	
7.	I am aware that no benefits will accrue to me in the form of remuneration as a result of my participation in this study.	
8.	I understand that the findings may be used in the future for other research studies and I am happy for this to occur as long as I am not identified in the interview or in any reports or publications. In addition, I understand that my personal results and identity will remain anonymous and confidential.	
9.	I understand that I will be audiotaped during the interview.	
10.	I understand that data will be safely stored by the researcher, Curwyn Mapaling, in a locked security storage box in an office in the Faculty of Education on South Campus for five years and that nobody besides him will have access to it. Copies of the transcripts	

Statements	Initials
will be shared with the promoters, Prof. Paul Webb and Dr Belinda du Plooy, but any information that identifies me on the transcript will be removed before it is shared.	
11. No pressure was exerted on me to consent to participation and I understand that my participation is completely voluntary.	
12. I understand that participation in this study should not result in any cost to myself.	
13. I understand that I may contact the researcher or promoter(s) if I require further information about the research, and that I may contact Prof. Mathabo Khau, the Research Ethics Coordinator of the Faculty of Education, Nelson Mandela University if I wish to make a complaint relating to my involvement in the research at Mathabo.Khau@mandela.ac.za	

Signed: ..... (Research Participant)

Print name: .....

Date: .....

Appendix J: Research Participant Consent Form for Engineering Lecturers

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

Researchers/Investigators:

- Curwyn Mapaling, PhD Candidate, Faculty of Education, Nelson Mandela University. Curwyn.Mapaling@gmail.com
- Prof. Paul Webb, Emeritus Professor, Faculty of Education, Nelson Mandela University. Paul.Webb@mandela.ac.za
- Dr Belinda du Plooy, Senior Manager, Engagement, Nelson Mandela University. Belinda.duPlooy@mandela.ac.za

Participant Instructions:

Please read the Participant Information Sheet. If you are interested in participating in this study and have read the 13 statements below and are happy to participate, please indicate this by placing your initials next to each statement you agree with and by signing the agreement below.

Statements	Initials
1. I have read the Participant Information Sheet and the nature and purpose of the research study has been explained to me. I understand and voluntarily agree to participate in the study.	
2. I volunteer to participate in a semi-structured interview.	
3. I understand the purpose of the research study and my involvement in it.	

Statements	Initials
4. I understand that I may withdraw from the research study at any stage.	
5. I understand that information gained during the study will be published and shared with key stakeholders such as the School of Engineering and the School of Civil Engineering and the Built Environment. However, I will not be identified and my personal results and identity will remain confidential and anonymous. My identity will not be revealed in any discussion, description or scientific publications by the researchers/investigators.	
6. I understand that my participation in this study may evoke feelings of discomfort which may in turn make me feel distressed or vulnerable. Should this occur, I am aware that I can terminate the interview at any point. Furthermore, I am aware that I will have the opportunity to express my discomfort or distress at which point the situation will be contained. I will be referred for further psychological assistance if necessary.	
7. I am aware that no benefits will accrue to me in the form of remuneration as a result of my participation in this study.	
8. I understand that the findings may be used in the future for other research studies and I am happy for this to occur as long as I am not identified in the interview or in any reports or publications. In addition, I understand that my personal results and identity will remain anonymous and confidential.	
9. I understand that I will be audiotaped during the interview.	
10. I understand that data will be safely stored by the researcher, Curwyn Mapaling, in a locked security storage box in an office in the Faculty of Education on South Campus for five years and that nobody besides him will have access to it. Copies of the transcripts will be shared with the promoters: Prof. Paul Webb and Dr Belinda du Plooy, but any information that identifies me on the transcript will be removed before it is shared.	
11. No pressure was exerted on me to consent to participation and I understand that my participation is completely voluntary.	

Statements	**Initials**
12. I understand that participation in this study should not result in any cost to myself.	
13. I understand that I may contact the researcher or promoter(s) if I require further information about the research, and that I may contact Prof. Mathabo Khau, the Research Ethics Coordinator of the Faculty of Education, Nelson Mandela University if I wish to make a complaint relating to my involvement in the research at Mathabo.Khau@mandela.ac.za	

Signed: ..... (Research Participant)

Print name: .....

Date: .....

Appendix K: Research Participant Consent Form for Student Support Staff

NELSON MANDELA UNIVERSITY

Academic Resilience of Engineering Students: A Case Study

Undertaken as part of a PhD in Education

Researchers/Investigators:

- Curwyn Mapaling, PhD Candidate, Faculty of Education, Nelson Mandela University. Curwyn.Mapaling@gmail.com
- Prof. Paul Webb, Emeritus Professor, Faculty of Education, Nelson Mandela University. Paul.Webb@mandela.ac.za
- Dr Belinda du Plooy, Senior Manager, Engagement, Nelson Mandela University. Belinda.duPlooy@mandela.ac.za

Participant Instructions:

Please read the Participant Information Sheet. If you are interested in participating in this study and have read the 13 statements below and are happy to participate, please indicate this by placing your initials next to each statement you agree with and by signing the agreement below.

Statements	**Initials**
1. I have read the Participant Information Sheet and the nature and purpose of the research study has been explained to me. I understand and voluntarily agree to participate in the study.	
2. I volunteer to participate in a semi-structured interview.	

Statements	**Initials**
3. I understand the purpose of the research study and my involvement in it.	
4. I understand that I may withdraw from the research study at any stage.	
5. I understand that information gained during the study will be published and shared with key stakeholders such as the School of Engineering and the School of Civil Engineering and the Built Environment. However, I will not be identified and my personal results and identity will remain confidential and anonymous. My identity will not be revealed in any discussion, description or scientific publications by the researchers/investigators.	
6. I understand that my participation in this study may evoke feelings of discomfort which may in turn make me feel distressed or vulnerable. Should this occur, I am aware that I can terminate the interview at any point. Furthermore, I am aware that I will have the opportunity to express my discomfort or distress at which point the situation will be contained. I will be referred for further psychological assistance if necessary.	
7. I am aware that no benefits will accrue to me in the form of remuneration as a result of my participation in this study.	
8. I understand that the findings may be used in the future for other research studies and I am happy for this to occur as long as I am not identified in the interview or in any reports or publications. In addition, I understand that my personal results and identity will remain anonymous and confidential.	
9. I understand that I will be audiotaped during the interview.	
10. I understand that data will be safely stored by the researcher, Curwyn Mapaling, in a locked security storage box in an office in the Faculty of Education on South Campus for five years and that nobody besides him will have access to it. Copies of the transcripts will be shared with the promoters: Prof. Paul Webb and Dr Belinda du Plooy, but any information that identifies me on the transcript will be removed before it is shared.	
11. No pressure was exerted on me to consent to participation and I understand that my participation is completely voluntary.	
12. I understand that participation in this study should not result in any cost to myself.	
13. I understand that I may contact the researcher or promoter(s) if I require further information about the research, and that I may contact Prof. Mathabo Khau, the Research Ethics Coordinator of the Faculty of Education, Nelson Mandela University if I wish to make a complaint relating to my involvement in the research at Mathabo.Khau@mandela.ac.za	

Signed: ..... (Research Participant)

Print name: .....

Date: .....

Appendix L: Kessler Psychological Distress Scale (K10)

These questions concern how you have been feeling over the past 30 days. Tick a box below each question that best represents how you have been .

1. During the last 30 days, about how often did you feel tired out for no good reason?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

2. During the last 30 days, about how often did you feel nervous?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

3. During the last 30 days, about how often did you feel so nervous that nothing could calm you down?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

4. During the last 30 days, about how often did you feel hopeless?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

5. During the last 30 days, about how often did you feel restless or fidgety?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

6. During the last 30 days, about how often did you feel so restless you could not sit still?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

7. During the last 30 days, about how often did you feel depressed?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

8. During the last 30 days, about how often did you feel that everything was an effort?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

9. During the last 30 days, about how often did you feel so sad that nothing could cheer you up?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

10. During the last 30 days, about how often did you feel worthless?				
1. None of the time	2. A little of the time	3. Some of the time	4. Most of the time	5. All of the time

Appendix M: DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure – Adult

Name: _____ **Age:** ____ **Sex:** ❑ **Male** ❑ **Female** **Date:**_____

If this questionnaire is completed by an informant, **what is your relationship with the individual?** _____
In a typical week, approximately how much time do you spend with the individual? _____ **hours/week**

Instructions: The questions below ask about things that might have bothered you. For each question, circle the number that best describes how much (or how often) you have been bothered by each problem during the **past TWO (2) WEEKS**.

	During the past **TWO (2) WEEKS**, how much (or how often) have you been bothered by the following problems?	**None** Not at all	**Slight** Rare, less than a day or two	**Mild** Several days	**Moderate** More than half the days	**Severe** Nearly every day	**Highest Domain Score** (clinician)
I.	1. Little interest or pleasure in doing things?	0	1	2	3	4	
	2. Feeling down, depressed, or hopeless?	0	1	2	3	4	
II.	3. Feeling more irritated, grouchy, or angry than usual?	0	1	2	3	4	
III.	4. Sleeping less than usual, but still have a lot of energy?	0	1	2	3	4	
	5. Starting lots more projects than usual or doing more risky things than usual?	0	1	2	3	4	
IV.	6. Feeling nervous, anxious, frightened, worried, or on edge?	0	1	2	3	4	
	7. Feeling panic or being frightened?	0	1	2	3	4	
	8. Avoiding situations that make you anxious?	0	1	2	3	4	
V.	9. Unexplained aches and pains (e.g., head, back, joints, abdomen, legs)?	0	1	2	3	4	
	10. Feeling that your illnesses are not being taken seriously enough?	0	1	2	3	4	
VI.	11. Thoughts of actually hurting yourself?	0	1	2	3	4	
VII.	12. Hearing things other people couldn't hear, such as voices even when no one was around?	0	1	2	3	4	
	13. Feeling that someone could hear your thoughts, or that you could hear what another person was thinking?	0	1	2	3	4	
VIII.	14. Problems with sleep that affected your sleep quality over all?	0	1	2	3	4	
IX.	15. Problems with memory (e.g., learning new information) or with location (e.g., finding your way home)?	0	1	2	3	4	
X.	16. Unpleasant thoughts, urges, or images that repeatedly enter your mind?	0	1	2	3	4	
	17. Feeling driven to perform certain behaviors or mental acts over and over again?	0	1	2	3	4	
XI.	18. Feeling detached or distant from yourself, your body, your physical surroundings, or your memories?	0	1	2	3	4	
XII.	19. Not knowing who you really are or what you want out of life?	0	1	2	3	4	
	20. Not feeling close to other people or enjoying your relationships with them?	0	1	2	3	4	
XIII.	21. Drinking at least 4 drinks of any kind of alcohol in a single day?	0	1	2	3	4	
	22. Smoking any cigarettes, a cigar, or pipe, or using snuff or chewing tobacco?	0	1	2	3	4	
	23. Using any of the following medicines ON YOUR OWN, that is, without a doctor's prescription, in greater amounts or longer than prescribed [e.g., painkillers (like Vicodin), stimulants (like Ritalin or Adderall), sedatives or tranquilizers (like sleeping pills or Valium), or drugs like marijuana, cocaine or crack, club drugs (like ecstasy), hallucinogens (like LSD), heroin, inhalants or solvents (like glue), or methamphetamine (like speed)]?	0	1	2	3	4	

Appendix N: Adult Resilience Measure-Revised (ARM-R)

ARM-R						
To what extent do the following statements apply to you? There are no right or wrong answers.		Not at all [1]	A little [2]	Somewhat [3]	Quite a bit [4]	A lot [5]
1	I get along with people around me	1	2	3	4	5
2	Getting and improving qualifications or skills is important to me	1	2	3	4	5
3	I know how to behave in different social situations (such as at work, home, or other public places)	1	2	3	4	5
4	My family is supportive towards me	1	2	3	4	5
5	My family knows a lot about me (for example, who my friends are, what I like to do)	1	2	3	4	5
6	If I am hungry, I can usually get enough food to eat	1	2	3	4	5
7	People like to spend time with me	1	2	3	4	5
8	I talk to my family/partner about how I feel (for example, when I am sad or concerned)	1	2	3	4	5
9	I feel supported by my friends	1	2	3	4	5
10	I feel that I belong in my community	1	2	3	4	5
11	My family/partner stands by me when times are hard (for example, when I am ill or in trouble)	1	2	3	4	5
12	My friends care about me when times are hard (for example, when I am ill or in trouble)	1	2	3	4	5
13	I am treated fairly in my community	1	2	3	4	5
14	I have opportunities to show others that I can act responsibly	1	2	3	4	5
15	I feel secure when I am with my family/partner	1	2	3	4	5
16	I have opportunities to apply my abilities in life (like using skills, working at a job, or caring for others)	1	2	3	4	5
17	I like my family's/partner's culture and the way my family celebrates things (like holidays or learning about my culture)	1	2	3	4	5

Appendix O: Academic Resilience Scale (ARS-30)

Please read the paragraph in the box below and do your best to imagine that **you** are in the situation being described:

> You have received your mark for a recent assignment and it is a 'fail'. The marks for two other recent assignments were also poorer than you would want as you are aiming to get as good a degree as you can because you have clear career goals in mind and don't want to disappoint your family. The feedback from the tutor for the assignment is quite critical, including reference to 'lack of understanding' and 'poor writing and expression', but it also includes ways that the work could be improved. Similar comments were made by the tutors who marked your other two assignments.

If **you** were in the situation described above how do you think **you** would react?

Read each of the statements below and **tick (✓) the box** between **1** (*strongly agree*) and **5** (*strongly disagree*) that best reflects how much you think each statement describes how **you personally** would react.

Please make sure that you give a response to **ALL** the statements and try to be as sincere and precise as possible in your answers.

		Strongly Agree 1	2	(✓) 3	4	Strongly Disagree 5
1.	I would not accept the tutors' feedback	❒	❒	❒	❒	❒
2.	I would use the feedback to improve my work	❒	❒	❒	❒	❒
3.	I would just give up	❒	❒	❒	❒	❒
4.	I would use the situation to motivate myself	❒	❒	❒	❒	❒
5.	I would change my career plans	❒	❒	❒	❒	❒
6.	I would probably get annoyed	❒	❒	❒	❒	❒
7.	I would begin to think my chances of success at university were poor	❒	❒	❒	❒	❒
8.	I would see the situation as a challenge	❒	❒	❒	❒	❒
9.	I would do my best to stop thinking negative thoughts	❒	❒	❒	❒	❒
10.	I would see the situation as temporary	❒	❒	❒	❒	❒
11.	I would work harder	❒	❒	❒	❒	❒
12.	I would probably get depressed	❒	❒	❒	❒	❒
13.	I would try to think of new solutions	❒	❒	❒	❒	❒
14.	I would be very disappointed	❒	❒	❒	❒	❒
15.	I would blame the tutor	❒	❒	❒	❒	❒

Appendix P: Semi-Structured Interview Schedule for Engineering Students

NELSON MANDELA UNIVERSITY

Educational History/Background

Prompt: There is a significant gap (in the workload and level of critical thinking required) between high school and university.

- What was the transition from high school to university like for you? / Can you describe your transition/pathway from a high school learner to an engineering student at university?
- What about yourself (your qualities, character strengths) enabled you to make the transition?
- What in the university system enabled you to transition from a high school learner to a university student? / What university resources aided you as you transitioned to higher education?
- What in the university system constrained you from transitioning from high school to university?

Risk Factors and Protective Factors

Prompt: Engineering is often referred to as a "high risk" and "high pressure" discipline.

- In your opinion, how does your experience as an engineering student differ from that of students in other disciplines?
- What are some of the challenges you have encountered as an engineering student?
- Can you share a bit about the support you received throughout your engineering studies? / What support did you make use of?

Protective/Risk Factor Relationships

- How have you experienced support within your engineering studies in relation to the challenges you experience(d)?
- How have the challenging experiences affected your desire to persist with your engineering qualification?

Resilience Process

- What has enabled your resilience up to this point?
- What has constrained your resilience up to this point?
- What in the Nelson Mandela University environment supported your academic resilience as an engineering student? / Which of the university resources (technological, support services etc.) assisted you in persisting with your studies?

Prompt: As a final-year engineering student you are months away from entering industry/into the workplace or pursuing postgraduate studies.

- Do you feel that your time as an engineering student has prepared you sufficiently to work in industry? / Do you feel that your time as an engineering student has sufficiently prepared you to pursue postgraduate studies?
- Which of your personal character strengths will you rely on the most into the future (at work/during your postgraduate studies)?
- What about the university environment has prepared you for the world of work/ postgraduate studies?
- What advice would you offer current (first and second year) and future engineering students? What do you wish you would have known sooner?

Appendix Q: Semi-Structured Interview Schedule for Engineering Lecturers

NELSON MANDELA UNIVERSITY

Educational History/Background

- Is there a shift in the type of engineering student enrolled at Nelson Mandela University since the inception of the new curriculum/programme? If so, can you explain the shift you have observed?

Risk Factor and Protective Factors

- Is there a new type of student and have you needed to change the way you lecture?
- In your opinion, what enables engineering students to persist with their studies?
- What enables engineering students to achieve better learning outcomes?
- What do you believe has constrained engineering students from persisting with their studies?

Protective/Risk Factor Relationships

- Can you think of engineering students that have demonstrated academic resilience in the context of their engineering studies?
    - What are some of the qualities which you observed in these students? / What personal resilience enablers have you observed in engineering students?
- Do you think the new curriculum has impacted the mental health of the engineering students? If so, what do you think the possible impact has been?

Resilience Process

- Which university resources did you refer engineering students to and/or notice them making use of? / What resilience enablers in the socio-ecological processes have impacted engineering students?
- How do you believe the new qualification has enabled students to attain the Engineering Council of South Africa (ECSA) graduate attributes?
- What advice would you offer current (first- and second year) and future engineering students?

Appendix R: Semi-Structured Interview Schedule for Student Support Staff

NELSON MANDELA UNIVERSITY

Educational History/Background

- What kind of support was previously offered to engineering students studying towards a National Diploma? In your opinion, is this support still relevant and needed today?
- Is there a shift in the type of engineering student enrolled at Nelson Mandela University since the inception of the new curriculum/programme? If so, can you explain the shift you have observed?
- How does the support being offered to the Bachelor of Engineering Technology students differ from that which was offered to the National Diploma students?
- How do you believe the new qualification has enabled students to realise the Engineering Council of South Africa (ECSA) graduate attributes?
- How prepared do you think the first cohort of Bachelor of Engineering Technology graduates will be for the world of work (industry) and postgraduate studies?
- Please describe the kind of support that will be provided to students who decide to pursue postgraduate studies?
- What advice would you offer current (first- and second year) and future engineering students?

Risk Factors and Protective Factors

- What kind of support do you offer current engineering students studying towards a Bachelor of Engineering Technology?
- What has your experience been like of supporting students registered for the new Bachelor of Engineering Technology curriculum?
- Do engineering students require a different kind of support? Or do you support them the same way you would support students from other academic disciplines?

Protective/Risk Factor Relationships and Resilience Process

For the few three questions you are asked to please be mindful of specific personal character strengths and university resources in your responses:

- In your opinion, what enables engineering students to persist with their studies?
- What enables engineering students to achieve better learning outcomes?
- What do you believe has constrained engineering students from persisting with their studies?
- Can you describe traits/characteristics that demonstrate academic resilience in the context of the engineering students and their studies?
- Please describe some personal resilience enablers you have observed in engineering students?
- Which university resources did you refer engineering students to? Of these, which did you notice them making use of?
- What resilience enablers in the socio-ecological processes have impacted engineering students?
- Do you think the new curriculum has impacted the mental health of the engineering students? If so, what do you think the possible impact has been?

Appendix S: Language Editor Declaration

Ella Belcher
Language Editor and Translator
611 Northside
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Member of the Professional Editors' Group
083 294 8393

DECLARATION

I hereby certify that I professionally language edited the PhD dissertation mentioned below.

The 'track changes' function was used and the candidate was responsible for accepting my changes, finalising the in-text references and the list of references, and adhering to all the technical requirements.

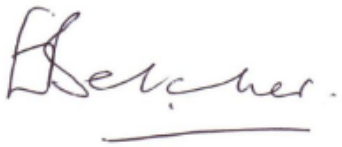
I did not see the candidate's final version that was submitted for examination.

Title of dissertation

'Academic resilience of engineering students: A case study'

Candidate

Curwyn Mapaling



ELLA BELCHER
Somerset West
14 November 2022