A Discourse Analysis of Male Engineering Students Perceptions of Gender Equality and Women Empowerment in South Africa.

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Acknowledgments

To the Lord most high who is, and who was, and who is to come, thank you for your grace and never-ending faithfulness. You do exceedingly, abundantly more than I could ever ask for or imagine. Your love endures forever. To you be the glory, my rock, my fortress and my deliverer.

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Here's to always being committed to learning.

Abstract

This research investigates the discourses surrounding gender (in)equality and women's empowerment among male students in their final year of a Bachelor of Science in Mechanical Engineering at the University of the Witwatersrand, South Africa. While previous research has explored women's underrepresentation in STEM, there is a gap in understanding how men perceive and engage with these issues in traditionally male-dominated fields. Utilising social constructionism and intersectionality as theoretical frameworks, this study examines how societal norms, power dynamics, and discourses shape men's views of women in engineering. Data was gathered through Zoom-based focus group discussions with 11 male students and analysed using Foucauldian discourse analysis. The findings reveal a range of discourses related to femininity, masculinity, historical and cultural contexts influencing men's attitudes, institutional responsibility, and governmental interventions. Participants expressed awareness of the systemic obstacles women in mechanical engineering encounter and emphasised the need for impartiality in evaluating skills. However, they also expressed ambivalence toward gender equality and women empowerment initiatives and discomfort with preferential policies for women, highlighting the tensions around men's experiences of marginalisation, as they face pressures to conform to traditional masculine ideals, which complicates their engagement with initiatives. The study underscores the role of hegemonic masculinity in maintaining exclusionary practices but also points to the potential for men to reshape these discourses and support gender equality efforts. It concludes that achieving meaningful gender equality in mechanical engineering requires structural changes in academic and professional environments, as well as critical reflection by men on their role in these efforts. Future research should examine more diverse perspectives, considering the intersections of gender, race, sexual orientation, and class, to promote a more inclusive culture within STEM fields.

Key words: discourse analysis, gendered discourse, gender equality, mechanical engineering, women empowerment.

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List of Abbreviations

ANC	-	African National Congress
Covid-19	-	Coronavirus Disease 2019
DA	-	Discourse Analysis
DHET	-	Department of Higher Education and Training
FDA	-	Foucauldian Discourse Analysis
GBV	-	Gender Based Violence
HEI	-	Higher Education Institution
OECD	-	Organisation for Economic Cooperation and Development
SA	-	South Africa
SAIMechE	-	The SA Institution of Mechanical Engineering
SAJP	-	South African Journal of Psychology
SC	-	Social Constructionism
SES	-	Socioeconomic Status
STEM	-	Science, Technology, Engineering, and Mathematics
UK	-	United Kingdom
WGDAWG	-	Working Group on Discrimination against Women and Girls

Chapter 1

Introduction

"Gender equality is the goal that will help abolish poverty that will create more equal economies, fairer societies and happier men, women and children." – Graça Machel (Plan International, 2015).

1.1 Introduction

On a global scale, there is a higher representation of men in comparison to women in roles as students, researchers, educators, and professionals within Science, Technology, Engineering, and Mathematics (STEM) fields (Stewart-Williams & Halsey, 2021). STEM is a term that is discussed frequently in this study. To provide clarity on the term "women in STEM," it is essential to explain that STEM refers to the fields of 1) Science, including disciplines like chemistry, physics, computer or physical science; 2) Technology, covering areas such as information technology, software development, or data analysis; 3) Engineering, comprising fields like mechanical, chemical, electrical, or civil engineering; and 4) Mathematics, encompassing applied mathematics, financial mathematics, or mathematical statistics (Reporter, 2016). Mechanical engineering is the selected field of engineering that this study engages with and focuses on, as it is a well-established branch of engineering in South Africa, and it has had a long-standing presence in the country. As the name implies, mechanical engineering focuses on the generation, transmission, and application of mechanical power (*SAIMechE*, n.d.). The focus of mechanical engineering is on the design, operation, development, maintenance, and construction of machinery, equipment, and mechanical systems, including but not limited to automobiles, escalators, or any object incorporating moving components (Reporter, 2016). Mechanical engineers play a key role in designing and constructing a wide range of power-driven machines as they are involved in every stage of a machine's development, from creating prototypes to overseeing the installation of the final product and training the operators who will use it (*A Career in Mechanical Engineering*, n.d.). In South Africa, aspiring mechanical engineers generally need to achieve a matriculation exemption, with strong performance in both mathematics and physical science at the higher grade level (SAIMechE, n.d.). They are also required to complete a four-year degree in the discipline of mechanical engineering. This is one of the broadest STEM fields as mechanical engineers can work in different industries including design, research and development, and

production. Given the abovementioned description, the purpose and significance of mechanical engineers in South Africa is quite evident.

1.2 Background of the Study

Globally, researchers have investigated the factors behind women's underrepresentation in engineering and assessed the success or shortcomings of initiatives aimed at addressing this imbalance (Meiksins & Layne, 2022). There is a broad spectrum of objectives for the advancement of gender equality and women's empowerment, such as enhancing women's political involvement and representation, expanding educational and employment opportunities, securing ownership of assets, safeguarding reproductive and sexual autonomy, achieving income parity, improving resource availability, and promoting equitable labour distribution (Kaur, 2010). Initiatives, legislations, and programmes which have been implemented to promote gender equality and women empowerment are discussed further in the literature review of this study. Further investigation into this topic is imperative as there are many existing questions which are important. For instance, are the existing gender gaps possibly rooted in socialisation within the home, where young women are conditioned to perceive certain domains as either accessible or inaccessible based on their gender? Alternatively, do men find themselves in a conflicted stance, seemingly supportive of gender-related policies in principle but resistant to putting them into practice? While many crucial questions remain unanswered, some understanding has been garnered on the matter (Meiksins & Layne, 2022). Gender disparity is defined as "differences in women and men's access to resources, status and well-being, which usually favour men and are often institutionalised through law, justice and social norms" (*European Institute for Gender Equality*, 2024). The predominant explanations commonly cited for the gender disparities in engineering are discrimination and socialisation, with policy recommendations primarily being aimed at addressing these perceived root causes (Meiksins & Layne, 2022).

Mechanical engineering is a male-dominated profession. Male-dominated professions are characterised by "organisational structures and practices that reinforce traditional gender hierarchies within the professional workplace" (Martin & Barnard, 2013). The masculine culture in engineering may exacerbate the challenge for women to integrate into the profession and feel as though they belong. The Society of Women Engineers carried out a review of literature on an expanding research area focused on intersectionality, specifically examining how factors such as race, sexual orientation, and ethnicity affect a woman's experience in engineering; it also highlighted the unique challenges faced by female engineers with

disabilities (Meiksins & Layne, 2022). There are unique challenges encountered by female students who face "double binds," where they often refute stereotypes tied to their racial/ethnic background, gender, or sexual orientation, while simultaneously justifying their place within the engineering community (Cross et al., 2021).

Gender stereotypes play a key role in explaining why women in male-dominated professions may experience persistent pressure to prove themselves to male colleagues or experience challenges assimilating into the engineering culture; as a result, some women may respond by conforming to the masculine culture, aligning themselves with male colleagues and minimising the effect of sexism, and essentially identifying with the masculine identity associated with male-dominated occupations rather than challenging it (Cardador et al., 2021). Failing to assimilate into the culture poses the risk of women not receiving equal recognition and rewards in comparison to men (Cardador et al., 2021). The abovementioned factors have informed the decision to take men's position into consideration in this study, as their cooperation in gender equality and women empowerment is important for meaningful progress and transformation to take place.

A great deal of evidence suggests that discrimination and socialisation only paint a portion of the full picture (Stewart-Williams & Halsey, 2021). Additional elements contributing to women's underrepresentation include a lack of awareness regarding the potential opportunities within mechanical engineering and insight into how it could serve as a viable career path. A potential approach to challenge the cultural link between engineering and masculinity could involve reshaping the perception of engineering in a way that resonates more with women (Meiksins & Layne, 2022). The influence of gender stereotypes goes beyond professional settings and can permeate the household, particularly through parental influence, for example, men may often be portrayed as professionals in science, whether explicitly mentioned or not, while women are more commonly depicted as teachers (Brijbans, 2015). Women in male-dominated disciplines also experience challenges such as the imposter syndrome, sexual harassment, male-leader bias, and pressure to distance themselves from other women in the field due to competition, or because of the expectation to conform to a masculine culture (Pillay & Vermeulen, 2023). As stated by Onojobi (2015), unity among women is crucial in combatting male hegemony, however, challenges arise when senior women in mechanical engineering do not show solidarity or actively support women entering the field. This subsequently hinders unity between and among women and ultimately contributes to a lack of mentoring and support to assist in strengthening women's engineering identities (Pillay & Vermeulen, 2023).

These challenges and gender disparities continue to exist in both the developed and developing world. When looking at global statistics, the 2023 Global Gender Gap Index noted that no country has attained total gender equality thus far; nevertheless, the top nine countries including Iceland, Norway, Finland, New Zealand, Sweden, Germany, Nicaragua, Namibia, and Lithuania, have narrowed their gender gaps to approximately 80% (*World Economic Forum*, 2022). The Democratic Republic of the Congo, Mali, and Chad on the other hand, rank as the lowest-performing countries, with scores falling below 62% (*World Economic Forum*, 2022). Over the last twenty years, research has noted that the percentage of women obtaining bachelor's degrees in various disciplines has remained relatively consistent. For instance, in mechanical engineering, women accounted for 37% of bachelor's degrees, with a slight increase from 14% in 2002 to 16.5% in 2020 (Meiksins & Layne, 2022). Meanwhile, the percentage of women holding faculty positions in engineering have doubled from 9.25% in 2002 to 18.5% in 2021, indicating considerable progress (Meiksins & Layne, 2022). However, certain disciplines, like mechanical and electrical engineering, exhibit lower percentages of female faculty (around 15%), whereas others such as chemical, civil, and biomedical engineering have higher percentages (over 20%) (Meiksins & Layne, 2022). Additionally, the percentage of female faculty declines as rank increases, with merely 13.6% of full professors and 25.4% of assistant professors being women in 2020 (Meiksins & Layne, 2022). Although the percentage of women employed in engineering has steadily increased over the past 25 years, reaching about 14% in 2019, the growth rate remains slow, and women's representation in engineering employment still lags their representation in engineering degrees (Meiksins & Layne, 2022).

Gender gaps remain apparent overall, and South Africa is no exception. Namibia, Rwanda, and South Africa, along with thirteen other countries in Sub-Saharan Africa have managed to close approximately 70% of the overall gender gap (*World Economic Forum, 2022*). Given the present pace of advancement, it is estimated that it may require 102 years to eliminate the gender gap in Sub-Saharan Africa (*World Economic Forum, 2022*). The lack of female representation in STEM fields in South Africa can be linked to the historical impact of colonialism and the Apartheid period (Abe & Chikoko, 2020; Idahosa & Mkhize, 2021). Throughout Apartheid, Black people were deprived of access to high quality education and equitable employment opportunities (Christie & Collins, 1982). For example, education opportunities for White students were tailored to prepare them for near-exclusive access to, occupancy of, and dominance in high-status employment opportunities, while the education given to Black students confined them to low-wage employment (Otu & Mkhize, 2018). Black

women were the group most impacted, facing systematic barriers to enrolment and participation in STEM programs or occupations (Sikhosana et al., 2023). Consequently, STEM fields in South Africa continue to be predominantly male dominated, characterised by instances of racism and discrimination, which underscore the enduring legacy of apartheid (Sikhosana et al., 2023).

1.3 Rationale

Women in STEM undoubtedly contribute significantly to the advancement of countries all over the world, including advancing the boundaries of gender equality (Mukhwana et al., 2020). Many women have made notable contributions in the STEM fields and their efforts have been needed to inspire younger generations of women to consider entering these fields (Fomunyam, 2020). In countries with standardised science and mathematics test data, it has been noted that girls in school often achieve results comparable to or exceeding those of boys, in science and mathematics subjects; and at the tertiary level globally, women typically outnumber men in university enrolment and achieve higher graduation rates (Hammond et al., 2020). Furthermore, research has shown that women in STEM-related occupations often earn higher salaries compared to their counterparts in non-STEM fields across multiple sectors (Jiang, 2021). In essence, some women and girls experience educational and career success within STEM fields. This should leave us pondering about the reasons behind the lower persistence of women compared to men in the engineering field and what factors contribute to women remaining substantially under-represented in STEM (Mukhwana et al., 2020).

The proportion of female STEM graduates transitioning into STEM careers is rising with every new cohort. However, data regarding the incorporation of STEM university graduates into the workforce reveals to us that there is a decrease in the retention of women in STEM following graduation (*World Economic Forum*, 2022). Consequently, it is essential for this research to recognise that there are multifaceted barriers that exist for women who are both in STEM and aspiring to be in STEM. According to Brijbans (2015), some of the significant challenges that hinder the career progress of women in STEM include struggles to integrate into male-dominated networks, a lack of sufficient mentors for career guidance, and inadequate organisational support in balancing professional and family responsibilities. Institutionalised gender barriers, such as work organisations being structured in such a way that disproportionately benefits men, white people, and other systemically advantaged groups also pose as a challenge; in addition to intersectional systemic barriers which exist for previously

disadvantaged groups, namely black and brown women (Bird & Rhoton, 2021). Despite progress being made to increase women's participation, including initiatives like gender-transformative programmes, policies, and legislation, women still make up a small portion of the global workforce in STEM (Mukhwana et al., 2020).

Part of what is missing in the literature on this topic is men's perceptions of women in STEM-related fields. Men form part of the systematically advantaged group whose careers have been enhanced by systemic gender inequality, while their female counterparts have been limited by the very same system. There are strands of evidence which point to how preconceived notions and prejudices affect the disparities in gender representation within STEM. For instance, beliefs that men are more qualified to be mechanical engineers than women persist in segments of society, particularly in countries where such beliefs are reinforced by cultural norms (Nthongoa, 2019). Historically, men have held a predominant influence in academic institutions and the STEM workplace, thus shaping and reinforcing the rules and belief systems which make up today's culture (Mhlanga, 2013). It is therefore important to consider that the present struggle for gender equality and women empowerment in STEM fields is the result of a deeply rooted patriarchal culture that has endured, adapted, and persisted into the present (Mhlanga, 2013).

Gender equality and women empowerment are not exclusively concerns for women; rather, they are societal issues that demand the involvement and support of all individuals, men included. In STEM fields, black South African women, continue to face inadequate representation and marginalisation. There are systemic structures of racism and sexism which persist and contribute to the reinforcement of inequalities within the education system, particularly towards those with intersecting identities (Appelhans et al., 2019). White males have maintained a position of dominance in STEM and can therefore use this power and privilege to help foster more collaboration, inclusivity, fairness and diversity (Clarke & Mondisa, 2023). Since this study is interested in male mechanical engineering student's perceptions of gender equality and women empowerment at the tertiary education level, it is imperative that we include men's viewpoints on these topics. Their involvement is essential in challenging stereotypes, the structures, beliefs, practices, and institutions that historically upheld male privilege and dominance over women in the field (OECD, 2021).

The university experience for young women in engineering is that of a feeling of pride and accomplishment, coupled with a sense of being outsiders in the workspaces on campus on the other, despite their legitimate status as students (Bradbury & Kiguwa, 2012). Ultimately, actions are needed to narrow the disparity between genders in engineering and eliminating

gender discrimination in STEM fields would require both men and women to work together to bring about social change, promote inclusive spaces, offer equal recognition, awareness, and provide more opportunities for women (Brijbans, 2015).

1.4 Research Aims

This research explored the discourses that emerged in discussions about gender (in)equality and women's empowerment among young South African men in a university context. The research specifically focused on male students who were enrolled in their final year of a Bachelor of Science qualification in the typically male-dominated field of mechanical engineering. The aim was to explore their subjective perceptions on issues regarding gender equality and women empowerment within the field. Feldman (1999) defines 'perception' as a "constructive process by which we go beyond the stimuli that are presented to us and attempt to construct a meaningful situation" (p. 126). Since what was of interest for this study were gender perceptions, what was primarily explored were the ideas related to the social expectations of behaviours, attitudes and duties that are typically deemed suitable, appropriate, or preferable for each gender (Thasniya, 2020). This was done to capture participants' views on their female counterparts to highlight any cultural/societal norms, stereotypes, biases, or resistances that they could be holding on to, and thus inadvertently perpetuating. The study takes an interest in Foucauldian study of power relations, which is covered in detail in the methodology and data analysis chapters. It essentially dives into the power relations involved in being in the position of a male mechanical engineering student and which types of behaviours and experiences align with this stance.

1.5 Objectives

1) To explore how male mechanical engineering students construct gender equality and women empowerment.
2) To identify the prominent discourses that male engineering students draw upon and deploy in discussing their female counterparts' positioning within their field.

1.6 Chapter Organisation

This thesis is presented in five chapters. Chapter 1 introduces the study, gives an overview of the study, and situates it within its broader context. The aims, research questions and background information relevant to the study have been discussed.

Chapter 2 primarily focuses on reviewing pertinent literature. The chapter opens with a discussion of the theoretical frameworks underpinning this study, namely social constructionism and intersectionality. The chapter moves on to discussing the legislative and affirmative action measures that have been implemented for the promotion of gender equality and women's empowerment in South Africa. This provides essential contextual background on gender equality and women empowerment in the country. The chapter proceeds to delve into discussions on masculinity and femininity, where prevailing norms and stereotypes surrounding gender identities are explored. Cultural and societal perceptions of gender roles are also explored. Thereafter, the chapter investigates the historical context and experiences of women in STEM disciplines, illuminating the difficulties and obstacles they face within these male-dominated domains. Finally, the chapter discusses men's perceptions of gender equality and women empowerment, aiming to emphasise the significance of men's participation in discussions surrounding the topic at hand, and gain insight on how men perceive and engage with these issues.

Chapter 3 examines the research methods utilised in the study and encompasses information on the research design, the research aims and questions, along with an outline of the methodological approach employed. Additionally, the chapter discusses the participant selection process, outlines the data collection procedures, and addresses reflexive and ethical considerations.

In Chapter 4, the findings of the research are presented, as well as a comprehensive discussion of the findings which emerged. The analysis is structured according to Carla Willig's six-stage Foucauldian Discourse Analysis process. The analysis, findings and discussion components are all presented together seamlessly to maintain flow and coherence throughout the chapter.

Chapter 5 gives a synopsis of the key findings in the previous chapter, discusses the limitations of the study and suggests potential avenues for future research. Finally, a summary of the study's overall conclusions is presented.

Chapter 2

Literature Review

2.1 Introduction

This chapter presents an examination of pertinent literature related to the current research investigation. Here, the researcher explores an intricate web of topics that constitute the landscape of gender equality and women's empowerment in South Africa. This chapter opens with a brief overview focused on the theoretical framework underpinning this study, namely the prominent theories of social constructionism and intersectionality. This chapter attempts to enable a broader comprehension of the ways in which societal norms, gender roles, power structures, and discourses shape the lived experiences of individuals, namely male mechanical engineering students in a university context.

Furthermore, the chapter discusses the legislative steps taken to advance women's rights and affirmative action policies that have been put in place in South Africa to address historical inequalities and promote gender equality in the country. This chapter then delves into the evolving notions of masculinity and femininity and explains them in accordance with various interpretations by scholars. Thereafter, women's participation in Science, Technology, Engineering, and Mathematics (STEM) disciplines is explored as it is a critical dimension of this review. I consider the challenges and opportunities that women encounter as they navigate these traditionally male-dominated fields, shedding light on the progress made and the barriers that persist.

Lastly, this literature review considers a crucial perspective which is often overlooked in discussions of gender equality and women empowerment: men's perceptions and attitudes. As we commence on this fruitful exploration through the literature, it becomes clear that achieving gender equality and women empowerment is not a simple endeavour, but rather a complex interplay of policies, institutions, ideas, and individual beliefs. This review seeks to offer perspectives that can guide future research, and advocacy initiatives in the ongoing quest for gender equality and women's empowerment in South Africa and beyond.

2.2 Theoretical Framework

The theoretical framework supporting this research is derived from two prominent and complementary theories, namely social constructionism and intersectionality. This section begins by introducing social constructionism and intersectionality as they relate to this study.

The study uses the social constructionism paradigm to take the use of language and dimensions of social interaction that go on beyond words into consideration (Burr, 2015). Social constructionism (SC) allows us to explore how individuals construct multiple realities based on their unique combinations of social identities (such as race, gender, class and ethnicity) in socio-cultural and political contexts (Burr, 2015). SC acknowledges the significance of individuals' societal, cultural, and historical contexts, along with language or discourse in the formation of knowledge (Brunton et al., 2018). Furthermore, it sheds light on how societies have adjusted to characterising things according to their own cultures, so much so that everyone usually thinks that their descriptions or their knowledge are accurate renditions of "the truth" (Visser & Moleko, 2012).

Intersectionality adds to this understanding by exploring how social categories are constructed and portrayed in popular culture, and how this process can marginalise individuals who occupy specific intersectional positions (Else-Quest & Hyde, 2016). It acknowledges that various elements of an individual's identity are influenced by the simultaneous interaction of multiple social classifications, such as gender, ethnicity, class, race, and sexual orientation (Else-Quest & Hyde, 2016). These classifications are interconnected, meaning that the experience of one classification is influenced by the others (Else-Quest & Hyde, 2016). Intersectionality underscores the significance of recognising the inequalities and power dynamics embedded within societal structures, as these interconnected categories can profoundly impact how individuals are treated (Else-Quest & Hyde, 2016). Each of these perspectives is explored here in more depth, culminating in an exploration of how being employed together, they can enhance an interpretation of the findings of this research.

2.2.1. The Central Tenets of Social Constructionism

In SC, multiple truths exist because this theory asserts that our knowledge and comprehension are neither fixed nor conclusive but are rather shaped by 'discourses' that frequently mirror the beliefs of dominant groups in society, thereby marginalising those who are less dominant (Burr & Dick, 2017). From this perspective, all forms of classification and categorisation such as the terms 'masculine' and 'feminine', are products of social construction. This in turn suggests that behaviour that is deemed to be 'correct' for men and women depends on both the culture and era that shaped and maintained them (Visser & Moleko, 2012). Meanings do not precede experiences or discourses, so one of the ways that meanings and knowledge are upheld is through discourse. SC differs from psychodynamic perspectives in its emphasis on the continuous influence of practices and narratives on life and identity formation,

rather than on delving into internal psychological processes (Wetherell, 1996). Less emphasis is placed on the individual, and more towards analysing discourse patterns and the collective voices (whether scientific or otherwise) that contribute to shaping the internal dialogues within an individual's psyche (Kilroe, 2010). There is therefore an understanding that the discussions taking place in this study were socially and discursively constructed.

The study by Kilroe (2010) was anchored in SC, with the researcher drawing upon the premise by Gergen (1985) that understanding does not arise innately or through nature, but rather through active and cooperative processes within relationships. The significance of considering history and culture was emphasised to grasp the diverse ways in which the world is constructed (Kilroe, 2010). An exploratory study conducted by Smuts et al. (2015) also made use of the SC perspective as it aimed to examine the degree to which university students are inclined to possess heteronormative and conventional gender perspectives. The study by Smuts et al. (2015) resonates with this study as it dove into the social world of university students in South Africa to understand the socio-culturally constructed meaning of their experiences. It furthermore highlights a need to comprehend how students perceive gender and sexuality, and how their discourses may either support or challenge existing gender norms and inequalities. The researchers remained cognisant of discourse and viewed it as a tool for understanding the construction and perpetuation of social realities (Smuts et al., 2015). Data from the study was obtained through a quantitative survey from undergraduate students in an urban university in South Africa. The researchers found that a student's field of study was an important factor in determining their views on sexual and gendered norms. Students from the Humanities and Arts faculties notably provided more liberal responses, while students from faculties such as Business and Engineering tended to be more patriarchal in their thinking (Smuts et al., 2015). Furthermore, the results of the research indicated that students' views were primarily shaped by their religious beliefs and upbringing within their families, which highlights the need for consideration of the social, moral, political, and economic institutions that uphold and align with prevailing assumptions about human behaviour (Gergen, 1985).

From this epistemic perspective, we observe how individuals are relational beings who continuously generate evolving meanings through interaction with others (Gubrium & Koro-Ljungberg, 2005). We also observe how language functions as the medium by which we perceive and comprehend the world (Edley, 2001). The utilisation of language to address and shape matters of gender plays a pivotal role in constructing gender norms and identities (Smuts et al., 2015). SC is however, not exempt from criticism. Critics argue that SC approaches focus solely on the surface-level meanings of actions or texts, focusing on aspects like observing

patterns or categories, and overlooking crucial dimensions of reality (Khan & MacEachen, 2021). It can therefore be argued that most SC accounts provide a restricted perspective or scope of human experience. In the context of qualitative interviews for instance, Gubrium and Koro-Ljungberg (2005) contend that interactions between interviewers and participants lead to the production of "constructions" which uphold specific trends of social actions or practices, while omitting others. This process of inclusion and exclusion is perpetuated within the framework of social constructionism (Gubrium & Koro-Ljungberg, 2005). Another major criticism suggests that SC endeavours to deny science the capacity and authority to determine truth (Kamhuka, 2023). Burr (2015) is among those who argue that SC is reductionist because it reduces all phenomena to discourse. This overlooks elements that cannot be articulated or depicted with language and renders them insignificant (Burr, 2015). Additionally, the theory does produce some uncertainty as it assigns equal value to various forms of knowledge (Gergen, 2015). This works against the establishment of a hierarchical framework, as there are no definitive criteria for evaluation (Gergen, 2015). This current study takes the abovementioned into consideration. However, like any theory, social constructionism has demonstrated its capacity to evolve and expand its arguments. As such, it acknowledges the existence of events and objects (Kamhuka, 2023).

Burr (2015) states that SC still holds value and remains compelling in qualitative data analysis due to its critical perspective toward taken-for-granted knowledge. SC enables us to shift our understanding by questioning commonly held beliefs and suggesting that supposed objective truths are neither universally knowable nor inevitable (Burr, 2015). It emphasises that our comprehension of reality is influenced by historical and cultural contexts, asserting that knowledge is formed and maintained through social exchanges where knowledge and social behaviour are interconnected (Burr, 2015). Thus, SC approaches are centred on how we interpret our daily experiences and create knowledge within the context of symbols and societal structures (Burr, 2015). The use of SC in this study supports the rationale for selecting male mechanical engineering students as participants. SC highlights the connection between power dynamics and the production of knowledge, and therefore acknowledges the influence that dominant groups have in shaping the narratives surrounding gender, both within the field of STEM and more broadly. This does not imply that the discourse of dominant groups always prevails, as discourse is just one of several social practices through which SC occurs (Kilroe, 2010). The framework's postmodernist perspective highlights the ever-changing and flexible nature of interpretations across social, cultural, and linguistic contexts (Gergen, 1985).

2.2.2. An Intersectional Lens

Intersectionality, a term introduced by Kimberlé Crenshaw, expands upon the principles of social constructionism by emphasising the intertwined nature of social identities and the distinct lived experiences of individuals who occupy multiple marginalised positions (Crenshaw, 1991). This framework delves into the connections between various dimensions of social interactions and the formation of individual subjectivities (Treloar, 2014). Essentially, intersectionality posits that social categories are interconnected and do not operate in isolation from one another (Bruning et al., 2015). The theory aims to explain how these different facets of identity intersect within society (Bruning et al., 2015). Intersectionality originated from Black women within the feminist movements of the 1980s, which is important to note, as the concept was introduced to counter the notable absence of representation of Black women in the creation of knowledge and academic spaces at that time (Jones, 2022). Black women's perspectives in much of the discourse at that time were generally left out. Intersectionality recognises the multifaceted nature of identity, encompassing multiple forms of oppression, such as being queer or a woman, but also forms of dominance, such as whiteness or being a man (Marutlulle, 2020).

Research by Crenshaw (1991) states that the prevailing narrow perspectives and interpretations of women's identities at the time that intersectionality was constructed often overlooked the significant impact of race and ethnicity on women's subjective experiences. Hence, intersectionality was constructed to address the realities of experiencing various forms of subjugation, particularly those faced by individuals such as Black women (Crenshaw, 1991). Intersectionality essentially emerged in response to the shortcomings of gender and race-focused research, which failed to adequately consider the lived experiences at neglected points of intersection (Crenshaw, 1991). This approach has enriched our understanding by avoiding the tendency to isolate and prioritise one system of oppression over others (Carastathis, 2014). Instead, it acknowledges the different contexts and complexities in which individuals exist and provides a new way of conceptualising how multiple systems of oppression intersect to influence our diverse identities, and our positions within hierarchies of privilege and power (Carastathis, 2014).

An intersectional theoretical framework proves to be particularly valuable for comprehending the factors which influence the likelihood of young women from diverse social backgrounds pursuing or committing to engineering, and ultimately establishing a career in this field (Bruning et al., 2015). Only a few researchers have employed intersectionality as a framework for examining gender and its intersections with other forms of diversity in

engineering. However, Bruning et al. (2015) implemented intersectionality as a lens to comprehend the varied dedication of young women to the field of engineering in their study and contended that there are academically gifted women who possess considerable potential, much of which remains unrecognised or disregarded in the discipline of engineering. Bruning et al. (2015) considered the impact of socioeconomic status on young women, which is a factor that exacerbates gender disparities, as low-income girls interested in maths and science often attend under-resourced schools lacking essential resources, thus making it challenging for them to compete with better-prepared peers (Matón et al., 2000).

Race and ethnicity serve as additional factors that contribute to differentiation. Research suggests that white and middle-class educators often hold higher expectations for white girls in comparison to black girls, assigning tasks to white girls that promote academic development while assigning tasks to black girls that emphasise social maturity and caregiving skills (Brickhouse et al., 2000). On the other hand, it was noted that young Black women interested in STEM often receive strong support from their families (Bruning et al., 2015). It is apparent that despite intentional efforts made towards inclusion, women still cannot afford to overlook aspects of their identities in various spaces. Bedolla (2007) elaborates on this thought in a discussion of intersectionality at both micro and macro scales. She suggests that at the micro level, individual identity is composed of multiple social categories and can include both marginalisation and privilege simultaneously (Bedolla, 2007). People perceive these diverse categories in relation to one another, and their self-identifications are influenced by these relationships (Bedolla, 2007). At the macro level, scholars studying intersections contextualise individual experiences within broader historical and structural frameworks by situating them within existing systems of power and oppression (Bedolla, 2007). It is simply a presumption that every woman shares identical experiences of discrimination and gender solely because they are women (Kiguwa, 2004). By drawing on intersectionality, the current research was able to gain deeper insights into the mutual shaping of identities and the mechanisms by which societal customs and systems establish, arrange, and perpetuate hierarchies of disparities (Bedolla, 2007).

2.2.3. Integrating Social Constructionism and Intersectionality

This study recognises the presence of diverse initiatives aimed at fostering inclusivity. Yet, despite these efforts, the continued low enrolment of women in STEM courses highlights fundamental aspects of women's experiences within these institutions that are not adequately addressed to effectively encourage their participation in these fields. This is where the

importance of comprehending people through the lens of intersectionality is beneficial. The aim is to better understand individuals' experiences in academic environments, especially regarding their sense of belonging, as students frequently find themselves in positions that cannot be easily categorised (Veldman et al., 2019). It would therefore be insightful to engage in a discussion about the reasons why women in engineering might experience feelings of alienation within their specific context. For example, women engineers may feel a sense of not completely fitting into the masculine culture prevalent in the field, primarily because the space was not originally designed to accommodate them (Bourdieu, 1998). The study by Ramafalo (2023) on belonging explored the experiences of black female scholars in STEM disciplines, aiming to comprehend how these women, shaped by their overlapping identities, manoeuvre through the predominantly white and masculine landscape of the science academic field (Ramafalo, 2023). The study recognised that while women do occupy these spaces and contribute to inclusion efforts, they also face exclusion within masculine disciplines and are constrained by the lingering effects of apartheid-era racism, and patriarchy (Ramafalo, 2023). The results of the research underscored the importance of supportive families that value education, serving as a safeguarding element for the women (Ramafalo, 2023). Additionally, it highlighted the significant impact of having access to better education resources.

Every discipline has its own set of norms and practices, upheld by both individuals and institutions, which dictate what is considered permissible within that field (Beames & Telford, 2013). Nevertheless, societal developments external to the field, such as urbanisation, progress in technology, and the increasing presence of women in the workforce, have the capacity to reshape established power structures and, consequently, influence the overarching framework of the field (Husu, 2013). In this current study, intersectionality is applied as an analytical tool to conceptualise oppression and discrimination as they pertain to women in the field of mechanical engineering, whose underrepresentation is at the core of this research (Marutlulle, 2020). Recognising the social structures that privilege certain groups (e.g. men in engineering) while disadvantaging others (e.g. women in engineering), as well as acknowledging how various identities intersect within individuals' lived experiences of privilege and oppression (e.g. being a black male encountering discrimination in the field, or being a white woman in engineering facing discrimination, yet to a lesser extent than women of colour in the field) (Marutlulle, 2020). By incorporating both social constructionism and intersectionality, this study embraces a framework that acknowledges the identity categories shaped by social constructs, while also recognising the distinct experiences of people who navigate intersecting identities.

2.3 Legislation and Affirmative Action for South African Women

South Africa's history of gender inequality is deeply embedded in its socio-political context. Since the end of apartheid in 1994, legislative measures and affirmative action policies have been instrumental in tackling these disparities. The country's legislative landscape underwent significant changes, ushering in reforms aimed at rectifying the systemic inequalities and injustices that had persisted for decades (Wittmann, 2012). Affirmative action policies were introduced to mitigate disparities in education, employment, and representation, with a particular focus on marginalised groups, especially women.

2.3.1. Key Legislative Frameworks Addressing Gender Equality

South Africa's constitution is notably progressive, and leaders like Thabo Mbeki and the late Nelson Mandela actively encouraged South Africans to participate in economic transformation and the empowerment of women; Mandela asserted that: “Freedom cannot be achieved unless women have been emancipated from all forms of oppression” (Hills, 2015). As such, numerous initiatives have been implemented and are ongoing to ensure the complete integration and empowerment of women, enabling their equal participation in all facets of society alongside their peers (Hills, 2015). South Africa has enacted several key legislations, regulations, policies, and best practice guidelines, including the Higher Education Act 101 of 1997, the Employment Equity Act 55 of 1998, the Broad-Based Black Economic Empowerment Act 52 of 2003, the Basic Conditions of Employment Act 75 of 1997, the Republic of South Africa Constitution Act 108 of 1996, and the Labour Relations Act 66 of 1995 (Engineering Council of South Africa, 2022).

Additionally, laws favouring positive discrimination for women, such as the Recognition of Customary Marriages Act of 1998 and the Choice on Termination of Pregnancy Act of 1996, have been adopted (Wittmann, 2012). Appendix A provides a comprehensive table summarising significant legislation enacted in South Africa since the democratic elections in 1994 aimed at empowering women. Despite the development of diverse policies and initiatives to enhance women’s involvement in STEM disciplines, many countries still grapple with issues of gender disparity and women's underrepresentation in these areas (Ro et al., 2021). Researchers have analysed the South African government's efforts to tackle gender disparities through affirmative action and legislative measures.

2.3.2. Affirmative Action Policies and Their Effectiveness for Women

Wittman's (2012) study found that while affirmative action policies have been established and implemented, they have been less effective in addressing the specific challenges faced by women. It is essential to focus on the unique experiences of women, as they often encounter compounded obstacles around gender and the combined effects of other social factors such as race, class, or sexual orientation (Kiguwa, 2004). They contended that existing social and cultural conditions perpetuate women's marginalisation. The paper examined several legislative measures, such as the Basic Conditions of Employment Act, which establishes minimum workplace standards applicable to all workers, irrespective of gender (Wittmann, 2012). However, this act falls short in effectively addressing or eliminating discrimination against women (Wittmann, 2012). A major obstacle is the entrenched male-dominated culture in STEM fields, which is deeply rooted in broader social norms that the act does not effectively challenge (Wittmann, 2012). Here, the Employment Equity Act becomes relevant, as it targets areas of discrimination including gender, compelling employers to adopt new employment practices to better integrate previously excluded groups, such as women, into the workforce (Wittmann, 2012). However, this act has yet to significantly influence employment practices because many women may not be well-informed about these various legislative measures, highlighting the necessity of raising awareness about the opportunities available to women (Wittmann, 2012).

This sentiment is echoed in another study by Akala (2018), which contends that the political discourse on equality has not consistently resulted in tangible improvements in practice. Despite the presence of current policies and legislation aimed at addressing gender and broader forms of discrimination in South Africa, numerous factors persistently perpetuate gender inequality and obstruct transformation (Akala, 2018). The study argues that it is crucial to thoroughly examine the definitions and outcomes of terms like "equal opportunities" and "equal access" in policies, especially when targeting specific groups, as there are cultural norms and social institutions, among other influences, which continue to reinforce male dominance and perpetuate the perception of female inferiority (Akala, 2018). While educational institutions have made strides in addressing some gender disparities, systemic gender discrimination remains ingrained within their frameworks (Akala, 2018). Akala (2018) posits that gender, and its dynamics are intricate and multifaceted, suggesting that a uniform approach to designing interventions to address gender equality does not automatically ensure gender parity. The study advocates for a multifaceted strategy, emphasising a realistic and comprehensive perspective on the diverse needs of Black women specifically, and women in general, as a potential solution to the prevailing challenges (Akala, 2018).

2.3.3. Intersectionality and Gender Representation

Research by Mlambo (2017) highlights the significant underrepresentation of Black African women in engineering, especially within academic staff roles, noting that the engineering faculty is particularly dominated by men. Although Black African women do enrol in and graduate with undergraduate and postgraduate engineering qualifications, their representation in the workspace remains low (Mlambo, 2017). According to the Engineering Council of South Africa (2019), women currently constitute under 7% of all registered professional engineers currently, and approximately 24% of candidate engineers undergoing training. Mlambo (2017) suggests that this disparity could potentially discourage other women from entering the profession, thereby impeding the progress and transformation needed for engineering to better reflect the diversity of the South African population.

Women contribute significantly to knowledge production globally. Therefore, the limited presence of women in workplaces and within the South African professoriate is concerning, because it indicates that crucial narratives of women's experiences in these spaces are not adequately highlighted or addressed. Adams and Mahomed (2018) examined policy developments in South Africa and emphasised the necessity of redefining how women are conceptualised and assessed within policies. They contended that existing policies often overlook the underlying structural causes of gender inequality from a gender-aware standpoint (Adams & Mahomed, 2018). They advocated for discontinuing the portrayal of women solely as a "vulnerable group" and instead emphasised the importance of viewing women as a socially disadvantaged and diverse group that requires empowerment through the creation of multiple and varied opportunities (Adams & Mahomed, 2018).

2.3.4. Legislation Supporting Equality in Education

It is also crucial to investigate literature around the educational experiences of South African women, which have been shaped by the country's history of racial segregation and discrimination. Prior to 1994, the education sector for black South Africans was regulated by the Bantu Education Act of 1953. The Act was implemented during the era of institutionalised apartheid in 1942, with racial division as its foundational premise, and it reflected the National Party's concern that black individuals were adopting white cultural norms and assimilating into the dominant society (McConkey, 1972). It is crucial to highlight that disparities in education were evident across all educational levels. Under mounting political pressure, traditionally advantaged white English-medium universities began to consider admitting students who had previously been excluded from gaining entry to these institutions (Cross & Carpentier, 2009).

Following the conclusion of apartheid in 1994, significant reforms in the education system aimed to unify the previously divided system and address the discriminatory practices of apartheid education (Mlambo, 2017). Institutions in South Africa started shifting their policies and practices away from the racist and misogynistic standards that persisted during apartheid. This shift was facilitated by laws like the Higher Education Act of 1997 and the White Paper 1 of 1995. For instance, Section 37 of the Higher Education Act of 1997 mandates that “in their admissions policies, all South African universities are required to comply with appropriate measures for the redress of past inequalities, but they may not unfairly discriminate in any way” (Republic of South Africa, 1997). It is through this legislation that universities now admit students from diverse backgrounds. The African National Congress implemented the White Paper 1 of 1995 and the equity clause as measures to help higher education institutes combat sexism and racism (Akala & Divala, 2016).

2.3.5. Evaluating the Effectiveness of Legislation and Affirmative Action Policies

The Employment Equity Act No. 55 of 1998 along with the Broad-Based Black Economic Empowerment Act No. 52 of 2003 enable preferential treatment for historically marginalised communities, such as black people and women (Ramafalo, 2023). However, despite these policies, faculty members in higher education establishments, particularly in the faculty of engineering, do not adequately reflect the country's demographic realities (Ro et al., 2021). This is concerning because studies have shown that key factors for retaining women in STEM fields include curricula and teaching that is sensitive to cultural contexts, mentorship from same-gender faculty, supportive interactions among peers, networks, and the presence of female role models through professional associations (Ro et al., 2021). Although the post-apartheid era has brought improvements in access to higher education, significant disparities persist.

Policies aimed at supporting families, such as childcare provisions, have also been introduced in the pursuit of gender equality. However, these initiatives can inadvertently act as obstacles for women in fields like engineering by reinforcing the perception that women are inherently disadvantaged and need "special accommodations" to thrive in traditionally male-dominated domains (Bastalich et al., 2007). It is therefore evident that the educational environment that institutions create is as crucial as the academic experience they offer, as these factors are intertwined with their mandates to educate, recruit, and graduate students (Ro et al., 2021). Likewise, attributing women's underrepresentation solely to family-friendly policies reinforces stereotypical gender roles, like the belief that women are mainly tasked with

childcare responsibilities, and perpetuates the masculine culture often associated with engineering (Bastalich et al., 2007). It is essential to take into account the discourses surrounding women as primary caregivers in male-dominated environments, where existing masculine cultural norms and institutional practices may be hostile to women (Bastalich et al., 2007).

South Africa presents a compelling context for understanding interconnected types of discrimination rooted in race, gender, and sexuality, given its historical background (Luiz & Terziev, 2022). However, despite progress and changes in engineering and gender dynamics, gender segregation and stereotypes continue to influence the field (Morrell, 2002). While legislative measures are in place, effective enforcement and dissemination of information are essential (Wittmann, 2012).

2.4 Masculinity and Femininity

Gender dynamics and the notions of masculinity and femininity are continuously shifting and undergoing transformation. South Africa is an interesting place to look at how people understand and deal with these ideas. Here, we are delving into the evolving definitions of masculinity and femininity, and how they shape social norms, behaviour, and efforts towards gender equality.

2.4.1. Defining Masculinities

This chapter begins by discussing masculinity, which encompasses typical beliefs and actions linked to boys and men (Connell, 2005). When this study looks at masculinity, it takes into consideration both individual and social identities, along with more profound cultural and societal implications of masculinity within social contexts. Given the fact that masculinity is socially constructed, it is reasonable to anticipate the existence of multiple forms of masculinity (Morrell, 2001). Types of masculinity include hegemonic, complicit, subordinated, and marginalised masculinity (Connell, 1987).

Hegemonic masculinity is widely used and regarded as the dominant position which encapsulates the most influential cultural stereotypes of what it may mean to be a real man (Connell, 1987). This position entails: physical dominance; competitiveness; control; and engaging in sexual activity with multiple women to demonstrate one's heterosexuality (Langa, 2017). Furthermore, real men are also characterised by additional qualities such as self-reliance, being able to endure pain, taking charge of household decisions, and, fundamentally,

avoiding anything that might be perceived as feminine (Tseole & Vermaak, 2020). Moreover, characteristics linked to being a real man include discouraging the display of emotions, seeking help from others, or acknowledging vulnerabilities (McVittie et al., 2017). The traits and behaviours mentioned above serve as a foundation for establishing and upholding superiority over femininity and other forms of masculinity (Kamhuka, 2023). Elements of this prevailing masculinity encompass a male culture marked by humour, stories, recreational activities, and other informal tactics, all designed, whether knowingly or unknowingly, to marginalise women, consciously or subconsciously (Connell, 2000).

2.4.2. Gender Dynamics in Engineering

Hegemonic masculinity can be observed in some males in engineering education settings (Connell, 1987). The connection between engineering and masculinity which is hegemonic primarily stems from social constructionism, where the field often invokes a narrative that is blind to colour, class, and gender, however, distinctions are closely tied to social status and power (Secules, 2019). Individuals who have historically possessed relative social power, such as white males during the apartheid era, and wielded specific influence within institutions linked to engineering, have been the ones to shape the definition of engineering (Secules, 2019). These definitions have served to maintain and strengthen their power (Secules, 2019). These power dynamics reside within the conventional patriarchal domain, which typically privileges men and dominant identities of masculinity (Anarfi and Owusu 2010).

This is consistent with the article by Sagebiel and Dahmen (2006) which makes note of the exclusive male-oriented culture of humour and language present in an atmosphere which is predominantly masculine and competitive (Sagebiel & Dahmen, 2006). Full and central participation in these masculine norms is not an ideal option for women in the space as they are left either participating as outsiders, or they are left resisting participation, thus being excluded (Sagebiel & Dahmen, 2006). The environment therefore appears welcoming and accommodating, yet overall, the needs and existence of women are not as highly regarded as men. This validates that gender dynamics within engineering are intricately woven into both interpersonal relationships and broader social and institutional frameworks (Beddoes, 2019). If gender differences are avoided, then existing masculine norms and discriminating practices in the field will persist as there are many individuals in society who have a more masculine than feminine view of the profession (Sagebiel & Dahmen, 2006). The lack of female representation within engineering faculties and workplaces fans these flames, and the higher rate at which

female engineers leave the profession compared to their male counterparts is also a matter of concern (Bastalich et al., 2007). Furthermore, it has been noted that women entering the engineering profession pose a challenge to the dominant masculine identity, thereby reinforcing the gendered discourse within the engineering field, which significantly contributes to women's exclusion (Bastalich et al., 2007). The efforts and determination of men to maintain their esteemed positions leads to the depreciation of women in roles traditionally associated with males, necessitating that women conform to masculine occupational and organisational norms (Cardador et al., 2021).

2.4.3. Male Privilege

Before proceeding, it is essential to briefly establish the definition of male privilege. O'Brien (2009) defines this term as the rights and advantages, including social and political assets, given to men in societies structured around male dominance. Men frequently remain unaware of this privilege since it often feels inherent, yet it is routinely taken for granted as the norm, thus perpetuating it (O'Brien, 2009). The second type, complicit masculinity, describes a passive manifestation of masculinity that fails to contest the gender structure; men here neither conform to nor challenge hegemonic standards, as they still benefit from male privilege regardless (Tseole & Vermaak, 2020). Most men align with this form of masculinity because its primary advantage lies in experiencing a sense of dominance, yet ultimately avoiding subordination (Tseole & Vermaak, 2020).

2.4.4. Intersectionality and Masculinity

The third classification of masculinity is marginalised, representing a subculture within the dominant system where the convergence of factors such as race, gender, and class cultivates various interactions among masculinities (Connell, 2005). While the marginalised type may exhibit traits like hegemony, it differs in that it lacks certain key characteristics, such as control (Mincey et al., 2013). Race dynamics have a substantial impact on the interactions among various forms of masculinity, and in Westernised societies, among the many facets linked with hegemony such as those previously mentioned, another crucial aspect is whiteness (Connell, 2005). Consequently, Black men may for instance, be categorised under marginalised masculinity due to their historical and social marginalisation (Mincey et al., 2013). Mdanda (2010) briefly discussed the evolution of African masculinities and how the apartheid context placed Black men in a situation where they doubted their dominance and influence, given that their surroundings were influenced by factors like power dynamics and racial prejudices.

History has therefore significantly influenced the various forms of masculinity observed in present-day South Africa (Mdanda, 2010). African men have had to adapt and shape their identities to align with the transformations in South Africa today, including the establishment of democracy and the promotion of gender equality (Mdanda, 2010). The final category of masculinity recognised by Connell (1987) is subordinated masculinity. While individuals here may exhibit the physical attributes commonly associated with hegemony, they embody characteristics that are deemed opposite to hegemonic norms (Tseole & Vermaak, 2020). An example of this is homosexual men who may exhibit characteristics stereotypically linked with femininity, such as emotional expression and perceived physical fragility (Tseole & Vermaak, 2020).

2.4.5. Gender Attitudes and Femininity

Literature has highlighted some social and attitudinal barriers that exist beyond the workspace to hinder women from entering and thriving in engineering (Bastalich et al., 2007). The study by Helman and Ratele (2016) emphasised the central role that family plays in shaping and practicing ideas about masculinity, femininity, and gender equality. However, there is a notable absence of research investigating how gender dynamics unfold in the context of the South African home. Numerous feminist scholars contend that families function as "gender mills," perpetuating hierarchical gender dynamics (Helman & Ratele, 2016). This underscores the significance and power of gender dynamics within family settings, indicating that they are crucial environments for examining (in)equality practices (Helman & Ratele, 2016). The research findings uncover the intricate dynamics through which problematic discussions of gender inequality are influenced by a multifaceted interplay of intersecting identity elements including gender, age, race, class, culture, and education (Helman & Ratele, 2016). While some families demonstrated greater success in challenging problematic discourses relating to gender, it is imperative for us to acknowledge the persistent influence of patriarchy in shaping beliefs and behaviours related to gender within South African families (Helman & Ratele, 2016). The patriarchal norms present in African communities perpetuates the prevailing hegemonic perspective of stereotypical masculinity and femininity. The prevailing concepts of masculinity revolve around men's authority and dominance over others, along with men's presumed sexual entitlement (Ratele, & Shefer, 2013). In contrast, femininity is often defined by essential traits such as submissiveness, passivity, and sexual purity; and this culturally accepted concept of femininity positions women as subordinate to men across different domains (Boonzaier & De La Rey, 2003).

Additional social and attitudinal barriers that exist include the ‘masculine’ image that engineering has, and the perception that it is not compatible with ‘normal femininity’ (Bastalich et al., 2007). Gender bias within work-related guidance is another barrier, along with a scarcity of female role models in the profession; limited awareness among parents and educators regarding women's potential in engineering; inadequacies in professional organisations’ efforts to address these issues; and male perceptions that women are incompetent or unsuitable for engineering, coupled with their hostility toward women (Bastalich et al., 2007). Akinlolu and Haupt (2019) assert that many of these barriers are present in workplaces in South Africa, and women ultimately opt out of pursuing careers in male-dominated fields due to the obstacles they face stemming from the entrenched masculinity of the profession. As female engineers, their identities are marginalised, forcing them to decide between abandoning their femininity, distancing themselves from being perceived as 'overly emotional' women, conforming to male norms, or embracing their femininity and being perceived as 'different,' thereby leaving them vulnerable to hostility and derogation (Akinlolu & Haupt, 2019).

2.4.6. Femininity in the Context of STEM Fields

Gender role norms, also known as ideologies, denote the societal expectations regarding appropriate or inappropriate behaviour for individuals based on their gender within specific social contexts (Van Niekerk, 2009). These norms are acquired through observing one's environment, and individuals internalise the perceived 'acceptable' expectations (Van Niekerk, 2009). In certain settings, girls are instructed in the skills deemed necessary for fulfilling traditional feminine roles, such as sewing and household chores, with an emphasis on preparing them to be good wives (Dlamini & Adams, 2014). Therefore, the ability to obtain education and job opportunities continues to be heavily influenced by traditional gender roles, resulting in the underrepresentation of women in STEM disciplines, political spheres, decision-making processes, and efforts related to nation-building (Sikhosana et al., 2023).

Gender theorists like Judith Butler argue that classifications such as male or female and masculinity or femininity lack inherent, fixed meanings as they are shaped by context and cultural influences (Kulish, 2010). Femininity is perceived as a concept ingrained with internalised patriarchal ideals and criteria, which burdens women in various ways as they strive to achieve and adhere to it (Jones, 2022). It could be argued that femininity is a less researched subject compared to masculinity. Research by Francis et al. (2016) investigated hyper-femininity and the formation of the 'girly girl' stereotype, especially regarding the low representation of women in STEM fields, particularly in science. The abovementioned study

observed that science is often seen as a predominantly masculine domain; they also pointed out that there has been relatively limited exploration into the factors contributing to the marginalisation of femininity within the field of science (Francis et al., 2016). Consistent with the current research, this study employed a Foucauldian discourse analysis approach. These authors examined the discourses employed by both young individuals and parents when discussing 'girly girls' and physics (Francis et al., 2016). The findings revealed that even traits traditionally viewed positively within femininity, such as being nurturing, vocationalism, or elegance, have been negatively portrayed within the framework of 'girly girl' (Francis et al., 2016). Their findings contribute to the substantial body of evidence indicating that STEM fields are shaped by and perpetuate a masculine epistemology that excludes femininity (Francis et al., 2016). This exclusivity needs to be identified and challenged to provide the means for gender deconstruction (Francis et al., 2016). Although there are indications that the patriarchal system is weakening, there is still room for diverse experiences and expressions of femininity; it remains crucial to understand these within the context of the ongoing oppression and exclusion that women face (Jones, 2022).

2.5 Women in STEM

2.5.1. Historical Context

During the Apartheid era, most of the South African population was denied access to education due to the racially discriminatory policies of the Apartheid government (Keswell, 2010). Apartheid policies sanctioned both racial segregation and the reinforcement of patriarchy (Sikhosana et al., 2023). In 1994, when South Africa transitioned to democracy, the ANC-led government implemented initiatives to transform the higher education landscape which included abolishing racially discriminatory policies and providing financial support to Black students to rectify historical imbalances (Akala & Divala, 2016). The Apartheid legacy still affects South African HEIs today, as many Black students from impoverished households and communities continue to encounter significant obstacles that deeply affect their achievement levels in tertiary education (Idahosa & Mkhize, 2021). Similarly, women in STEM fields continue to be affected as research indicates that there is a low completion rate for Black women pursuing STEM disciplines at the university level (Idahosa & Mkhize, 2021).

2.5.2. Intersectionality and Women in STEM

Sikhosana et al. (2023) conducted research to investigate the experiences and barriers impacting the academic success of Black South African women pursuing STEM qualifications, revealing the common challenges faced and the strategies these women employ to navigate them. Most participants in the study attended under-resourced schools where English was not the medium of instruction and there was often a shortage of qualified STEM teachers. This background posed significant challenges when entering a highly competitive urban university, they faced challenges in adjusting to the academic environment and managing the rigorous demands of their coursework (Sikhosana et al., 2023). However, they also reported experiencing a sense of personal development as they were exposed to new knowledge (Sikhosana et al., 2023). Majority of participants also believed that male dominance in the field contributed to the challenges they encountered, along with challenges related to financial constraints and technological literacy (Sikhosana et al., 2023). They advocated for the hiring of more women academics to serve as mentors, as they experienced a shortage in this area (Sikhosana et al., 2023). Simmonds' (2014) study builds upon research that highlights the significant impact of educational inequalities on women's socioeconomic circumstances, encompassing persistent poverty and unemployment in subsequent years. The study underscores the need to advance gender equality and empower women in South Africa as key strategies to combat poverty and disease, ultimately contributing to sustainable development (Simmonds, 2014). The importance of integrating gender equality into educational spaces is highlighted which aligns with the Gender Policy Framework, as it regards gender equality as ensuring that men and women have equal opportunities to achieve their full potential in society (Simmonds, 2014).

2.5.3. Progress and Remaining Challenges in Engineering

The Engineering Council of South Africa (2022) notes that women still represent only a minor percentage of the overall number of engineers in the country. An overview of ongoing registration trends can be found in Appendix F. The statistics presented in the tables reveal significant gender disparities between males and females in the field of engineering, indicating that considerable efforts are still needed to enhance women's participation and address existing gender inequalities in the sector. These actions are essential for creating a fair and just engineering environment in South Africa (Unterhalter et al., 2024).

The Department of Higher Education and Training (DHET) issued the White Paper on Post-School Education and Training in 2013, it observed that entrenched patriarchy in South Africa perpetuates the subordinate position of women and girls across various aspects of life,

particularly within the education and training sectors (DHET, 2013). It also stated that "Discrimination, particularly regarding racism and sexism, continues to be pervasive in South African universities, as it is in the broader society" (p. 28) (DHET, 2013). The government acknowledged the severity of these issues by publishing a policy framework on gender-based violence for the post-school education system in 2020 (Unterhalter et al., 2024). This framework aims to tackle the pervasive cases of GBV within the sector by implementing various structures and processes, including awareness-raising initiatives and consistent oversight (Unterhalter et al., 2024).

South Africa generally has more girls than boys enrolled at the secondary school level, and this trend continues into tertiary education, but it does not extend to STEM-related fields (Unterhalter et al., 2024). Between 2005 and 2020, the quantity of women earning degrees in STEM disciplines increased significantly, growing from 16,381 graduates in 2005 to 34,217 in 2020 (DHET, 2023). Despite this progress, by 2020, just 23% of female graduates finished STEM-related programs, in contrast to 35% of their male counterparts (DHET, 2023). This indicates that, despite considerable progress toward creating an equitable higher education system in South Africa, obstacles still exist that affect women's decisions to pursue careers in STEM, thus contributing to their continued underrepresentation in the field.

2.5.4. Factors Influencing Career Choices in STEM

The study by Powell et al. (2012) highlighted that recruiting and retaining women and minorities in engineering programs, and higher education more broadly, are crucial efforts of paramount importance. Powell et al. (2012) cited UK studies that identified several key factors influencing young people's decisions to pursue engineering careers. These factors included the influence of family, teachers, and peers (socialisers), career rewards such as salaries and job prospects, and direct exposure to the field of engineering (Powell et al., 2012). Educational experiences, particularly enjoyment and success in relevant subjects, also played a significant role. Additionally, the desire to contribute to society (social identity), enjoyment of practical activities and problem-solving (engineering-related activities), and the flexibility to enter various careers (employability) were important considerations (Powell et al., 2012). Socialisation and societal norms surrounding gender roles also had a significant impact on young people's decisions to pursue engineering careers, which are factors particularly intertwined with women's experiences in choosing to enter the field. This supports the notion that career decision-making is influenced by gender, indicating that distinct strategies may be

necessary to effectively promote engineering as a career path to both women and men (Powell et al., 2012).

Reed and Case (2003) conducted similar research in South Africa, surveying students at the University of Cape Town about their decision to pursue mechanical engineering. The findings highlighted several factors, including societal influences such as direct or indirect exposure to engineering as students, the role of socialisers, and the impact of subjects like physical science, mathematics, and technology on their career choice (Reed & Case, 2003). Another factor identified was personal career vision, which encompasses aspects such as career rewards, whether mechanical engineering was a primary or secondary choice, intellectual stimulation, and opportunities for career diversification (Reed & Case, 2003). Additionally, product-related activities were noted as one of the influencing factors, this refers to interaction with science and technology during upbringing and their cognitive engagement with these products (Reed & Case, 2003). Social and civic responsibility was also considered, including challenges faced by female learners in a male-dominated field and their potential to contribute to community and economic development (Reed & Case, 2003).

The findings from these studies align with the current gender dynamics within the profession. For instance, a female student in one of the studies shared how her childhood interests in technical hobbies and playing with Lego toys, rather than dolls, illustrates the gendered perceptions associated with certain behaviours and toys (Powell et al., 2012). In the South African context, it is more common for white children to have had access to "educational" toys and gadgets during their upbringing compared to black children, underscoring the disparity in influencing factors (Reed & Case, 2003). Men are also more likely to enter engineering with less deliberate effort, whereas women generally need more active support and encouragement to study engineering (Powell et al., 2012).

2.5.5. Challenges Faced by Women in STEM

It has been observed that the underrepresentation of women in STEM fields is primarily linked to issues related to organisational culture, socio-cultural factors, structural obstacles, and institutional biases (Zulu, 2016). According to Bird and Rhoton (2021) systemic inequalities in STEM fields have various causes and effects, perpetuating career advantages for certain groups (such as men and white people) while hindering opportunities for others (Bird & Rhoton, 2021). In academic settings, women and racially minoritised STEM faculty face disproportionate challenges, including increased "service" work that detracts from teaching and research, isolation from being in the minority, and less recognition for their

accomplishments (Bird & Rhoton, 2021). Prevalent issues also include exclusion from essential information networks, insufficient mentoring, and a lack of transparency in tenure and promotion procedures (Bird & Rhoton, 2021). These challenges are compounded by persistent institutional inaction from those in authority, who fail to address persistent systemic biases (Bird & Rhoton, 2021).

The effects of the Covid-19 pandemic, particularly on women in STEM education and the workforce, are also significant and warrant reflection. Prior to the pandemic, mothers in STEM fields were more likely than their male partners to be primary caregivers at home (Ro et al., 2021). The Covid-19 pandemic has exacerbated this responsibility, resulting in reduced research output among female faculty and researchers in STEM who have young children (Ro et al., 2021). Similarly, women in university, especially those from ethnic minority and low-SES backgrounds, have also encountered increased demands to assist with household tasks or look after younger siblings who had to stay home due to school closures as per lockdown restrictions (Ro et al., 2021). These challenges are influenced by gendered norms, and are further compounded by restricted access to resources, technology, and educational opportunities (Ro et al., 2021).

Bastalich et al. (2007) found that many women engineers have felt uncertain about their technical skills, which made them less likely to assert their ideas confidently. Their anxiety about technical competence often increased once they were in the workplace, potentially influenced by factors such as their socialisation, social identity, or their educational experiences (Bastalich et al., 2007). Simultaneously, women in engineering may feel inadequate when faced with men who come across as assertive and egotistical in the field (Bastalich et al., 2007). This feeling could stem from socialisation and the historical disparity in access to, and engagement with, science and technology-related toys and activities, which have traditionally been more socially accepted for boys (Bastalich et al., 2007).

Additionally, Hill (2010) suggests that persistent exposure to stereotypes can gradually reduce girls' aspirations to pursue STEM careers. Conversely, recognition and career success are some key factors that motivate women to persist in male-dominated fields (Martin and Barnard, 2013). Women often develop a stronger sense of identity in engineering by engaging in formal opportunities like internships. Such experiences help mitigate the negative effects of the engineering climate on women and can enhance their prospects for success (Faulkner, 2009). In conclusion, while there are factors that support women's retention in STEM fields, there are also challenges that drive them away. Despite the equal opportunities available in engineering, women often have to greatly surpass their male counterparts to achieve

recognition (Appelhans et al., 2019). Grasping these factors is crucial for designing impactful strategies to boost female participation in engineering (Reed & Case, 2003).

2.6 Men's Perceptions of Gender Equality and Women Empowerment

2.6.1. The Importance of Collaboration in Gender Equality Efforts

Men are the predominant group in STEM fields, particularly in Mechanical Engineering. Consequently, this research delves into men's discourse, perspectives, and involvement in gender equality and women's empowerment initiatives, recognising that their involvement is essential for formulating successful approaches to challenge and transform traditional gender norms and power dynamics. Men's behaviours and actions play a crucial role in tackling inequities within their immediate environments (Matsenjwa, 2020). They have the potential to advocate for greater support for women in the engineering space by promoting equal opportunities, standing against discrimination, and ensuring that women receive equal treatment to that of their male peers (Matsenjwa, 2020). Ndlovu (2020) highlights the importance of creating gender-focused interventions through collaborative efforts, noting that it is not effective for women to tackle gender issues without involving men. In addition, being able to collaborate and work as a team is widely acknowledged as essential for engineering students by educators, employers, and professionals (Nudelman, 2020), as it is a vital skill that benefits individuals across all levels. Engaging men in these initiatives can help break down barriers to change.

2.6.2. Male Allyship and Advocacy

Patton and Bondi (2015) describe an advocate (or ally) as someone who is willing to actively promote inclusion and equity, even when facing opposition. Clarke and Mondisa (2023) explored the concept of male allyship, identifying key themes such as the necessity for critical self-reflection, meaningful engagement with diverse groups, a commitment to opposing oppression regardless of the consequences, and the importance of encouraging others to do the same. Given the privilege men hold in male-dominated fields, they possess the ability to challenge and transform gender norms. Men are uniquely positioned to develop a growing awareness and eventually take actions that promote the advancement of marginalised groups in STEM fields (Clarke & Mondisa, 2023). Men can for instance, advocate for a healthy work-life balance for all genders, actively acknowledge and celebrate the achievements of women, and educate their male peers about their role as allies in gender equality (Matsenjwa, 2020).

Additionally, they can address instances of gender bias as opportunities for learning and growth (Matsenjwa, 2020).

Nash et al. (2021) explore men's participation in an institutional gender equality recognition programme and how their self-perception as allies evolves over time. The study highlights the importance of allies recognising their potential role in maintaining the status quo. For men to be confident and impactful allies, they need a nuanced comprehension of gender inequality (Nash et al., 2021). Without an understanding of their dominant status and the gendered advantages that come with it, men may be less likely to engage in efforts to address inequality (Nash et al., 2021). Consequently, education on gender equality is essential, along with awareness of the challenges associated with advocating for women's empowerment and gender equality, as well as men's changing perceptions and critiques in this context (Nash et al., 2021).

Men should however, approach allyship with a mindset focused on collaboration with women and others to achieve equality, rather than dominating the process. Patton and Bondi (2015) caution that men may often gravitate toward actions that enhance their appearance of virtue, rather than those that foster real change. Nevertheless, male allies can be valuable as they have the potential to engage other men in the cause and exemplify a departure from conventional masculine standards (Nash et al., 2021). This is beneficial as some men wish to support women but are unsure of where to start. Additionally, men might perceive gender equality efforts as discriminatory against them, which can hinder their ability to recognise their own privilege and create a blind spot (Clarke & Mondisa, 2023). Moreover, men might not fully recognise the extent of inequality until it directly affects someone close to them. For instance, in the study by Nash et al. (2021), a participant shared that while he had previously recognised gender discrimination in STEM as a theoretical issue, it wasn’t until a woman he knew faced sexual harassment that he truly grasped the reality of such experiences.

2.6.3. Challenges and Barriers to Male Involvement

Individuals confront gender norms and inequalities that are deeply embedded in power imbalances, influencing institutions, policies, and everyday interactions (Fernandez, 2023). Men are no exception as they are positioned in a patriarchal cultural context that often pressures them to conform to conventional masculine roles and behaviours (Thomas & Levant, 2012). Men, like women, may experience backlash if they defy traditional gender norms, often being culturally labelled as "weak" or "feminine" if they openly advocate for gender equality (Nash et al., 2021). These expectations can hinder their involvement in "women's issues," and men

might feel helpless in contributing effectively to the cause. Gendered behaviours and traits are integral to individuals' identities, and when these aspects are threatened, people often respond by reinforcing their adherence to group norms to restore their status within the group (Kosakowska-Berezecka et al., 2016). When confronted with challenges to their masculinity, men might symbolically compensate by adopting attitudes that reinforce their stereotypical male image, such as implying that women are unsuitable for STEM fields (Kosakowska-Berezecka et al., 2016). This behaviour reinforces that gender dynamics are not fixed but are fluid and context-dependent, shaped by historical legacies, cultural contexts, and socio-economic structures (Fernandez, 2023).

When men engage in conversations about women in STEM, they contribute to challenging the ongoing biases and stereotypes that continue to exist in the field. This involvement demonstrates that men can actively contribute to finding solutions, emphasising that these issues are not exclusively "women's issues" (Nash et al., 2021). When men choose to get involved, it can encourage collaboration between genders, provide insight into their perspectives and attitudes on these issues, and ultimately lead to significant cultural shifts in STEM fields (Nash et al., 2021). This involvement can play a crucial role in tackling the systemic and structural barriers that hinder gender equality and women's empowerment.

2.7 Synopsis of the Literature

This literature review explores the integration of social constructionism and intersectionality as theoretical frameworks to examine the elements leading to the ongoing scarcity of women in STEM fields in South Africa. It highlights male perceptions of women's positioning within STEM, and how these views—shaped by societal norms, gender roles, power structures, and discourses— may reinforce this ongoing disparity. Social constructionism is employed to understand how individuals construct multiple realities based on their unique social identities like race, gender, class, and ethnicity, emphasising the role of language and discourse in knowledge formation. Intersectionality complements this understanding by examining how overlapping social categories play a role in the marginalisation of women in male-dominated fields. The review discusses how the masculine culture in fields like engineering alienates women, leaving them to navigate complex identities within these spaces. It delves into the gender dynamics within engineering, exploring how hegemonic masculinity reinforces exclusionary practices and the marginalisation of women, further complicating their participation in these male-dominated fields. The review also

considers South Africa's legislative efforts aimed at gender equality post-apartheid. Despite legislative progress, systemic barriers persist, thus emphasising the necessity for a multifaceted strategy to tackle ongoing gender disparities.

2.8 Gaps in the Literature

The literature reveals important gaps in understanding how men, as the predominant group in STEM fields like Mechanical Engineering, can effectively contribute to gender equality and women's empowerment. While existing literature underscores that men's involvement is essential for challenging traditional gender norms and addressing systemic barriers in STEM (Nash et al., 2021), there is limited exploration of how systemic barriers and societal and cultural expectations may impact their participation, as men are also subjected to cultural and societal pressures to conform to traditional masculine standards.

Men's commitment to allyship often evolves slowly and is influenced by gradual awareness of their own privilege (Clarke & Mondisa, 2023). Effective allyship requires critical reflection on one's privilege, active engagement in supporting marginalised groups, as well as resistance to discriminatory practices (Kosakowska-Berezecka et al., 2016). Engaging men as allies can help challenge stereotypes and promote equal opportunities, as they can use their influence to advocate for women in the engineering space (Matsenjwa, 2020; Ndlovu, 2020). While progress has been made, women in STEM continue to face substantial challenges related to workspace culture and systemic inequities (Bird & Rhoton, 2021). Addressing these gaps requires a deeper understanding of men's perceptions and roles in gender equality and women empowerment, particularly in diverse contexts like South Africa, to develop more thorough and impactful gender policies, and foster inclusivity (Godwin, 2016; Fernandez, 2023).

2.9 Conclusion

In conclusion, this study integrates the theoretical frameworks of social constructionism and intersectionality to offer a nuanced comprehension of the difficulties encountered by women in STEM fields, particularly in mechanical engineering. By acknowledging that gender dynamics are fluid and shaped by historical, cultural, and socio-economic contexts, the review emphasises the significance of examining how intersecting social identities influence individuals' experiences in these environments. This framework underscores the critical need to recognise and address power imbalances embedded in institutions, policies, and everyday interactions that perpetuate gender disparities, particularly in the field of mechanical

engineering. Furthermore, the exploration of African masculinities, femininities, and gender dynamics within South Africa, alongside the challenges women face in STEM fields, highlights the profound impact of historical, cultural and social influences on gender identities and roles. This includes the enduring effects of apartheid and the subsequent transformations in the post-apartheid era.

The legislative and affirmative action measures in South Africa, while influential, have not fully addressed entrenched inequalities. The concept of male allyship emerges as a potential avenue for promoting gender equality. Men, positioned within patriarchal frameworks, have the opportunity to use their privilege to support gender equality and women's empowerment while also challenging entrenched gender norms. Effective allyship involves self-awareness, education, and a commitment to meaningful change. However, men must navigate cultural pressures and potential backlash to contribute positively to gender equality efforts.

Overall, while progress has been made, addressing gender disparities in STEM and beyond requires continued effort and collaboration. The involvement of all genders, including male allies, is crucial for dismantling systemic barriers and fostering a more equitable and inclusive environment. With this in mind, the subsequent chapter explores the methodological approach used in this study. By employing a qualitative approach, this study aims to capture the nuanced perspectives of male mechanical engineering students and the discursive practices influencing their views on gender issues. This methodology provides a comprehensive understanding of how gender dynamics are constructed and discussed within mechanical engineering education. The section introduces the research questions that guided the study, focusing on how these students conceptualise gender equality and women empowerment within their field.

Chapter 3

Methodology

3.1 Introduction

This chapter outlines the methodological framework used to conduct this research. It commences with a discussion of the selected research design, followed by a clarification of the data collection procedures. Subsequently, the participants and the recruitment process are comprehensively discussed. The method of analysis, which is Carla Willig's (2013) six stages of Foucauldian Discourse Analysis (FDA), are introduced and expanded on. Ethical considerations are then discussed, and finally, the researcher's role in the whole process is to be examined reflectively.

3.2 Research Questions

The following research questions informed the study:

3.2.1. How do male mechanical engineering students construct gender equality and women empowerment?

3.2.2 What are the most prominent discourses that male engineering students draw upon and deploy in discussing female counterparts' positioning in their historically male-dominated field?

3.3 Research Design

Qualitative data collection and analysis strategies were implemented in this study to conceptualise and explore the meaning that is embedded in the data that was generated. This study took the way that participants construct language into consideration and examined the implications of different types of constructions (Willig, 2015). Qualitative methods were therefore the most suitable as this approach gives more space for participants to be open in providing information and allows for more in-depth insight into the participant's perspectives, as well as their experiences and what meaning they make out of their experiences (Khan & MacEachen, 2021). The study employs a qualitative approach grounded in the social constructionism paradigm, and therefore takes human communication and interaction into consideration by exploring, describing, and interpreting the social and personal experiences of

participants (Smith, 2008). The approach emphasises how meanings are shaped and constructed by individuals, which is in line with this study's discourse analytic framework (Smith, 2008). Qualitative inquiry also enabled the researcher to actively interact with the participants to obtain information relating to patterns of conversation about gender equality and women empowerment (Khan & MacEachen, 2021). There are various interpretations of the world which are shaped by discourses and practices, therefore, rather than analysing a fixed and pre-established social reality, qualitative research is aimed at comprehending the socio-culturally constructed meaning embedded in people's experiences (Khan & MacEachen, 2021).

3.4 Data Collection

Data was collected from participants in focus group discussions that were conducted on Zoom, which is an online audio and video platform, as it is important for the study to collect interactional data. Numerous higher education institutions adopted Zoom for remote instruction due to its effective technology for distance learning (Krome, 2021). It has interactive and collaborative features which allow for synchronous delivery of content (Krome, 2021). A focus group is commonly used in qualitative research. Individuals who participate in a focus group discussion are brought together by a researcher to discuss a specific topic (Nyumba et al., 2009). The focus group method is implemented to obtain an in-depth understanding of people's views and social issues (Nyumba et al., 2009). Focus group discussions are generally more naturalistic than individual interviews because they include a variety of communicative processes inherent in group dynamics, including storytelling, humour, challenges, and disagreements (Smith, 2008).

This focus group discussion consisted of male students at the University of the Witwatersrand who were completing the final year (fourth year) of their Bachelor of Science in Mechanical Engineering qualification at the university. Focus groups support the notion that meaning is collaboratively produced in social interactions between people, and in this particular focus group, the researcher was able to observe how the views of the young men were constructed, expressed, defended, and debated amongst themselves in relation to the topic at hand (Smith, 2008). It is essential to acknowledge that one of the participants involved in this study had completed his final year of mechanical engineering in the preceding year and had recently entered the field of work at the time the data was gathered. Another participant was in his final year of mechanical engineering; however, he had still been completing some third-year modules which he was required to re-take. The focus remains on the interactional

dynamics that this group brought, and the content that seamlessly came up in discussions (Morgan, 2018). Ultimately, whether past or present, the individuals involved in this research all had the common experience of being in the position of male mechanical engineering students in the last academic year of their qualification at the University of the Witwatersrand.

The groups in this research were facilitated using a semi-structured interview approach. This was implemented to allow space for more free-flowing discussions about gender equality and women empowerment in South Africa from the perspectives of young men in a male-dominated field. This in turn helped to identify recurring themes in discourses that arose. The researcher also used open-ended questions in the interview to encourage more in-depth and comprehensive responses that could be explored further. The focus group topic guide provided in Appendix E was developed in accordance with the research aims and inquiries of this investigation.

Data for the study was collected in 2021. Because of Covid-19, the focus group discussions were held on Zoom, an online platform, to avoid the risks of gathering as a group in person and potentially putting the participant's health at risk. Online focus groups enable researchers to mitigate challenges such as geographical constraints, and the costs associated with attending an in-person interview, and they help gather participants together who are dispersed across vast geographic areas (Stewart & Shamdasani, 2016). An advantage of facilitating online focus group discussions is that the participants were able to participate from the comfort of their own space. The lack of in-person engagement may have limited the closeness, spontaneity, and openness of the group, as well as the nonverbal communication aspect that is pivotal in eliciting responses (Stewart & Shamdasani, 2016).

During the period when the data was gathered, there was a widespread prevalence of online learning taking place to maximise learning during a pandemic. Despite existing obstacles, such as limited access to computers and the internet, universities managed to address these issues by providing students with complimentary laptops and Wi-Fi access within campus premises and residential areas (Mpungose, 2020). As a result, participants had the necessary resources to take part in the study, including access to Wi-Fi or data, the necessary devices, and proficiency in utilising online platforms such as Zoom.

3.5 Sampling

The sampling technique that was implemented in this study is non-probability convenience sampling. Non-probability convenience sampling is based on the researcher's

judgment, which means it may be prone to researcher bias which will be reflected on more in the limitations section of this study (Sharma, 2017). This sampling method selects individuals based on non-random criteria (Mweshi & Sakyi, 2020). Given the specific participant group required, snowballing and purposive sampling techniques were employed. The purposive sampling technique is based on the specific population selected by the researcher to align with the research objectives (Sharma, 2017). The group was chosen based on the researcher's judgment that this group of individuals would offer access to the desired information (Mweshi & Sakyi, 2020).

Permission was granted from the Dean of Student Affairs at Wits to use university students in the research study, and an email containing information on the study as well as the inclusion criteria of the study, and a section for potential participants to list their preferred method of contact was disseminated to all final year mechanical engineering students. Thus, participants were chosen based on their willingness to be studied (Mweshi & Sakyi, 2020). The chosen population proved to be challenging to access due to the low response rates from the male final year mechanical engineering students. Snowball sampling was therefore implemented to recruit more participants via the first group of participants (Mweshi & Sakyi, 2020).

The sample size of this study comprised 11 male students who were between the ages of 18 to 35 years old. This specific sample was chosen because it was anticipated that not only would the men have experienced working and studying alongside women in the field, but the majority of students within this age bracket are likely preparing to enter the workforce and have already developed particular perspectives on gender equality and women empowerment. Minimal identifying information was collected from participants for confidentiality purposes, as the participants likely knew one another from class by sight and voice, and disclosing further identifying information would not have been necessary for the purpose of the study. The students' participation was therefore not anonymous in respect of other participants. In addition, Willig (2013) suggests that including biographical details in discourse analysis research is not necessary and could potentially compromise confidentiality.

The interested participants had listed their contact details for the researcher to proceed with scheduling the focus group discussions with them. A suitable time and date were discussed with each participant, and they were divided into three separate groups depending on their availability. The initial group comprised of four students, the second group consisted of three students, and the third group included four students. The duration of the focus group interviews ranged between 60 – 90 minutes each and with the consent of the participants, they were each

recorded. It is essential to highlight that data was transcribed and stored in a safe place electronically. For some more details of the participant's information, see Table 1 below.

Table 1

Participant Information

Participant	Race	Level of Study
Peter	White	Completed Final year of BSc in Mechanical Engineering in the preceding year. First year of working in the field.
Rea	Black	Final year of BSc in Mechanical Engineering
Thabiso	Black	Final year of BSc in Mechanical Engineering
Xolani	Black	Final year of BSc in Mechanical Engineering
Ben	Indian	Final year of BSc in Mechanical Engineering
Victor	Black	Final year of BSc in Mechanical Engineering
Aaron	Black	Final year of BSc in Mechanical Engineering
Kopano	Black	Final year of BSc in Mechanical Engineering and completing certain third year modules.
Masego	Black	Final year of BSc in Mechanical Engineering
John	Black	Final year of BSc in Mechanical Engineering
Musa	Black	Final year of BSc in Mechanical Engineering

3.6 Data Analysis: Discourse Analysis

Discourse Analysis (DA) was selected as the method of data analysis as it would bring a different lens through which to potentially add to and deepen our understanding of the ideas being put forward, and the social interactions occurring between participants (Khan & MacEachen, 2021). DA is an expanding research approach that examines how language is used. It is essential to recognise that discourse analysis doesn't aim to establish any objective 'truth' but instead focuses on observing the power dynamics created by various uses of language (Schneider et al., 2008). DA believes that people's worldviews and the accounts they provide are influenced by the discursive context in which they are created (Willig, 2015). Therefore, factors such as socio-cultural and political context as well as discursive construction are important in discourse analytic work (Willig, 2015). According to Willig (2013), two main types of discourse analysis exist, each focused on how language shapes the construction of social reality.

Discursive psychology is the first version of DA, and it originated from the impactful work of Potter and Wetherell (1987): *Discourse and Social Psychology*. The interest in discursive psychology is rooted in the negotiation of meaning in everyday communications (Potter, 2011). Discursive psychology emphasises the accomplishments people can attain through communication, viewed as discourse practices (Gmeiner, 2015). Discourse practices include talk, and they are action oriented by nature, meaning that talk is coordinated with embodied action (Potter, 2011). The performative nature of discourse is therefore significant here.

Discursive psychology is concerned with the sequence, context, and overall analysis of conversations (Potter, 2011). The construction of psychological phenomena (such as identity, perceptions, and memory) through language is taken into consideration, as well as institutional settings, as action is also situated institutionally (Willig, 2015). For example, how feelings of upset and concern could be displayed, understood, and received in an emergency call to the police. Factors such as the tone and style of speaking, descriptions indicating mental states and dispositions, along with the accountability mechanisms that foster drive and purpose are all noteworthy (Potter, 2011).

FDA is the second version and is a very specific approach within DA. FDA stems from the works of Michel Foucault and post-structuralist scholars (Frith, 2004). It is "concerned with the discursive resources that are available to people, and the ways in which discourse constructs subjectivity, selfhood and power relations" (Willig, 2013, p. 95). DA in the Foucauldian tradition seeks to comprehend the role of language in shaping both social and psychological realities, with a particular emphasis on the connection between discourse and social as well as institutional structures, and power relations (Brunton et al., 2018). The Foucauldian perspective proves to be valuable when engaging in the critique of power dynamics, oppression, liberation efforts, awareness-raising, and the validation of societal norms and behaviours (Teo, 2015). Hence, FDA can embrace a critical epistemology like intersectionality as it aims to shed light on contemporary social issues and understand the underlying mechanisms that enable the formation of specific discourses (Willig, 2013). An epistemological approach rooted in social constructionism is highly compatible with FDA as it works to challenge the notion of an absolute truth, instead recognising the existence of multiple diverse viewpoints that shape individuals' realities (Burr, 2015).

FDA explores prevailing societal norms and assesses their impact on various groups, enabling a critique of these values and the institutions that uphold them, including academic institutions (Teo, 2015). Furthermore, the FDA approach acknowledges the necessity to

analyse and challenge language, discourse, power structures, and oppression, while considering how these elements are situated within their cultural and historical contexts (Burr, 2015). With this study's research aims and questions in mind, the researcher analysed the data using the Foucauldian discourse analysis approach.

The Zoom audio recordings gathered from the focus group discussions were transcribed verbatim, and the data collected was closely looked into using the abovementioned method of analysis. Following this, a thorough analysis of themes which arose as well as the use of language and how participants construct meaning in relation to this topic was examined (Willig, 2013). Many scholars warn that there are no fixed methods with standardised rules for conducting a discourse analysis (Coupland & Jaworski, 2001). Since no fixed guidelines exist for carrying out a discourse analysis, this analysis has loosely been guided by Carla Willig's (2013) six stages of Foucauldian Discourse Analysis (FDA). Michael Foucault wanted to reveal how specific discourses contribute to upholding interconnected social meanings that govern and influence individuals in seemingly natural ways (Frith, 2004). The analysis therefore also unpacked how and why certain things were said during discussions while others were not, understanding the rationale behind participants' choice of words or phrases, and how the meanings of the terms used align with various approaches to discussing the world (Parker, 1992, p. 4).

The six-stages that Willig (2013) outlines in her frame of the discourse analysis process are as follows:

1. Discursive Constructions

This is the initial stage of analysis, it is focused on detecting and mapping the diverse ways that the discursive object is discussed and constructed, whether through explicit or implicit means (Muishout et al., 2020). This research was interested in identifying the various perspectives through which the young males in the final year of their Mechanical Engineering qualification talked about gender equality and women empowerment within the South African setting and concerning their female peers.

2. Discourses

Segments of text that contribute to the discursive object have been identified; we then move onto looking at the variations in how the discursive object was discussed or shaped and locate the various discursive constructions of the object within broader discourses (Muishout et al., 2020). Individuals discussing gender equality and women empowerment may utilise various discourses such as a political discourse to highlight the legislations and policies

established by the government to enhance women's empowerment and promote gender equality and how that may or may not affect them.

3. Action Orientation

This stage entails a more detailed exploration of the discursive environments in which various constructions are employed, and the functions they serve, or the action orientation of the talk is considered (Willig, 2013). Therefore, when looking at the constructions of gender equality and women empowerment within the South African context, the study sought to determine the potential outcomes achievable through the utilisation of the specific constructions put forward by the research participants.

4. Positionings

Discourses construct both objects as well as subjects thereby offering positions within frameworks of significance that speakers can assume (Willig, 2013). At this stage of analysis, subject positions are identified within the framework of duties and rights that derive from the various constructions of the discursive object (Muishout et al., 2020). The subject positions present discursive locations from which to speak and act (Muishout et al., 2020).

5. Practice

In this stage, we explore the relationship between discourse and practice as we pay close attention to the opportunities for action facilitated by the discursive constructions or discourses (Brunton et al., 2018). The manner in which discursive constructions either make room for certain actions or omit them is mapped out (Muishout et al., 2020).

6. Subjectivity

The last stage of analysis identified by Willig (2013) investigates the relationship between discourse and subjectivity (Smith, 2008). This involves analysing the impact on participants' subjective experiences resulting from adopting different subject positions (Muishout et al., 2020). “Once having taken up a particular position as one’s own, a person inevitably sees the world from the vantage point of that position” (Davies & Harré, 1999, p. 35). This is the most hypothetical stage, it focuses on what can be sensed, contemplated, and encountered from various subject positions (Willig, 2013).

3.7 Ethical Considerations

Research integrity encompasses a dedication to academic honesty and individual accountability for one's actions, along with adherence to practices that exemplify ethical research behaviour (The US Dept of Health and Human Services, 2018). All pertinent ethical

considerations were followed as this research was being conducted. The necessary ethics and clearance forms were provided to the ethics committee and approval was obtained from the University of the Witwatersrand for this research to be conducted. This study falls within the minimal-risk category as human participants were involved; however, the research did not expose the participants or researcher to any possible harm or risks that they would not have encountered otherwise. The Human Research Ethics Committee (HREC) which focuses on 'non-medical' issues assumed responsibility of evaluating the ethical components associated with this study due to the involvement of human participants. The ethical clearance number is MCLIN/21/04, and the ethical clearance certificate is included in Appendix G.

Permission was requested from the Dean of Students to approach final year Mechanical Engineering students to engage in the research project. Prior to the focus group discussion, the respondents were given a participant information sheet (Appendix B) which described the research and the nature of the discussions that would be taking place so that they could be informed on the study they would be taking part in and what would be required from them. They were also asked to complete a consent form which included consent for recording the interviews (Appendix C), as well as a focus group confidentiality agreement form (Appendix D). This was done because the research required audio and video recordings of the discussions for ease of analysis and transcription of the information obtained.

Visual information would have been useful to obtain, however, if participants had issues with their network on the online platform, they turned their videos off (Stewart & Shamdasani, 2016). The audio contribution of the participants was still recorded as part of the study as only audio data was saved, and notes were kept on any significant non-verbal material that arose. Participation in the research was entirely optional, and participants were made aware that they could decide not to answer any question put to them. Participants had the freedom to withdraw from the study at any moment if they saw fit without incurring any negative ramifications. Appropriate debriefing would have been implemented after the focus group discussions if different topics of conversation left any participants feeling negative feelings such as frustration about competition in their field or concerns about securing jobs and so forth. However, this did not occur for any participant.

3.8 Reflexivity

Self-reflexivity involves reflecting on and becoming aware of our own personal convictions, principles and dispositions, and understanding how this influences our perceptions

of reality (Alejandro, 2020). It is therefore vital to be aware of your own personal convictions and biases which affect the research process and outcomes (Mdanda, 2010). Due to the social constructionist and intersectional underpinnings of the study, reflexivity throughout the research process was essential. Regardless of the chosen analytical method, qualitative data analysis is shaped by the researchers' individual perspectives and experiences related to factors such as gender, race, sexuality, ethnicity, and other identity aspects (Khan & MacEachen, 2021). It was therefore essential for me to reflect on and remain cognisant of my perspective in relation to the collected data and the effects of that on the analysis (Parker, 1992).

I identify as a young Black woman of Xhosa descent, currently studying at the University of the Witwatersrand. This positionality not only shaped the choice of the research topic, but also guided the analysis and interpretation of the transcribed data. I drew from Foucault's work in interpreting the findings, and Foucault suggests that power resides in structures and their ability to shape identities, actions, values, and norms (Foucault, 1979). This aligns with my thinking around the potential for women in the developing world to overcome predetermined structural influences from history as there are various factors such as structures, language and prevailing ideologies that could be constraining to women's agency. As a result of my personal views regarding women, as well as their own experiences, cultural factors and socialisation towards male figures, I posit that discourse and conversation significantly influence gender studies, as people experience themselves through the means of language, culture, and networks of meaning (Khan & MacEachen, 2021). Hence, throughout the study, I was mindful of my perspectives as my personal and demographic attributes could influence their observations and the interpretation and presentation of the research findings thereof (Eagle et al., 2006). Irrespective of me remaining cognisant of my own subjectivity, it is plausible that my gender, being a woman, might have affected the replies of the male participants in the research. This could pose a challenge, as participants might not have felt as inclined to openly express their personal beliefs and experiences regarding gender equality and women empowerment.

Furthermore, participants across all the focus group discussions expressed that they welcome and value women in mechanical engineering, along with the unique skills they contribute. Participants also agreed that the number of women is considerably lower than that of men in their academic spaces. However, in the third focus group, participants suggested that the topic might not be as pertinent to the student population, as they consider themselves more open-minded regarding gender-related issues compared to the older generation. According to Flood et al. (2020) People are generally more attuned to their experiences of oppression than

to their awareness of privilege. In male-dominated environments, men may resist acknowledging their privilege by denying the existence of the issue, downplaying its extent, significance, and impact, or redefining it to the point of negating it (Flood et al., 2020). Recruiting male participants and securing their commitment to attend the focus groups discussions proved to be challenging. This could be attributed to their status as busy final-year students, or other factors such as a possible lack of interest in the topic.

3.9 Conclusion

This chapter has given a comprehensive overview of the methodological framework used in this study. Starting off by outlining the chosen research design, the chapter explained the suitability of adopting a qualitative approach to explore the embedded meanings in the data generated. The data collection procedures were detailed, emphasising the use of focus group discussions conducted via Zoom, because of the Covid-19 pandemic during that period. The chapter then elaborated on the sampling methods, recruitment processes, and the demographics of the participant group, consisting of final-year male students in mechanical engineering at the University of the Witwatersrand.

The method of analysis, Carla Willig's six stages of FDA, was introduced and expanded upon. This approach was chosen because of its ability to delve into the power dynamics and socio-cultural constructions present in the participants' discourse on gender equality and women empowerment. Ethical considerations were addressed, ensuring that the study adhered to principles of research integrity and participant confidentiality. Finally, the researcher's role was examined through a reflexive lens, acknowledging the potential influence of the researcher's own positionality on the study's process.

The methodological framework implemented allows for greater comprehension of the intricate relationship between language, power, and subjectivity in the context of gender dynamics within a traditionally male-dominated field. To summarise, this chapter has laid a robust methodological foundation for the research, ensuring that the subsequent analysis and findings are grounded in a rigorous and ethically sound research framework. The chapter that follows presents the findings of the study.

Chapter 4

Findings and Discussion

4.1 Introduction

This chapter analyses the male mechanical engineering students' perceptions of gender equality and women's empowerment and presents the crucial findings. Contextualised within the current body of research on gender studies in STEM fields and guided by the study's dual frameworks of social constructionism and intersectionality, this chapter explores how these theories inform an understanding of the findings.

By examining the influence of intersectionality on individual identities and the socially constructed effects of these phenomena, I delve into how male mechanical engineering students construct the equitable treatment of genders and the advancement of women. Through the analysis of the data, I identified six noteworthy discourses used by the participants to articulate their viewpoints on these topics: 1) a feminine discourse, 2) a masculine discourse, 3) an individual discourse, 4) a contextual discourse, 6) an institutional responsibility discourse, and 6) a government responsibility discourse. Each of these encapsulates sub-discourses, which are represented in Table 2 below.

Table 2

Discourses and Sub-discourses

Discourses				
Feminine Discourse	Masculine Discourse	Contextual Discourse	Institutional Responsibility Discourse	Government Responsibility Discourse
Sub-discourses				
Factors that contribute to women's perceived lack of interest in engineering	Male students are open and accepting of female students in formerly male-	The era of upbringing influences male students' acceptance of women with a	Engineering students in the class context	Governments' approach to empowering and promoting women in STEM careers

	dominated fields	male preponderance		
1. Female students are accustomed to being nurtured	Males in the industry have preconceived notions about how women behave in the workplace		1. It is beneficial to have female students in engineering classes	1. A focus on the constructive methods for resolving the disparities
2. Support for women in engineering is lacking	Effect on my masculinity: "My masculinity is unaffected by the rise of women in STEM fields"		2. Students of both genders are treated equally in the class	2. There is a tendency toward negative strategies in efforts to address the disparities
3. Women do not fit in, and they experience an intimidating environment			3. Recognition that women are underrepresented in STEM fields	3. Male students support gender equality but feel it can also be used to advance certain agendas
4. Engineering is work-load intensive and emotionally draining			4. Discourse around opportunities exclusively for women	
5. Engineering may not be compatible				

with motherhood due to its association with arduous work				

When conceptualising discussions regarding the identified discourses, I focused on sentiments that reflected the viewpoints shared by most male students, aiming to offer a degree of relative generalisation across the male mechanical engineering student population. The data analysis was conducted using Carla Willig's (2013) interpretation of FDA, providing an easily understandable overview for applying Foucault's influence on discourse analysis. The following sections delve into these discourses, providing a comprehensive discussion of the resulting findings.

4.2 Discursive Constructions

In this section, I focus on pinpointing the various discursive constructions of gender equality and women's empowerment in the interviews. In practice, this entails highlighting clear excerpts where the male mechanical engineering participants discussed the *discursive objects* which I have identified as their female counterparts' positioning within the field as well as their perspectives on gender equality and women's empowerment. Furthermore, I placed each discursive construction within the larger framework of existing research. The discursive object of 'women empowerment' was constructed through language and referred to in a positive light by the male mechanical engineering students. The participants all expressed their acceptance and enthusiasm regarding the empowerment of women. Many participants articulated the concept of women's empowerment as encompassing advancements in women's education and necessary positive transformations in women's roles within academia, the workforce, and the economic sphere. They emphasised the importance of women feeling empowered to pursue careers in mechanical engineering and advocated for fair treatment, support, and equal opportunities for both women and men across all fields (Schuler et al., 2017).

The study by Faulkner (2009) emphasised the need for the engineering institutional culture to evolve into more supportive and inclusive environments for women and other

underrepresented or marginalised communities, to prevent the loss or underutilisation of talent. Evidence of progress in this respect is bolstered by the viewpoints of the participants in this current study, and partly influenced by broader shifts in gender dynamics (Faulkner, 2009). When referring to women empowerment, one of the participants, Xolani, suggested that the limited presence of women in mechanical engineering may be attributed to a perceived disinterest in pursuing careers in the field.

> *'You know, I mean, women are welcome. They've been welcome for a while now. You know, so the question is, are they interested in engineering? And if they are, then they are welcome to come. And we are not going to take them down or look down on them because they are ladies. At the end of the day, they are just professionals.' F1_I4*

Xolani mentioned that women are now welcomed in the field of mechanical engineering, implying that their participation was not always encouraged. Gender stereotypes often stem from people's observed experiences, and Xolani relied on such stereotypes to infer that women may have less interest or inclination towards the field (Master et al., 2021). These preconceived notions can subtly influence students' perceptions of whether they fit in with others in the field, for instance, if one believes their group is less interested in engineering, they may experience a sense of exclusion, which in turn diminishes their drive to pursue it (Master et al., 2021). Consequently, the stereotype that women have less interest in engineering might signal to them that they do not belong, discouraging them from developing an interest in these fields (Master et al., 2021). In a separate focus group, Kopano similarly expressed curiosity around potential misconceptions that women may hold about the nature of the profession.

> *'From my side, we welcome women in the field of engineering, I think it's the stereotype that engineering is for men that keeps women away and scares them off engineering. Engineering used to be heavy work, but now we have so many things requiring less manpower.' F2_Chat*

By its definition, empowerment inherently includes a sense of agency (Kabeer, 1999). Through the participants' shared interpretation of women's empowerment, they have underscored the significance of women making informed decisions to pursue the profession autonomously. Several participants mentioned the idea of intentionally equipping women with knowledge and information about the field. Aaron noted the following:

'So, coming into university there was this foundation called 'Women in Engineering.' So that foundation seeks to motivate and empower women in the field, to teach them and to influence other women out there to not be afraid of the engineering field. So, having such an organisation is really a good thing as it will affect a woman's perception in engineering.' F2_I3

Consistent with Aaron's observation, Rea provided the following statement in a separate focus group discussion:

'I feel like mechanical has a bad reputation. You only do like... Maybe fixing engines and who wants to fix engines? If you are a girl, why would you want to fix engines. So, I feel like it's a reputation thing. So, I feel like there should be more programmes like... It shouldn't be engineering as a general, but maybe there could be programmes for mechanical engineering. Maybe they could tell young girls that mechanical is not all about cars and stuff. There's like design, you can do work as a designer and stuff.' F1_I2

Rea's assertion that girls would not want to fix engines associates this activity exclusively with boys, ignoring the reality that such behaviours are not inherently tied to any gender and can be exhibited by anyone (Riger, 1993). When discussing empowerment, there is often a misconception that simply increasing participation will lead to shifts in the broader context or the distribution of resources (Riger, 1993). However, participation alone does not automatically translate to greater influence or control (Riger, 1993). Empowerment encompasses the capacity to make choices and involves access to physical, human, and communal resources, along with autonomy, which includes decision-making processes (Kabeer, 1999). The male mechanical engineering students have acknowledged and supported the importance of women being well-informed when making the decision to pursue mechanical engineering. They recognised that simply providing opportunities for women and girls is not enough; women also require inner resources, such as a sense of self-efficacy, to take advantage of these opportunities (Schuler et al., 2017). Peter, raised significant considerations regarding the effective empowerment of others in a meaningful way:

'How do you uplift people, and empower them? Because you see the thing that I have a problem with where you, you know, like, I know, you should give more jobs to certain

people to help them. But what I don't like is when they set that person up for failure. When they say cool, you're going to get this nice big role, and they're very excited. Everyone's like, cool, this is a great move forward. But then that person doesn't have the emotional support. They don't have like a mentor that's been given to them to help them with this. And that's where I'm like, that is so bloody unfair. Like you put this person in this job. And then after five years, everyone's like, "aw no, but they couldn't do the job." And I'm like, well, you didn't mentor them. That job - yeah, you need an education, and you need to be driven, and you need to work hard. But there's another part that people seem to forget, is there's a mentorship.' F1_I1

Existing literature indicates that women who receive support in their academic and professional environments are more likely to continue their careers in engineering. For instance, Buse et al. (2013) revealed that women who remained in the engineering field emphasised the importance of feeling supported through reciprocal interactions with others, such as engaging in collaborative efforts and the exchange of support, guidance, and advice. In addition, Hughes and Hurtado (2013) found that students who received mentorship and support from faculty experienced a stronger sense of identity in engineering, and those who participated in internships or joined engineering-related student organisations were more inclined to choose engineering as a career path. In essence, gender equality involves ensuring that women attain equitable outcomes from opportunities (WGDAWG, 2022). When women are sufficiently equipped, supported, and prepared, they can make the most of opportunities.

When discussing the discursive object of 'gender equality' which was another topic constructed through language, a consensus was reached among many participants that both females and males should be evaluated impartially based on their skill sets. They acknowledged that the equitable inclusion of all genders ultimately contributes to the advancement of society. This sentiment was echoed by Masego:

'We should all be treated the same, as long as you can do the same amount of work, and whatever task you are given.' F3_I1

There was, however, no consensus reached regarding the approach to achieving gender equality, as many participants reflected on the bias and imbalances that attempts to address this issue have subsequently created. During the first focus group discussion, Peter expressed the following:

'How do we solve the past? This is our entire country's problem. Whether it's like, you know, whether it's a racial thing, whether it's a gender thing, it's who knows how to fix it. Do you try BEE, do you try give more like bursary opportunities to women? Like, honestly, if someone could just give us the recipe to fix this, it would be fantastic.' F1_I1

Some participants observed that initiatives aimed at promoting gender equality often imply that men must relinquish or diminish their power to support the advancement of women's empowerment (Glinski et al., 2018). Riger (1993) suggests that when disempowered groups make significant efforts to gain power, those who perceive themselves as losing power will likely be resistant. The dominant group may allow increased access to resources and opportunities only up to the point where it does not pose a threat to their control (Riger, 1993). This sentiment might arise from viewing progress in gender equality as solely benefiting one gender, while causing setbacks for the other. Throughout history, black men have been subjugated to immense amounts of discrimination and oppression, they therefore serve as an illustration of individuals who are classified as marginalised due to historical and social factors, as mentioned in the literature review section of this study (Mincey et al., 2013). The emphasis on women's advancement might seem to overshadow the needs and challenges faced by men in similar contexts. It can therefore be argued that true empowerment necessitates a redistribution of power across various levels, underscoring the inherent connection between empowerment and broader macro-level factors like politics (Riger, 1993). Xolani shared the following:

'But when it comes to this thing of saying, they are now only giving women more chances to get into engineering, and then they're excluding other guys... That doesn't sit well with me.' F1_I4

Rea added:

'The way the government goes about it, when it comes to women being involved in STEM, it's like they're introducing all of these programs that exclude men.' F1_I2

Participants also observed parallels between the history of oppression and power dynamics concerning gender and race in the country. Thabiso, expressed the following thoughts:

> *'Black broad-based empowerment like "BEE" for me. It's like that one, now it's an issue of whiteness and blackness, and then the introducing of all these things to benefit black people. So, in the same way, when it comes to women being involved in STEM, it's like they're introducing all of these programs that exclude men. And that are open to more females, that are open to more women. But for me, I can't be for BEE and then not be for the way they're including women in STEM, because for me, it's like, it's the same ideologies, or it's being introduced in the same way.' F1_I3*

Ben added the following statement in a separate focus group discussion:

> *'I mean, even if we look at let's say, the way BEE has been structured, you know, when I'm looking for a job next year, or whenever it is, it... Having a lot more females in my field may make it a lot more difficult for me.' F2_I1*

These discourses reflect the complex and troubled history of apartheid in South Africa, which not only encompassed systematic discrimination grounded in race as well as in gender, sexuality, and additional elements (Luiz & Terziev, 2022). The participants in this study appear to grasp the significance of diversity and the valuable skills that women contribute to their field, yet it is also crucial to acknowledge intersectionality and the various axes of oppression within different contexts (Luiz & Terziev, 2022). Some participants admitted to feeling uninformed and having a sense of oblivion regarding the gender disparities within their profession. Thabiso contributed the following:

> *'It's just now when I got to university in engineering, when there's way less females in class. Way less even black females in class, there's not that much black females in class. So that's where you see that, okay, such things are necessary. But if it's to work, it can't start at university level.' F1_I3*

Ben conveyed a comparable perspective:

'Well, I never realised that it would be so one sided in terms of gender. So, when I came into engineering, I generally did expect... I thought it was going to be something where it was a lot more even.' F2_I1

Ultimately, attaining gender parity necessitates a fair distribution of power and resources among genders (United Nations Population Fund [UNFPA]), 2023). In the pursuit of gender equality, it becomes clear that educating and involving men in the process is important. This entails not just changing the mindsets, beliefs, and actions of individual men and boys; but also empowering and motivating them to reshape the structures and systems that uphold gender inequality (WGDAWG, 2022). According to Stewart-Williams and Halsey (2021), the prevalent explanations for the gender disparities in STEM often revolve around discrimination and socialisation. If men are sufficiently informed, they have the potential to advocate for increased support for women (Nash et al., 2021). In terms of men's accountability in advancing gender equality, it is optimal to be fundamentally grounded in a substantive equality framework that focuses on reshaping power dynamics and ensuring an equitable distribution of benefits among genders, all while considering intersectionality (WGDAWG, 2022).

When discussing the discursive object of their 'female counterparts positioning within the field of mechanical engineering' which was another topic constructed through language, the male mechanical engineering students reiterated the notion that women might not resonate with the societal stereotype or expectations associated with being a mechanical engineer; potentially resulting in experiencing a lack of belonging in the profession, or a lack of motivation to pursue mechanical engineering altogether because of perceived unsuitability. Xolani raised the following questions with a sense of curiosity:

'Why aren't women joining engineering? You know, I mean, women are welcome. They've been welcome for a while now. You know, so the question is, are they interested in engineering?' F1_I4

John shared the following observation:

'Most females start dropping, and you see more males continuing with the course.' F3_I2

Participants have observed that their female counterparts often experience a sense of social isolation or a lack of belonging in the field. Given the numerical dominance of males, it often results in situations where women find themselves in the minority as one of the few females present in a room; thus, leading to feelings of exclusion as they experience a lack of belonging that their male counterparts may not fully understand (Wilson & Van Antwerp, 2021). Masego alluded to this sense of social isolation that women in the class may experience:

> *'With girls, I think if there's a few of them, most of them prefer studying alone. Which is them taking all the pressure alone, and that gets really difficult for them.' F3_I1*

When considering the significance of belonging, it's undeniable that it holds importance for everyone, yet its impact can be particularly profound for individuals belonging to groups with a history of being underrepresented, such as women in the mechanical engineering profession (Walton & Cohen, 2007). The prevalence of men in greater numbers is often intensified by deeply ingrained male normative cultures, resulting in chilly environments for women (Wilson & Van Antwerp, 2021). This dynamic may account for women's feelings of social isolation noted by some participants. Consistent with the study by Sikhosana et al. (2023), male participants made observations regarding male dominance in the field. They acknowledged that this dominance contributes to the challenges women may encounter in pursuing a career in mechanical engineering. Hence, this underscores the significance of intentionally equipping female students with support and mentorship as discussed earlier.

4.3 Discourses

Discourses have profound implications that require further consideration. In this section, the various discourses constructed in this study are situated within even broader discourses and organised into sections. The sections include: 1) feminine discourse, 2) masculine discourse, 3) contextual discourse, 4) institutional responsibility discourse, and 5) government responsibility discourse. It was noted that the participants drew on a feminine discourse to discuss why women may not be joining the discipline of mechanical engineering. When addressing the underrepresentation of women in mechanical engineering, the male participants thought about how femininity might be perceived when women enter a field traditionally regarded as a quintessential masculine profession (Kvande, 1999). Additionally,

they considered the challenges encountered by female students in engineering programmes and discussed the elements that lead to the perception that women are less interested in engineering.

Another discourse drawn on was a masculine discourse where participants acknowledged their numerical dominance within the field, thus collectively influencing the culture more so than women do as a group. They discussed their own masculinity, contemplating how it might be impacted by the gradual empowerment of women entering the field. They also reflected on their understanding of women's experiences in the predominantly male environment, and considered any preconceived notions they might have about women in mechanical engineering. The contextual discourse drawn upon considered the unequal power relations at play which have sustained gender inequality in the mechanical engineering field. The participants also explored how historical factors have influenced women's socialisation and upbringing, ultimately contributing to their underrepresentation in the field.

The discourse on institutional responsibility underscored the accountability that participants attributed to universities and schools as hubs of power and knowledge generation, especially in educating females about mechanical engineering. They also pondered on their female counterparts' experiences within the academic space and whether these experiences differed from their own as males. Finally, the discourse on government responsibility emphasised participants' perceptions of the legislative measures, programmes, and government-implemented policies enacted to address gender disparities in their field.

It is important to keep in mind that certain discourses or narratives are more widespread and commonly embraced, becoming deeply ingrained and perceived as the most accurate, while alternative viewpoints are sidelined or dismissed (Willig, 2013). Nevertheless, this does not imply that alternative discourses will never surface. Counter-narratives emerge and gradually gain accessibility to individuals over time (Weedon, 1997). The discourses noted underscore the competing representations and interpretations concerning the discursive objects of women's empowerment, gender equality, and the position of female counterparts within the historically male-dominated field of mechanical engineering.

4.3.1 Feminine Discourse

Based on interactions with their female counterparts, some participants noted that women might not find engineering interesting or appealing, thus leading to a reluctance to pursue mechanical engineering. This prompted further reflection on the factors contributing to the disparities in the number of women entering the field.

'But at the same time, you know, from my interaction with females regarding such a topic, it doesn't seem like many are interested in pursuing a career like that, and that's just from my experience.' F2_I1 (Ben)

'And then you get to varsity and they're all like, "nah, not engineering, never." I don't think it's an access thing, but I think on a general scale... I don't think women want to do engineering.' F1_I1 (Peter)

'Maybe it's interest, maybe they are not like interested in that stuff.' F1_I2 (Rea)

'Ladies have what they are interested in, and if they are not interested in engineering, it's okay.' F2_I2 (Victor)

'You don't want to have females working in a field that they don't like, because they were pressurised, because they are females to get those jobs.' F1_I4 (Xolani)

When analysing the above discourse through the lens of social constructionism theory, it is essential to acknowledge that cultural beliefs and expectations surrounding the roles, behaviours, and traits that define women and men are widely held (Risman, 2004). These beliefs and expectations are firmly entrenched within societal structures and greatly influence interpersonal dynamics and social interactions (Patrick et al., 2021). The prevailing norms regarding femininity and masculinity, which shape the framework within which society functions, are illustrative of these beliefs and expectations (Cviková, 2003). According to Cviková (2003), girls and women often encounter the basic principle of femininity, which commonly prescribes that a woman should never aspire to be like a man. Expressing interest in the predominantly male domain of mechanical engineering is perceived as deviating from traditional femininity, thereby challenging established gender norms.

4.3.1.1 Factors that Contribute to Women's Perceived Lack of Interest in Engineering

4.3.1.1.1 Female students are accustomed to being nurtured.

Participants suggested that women are generally accustomed to nurturing environments, which leads to perceptions of them being softer as a result. It has been noted that the attributes linked to femininity and women's formative experiences and socialisation are perceived to be at odds with the demands of the field. Femininity is associated with behaviours like empathy, compassion, and selflessness, which can be perceived as passive and weak, whereas masculinity is linked with behaviours such as independence, mastery, and competence (Pozzebon et al., 2015). John's perception below aligns with broader discourses on femininity and masculinity and their distinctions.

> *'It is also due to the fact that they are used to being nurtured and having teachers care about them.' F3_I2 (John)*

> *'Girls tend to be more soft in the field of work and feel entitled to lighter work than their male counterparts.' F3_I2 (John)*

John highlighted a key factor in understanding the underrepresentation of women in STEM, as traditional notions of femininity are often seen as incompatible with mechanical engineering (Francis et al., 2017). Considering both femininity and masculinity, it is essential to take into account the fact that gender socialisation processes occurred well before men and women selected their engineering specialties, thus leading to overall gender disparities that persist irrespective of the gender makeup or distinctive culture of an engineering domain (Patrick et al., 2021). Hence, it is crucial to recognise and appreciate the distinct qualities and approaches that women contribute, rather than expecting them to conform to male standards (Bastalich et al., 2007). If males, who constitute the majority in the field, perceive women to be soft and more inclined to needing nurturing, this reinforces negative stereotypes about women's suitability for the field. Consequently, women may be viewed as lacking the qualities typically associated with a mechanical engineer (Rukondo & Kinyota, 2022).

4.3.1.1.2 Support for women in engineering is lacking.

Masego's quote below underscores the lack of belonging and inclusion of women engineering students in relation to the formation of study groups but locates this in women's own 'preference' to study on their own. This negates some of the mechanisms and discourses of exclusion that may be present.

'Most of the guys in engineering have created groups, while most of the girls prefer studying alone. This makes it difficult for them to do the course work alone, as it requires them to have other information and help.' F3_I1 (Masego)

However, this quote highlights that a lack of inclusion in these groups deprives women of access to relevant support and resources, which makes it harder for women in the field. Aaron, on the other hand, speaks about a perception by women of engineering as 'hard labour':

'They receive limited information when it comes to career choices, and what really is happening in each career. So due to that, and due to the lack of information, their brain has already decided that engineering is just hard labour.' F2_I3 (Aaron)

This suggests a stereotype that women are averse to hard work, and that engineering is too hard for them, and they may therefore avoid engineering because of this perception. In their discourse, some participants have acknowledged that insufficient training, resources, or mentorship opportunities for women could act as barriers to their integration into the field (Martin & Barnard, 2013). Upon entering the workforce, the profession does entail labour-intensive tasks, and women's unique physical needs, such as the impact of monthly menstrual cycles on their bodies, are often overlooked. As highlighted by Martin and Barnard (2013), supportive organisational practices are scarce, this leaves women to cope and navigate male-dominated spaces largely on their own. This aligns with the observations noted by Masego above. Given this reality, certain aspects of engineering are naturally perceived as masculine, embodying preferences traditionally associated with the male gender role (Patrick et al., 2021).

4.3.1.1.3 Women do not fit in, and they experience an intimidating environment.

The perception that women do not belong in mechanical engineering, coupled with the intimidating atmosphere they often face, highlights the challenges of gender bias and the exclusionary culture within the field. The participants acknowledge the significant barriers women encounter as they navigate a traditionally male-dominated environment.

'I don't... Have you ever been exposed to a place where there's like 100 men and you're the only girl there, you know? I've been and it was... But I was intimidated, yoh yoh yoh.' F1_ I4 (Xolani)

'It's scary, like you don't want to do anything.' F1_I1 (Peter)

'....and you're like the only guy or you're the only woman. I think it might actually be quite intimidating and kind of annoying.' F1_I1 (Peter)

'The majority of those who went to the mines and labour-intensive industries were male dominated, and that as a woman, they often felt inferior and discriminated. This has caused women to feel uncomfortable going back to those industries, but the industries are starting to open up, and if that changes, women would be more open to saying that they want to go to a certain industry. For example, consulting is more popular than mining and maintenance companies, and women are more into consulting than mine types.' F3_I2 (John)

'Unwanted attention can be annoying, especially if you are the only attractive or popular girl or guy in the class.' F1_I1 (Peter)

'In those industries, they don't have filters. I don't want to lie to you. They see what they want to say with their chest, and as a woman, sometimes you'd feel inferior to that. Or the comments, you'd feel that you know what, you're discriminated, or you're being treated some type of way. Or even sexually harassed if I may say.' F3_I2 (John)

Participants alluded to the idea that women may feel intimidated or may face discrimination due to their underrepresentation, indicating their awareness that women are more likely to encounter negative stereotypes or harassment in environments where they are outnumbered by men. Fitzgerald et al. (1995) mention gender harassment and describe it as encompassing a wide array of behaviours, both verbal (such as sexist jokes and derogatory remarks about women's capabilities) and nonverbal (such as crude gestures and inappropriate stares), which are not intended to seek sexual cooperation but rather to express demeaning, hostile, and degrading attitudes toward women. Xolani's remark about attractive individuals receiving unwanted attention not only sheds light on the inappropriate scrutiny women may endure but also underscores a possible resentment men might harbour towards their own perceived vulnerability to the influence of attractive women. This reflects broader power dynamics, where women, by challenging traditional gender norms and leveraging their attractiveness, may be seen as wielding power, which can lead to accusations of manipulation

(Cundiff, 2021). Research indicates that gender-based harassment is driven by animosity towards women who challenge traditional feminine norms, aiming to demean, exclude, and pressure them to leave male-dominated environments (Cundiff, 2021). Gender harassment is frequently downplayed or dismissed as inconsequential, however, it may cause significant harm to women (Cundiff, 2021).

Some participants confirmed that the experiences women encounter while studying and working in the field might deter them. Participants inferred that there are valid reasons for women to feel intimidated by the profession, given the ongoing prevalence of discrimination and sexual harassment. Bradbury and Kiguwa (2012) reported that such actual and "potential" dangers of sexual violence function to govern women's engagement not just within academic or professional settings, but also in the wider social realm. As a result, both the implicit and explicit influence of hegemonic masculinity effectively maintains control over space and limits women's mobility within these spaces, consequently affecting their academic engagement (Bradbury & Kiguwa, 2012). Participants acknowledged the gender disparity within the mechanical engineering space, recognising the potential feelings of annoyance and intimidation women may experience because of this. Being consistently outnumbered in such settings can affect one's sense of identity and interactions (Bradbury & Kiguwa, 2012).

4.3.1.1.4 Engineering is workload-intensive and emotionally draining.

In discussing the demanding nature of their mechanical engineering course, participants highlighted the significant emotional and physical toll the field can impose, particularly on women. This section delves into how male students perceive the rigorous demands of the course as contributing to emotional strain and creating a difficult learning environment for their female peers.

> *'And I think talking to my, female counterparts in class, sometimes they just feel like it's just too much, then they just let it go. And it becomes just too emotional for them to deal with, and they just let it go.' F1_I4 (Xolani)*

> *'The course is not for the faint hearted and many women drop out due to the workload and stress.' F3_I2 (John)*

> *'And yeah, the young ladies should not be scared of engineering, it's a nice field.' F2_I2 (Victor)*

'The majority of girls would join the course in first year, but then it starts getting hectic in second year, and the numbers start dropping. Only a few key ladies hold fast to the course, as it is not only about intellect, but also about being able to handle the stress and every nonsense that comes with it. It needs a backbone, and it is up to the students to decide if they are going to take it down or challenge the lecturers.' F3_I2 (John)

'Women in engineering tend to struggle with Mechanical Engineering and Aeronautical Engineering, while men seem to excel in Industrial. If the root cause of this can be found, things can improve.' F3_I1 (Masego)

The participants allude to a perception that women may underperform compared to men in mechanical engineering. There is, however, an argument that early childhood learning contributes to men's dominance in the field (Bastalich et al., 2007). It is therefore undeniable that women who lack a foundation in mechanical engineering or exposure to modern engineering would face inherent disadvantages (Bastalich et al., 2007). John mentioned that women dropping out implies that students' subjectivities was also a factor to consider, as studies have indicated that girls tend to exhibit lower confidence in their skills and are less inclined to perceive themselves as proficient in science and/or mathematics, regardless of their true academic achievements (Francis et al., 2016). The portrayal of the field as inherently masculine has also deterred numerous girls from involvement, as the symbolically masculinised nature of this subject does not 'fit' with their feminine identification (Francis et al., 2016).

4.3.1.1.5 Engineering may not be compatible with motherhood due to its association with arduous work.

The perception that engineering may be incompatible with motherhood stems from the field's reputation for intense and challenging work. This section explores how some participants consider the difficulty women might face in balancing the demanding nature of engineering with the responsibilities of motherhood.

'Even on field, I have heard a woman colleague saying that she is going to quit the job for an office job because she wanted to conceive a baby. She wanted a comfortable environment, so that she can feel comfortable in the environment.' F2_CHAT (Kopano)

'I know that having a child within... It depends also on what engineering environment you are in. There are a lot of engineering environments which would be perfectly suitable for you to have a child and, you know, maintain that environment.' F2_I1 (Ben)

In the discussion above, Ben and Kopano considered the dominant discourse concerning gender roles, which commonly perceives women's roles as predominantly centred on caregiving. They recognised the prominent roles and responsibilities that society expects women to fulfil in the household and observed that some engineering environments were more 'family-friendly' than others. Although there have been advancements and changes in both engineering and gender dynamics, it is apparent that traditional gender-role expectations persist. Women, particularly those in science, engineering, and technology fields, encounter numerous challenges in their professional lives that are not experienced by their male counterparts (Chinyamurindi & Louw, 2010). In contrast to men, women are typically assigned primary responsibilities for childcare, elder care, and managing other household duties (Hoh, 2009). Consequently, women often face the challenge of balancing the demands of their profession or studies with their family responsibilities, which participants suggest may be the fate of their female counterparts (Mostert, 2009). This creates a ripple effect for women, leading to broader psycho-social issues, such as feeling demoralised or struggling to concentrate on their studies (Solomons, 2024).

4.3.2 Masculine Discourse

History has shown that any solution to gender disparity that does not involve men is likely to be ineffective as men play a significant role in fostering an inclusive culture within the field (Nsirim & Elechi, 2013). There are subtle, often overlooked gender dynamics in mechanical engineering institutional cultures that contribute to the limited representation of women. Examples include the habitual use of "he" to refer to mechanical engineers, conversations dominated by male interests, an environment characterised by heteronormativity and sexualisation, expectations to adhere to specific masculinities, and influential male networks within organisations (Faulkner, 2009). Masego shared his perspective on the overrepresentation of men in the field:

'I think one of the main reasons also is because I think engineering is more male based. Like, there's a lot more males than females; and majority of the guys, specifically in

engineering seem to have created groups. Like, I used to have a group of five guys, and we used to study together.' F3_I1 (Masego)

While Masego's statement and the abovementioned factors might seem insignificant when considered individually, together, they may make it harder for individuals on the outskirts of the culture to establish the essential connections necessary to advance and excel in the field (Faulkner, 2009). Hence educating and orienting men on the significance of women empowerment and gender equality measures is crucial for fostering ideological shifts. These shifts are vital for establishing a more just society with equal opportunities, where limitations are based on constitutional guidelines and individual capabilities rather than gender differences (Nsirim & Elechi, 2013).

4.3.2.1 Male students are open and accepting of female students in formerly male-dominated fields.

Peter articulated that the idea of excluding women from engineering is absurd, and other participants stated that men welcome women's presence in the field. They emphasised the significance of increasing female representation in the industry, noting that it would improve efficiency and make the field more engaging. Moreover, they pointed out that mixed-gender classes are enjoyable and advantageous, as they help prevent boredom.

'Because to be honest, it's crazy to think women can't be in engineering. That's madness.' F1_I1 (Peter)

'And we are not going to take them down or look down on them because they are ladies.' F1_I4 (Xolani)

'We'd love to have more women in engineering in actual fact.' F1_I4 (Xolani)

'We're really looking forward to having women in mechanical engineering specifically,' F2_I2 (Victor)

'I personally look forward to there being more females in the industry. I think it's important, I really do.' F2_I1 (Ben)

‘For me, I feel like there should be more women in the industry, like it would be more efficient. So, women should join us so that there's a balance.’ F1_I2 (Rea)

‘Men are not hostile with having women at the table.’ F2_I2 (Victor)

‘You know, we're not like: "hey man, this is a man's field, get outta here." No.’ F2_I2 (Victor)

‘So, I would really love to see more women coming into this field, because it is really interesting at the end of the day, and it's not much of hard labour as they perceive.’ F2_I3 (John)

‘I mean, we can't all be men in the same class. It gets boring sometimes, that's just not nice.’ F2_I3 (Aaron)

‘it's more of an intellect thing, and how good you are in science and math, of course. It's not disrespect to gender, so any person can join.’ F2_I3 (Aaron)

During the focus group discussions, male participants expressed that the increasing presence of women in the historically male-dominated field of mechanical engineering remains a positive development. They noted that such ideological shifts create chances for reciprocal education among women and men, highlighting the significant impact of achieving balanced gender representation. Aaron reflected on the importance of recognising individuals' intellectual capabilities in the field irrespective of gender. This sentiment was echoed by the participants, with Victor noting that men do not harbour feelings of hostility towards women in the field. This analysis of the discussions has shown that the culture within mechanical engineering is gradually becoming more welcoming, comfortable, and supportive for women compared to its historical context (Faulkner, 2009). To prevent the profession from losing or under-utilising talent, these broad gender changes are essential (Faulkner, 2009).

On the other hand, participants such as Masego, acknowledged the traditional masculine image that engineering has (Okeudo, 2017). They recognised that the field of mechanical engineering was challenging but suggested that it was more challenging for women.

'I think one of the main reasons also is because I think engineering is more male based. Like, there's a lot more males than females; and majority of the guys, specifically in engineering seem to have created groups. Like, I used to have a group of five guys, and we used to study together.' F3_I1 (Masego)

This sheds light on the existing sense of community that has developed around the masculine traits of perseverance and dedication essential for success in mechanical engineering (Lucas & Steimel, 2009). This may be an illustration of the male students' responses to gendered identity threats, as they cling to masculine images as their male-dominated profession undergoes what they overtly or covertly perceive as feminisation (Lucas & Steimel, 2009).

4.3.2.2 Males in the industry have preconceived notions about how women behave in the workplace.

Participants observed that there are certain tasks female students may be unable to perform due to biological differences, and they emphasised the importance of acknowledging these limitations. The concept of equality also seemed ambiguous, with some participants questioning whether it implies that both genders should perform the same tasks or if it means that individuals should engage in tasks suited to their respective capabilities.

'There are some things that the female students couldn't do, and that is completely due to biology. So, you can't take that away from them.' F1_I4 (Xolani)

'Should I say that 'okay no, the guys can carry on and do this task,' or does everybody not do it? Because the task will need to be done. So that's some of the things that I'm still on the fence about.' F1_I4 (Xolani)

'That okay, is equality meaning that we must each do the same task, or can we just do what each gender can do?' F1_I4 (Xolani)

'However, the engineering field requires hard work and physical labour, making it difficult for women to be employed due to men looking down on them. It is a competition, and it gets tough based on that.' F3_I1 (Masego)

'You know, if you're a guy, getting a job doing construction work, people just hire you. Because "ah that's fine, you're a guy you could probably do it." Whereas a lot of the construction companies that I did work for, or like peace jobs I did, it's all very, like physical labour, and they won't hire women, because they're very sexist.' F1_I1 (Peter)

Masego's assertion that women are looked down upon by men due to physical differences aligns with research by Kanakana et al. (2017), which found that many female students encountered various gender-related obstacles and social pressures within the field of engineering. This reveals an overlapping gendered discourse which emphasises women's physical stature and strength, particularly their assumed lack thereof, as a barrier to their competence as mechanical engineers (Lucas & Steimel, 2009). Women in the field have historically been viewed as different from men, rather than men being viewed as different from women. Consequently, men have a crucial influence in shaping the gender identities of women as identities are not formed in isolation; they develop through interactions across various contexts (Lucas & Steimel, 2009).

Prokos and Padavic (2002) highlighted that men also influence the construction of gender hierarchies due to their power and status in male-dominated fields like mechanical engineering, which demand physical strength (Silk et al., 2017). In these environments, women are frequently perceived as less capable and may face discriminatory behaviours like exclusion. Women frequently feel pressure to outperform their male peers to be seen as competent, which can discourage them from seeking additional support to avoid drawing attention to their gender (Woodfield, 2015). All of this in turn reinforces gender differences. Despite this, most national and international policies and reports on gender equality seldom address the need to transform men and masculinities (Hearn, 2021). They rarely call for any changes in male behaviour or attitudes.

4.3.2.3 Effect on masculinity: "My masculinity is unaffected by the rise of women in STEM fields."

This section explores how the growing participation of women in STEM disciplines influences male students' perceptions of their own masculinity. Many participants asserted that the increase in female participation in traditionally male-dominated fields does not impact their masculinity.

‘I do think of my background, like I grew up around a lot of women, so I think women being successful or what not doesn't scare me a lot because I grew up around a lot of women and they have working jobs and whatever.’ F1_ I4 (Xolani)

‘The wife was the boss she was in charge of everything. So, I think I grew up... Also, I grew up used to it, so for me it wasn't a thing. It was like a normal thing, whoever was the best at the job was doing it, so for me it's like, how it goes, I guess. Yeah. So, I guess I'm used to it, so it didn't impact my masculinity I guess.’ F1_I1 (Peter)

‘I don't really care.’ F1_I1 (Peter)

‘Because I still feel like even though that is happening, there's enough opportunities for men. So, for me, it doesn't really affect me as a guy or my masculinity.’ F1_ I4 (Xolani)

‘It doesn't also affect my masculinity in anyway, because I also work in an environment that was not categorised into gender in terms of what you do in life.’ F2_I3 (Aaron)

‘I don't think it affects me at all. I think that one of the smartest people I've ever met is a female. It also doesn't change me whether it's a female or male.’ F2_I1 (Ben)

‘It doesn't affect me at all. You know, it doesn't make you less of a man just because a woman is teaching you, or a woman is higher up than you are.’ F2_I1 (Ben)

‘For me it doesn't affect me, yeah. I don't know, maybe it's a personality thing because I don't care who is doing what, as long as you're doing your job fine, and you are treating me well.’ F3_I3 (Musa)

Some participants attributed their positive perception of women in mechanical engineering to socialisation and being raised around many accomplished women. This highlights the significance of considering the influence of broader societal discourses on individual perceptions (Budds et al., 2017). For many participants, prevailing norms about femininity and masculinity have significantly shaped their beliefs and expectations (Cviková, 2003). Overall, participants have notably embraced the transformational changes regarding gender equality and women's empowerment initiatives in the field. They have contributed to

promoting shifts in masculinities by fostering gender-equitable responses (Dworkin et al., 2012).

Participants seemingly assert that their masculinity remains unaffected by the increasing presence of women in mechanical engineering, provided that their opportunities remain unchanged and intact. This is congruent with research by Sagebiel and Dahmen (2006) which suggests that if gender differences are not addressed, existing masculine norms and discriminatory practices in the field will continue, as many individuals in society still view the profession through a masculine lens. Some men may feel disempowered and alienated by women's increased presence in the field and efforts to empower women, thus leading them to construct hypermasculine identities, sometimes through violent behaviours, to seek validation and recognition in male-dominated environments (Dworkin et al., 2012). A lot of studies in South Africa examining masculinity have centred on factors such as violence and race, highlighting how race intersects with culture and privilege (Morrell et al., 2012). This is equally relevant for femininity, thus emphasising the importance of considering intersectionality in these discussions (Morrell et al., 2012). Men may also symbolically compensate for threatened masculinity by adopting attitudes that reinforce public perceptions of traditional masculinity, displaying more overtly masculine behaviours to recover their status when they feel insecure. Consequently, men may behave more masculine than they would if they didn't feel threatened (Weller et al., 2021).

4.3.3 Contextual Discourse

Racist and sexist norms from the apartheid era have long influenced South Africa's social, political, and economic landscapes. Given this historical context, the study deemed it important to consider the concept of power as being inherently tied to gender and relational dynamics, influenced by broader social, institutional, and structural factors (WGDAWG, 2022). Reflecting on the topic at hand, it becomes evident that gender disparities within the field persist due to imbalanced power dynamics. These imbalanced power relations and privileges are deeply ingrained and have been perpetuated through discriminatory stereotypes and gender roles that devalue women and privilege men collectively (WGDAWG, 2022).

> *'I think it's important, I think, with everything that has happened over history, it is something that needs to happen within our current generation, and something that needs to be fixed. Because, as rightly pointed out, the world has been predominantly*

run... Well, the power circles within the world have been predominantly run by men. I think with women empowerment, there is... When done correctly, let's put it this way - when done correctly, there is not just women empowerment, but there's male empowerment as well.' F2_I1 (Ben)

Ben noted that systems of power have historically favoured male dominance and privilege, and he is one of the participants who acknowledged the need for change. This accords with Secule's (2009) research which combines engineering education with critical, cultural, and historical perspectives, arguing that masculinity and competition are deeply intertwined with each other and the engineering discipline. Those who historically held significant social power, such as white males during the apartheid era, and exercised influence within engineering-related institutions, have been the primary architects of the definition of engineering (Secules, 2019). Like other participants, Ben articulated a desire for a more impartial distribution of power between males and females. Although men collectively benefit from gender-based advantages, they may also face oppression or disempowerment based on their positions within intersecting relations of race, ethnicity, class, sexuality, or migration status (WGDAWG, 2022). Involving men in advancing gender parity and empowering women can be seen as mutually beneficial if approached effectively.

4.3.3.1 The era of upbringing influences male students' acceptance of women with a male preponderance.

This section explores how the upbringing and formative experiences of male students impact their acceptance of women in traditionally male-dominated disciplines. It examines how historical and cultural contexts shape their attitudes towards gender diversity in male-dominated environments.

'I didn't grow up in an era where women were not included and then now suddenly, I have to adapt myself and change myself, where woman are included.' F1_I4 (Xolani)

'There were more females than guys, everywhere that I've been.' F1_I4 (Xolani)
'A lot of my family… We're Jewish. So, I mean, if you go to Israel, you get to 18 you're going to the army, there's no exclusion principle. Everyone will go to the army; everyone will go fight everyone. So, it's a weird concept for me to sort of think "ah no,

you couldn't join" or you didn't feel welcome to join us. Absolutely absurd.' F1_I1 (Peter)

The discussion above illustrates how historical conditions shape the production of knowledge and subjectivity, as participants reflected on their culture, their upbringing and how their perceptions of women have been influenced in their formative years. This accords with the study by Helman and Ratele (2016) which highlighted the pivotal role of family in shaping and practicing concepts of masculinity, femininity, and gender equality. This emphasises the importance of being aware of stereotypes perpetuated from early childhood to adulthood. Research has indicated that children can understand gender labels and are aware of gender stereotyping from as young as two years old (Ruble et al., 2006). Around that age, children begin to develop generalised ideas about gender groups in the form of stereotypes, which extend to gender-typed activities, careers, and roles (Mulvey et al., 2010). During early adolescence, there is further development in the flexibility of gender attitudes and behaviours, accompanied by an increased need to conform to gender roles (McGuire et al., 2020).

It becomes evident that issues like race, gender, and class can be perceived differently, even within the same group, as various factors influence how individuals experience the same things (Crenshaw, 1991). For instance, because of the country's history, the experiences of black women regarding race and gender would vary greatly from those of white women and black men, despite some commonalities among them (Crenshaw, 1991). It is therefore comprehensible that students from marginalised or non-dominant backgrounds who enter elite academic environments often experience increased feelings of inadequacy, social isolation, and heightened pressure to succeed (Badat, 2010). Their feeling of inclusion and connection may frequently be challenged in environments where dominant social norms or expectations clash with their lived experiences (Kane, 2023). Participants also believed that engineering was not well advertised.

'Maybe it's not marketed properly it's not made to look like a field where women feel like it would be something they could do and actually enjoy.' F1_I1 (Peter)

'I feel like mechanical has a bad reputation.' F1_I2 (Rea)

'Maybe they could tell young girls that mechanical is not all about cars and stuff. There's like design, you can do work as a designer and stuff. So, you'll have your own office and stuff.' F1_I2 (Rea)

'Good marketing, change the marketing plan.' F1_I4 (Xolani)

'If you choose science and math, at my school there were way more girls than guys, way more. In my science class, my math class, it was mostly women.' F1_I1 (Peter)

Peter observed the fact that although many women are studying maths and science subjects in greater numbers than men, recruitment in the engineering field remains stagnant (Naukkarinen & Bairoh, 2020). Participants suggested that women may not be well-informed about mechanical engineering and may perceive it as being aligned with traditionally masculine interests like cars. Some engineering fields have more gender representation than others, and participants propose that if mechanical engineering were marketed to highlight women's interests, it could attract more women. The participants suggested that women could be just as interested in mechanical engineering as men if the discipline's culture signalled that they belong there, as suggested by scholars such as Naukkarinen and Bairoh (2020).

4.3.4 Institutional Responsibility Discourse

To rectify the exclusionary legacy of apartheid, higher education institutions were recognised as key instruments for tackling inequities and injustices, as well as for advancing the progress and modernisation of South Africa (Teferra & Altbach, 2004). The University of the Witwatersrand led the way in this with its 1950 manifesto, which aimed to create some space for students who had been historically excluded from predominantly white, English-medium universities (Cross & Carpentier, 2009). However, remnants of the oppressive, authoritarian white leadership style from the apartheid era, characterised by the typical "heterosexual masculinity," remain apparent in South African organisations and institutions (Gevisser, 2016).

4.3.4.1 Engineering students in the class context

4.3.4.1.1 It is beneficial to have female students in engineering classes.

Participants expressed that females in their class are more organised and take things more seriously, which helps them remain professional and focused when they are tasked with studying independently. They observed that their female counterparts are typically better organised when it comes to group projects, while men are more playful and tend to procrastinate. They highlighted the value of having a different perspective on a topic or project from another gender.

> *'I think it is a good thing that we have females in our class, as they are more organised and take things more seriously. This helps us to be more professional and focused when we are around them, as we tend to not be as professional as we should be when we are alone. I like that they are organised and more organised than us.' F3_I3 (Musa)*

> *'Women tend to be more organised and organised when it comes to group projects, while men are more playful and want to do things last minute. It is important to have a different perspective on a topic or project from a different gender.' F3_I1 (Masego)*

> *'All mechanical engineers are socially awkward because of a lack of females in class.' F1_ I4 (Xolani) '...Very valid points, actually. Because there's no balance.' F1_I1 (Peter)*

> *'And how are we supposed to design more feminine looking cars, if it's not from a lady's perspective, you know what I'm saying.' F1_ I4 (Xolani)*

> *'Now when we are designing lady specific products, we're struggling, and at the end of the day, it's us who are responsible for making all the kind of products that exist.' F1_ I4 (Xolani)*

Despite the historical influences of apartheid, colonialism, and patriarchy in South Africa, participants acknowledged and embraced women's unique differences and contributions. They demonstrated an open-mindedness and awareness of gendered preferences in various engineering activities (Patrick et al., 2021). This receptiveness reflects a progressive shift in male perspectives towards women in STEM fields, supporting research that indicates that a diverse student body in academic institutions yields numerous benefits (Kanakana et al., 2017). In an era of intense competition for enrolments at many academic institutions, especially

in engineering, overlooking the inclusion of female students can result in negative effects such as reduced revenue (Kanakana et al., 2017). It is also crucial to focus on offering women equal opportunities for success and career development, rather than merely achieving gender parity in enrolment numbers (Kanakana et al., 2017). The male students perceiving the absence of females in their classes as notable and linking it to their own challenges in socialising underscores the intricate dynamics of diversity and intersectionality within institutions, as well as how individuals construct their identities in response to these factors (Luiz & Terziev, 2022).

4.3.4.1.2 Students of both genders are treated equally in the class.

Participants asserted that women in their classes are indistinguishable from men, except for their gender, and thus should receive equal treatment. They reported no instances of differential treatment compared to their female peers in their educational environments; both lecturers and other classmates helped equally when needed. This equality is perceived as a societal norm rather than being attributed specifically to their degree or field of study.

> *'To be honest, I haven't really had any experience where they were treated differently, within our educational environments, at least, they haven't.' F2_I1 (Ben)*

> *'No. I don't believe that that's happening in our class. Like, yeah, I don't believe that has happened.' F3_I3 (Musa)*

> *'But I really don't know hey. Perhaps during consultation there, they say something different, but I wouldn't be there so I wouldn't know. But by lecturers in class, I think we're all the same in classes with answering and asking questions. In terms of marking and assignments, I think it's also the same.' F3_I2 (John)*

> *'With regards to lecturers and students, I think also, to our eyes, when we are in class lecture rooms and we ask questions or need help, they help you the same, like the same help. If a female asks a certain question or are struggling, they try by all means to help. Whether female or male.' F3_I1 (Masego)*

> *'But I think that is more from a society perspective, rather than specifically because of our degree or anything like that.' F2_I1 (Ben)*

One participant expressed an experience of women being treated differently in class:

> *'I think at some point they are treated differently. I remember in the lab, we were putting some weights somewhere, and the demonstrator was like, 'we must create a plan for the women' because it was difficult for them to put the weights correctly.' F2_CHAT (Kopano)*

The participants highlighted that in their experience, a balanced measure of assistance and support appears to exist for both genders. Participants also made noteworthy observations, and considering the hierarchical structure of universities, integrating the perspectives of both staff and students is crucial in shaping and executing institution-wide policies and practices relating to gender (Cornell et al., 2016). This is significant because the daily social interactions that students have at university can perpetuate power imbalances rooted in gender, which would ultimately lead to adverse experiences for students (Mallman et al., 2019). Achieving true gender equality and women's empowerment in South African universities requires confronting and challenging the existing oppressive practices and cultures within higher education institutions (Cornell et al., 2016). The findings of this present study suggest that having diverse university spaces can profoundly influence both the personal and systemic experiences of students (Mallman et al., 2019).

Kopano recounted a distinct encounter of discriminatory treatment towards his female peers in mechanical engineering. This incident suggested that women were perceived to be less competent than their male counterparts in the field due to perceived limitations in physical strength for carrying out required tasks. This is in accordance with the research conducted by Bastalich et al. (2007) which found that the field of engineering has a culture which encompasses a narrow set of masculine norms and demonstrates minimal tolerance for diversity. Within this culture, individuals who deviate from strict masculine standards, including women, are marginalised and viewed as outsiders (Bastalich et al., 2007). Kopano further expressed his feelings about women being treated differently in class:

> *'For me personally, it shocks me that people still do that, or still think like that. I understand that for some people, it is ingrained in them to think of gender roles, but for me, it is frowned upon. It would make me uncomfortable in a scenario like that, as it is 2021 and we are moving away from those things.' F2_CHAT (Kopano)*

This observation of differential treatment made by Kopano is consistent with literature that highlights that gender can pose challenges to the formation of engineering identity among undergraduate students (Dryburgh, 1999). Given the scenario brought up by Kopano, it is evident that gender roles remain prominent in society and in higher education institutions. This would in turn result in women and men not being equally recognised and validated as engineers by others (Tonso, 2006). In the mechanical engineering field, differential treatment towards women can further alienate them, and further reinforce perceptions of the academic environment as uncaring or even hostile (Kane, 2023).

4.3.4.1.3 Recognition that women are underrepresented in STEM fields.

This section delves into male students' recognition of the insufficient presence of women in STEM fields. It highlights how the participants perceive and acknowledge the gender imbalance within their field.

> *'Females haven't been heavily involved. Or rather they have been, and it just hasn't been maybe acknowledged as much.' F2_I1 (Ben)*

> *'Engineering is a male-dominated field, with more males than females.' F3_I1 (Masego)*

Some focus group participants highlighted a lack of recognition for women in mechanical engineering, which suggests that their presence has been undervalued in institutional spaces (Clowes et al., 2017). This brings into focus Fraser's (2007) research around misrecognition, which occurs when societal hierarchies and institutional values are structured to exclude non-hegemonic identities. This exclusion is exacerbated by insufficient efforts to address such barriers, thus leading to further marginalisation of already excluded groups (Solomons, 2024). This illustrates how prevailing structures shape the dominant cultural landscape, ultimately reflecting the perspectives of a small minority (Solomons, 2024).

4.3.4.1.4 Discourse around opportunities exclusively for women.

Several participants noted that opportunities are now being provided exclusively to women with the aim of rectifying historical injustices, rather than based on their intelligence and competence. Many participants shared the view that women are now at an advantage due to their previously disadvantaged status.

'I also won't feel okay if they employ a woman based on gender, because it's supposed to be based on qualifications.' F2_CHAT (Kopano)

'Because of the backlash they may get if all employees are male dominated. To rectify this, companies employ females.' F3_I2 (John)

'For me, personally, I think that somebody who is the most qualified for the position, should get that position.' F2_I1 (Ben)

'I think that's a better solution than just putting people into positions, just because they now need to increase the female density within a particular region. They may not be as qualified for a position.' F2_I1 (Ben)

'Then it's going to be a problem now because at the end of the day, like the company should hire people that are more capable.' F1_I2 (Rea)

'The thing that I don't like about people who are pushing gender equality is that things like, even on the posters... On posts... Even for example, the bursary posts, they'll say that they will prefer more females, and they will give preference to females, basically. So, it is discouraging us from applying for those posts,' F3_I3 (Musa)

Universities are expected to serve as catalysts for societal transformation through democratisation and by contributing to racial and gender equality, however, participants reported feeling marginalised by funding opportunities as universities strive to address gender imbalances (Cross & Carpentier, 2009). The participants' view that men are being excluded from the field while women receive opportunities solely based on gender underscores the hegemonic nature of masculinity as many participants struggled to recognise that women's advancement does not require men to reject or diminish their own gender identity (Kvande, 1999). Additionally, they expressed apprehension about entering the workforce due to government-led gender equality and women's empowerment initiatives, which they believe also excludes males. Balancing societal interests is difficult due to the presence of conflicting value systems (Cross & Carpentier, 2009).

On one hand, there are principles centred on equality, justice, and solidarity, while on the other, there are values emphasising differentiation, competition, and individualism (Cross & Carpentier, 2009). The shift from higher education is already a challenging phase for South African students due to the uncertainty surrounding job prospects. This challenge has been further intensified by the impact of the Covid-19 pandemic, which has accelerated job losses. With the country facing a high unemployment rate, the concerns voiced by male students in the focus group discussions are particularly well founded.

4.3.5. Government Responsibility Discourse

In theory, South Africa seems to have implemented all the essential forward-thinking legislations and policies, along with some of the most exemplary diversity and inclusion frameworks (Luiz & Terziev, 2022). However, we have seen that this often does not fully manifest in the cultures observed in everyday practices within organisations and institutions, thus highlighting a notable disconnect (Luiz & Terziev, 2022). Several participants spontaneously discussed governmental and policy reforms because these are indeed crucial in addressing the systemic issue of women's empowerment and gender inequality (WGDAWG, 2022). Nevertheless, it goes without say that it remains equally as important to foster changes in behaviours and attitudes at both individual and societal levels too (WGDAWG, 2022).

4.3.5.1 Government's approach to empowering and promoting women in STEM careers.

4.3.5.1.1 A focus on the constructive methods for resolving the disparities.

Participants noted the significance of providing equal opportunities for individuals of all genders within the same field, saying that competence should be the primary criterion for selecting candidates, regardless of gender. They also highlight the value of diverse skills from individuals of each gender coming together. In addition, there was a suggestion for the government to initiate educational programs aimed at company leaders and hiring managers.

> *'The government might need to start doing like, education programs for people who run companies and people who do the hiring for companies.' F1_I1 (Peter)*

> *'It is important for men and women to have the same opportunity in the same field, and that if they can do the job, then they are the right person for the job.' F3_I1 (Masego)*

'Gender should not matter, as long as everyone can do the same amount of work and be given the same tasks.' F3_I1 (Masego)

'I think everybody has different skills and everyone has different abilities. Some people are naturally more academically gifted than others, regardless of gender.' F2_I1 (Ben)

Participants believed that government initiatives should aim to establish a more equitable playing field for both men and women alike. Participants also touched on the ongoing issues of who should be participating in government interventions related to gender, and what the most fair and constructive ways to implement government initiatives are. Ben's insightful proposition of educational programmes for companies reflected consideration for how companies can best implement interventions. Interventions can either be supported or obstructed by socio-political conditions after all (El-Maawi & Owens, 2016). Research also indicates that governments and policy institutions often overlook "men" as a specific policy area, which suggests that developing dedicated policies and strategies for men remains relatively uncommon, despite potentially offering part of the solution for addressing gender disparities (Hearn, 2021).

4.3.5.1.2 There is a tendency toward negative strategies in efforts to address the disparities

Male participants suggest that efforts to address gender disparities in their field often involve negative strategies. They express concerns that these strategies leave them feeling disempowered and excluded, rather than fostering a sense of inclusion for all. This underscores a feeling of marginalisation in the pursuit of greater gender equality, as there appears to be a persistent imbalance in how policies are implemented.

'The only things that I'm a little bit like... I don't like is, I don't like the way the government goes about it.' F1_I1 (Peter)

'I don't like how it is implemented and how people perceive it.' F2_CHAT (Kopano)

'The government does make you feel like you're the enemy. And you're kind of like, 'well I was born a guy, I didn't really have this choice,' F1_I1 (Peter)

'I think a lot of times, it is not done correctly, or it is not done in a way that empowers everyone involved.' F2_I1 (Ben)

'When we are competing for the same job and they don't take us because they want the better BEE rating, it is unfair. We should be based on merit, quality and skill, not gender.' F3_I2 (John)

'You'd find that even if we all go there (job interview) and give it our best, and majority of the people who gave it their best are male, but still because of the numbers that they trying to get, you'd find that women would get more, and guys would get according to the numbers that they opted to get for the BEE rating.' F3_I2 (John)

Looking at affirmative action, particularly in relation to gender, it involves preferences for qualified female candidates, exclusive job opportunities tailored for women, and strict quotas in STEM fields for hiring, promotion, or grant allocation (Heilman et al., 1997). Such measures are put in place to increase the representation of targeted groups where implemented (Heilman et al., 1997). Historically, men have often benefited from similar preferential advantages over women in similar contexts (Stewart-Williams & Halsey, 2021).

The participants' discourse regarding strategies implemented to tackle gender inequality aligns with research by Stewart-Williams and Halsey (2021) which explored factors beyond workplace discrimination that lead to the gaps in STEM disciplines. The study argued that preferences and mandated quotas may detrimentally affect how women are viewed within STEM by raising doubts about the individual achievements of women (Stewart-Williams & Halsey, 2021). Participants in the current study were more inclined to discussing how government initiatives attempt to rebalance gender ratios by excluding men, rather than focusing on achieving equality and what has historically been achieved in the implementation of women empowerment initiatives. This shift in focus suggests that preferences and quota systems may have unintended consequences, namely inadvertently diverting attention away from efforts to empower women.

4.3.5.1.3 Male students support gender equality but feel it can also be used to advance certain agendas.

While participants show support for the ideals of equality and empowerment, they also express concerns that efforts to promote gender equality may be leveraged to further specific agendas. This section examines their views on how gender equality initiatives might intersect with broader strategic interests and the impact of this intersection. Their insights highlight the complexities involved in achieving true equality and empowerment within the context of mechanical engineering.

> *'The initial mandate for gender equality was to uplift women and give them the same opportunities as men. However, it has now shifted to pushing the agenda of getting the right BEE rating, which is unfair to women and unfair to male counterparts. It is now mostly about big corps and industries trying to save their assets and costs by optimizing on BEE ratings, which is what is happening at the moment.' F3_I2 (John)*

> *'Because they are excluding guys, what if like, the guys that they are excluding, they are more capable of doing the work than most of the girls.' F1_I2 (Rea)*

John suggested that the proposed initiatives aimed at empowering women and promoting equal opportunities are being inefficiently implemented, ultimately disadvantaging both genders while benefiting those in power. Many participants voiced that they view the process of including women in the mechanical engineering field as flawed in its execution. Men feel victimised by gender equality efforts, while women are perceived as mere instruments of legislated equality (Mdanda, 2010).

Greig and Flood (2020) asserted that men's accountability for advancing gender equality should also include men in positions of power, such as male political leaders, who have the capacity to enact changes to the patriarchal norms ingrained in institutions. A crucial aspect of men's involvement in advancing gender equality includes supporting women's representation in decision-making and ensuring the implementation of gender equality measures (Greig & Flood, 2020). Participants generally acknowledged the various forms of oppression and power dynamics encountered by both women and men. However, what rectifying these issues looks like in practice remains unclear for the participants. Furthermore, South Africa faces a particularly difficult challenge, as women of all races have historically held a secondary status in society.

4.4 Subject Positionings

In this section, we seek to understand the functions that each discourse achieves, and we examine the subject positions within discourses. Subject positions, as defined by Willig (2013), refer to the roles individuals occupy within the structure of rights and duties associated with a particular discourse. By adopting specific discourses, individuals can essentially enable and limit certain ways of being. Some discourses are more dominant and accepted as common sense, becoming entrenched as the most truthful, while marginalising or invalidating alternatives (Willig, 2013). Despite this, alternative subject positions can emerge over time and become more accessible, this process often begins at the individual level, as people resist roles that do not align with their own interests (Weedon, 1997). The participants' positioning as male mechanical engineering students contributed to the formation of their perceptions of how social constructs influence the topic at hand. Each participant vacillated between the various subject positions discussed in this section.

4.4.1. Insecure Man Subject Positioning

The "Insecure Man" subject position describes a male mechanical engineering student who, due to past experiences of discrimination, limited opportunities, or self-doubt, may question his own contributions, and may be unwilling to take on the responsibility of empowering or creating space for women, focusing instead on his own concerns about opportunities within the field. As Dancy et al. (2020) observed, privileged groups often fail to acknowledge their own privilege and may even perceive themselves as being the disadvantaged group. Male participants in this positioning may feel disempowered or alienated by the increasing presence of women, which could lead to counterproductive outcomes such as adopting negative stereotypes. Some examples of this can be found in the following discourse:

> *'I expect the best from male lecturers, while female lecturers have to prove themselves first.' F1_I4 (Xolani)*

> *'So now when they're looking at, like, only girls... What if some of them they are poor at doing their jobs and stuff.' F1_I2 (Rea)*

> *'We are not supposed to hold men to empower women, we can empower them along the process line.' F2_CHAT (Kopano)*

Not recognising the gender impacts on students' experiences in mechanical engineering will in turn, pose a threat to the ongoing efforts aimed at combating gender inequalities in the field (Rukondo & Kinyota, 2022). This following assertion provokes thoughts on how women can integrate their femininity into their professional identity:

> *'Women get attention from men for free but are uncomfortable when they receive help from other guys for free, wondering what they are hoping to achieve.' F1_I2 (Rea)*

Rea critically suggested that his female counterparts might use their femininity and sexual allure in a manipulative manner to gain benefits and acceptance. Regardless of whether this integration is beneficial or exploitative, it seems that women might leverage their femininity to manoeuvre through the obstacles present in male-dominated fields (Martin & Barnard, 2013). This prompts important thinking around how women can express their femininity in mechanical engineering spaces in a way that it can be accepted and not misconstrued. Within this positioning, there is also little recognition of factors like discrimination and socialisation that push women out of the field. Instead, there is a pronounced emphasis on the perception that government initiatives promoting women's empowerment result in men being excluded and overlooked.

> *'I can't get a job because there's a woman coming through, you know, it's not fair. It's not fair for the gents too.' F1_ I4 (Xolani)*

> *'Just because now I'm a female, it means now, you know that there are more opportunities for me to go work in engineering - I don't even like engineering, but I'm going to go work in engineering either way.' F1_I4 (Xolani)*

Xolani allusively refers to the wide range of interventions that exist which are aimed at encouraging women to enter male-dominated fields. These include initiatives like women-only bursaries and scholarships, tuition exemptions, and financial incentives for finishing training in specific areas (Stewart-Williams & Halsey, 2021). However, these policies might inadvertently cast doubt on the authenticity of women's achievements (Stewart-Williams & Halsey, 2021).

'For me, I would think that since they are pushing this gender equality change, yeah, obviously, I will think that they are trying to balance things. Like they didn't judge us equally, since they're pushing this gender equality thing. That's what I'll think if she gets considered first before me. I wouldn't think that they judged us based on the skills and capability of doing the work.' F3_I3 (Musa)

'Let's say he is a male, for example. So, he comes out of engineering, and he is killing it, he is a 90% student, whatever, and he is probably the most qualified for the position. But because of the whole gender... Trying to make things work out, you get someone else who is a female, and maybe perhaps not as qualified for the position, and they get it, because of gender.' F2_I1 (Ben)

Instead of trying to challenge or break down forms of male dominance, men in this subject position might perceive women as less competent than men and view their presence as merely fulfilling an equity initiative. This perception could ultimately contribute to women being driven out of the field. Characterising women as less competent in mechanical engineering reinforces gender stereotypes and encourages bias against them (Mdanda, 2010). Even when women show clear competence in male-dominated roles, they risk being seen as less appealing. Given that both likeability and competence are essential for achieving success in a professional setting, women in STEM fields frequently face a double bind (Hill et al., 2010). The significance of comprehending the diverse experiences of individuals, especially those with intersecting identities, is essentially reiterated here as these experiences greatly influence people's social environments and personal interactions (Collins et al., 2021).

4.4.2. The Neutral Man Subject Positioning

Here, participants maintained a neutral position on gender equality and women empowerment in mechanical engineering. Being neutral makes promoting gender equality in mechanical engineering challenging, because if the predominant demographic group fails to acknowledge the different experiences of other groups, it hampers the ability to establish the cultural and structural conditions essential for promoting empowerment and enhancing equality (Dancy et al., 2020). Rather than openly advocating for these causes, males in this positioning often deflected responsibility and stressed the need for higher authorities to be the ones to address the systematic implementation of such initiatives.

'So, they just need to open the opportunities equally for everyone and then it will also sort itself out in the future.' F1_I4 (Xolani)

'On my side, I don't really think anything different when I see women in the engineering field, I think of them the same as other males.' F2_Chat (Kopano)

'At university level, the damage has already been done, because at first year, there needs to be a high population of females.' F1_I2 (Rea)

'I also think it's a good thing, that they should include them more in most of the things, such as management and even in our industry, but I don't think they have to be more lenient. They must like judge us equally.' F3_I3 (Musa)

Viewing everyone as "the same" and ignoring their differences may seem trivial, but it can be argued that addressing gender inequality requires a greater recognition of the unique inequities experienced by each gender (Dancy et al., 2020). Gender significantly impacts students pursuing mechanical engineering, as evidenced by women's increased likelihood to report experiences of discrimination and harassment in the field (Rugheimer, 2019). Additionally, women may feel like they do not fit in. Such encounters have been shown to impact the physical, emotional and psychological well-being of women, ultimately influencing their capacity to succeed in the field and their motivation to remain in it (Rugheimer, 2019). While there is a broad consensus regarding the importance of accountability, its actual integration and implementation across all levels of intervention within the field remains unclear. Some participants below share their perspectives on the implementation of strategies aimed at empowering women in their field.

'Having a lot more females in my field may make it a lot more difficult for me.' F2_I1 (Ben)

'So even though there's a more capable guy who can do the job, the whole idea is to give an opportunity to a female, who previously did not have access to those things so that she can also like level up.' F1_I4 (Xolani)

'So, at the end of the day, you know yourself. I do actually qualify over her, but then because she's a female, she is chosen over me. It won't be fair, and it will spark a lot of conflicts.' F2_I3 (Aaron)

'I don't think the solution is necessarily taking someone who is less qualified and putting them in a position because they are female.' F2_I1 (Ben)

Most participants often attribute responsibility to the government and institutions for the redistribution of opportunities from men to women. This shifts the focus away from their individual accountability, however, it is imperative for men to engage in critical reflection on gender inequality and actively strive to transform masculinities, given that gender-unequal hegemonic masculinity poses a significant obstacle to women's representation and leadership in the field (Ratele et al., 2019). Additionally, it is still critical to examine and challenge the dominant Western/Eurocentric norms entrenched within institutions, as doing so can help liberate us from the oppressive legacies of colonialism and its influences (Solomons, 2024). Luiz and Terziev (2022) adequately highlight the significance of understanding how organisations, institutions, and individuals can all contribute to perpetuating inequality through intricate and interconnected practices of oppression. Participants also noted that when a woman is selected for opportunities over them, they often wonder whether the woman received preferential treatment based solely on her gender (Stewart-Williams & Halsey, 2021). This suggests that while institutions may adhere to legal diversity mandates, deeply rooted patterns of oppression persist, revealing a lack of sincere commitment to fostering diversity (Luiz & Terziev, 2022).

4.4.3. The Supportive yet Sceptical Man Subject Positioning

Males in this positioning actively supported perceived advancements for women but remained concerned that women's empowerment in their field might challenge male dominance and leave men feeling uncertain about their future career prospects. Research by Dworkin et al. (2012) identified multiple factors contributing to the perceived decline of men's social, political, and economic influence in South African society. These factors include ongoing labour migration, economic marginalisation, and high unemployment rates, all of which intersect with the progress in women's status and rights (Dworkin et al., 2012). Participants in this study expressed a genuine interest in reshaping the gender dynamics within their field.

'Gender equality is important, but some people have taken it the wrong way and put unrealistic expectations on it. It can also be used to push their own ideas and ideologies, which is not equality. However, when it is done well and when it is equal, and it is gender equality, I am all for it and think it is important.' F2_I1 (Ben)

'I'd say industries or big corps tend to be more lenient to women, because they are basically trying to rectify the numbers. But I think it's for a good cause, but sometimes it tends to be a bit more bias, because their pushing an agenda to rectify old problems. Well not really problems, but old gender equalities that were there before.' F3_I2 (John)

While participants generally support women in the field, they may hesitate to actively challenge discrimination within themselves or among their fellow male peers. This raises concern that their support for gender equality may still be influenced by patriarchal interests (Dahné, 2008). While there is widespread agreement on the significance of involving men at the institutional, individual and societal levels; this consensus often lacks practical implementation (Glinski et al., 2018). All final-year mechanical engineering students are competing for future opportunities. Given men's collective influence over women, there is an evident necessity for systematic initiatives designed to advance gender equality and transform masculinities at the higher education level (Ratele et al., 2019). Their participation is essential, as change initiatives will not succeed without the support of male students who benefit from the existing structures and processes (Crawford & Mills, 2011). Support should span beyond lecture rooms to encompass university departments, covering multiple ecological levels, with egalitarian men playing a key role in advocating for opportunities for women and girls (Ratele et al., 2019). One participant expressed that respect is shown for females who enter the engineering field:

'If you come to our field, or if you come to this field and you find a lot of men, as a lady, you have earned respect already to be amongst us, then we will treat you as such.' F2_I2 (Victor)

On one hand, Victor emphasises the importance of recognising women's agency and valuing their presence in the field. On the other hand, his choice of language, exemplified by

the term "our field," seems to suggest that women require an invitation or approval from men, raising discussions around the politics of belonging. This illustrates the presence of imbalanced power dynamics and their implications (Budds et al., 2017). It underscores the intricate connection between individual identity and the institutional environment in shaping identity within the field (Luiz & Terziev, 2022). The disconnect between formal adherence to diversity standards and implicit signals of exclusion may compel women to adapt their identity expressions to fit prevailing contexts (Luiz & Terziev, 2022).

4.4.4. The Ally Man Subject Positioning

Males in this positioning advocated for their female counterparts by highlighting the shortcomings of initiatives aimed at empowering women and by noting and raising awareness of various societal factors they believe are disadvantaging women in their field. Here, the students exhibit a sense of agency and emphasise the need for everyone, including those in leaders hip positions, to be involved in empowering women. The discourses that emerge address societal, individual and institutional levels.

> *'Many women drop out of engineering due to societal pressure. This is due to the stereotype that engineering is for men, and that they are not getting enough support from society. It is not necessarily that they can't do what they can do, but that their mindset is not there, and they are not receiving enough support. This is why they give up from doing engineering.' F3_I1 (Masego)*

> *'I mean, we're modernising and the generation that we live in is all about, you know what everybody goes for... Whatever you want to go for, and don't let anybody tell you that "this is your position, or this is your gender, and this is how you live by it etc." So, from my side, I think it's good that we're letting go of our old norms, and basically modernising our thought process and how everything should be about gender.' F3_I2 (John)*

> *'And I feel like it's kind of unfair, I feel like when people get put in those roles, they should get the job, so that they are getting empowered.' F1_I1 (Peter)*

‘But then that person doesn't have the emotional support. They don't have like a mentor that's been given to them to help them with this. And that's where I'm like, that is so bloody unfair’. F1_I1 (Peter)

‘But imagine now there's a male lecturer and like you're a female, and then you interact with all these male lecturers and you're always getting shun out, you know. Maybe then it starts feeling personal. But for me, it doesn't really.’ F1_I4 (Xolani)

Participants here engage with the more nuanced aspects of women's experiences in mechanical engineering. This is evident in their emphasis on opportunities for action within their field, such as challenging discrimination, calling on institutions to introduce mentorship for their female counterparts, and providing enhanced support for women (Casey & Smith, 2010). Understanding one's privilege and its impact on others requires self-reflection as a first step toward meaningful involvement (Casey & Smith, 2010). Traces of this reflection are evident in participants' recognition of the factors hindering women's success (Shoger, 2018). Participants in this positioning have demonstrated varying levels of personal awareness, knowledge, and action regarding women’s empowerment and fostering change. One participant reflected on societal views of masculinity:

‘I think society often puts pressure on men to be men in the traditional sense, rather than listen to them, you know, for men vulnerability is often neglected, dismissed, or combated and when a man pushes down the emotions, ignores his feelings and dismiss their feminine traits, like mostly their health suffers.’ F3_I1 (Masego)

Masego notes that despite advancements in gender roles, societal expectations still push men to conform to traditional masculine standards, and they are criticised when they show emotional, mental, or overall vulnerability (Khan & Malik, 2023). Both masculinity and femininity can be perceived differently across various contexts and can hold distinct meanings for different individuals. Masego highlights how societal expectations of masculinity in South Africa often lead men to adopt behaviours aimed at avoiding anything deemed feminine. These behaviours include suppressing emotions, taking on authoritative roles, becoming the primary family breadwinner, and seeking status and achievement, particularly in professional environments (Edwards & Jones, 2009).

Participants in this positioning demonstrate a level of understanding of the crisis of masculinity and its varied interpretations, which disrupts conventional beliefs about the normative ideals of masculinity in men (Khan & Malik, 2023). There is a clear necessity for further action across different fronts: empowering women, promoting gender equality within mechanical engineering, and mitigating societal pressures that enforce rigid adherence to traditional masculine norms.

> *'We're happy to have women here, you know, but the ones that are hiring, please talk to them and you tell us what they think.' F1_I4 (Xolani)*

> *'It can only make it better, it'll make it more competitive, it'll make it more interesting, and I think that females have different experiences in life, which will lead to different inventions, different creations, different solutions to different problems.' F2_I1 (Ben)*

> *'For me personally, it's a great thing, and I look forward to a world where the power circles are all held equally.' F2_I1 (Ben)*

Advocating for women's empowerment and gender equality in mechanical engineering challenges traditional gender role expectations. Participants engaged in these efforts actively strive to promote equality for women, increase awareness of inclusivity issues within the mechanical engineering sector, and demonstrate solidarity with their female counterparts. Male students' engagement in these discussions also underscores a commitment to cultivating a more nurturing and welcoming atmosphere for women in mechanical engineering. Genuine transformative change occurs when a significant number of women can maintain their identity in the field (Wilson & Van Antwerp, 2021). This change would also require normative male cultures to evolve towards greater inclusivity and genuine acceptance of women, extending this inclusiveness to all genders regardless of how individuals express their femininity or masculinity (Wilson & Van Antwerp, 2021).

4.5 Conclusion

The findings of this study shed light on the intricate and multifaceted perspectives of male mechanical engineering students regarding gender equality and women empowerment in their field. While participants broadly recognise the importance of empowering women and

fostering inclusive practices, the discussions reveal a range of nuanced views and concerns about the impact of these initiatives on men. The six distinct discourses identified - feminine, masculine, individual, contextual, institutional responsibility, and government responsibility - show the diverse factors shaping students' attitudes toward gender dynamics. The complexity of these discussions highlights the tension between promoting gender equality and addressing concerns related to power dynamics, male identity, and societal expectations. The participants' varied perspectives emphasise the significance of a balanced approach that fosters equal opportunities without alienating either gender. Importantly, the findings of the study reveal a call for more institutional responsibility and systemic changes that recognise and address the deeply rooted biases and barriers women face in mechanical engineering. As South Africa continues to navigate its post-apartheid landscape, ensuring true gender equality in this field will require sustained efforts from educational institutions, government bodies, and individuals alike, with a focus on reshaping masculinities and breaking down long-standing stereotypes. Only through collaborative and inclusive efforts can the mechanical engineering profession fully embrace the capabilities of both men and women, cultivating a culture of mutual respect and equal opportunity.

Chapter 5
Conclusion

5.1 Introduction

This concluding chapter presents an overview of the research, reflecting on the key findings that have emerged, and exploring its broader implications regarding male mechanical engineering students' perceptions of gender equality and women empowerment. By utilising social constructionism and intersectionality as theoretical frameworks, the research unveils the complex dynamics influencing these students' views and attitudes towards gender issues within their academic and future professional environments. The chapter reflects on how the participants' perceptions can affect the experiences of individuals in a predominantly male field, ultimately emphasising the need for inclusive practices that foster a supportive environment for women in mechanical engineering.

5.2 Synopsis of Key Findings

Drawing on the Foucauldian discourse analysis of male mechanical engineering students' views on gender equality and women empowerment, the preceding chapter sheds light on several crucial findings. Through the lenses of social constructionism and intersectionality, the study illuminates how these students construct their views on gender issues within their academic and future professional contexts. The findings identified six distinct discourses through which the students articulated their perspectives: feminine, masculine, individual, contextual, institutional responsibility, and government responsibility discourses. These discourses collectively illustrate the multifaceted nature of attitudes towards gender equality, demonstrating a mixture of support for initiatives aimed at promoting women's agency to reservations about the implications of gender equality measures.

The discourse on the empowerment of women underscores a collective agreement among the male students for initiatives that enhance women's agency and participation in mechanical engineering. They emphasise the importance of providing women with equal opportunities, supportive environments, and necessary resources to thrive in the field. Thus, echoing literature that highlights the benefits of supportive environments and mentorship for women in STEM. This support is seen as essential not only for addressing gender disparities, but also for enhancing diversity and innovation within their field.

In contrast, discussions on gender equality reveal more nuanced perspectives. While participants generally advocate for impartial evaluation based on skills rather than gender, concerns come up about the perceived implications of gender equality initiatives. Some participants expressed reservations about potential biases against men which might inadvertently disadvantage them, or unintended consequences of policies aimed at rectifying historical gender inequalities. This reflects broader societal debates on affirmative action, equity and fairness, especially in contexts where historical and contemporary power dynamics influence policy and practice.

Moreover, the discourse on the positioning of female counterparts within mechanical engineering highlights a recognition of the challenges women face in a predominantly male field. Participants acknowledge issues of social isolation and feelings of exclusion experienced by female peers, often exacerbated by prevailing male-dominated norms and cultures in engineering. Participants recognise these challenges and suggest the need for inclusive practices to be created where women can feel valued and supported. They deemed this to be crucial for fostering a diverse and thriving engineering environment.

The exploration of subject positions within discourses among male mechanical engineering students reveals the complex dynamics surrounding gender, power, and inclusivity within the field. From the "Insecure Man" subject position characterised by a resistance to women's empowerment initiatives and perceptions of unfair advantage, often resulting in scepticism and reinforcement of gender stereotypes, to the "Neutral Man" position which is seemingly equitable, but tends to overlook the distinct obstacles encountered by women, inadvertently maintaining the status quo, and the "Supportive yet Sceptical Man" which indicates a willingness to acknowledge and support gender equality, but also underscores a fear of losing traditional male dominance, to the "Ally Man" position which embodies a proactive stance in advocating for women's empowerment and challenging systemic issues within the field. Each position reflects broader societal attitudes and institutional challenges.

Overall, the participants' discourses underscore the need for ongoing efforts to challenge entrenched gender biases and promote genuine inclusivity in mechanical engineering, but also engage men in the process of transforming hegemonic masculinities. They highlight the need for transformative actions at multiple levels, from individual reflections to institutional reforms. By understanding and addressing the diverse viewpoints and experiences of male students, institutions can develop more effective approaches to empower women and ensure equitable opportunities for all.

5.3 Limitations

The study acknowledges certain limitations. While the three focus groups yielded sufficient data to fulfil the research objectives, a larger and more varied sample could have generated a broader range of discussions and themes. The majority of participants were male final-year Mechanical Engineering students at the University of the Witwatersrand. Among the participants, one had recently completed his degree and had just entered the workforce, while another was still in the process of retaking certain third-year modules. Consequently, the findings of this study may not be generalisable to a more diverse, broader population. Moreover, it was challenging to get male participants on board, likely because of the study's focus and the participants' discomfort discussing the topic with a facilitator who is a woman. The male participants who chose to participate might represent a specific subset of the population. A more diverse male group, including those reluctant to participate, could have produced a broader and more diverse range of discourses and themes.

The study did not adequately prompt participants to consider how they could personally contribute to change in their environments, as the research was largely exploratory in nature. The focus group setup and the nature of the topic may have also influenced participants' responses, potentially limiting their willingness to challenge gender norms. This could have led to a conformity bias, where participants either aligned with or resisted prevailing discourses to maintain acceptance within the group. The performative nature of discourse is a significant factor to consider in this context.

The focus on women's progress may have appeared to eclipse the issues and difficulties that men and others face in comparable situations. This perception might arise from the belief that advancement for one gender is viewed as a detriment to the other. Given that gender is socially constructed across multiple dimensions, it could also be argued that the study should have included perspectives and experiences from all genders and sexual orientations beyond the traditional binary (Else-Quest & Hyde, 2016). This approach would align more closely with contemporary trends and practices that recognise transgender men and women as distinct categories (Else-Quest & Hyde, 2016). This contrasts with assumptions in certain other societies that adhere to the traditional binary gender framework and would have expanded the study's focus, ultimately leading it beyond its intended scope (Else-Quest & Hyde, 2016). Participants expressed concerns that efforts to empower and integrate women into the mechanical engineering field should not marginalise their own group, which is important to recognise because men's experiences of power can vary significantly. Despite their association

with patriarchal structures, some men may feel disempowered due to intersecting factors such as social class or race. This issue reflects broader societal norms and expectations regarding gender roles and power dynamics, which extend beyond the primary focus of the study. Ultimately, it is important to highlight that gender equality benefits everyone. Addressing concerns about inclusivity and engaging in more open discussions can help alleviate apprehensions and promote a more collaborative effort toward achieving gender equality (Patrick et al., 2021).

Acknowledging “men” as a crucial focus area in discussions about women empowerment and gender equality remains a relatively uncommon practice (Hearn, 2021). Given their role in perpetuating power imbalances in male-dominated settings, it is essential to engage men in efforts to support women and address discrimination within institutions. Their involvement can drive meaningful change and foster greater inclusivity and diversity (Zimmermann, 2016). Both existing literature and this study lack clarity on the most effective strategies for engaging men in reflective discussions about gender equality and the empowerment of women. This includes finding ways to encourage their participation and determining the relevant content for these discussions (Glinski et al., 2018). A more in-depth investigation into the perspectives of both students and staff across various universities could provide a deeper understanding of the complexities surrounding gender inequality at universities. Gaining these insights would be crucial for advancing true gender equality within South African universities. Cornell et al. (2016) have contended that without careful examination and challenge, entrenched oppressive cultures and practices within higher education institutions are unlikely to change.

5.4 Future Research Considerations

Looking ahead at the future of research and its potential impact, it is essential to actively seek a deeper comprehension of the experiences of the broader South African population who were not represented in this study. As a researcher, it is essential to prioritise efforts that bridge gaps where marginalisation has occurred, with the overarching goal of fostering inclusion and empowerment. Future research should focus on incorporating a larger, more diverse sample that reflects ethnic and racial variety, along with varying levels of access to resources. There is also potential to further explore the interplay of race, class, and gender within mechanical engineering, particularly the power dynamics that lead to the marginalisation of Black women from these spaces. Current literature often fails to fully address the contextual and

intersectional challenges faced by Black South African students from impoverished communities (Sikhosana et al., 2023). These students typically come from backgrounds where they have attended under-resourced schools, had educators with limited competence, and had limited exposure to English as the language of instruction (Sikhosana et al., 2023). In such environments, students frequently receive instruction in their native languages, leaving them inadequately prepared and disadvantaged when transitioning to university (Sikhosana et al., 2023). Consequently, race and socioeconomic status significantly contribute to the challenges encountered by Black women in the engineering discipline.

Future studies should further investigate the varied experiences of both women and men in engineering fields and their potential impact on career decisions. For example, it would be valuable to investigate whether universities provide opportunities for hands-on experiences related to mechanical engineering, such as internships and research activities beyond the classroom, and how these opportunities might foster greater engagement and identification with the field among women (Patrick et al., 2021). There is also potential to explore working with white men, who often hold the most power in male-dominated environments. Research could focus on engaging white men in self-reflective practices to heighten their awareness of their role in perpetuating racism (Clarke and Mandisa, 2023). Additionally, it could investigate strategies for challenging their contributions to sustaining racial hierarchies and disrupting systemic whiteness (Clarke and Mondisa, 2023). Mentoring relationships could potentially be developed and facilitate understanding of the racialised encounters of women and individuals of colour and investigating ways to support them effectively (Clarke and Mondisa, 2023). This could provide valuable insights into how developing both male and racial allyship may be crucial for advancing marginalised populations in STEM fields (Clarke and Mondisa, 2023).

Further exploration could delve into how hegemonic masculinity and patriarchy contribute to the exclusion and marginalisation of certain men within mechanical engineering. Additionally, it would be valuable to examine various other identity factors beyond race and gender (Dancy et al., 2020). Sexual orientation is recognised as another critical aspect of intersectionality impacting women in engineering. Since both gender identity and sexual orientation impact access to power and resources, further investigation is needed to dismantle the gender binary and ensure inclusivity across the gender spectrum in gender equality initiatives (Glinski et al., 2018). Yang et al. (2021) found that LGBTQ+ students studying engineering at a major public university often felt isolated, even when other women were present in their classes, and faced a constant need to address homophobic remarks and actions. Given the field's predominantly male environment, some LGBTQ+ students might feel

pressured to hide their sexual identities to avoid the risk of facing rejection or discrimination by their peers (Engstrom & Sedlacek 1997). This indicates the influence of hegemonic masculinity and heteronormative patriarchal values within the field of engineering. Therefore, future research and mental health interventions should aim to explore not only how women are affected by these constructs, but also address how these norms can oppress anyone who fails to align with the expectations and ideals of hegemonic masculinity in engineering.

5.5 Conclusion

This study sheds light on the complex ways young male mechanical engineering students in South Africa perceive and engage with gender equality and women empowerment in a field that has historically been dominated by men. By employing the frameworks of social constructionism and intersectionality, the research offers a nuanced understanding of how entrenched societal norms and power structures shape attitudes toward gender in STEM fields, particularly in mechanical engineering. The findings indicate that the prevailing view of mechanical engineering as a demanding, inherently masculine profession contributes to the underrepresentation and marginalisation of women, who are frequently unjustly viewed as less competent than their male counterparts. This perpetuates gender biases that impede progress within the profession and broader society.

Addressing gender disparities requires a multifaceted approach that extends beyond changing individual attitudes. While reshaping men's perceptions is vital, implementing structural reforms within institutions to dismantle discriminatory practices and foster inclusivity is equally important. The research underscores the necessity for ongoing investigation into how masculinity is constructed in male-dominated spaces and how this perpetuates gender biases.

In conclusion, achieving meaningful gender equality in mechanical engineering necessitates a comprehensive strategy that challenges individual perceptions and addresses the cultural and institutional factors sustaining gender disparities. This includes recognising and rewarding women’s contributions, challenging the masculine image of the field, and creating inclusive networks. Men’s active participation is crucial, as their perspectives and actions significantly influence the advancement of women in the discipline.

Future studies should delve deeper into the intersectional challenges impacting women in mechanical engineering, examine how all genders contribute to shaping gender norms, and strive to transform engineering environments into more inclusive spaces. Such initiatives will

not only benefit women but also enhance the overall diversity and effectiveness of the engineering profession. Ultimately, the study calls for greater institutional responsibility and systemic changes to dismantle the deeply rooted biases and barriers encountered by women in mechanical engineering. By tackling these obstacles and reshaping educational and professional cultures, the field can progress toward a future that is more inclusive and equitable, contributing to broader societal advancement.

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Appendix A

Below is a table that has been derived from the article by Lues (2005) that consists of a summary of significant legislation introduced in South Africa to empower women since the 1994 democratic elections. This summary has been included as it is pertinent to emphasise the policies implemented to address historical imbalances and gender discrimination against women that occurred in the past (Lues, 2005, p.114).

Table A1

Family	***Legal***	***Employment***	***Health***	***Property***	***Education and Training***
		The Labour Relations Act, Act 66 of 1995 (Amended in 2014)			
					The National Education Act, Act 27 of 1996
Marriage Act, Act 50 of 1997	Criminal Procedure Amendment Act, (No's. 76 and 85 of 1997)	Unemployment Insurance Act, Act 30 of 1997	Choice on Termination of Pregnancy Act, Act 92 of 1997	Housing Act, Act 107 of 1997	Higher Education Act, Act 101 of 1997
Divorce Courts Amendment Act, Act 65 of 1997	Criminal Law Amendment Act, Act 105 of 1997	Basic Conditions of Employment Act, Act 75 of 1997		Land Restitution and Reform Laws Amendment Act, Act 63 of 1997	

Maintenance Act, Act 99 of 1998	Witness Protection Act, Act 112 of 1998	Employment Equity Act, Act 55 of 1998	National Water Act, Act 36 of 1998	Prevention of Illegal Eviction from and Unlawful Occupation of Land Act, Act 19 of 1998	Skills Development Act, Act 97 of 1998
Domestic Violence Act, Act 116 of 1998		Labour Relations Amendment Act, Act 127 of 1998			Further Education and Training Act, Act 98 of 1998
Recognition of Customary Marriages Act, Act 99 of 1998					
Adoption Matters Amendment Act, Act 56 of 1998					
	Prevention of Organised Crime Amendment Act, Act 24 of 1999			Reform Laws Amendment Act, Act 18 of 1999	National Student Financial Aid Scheme Act, Act 56 of 1999

		The Promotion of Equality and Prevention of Unfair Discrimination Act, Act 4 of 2000			
		The Women Empowerment and Gender Equality Bill (2013)			
		The National Policy Framework for Women's Empowerment and Gender Equality (2015)			

Source: (Lues, 2005, p.114).

Appendix B: Information Sheet

Dear Mechanical Engineering Student,

My name is Iviwe Mati, and I am a Masters in Clinical Psychology student at the University of the Witwatersrand, Johannesburg. As part of my studies, I am required to undertake a research project, and I am interested in investigating young South African male student's perceptions of gender equality and women empowerment, under the supervision of Professor Tanya Graham. The aim of this research project is to explore the kinds of ideas that emerge in discussions about gender (in)equality and women empowerment among young South African males in a university context.

As part of this project, I would like to invite you to take part in a group discussion with fellow final year mechanical engineering students. This activity will involve discussions around gender equality and women empowerment in your field of study and work, and it will take around 60 - 90 minutes of your time. I will be the person running the discussion sessions and will be interested to hear your different thoughts, experiences, and opinions. With your permission, I would also like to audio and video record the focus group interviews on Zoom. The audio data of the recording will be saved and notes on any significant non-verbal material in the video recording will be stored in a password protected folder and only me as the researcher will have access to this recording. It will be deleted after three years or once my research report has been examined. I will generate a transcript of the discussion to use for my analysis phase of my research and only myself and my supervisor will have access to these transcripts.

There will be no personal costs to you if you participate in this project, beyond the time you devote to taking part in the group, nor will you receive any direct benefits from participation. There are also no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to. The focus group discussion will be confidential to the extent that I will not be

asking for your name or any identifying information apart from what qualification you are studying towards. I ask that you all join the Zoom meeting under a pseudonym (false name) to avoid disclosing identifying information, however, I am aware that you are likely to know each other from class by sight and voice and so your participation will not be anonymous in respect of other participants. Although I will ask that all participants keep the group discussion confidential and do not disclose what others have said outside of the group, I cannot guarantee that participants will observe this commitment. The information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym to represent each participant in the group in my final research report. While I will be using some direct quotations from what was said in the groups in my research report, it will not be possible to trace what was said back to you or any specific group member.

Given the subject matter that we will be discussing, it is not anticipated that you will find the group participation distressing. However, if you were to experience the group discussion as stressful for any reason, I remind you that you can withdraw at any time. I would also be available to speak to you more privately if you would like to seek any counselling or other kind of support because of taking part in the group. As you are perhaps aware, there are free counselling services available at the Careers and Counselling Development Unit (CCDU) on campus. The contact details for the counselling service are 0800 111 331 for a crisis and 011 717 9140 during office hours. Their email address is info.ccdu@wits.ac.za.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. The data collected from this research project will be stored in a password protected folder and will be kept for three years or until the research report has been examined. With your permission the transcript data collected from this research project may be used by other researchers in an anonymized format. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely,
Iviwe Mati

Researcher:

Iviwe Mati, 1422736@students.wits.ac.za,

Supervisor:

Prof Tanya Graham, tanya.graham@wits.ac.za, (011) 717-8330.

Appendix C: Consent Form

Title of Research Project: A Discourse Analysis of Male Engineering Students Perceptions of Gender Equality and Women Empowerment in South Africa.

Consent Form for Focus Groups:

I, ……, agree to be part of this research project. The research has been described to me and I have a clear understanding of what my participation will involve. I agree to the following:

(Please circle the relevant options below).

I agree that my participation will remain confidential as I will not be providing the researcher with any identifying information about myself apart from my qualification.

YES NO

I appreciate that I and other participants will be asked to sign an agreement to keep the discussion confidential but that the researcher cannot guarantee that this agreement will be upheld.

YES NO

I agree that my participation in the focus group is completely voluntary.

YES NO

I agree that the interview can be audio and video recorded.

YES NO

I agree that the information I provide may be used in an anonymized format after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.

YES NO

…… (signature)

…… (name of participant)

…… (date)

Appendix D: Focus Group Confidentiality Agreement

Focus Group Confidentially Agreement

I, _____, agree that I will keep all information that has been disclosed in this focus group confidential.

I understand that anything that has been discussed during this focus group interview is to solely be used for research purpose, therefore I shall not disclose any of the information shared by other participants to others.

Date: _____

Signature of Participant: _____

Appendix E: Focus Group Topic Guide

Open-ended Question: It is likely that you are aware that with government commitment to gender equality, there have been attempts to encourage men and women to think and live with a greater sense of openness to options. An area in which women's increased inclusion has been promoted is in the study of Science, Technology, Engineering and Mathematics subjects, including in your field of mechanical engineering. However, there has perhaps not been enough attention paid to what young men think and feel about the increased presence of women in their environments and about what might make this kind of change more positive or negative. I am really interested in hearing from you what your ideas and experiences in relation to this are.

Prompts:

1. How do you feel about women studying Mechanical Engineering and/or other science-related subjects? How does it make you feel about your masculinity?
2. What are your thoughts on women competing for the same training placements, opportunities, and jobs as you?
3. What do you like and dislike about women empowerment?
4. What do you like and not like about gender equality?
5. What has it been like to have women in your class? How do you perceive women in your class?
6. Do you believe that women are treated differently to you in your class? If so, how and by who? (Lecturers or students)

Appendix F: Engineering Registration Statistics by Gender

This study considers an overview of ongoing engineering registration trends as they aim to forecast and analyse demographic registration data categorised by race and gender for the current reporting period (Engineering Council of South Africa, 2022). The statistics presented in the tables below are sourced from the Engineering Council of South Africa's 2022 annual report. The Engineering Council of South Africa holds a significant role in the field as it is tasked with accrediting engineering programs at HEIs, defining the scope of engineering work, overseeing the professional conduct of registered engineers, and managing a system for continuous professional development, among other duties (Engineering Council of South Africa, 2022).

Table A2

Professional Registration Statistics by Gender

Category	Male	Female	Total
Professional Engineer	19 065	1 231	20 296

Source: Engineering Council of South Africa (2022).

Table A3

Professional Category Registration Statistics

PROFESSIONAL ENGINEER						
		Total Registrations	New Registrations	Candidate Transfers	Cancellations	De-registrations
Totals		20 298	87	0	7 435	0
African	Male	2 027	25		480	
	Female	325	5		50	
White	Male	15 825	44		6 466	
	Female	676	5		320	
Indian/ Asian	Male	989	5		48	
	Female	206	2		15	
	Male	225	1		49	

Coloured	Female	26	0		7	

Source: Engineering Council of South Africa (2022).

Appendix G: Ethical Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT ETHICS COMMITTEE

CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE: PROTOCOL NUMBER: MCLIN/21/04

PROJECT TITLE:

A Discourse Analysis of Male Engineering Student's Perceptions of Gender Equality and Women Empowerment in South Africa.

INVESTIGATOR	Mati Iviwe (1422736)
SCHOOL/DEPARTMENT OF INVESTIGATOR	SHCD/Psychology
DATE CONSIDERED	11 June 2021
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	Minimal Risk

EXPIRY DATE 31 December 2024

ISSUE DATE OF CERTIFICATE **CHAIRPERSON** ____ G.Eagle

21 June 2021

(Prof. Gillian Eagle)

Cc: Prof. Tanya Graham (Supervisor)

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

_____ __04__/__07__/__2021__

Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES