




Gender regimes and gender relations in higher education: The case of a civil engineering course

**Authors:**

Noshmee D. Baguant¹ 
 Hyleen Mariaye² 
 Thabo Msibi³ 

Affiliations:

¹Higher Education Commission, Moka, Mauritius

²Mauritius Institute of Education, Moka, Mauritius

³School of Education, University of KwaZulu Natal, Durban, South Africa

Corresponding author:

Noshmee Baguant,
 noshmee@gmail.com

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This study documents how hegemonic masculinity is experienced through the lens of five female students registered in an engineering course using a single instrumental case study research contextualised in a national university in Mauritius. It analyses how these relations and interactions are interpreted and integrated in the ways the participants are choosing to 'do gender' reflecting critically on what this reveals about acceptance of and resistance to these gendered cultural norms by aspiring women engineers. Interpreted from the lens of gender regimes (Connell 2002), the findings indicate how male students legitimised their power by foregrounding the physical inadequacy of their female classmates, the cultural barriers associated with the rough vocabulary of builders which are certain to cause discomfort to female engineers, and the physically strenuous working environments, all of which are designed to assert a male reading of what engineering work is about. What is, however, also evident is the acceptance of these views by some female participants who feel compelled, to accept 'male help' designed to enforce some form of control and superiority. 'Beating the boys' on their own preferred terrain of abstract thinking appears to be a way for some participants to level the field despite attempts to represent engineering knowledge as 'male', and only allowing privileged female students to access such understandings is a common gatekeeping exercise endorsed by male classmates.

Contribution: This study shows the deep transformations that need to be brought about in higher education settings, particularly in small island contexts where the dominant culture is often silently resistant to progressive equality agenda.

Keywords: gender regimes; female engineering student; higher education; engineering; gender relations.

Introduction

Attracting and retaining female students at university is considered as key to breaking the invisible glass ceiling that exists in many male-dominated professions like engineering, surgery and law. But the gap in engineering persists in a range of contexts. In Mauritius, the statistics speak for themselves, as in 2020–2021, only 22.3% of female students were enrolled in engineering in higher education out of the total enrolment in engineering (Higher Education Commission 2021:22), revealing how the professional remains symbolically masculine. Engineering thus represents 'a particularly visible instantiation of the still durable equation between masculinity and technology' (Faulkner 2000:761).

The process through which this equation is maintained is often associated with the gendered practices in the workplace (Smith & Gayles 2018:11) and the socialisation of girls into science and technology-related disciplines at school and at university (Shawver & Clements 2015:558). Other studies have highlighted the gendered culture of engineering which maintains an environment that is hostile to women (Powell, Bagilhole & Dainty 2009:414), the inadequacy of guidance and counselling, a lack of support as well as cultural and occupational barriers. Studies on the gender gap at the university level indicate the reasons why women leave engineering courses or never enter the professional world despite having graduated with an engineering degree (Amelink & Creamer 2010; Herrmann et al. 2016:262; Smith 2011). These are related to hegemonic masculinity expressed in the cultural norms of the workplace and the university (Mathur 2018:165).

While there is an indication of some positive transformation in higher education, it is often oriented towards gender-conscious practices, which are designed to assist the success and retention of

women (Binagwaho et al. 2022:60). There is comparatively less focus on how classroom interactions between male and female students and faculty that can either support or hinder women's entry into the field (Leyva 2017:415). The contention is that despite the general policy orientation that intends to integrate women into the profession, on-the-ground practices are still very slow to change. Many studies have reported the tensions women students experience in managing and negotiating their femininity because of the expectations to do gender in a specific way to gain acceptance in the profession (O'Dea et al. 2018:4). These expectations are created through socially guided perceptions and interactions that favour certain ways of being and doing which are seen to be compatible with the dominant culture.

Context of the case study

Mauritius is a small island state that is often considered as an economic, social and political success story on the African continent (Sobhee 2009) after having gained independence from the British in 1968. The island comprises of a diverse population of African, Asian and European origins (Eriksen 2007:156), that resulted due to forced and voluntary migration through slavery and indentured labour brought about by successive colonisation from the Dutch, French and British (Boodia-Canoo 2023; Kothari 2013). The cultural, religious and linguistic diversity that resulted from this particular demographic profile constituted a distinctive characteristic of the island and accentuated it as a tourist attraction. Economically, per capita income rose from \$776.00 in 1976 to \$9106.00, (World Bank 2021) with the key drivers being the sugarcane industry, textiles, tourism and a growing financial sector (Fauzel, Seetanah & Sannasee 2016). Its democracy is also considered to be robust with independent institutions and a parliamentary system based on the Westminster model.

Mauritius is one of the few sub-Saharan countries to have achieved free universal primary education and both free secondary and tertiary education (Kasseeah & Tandrayen-Ragoobur 2011:82). Public higher education institutions account for the largest student population although private institutions, majorly internationally affiliated institutions or branch campuses, are also rapidly increasing their share of higher education enrolments and recruit a growing number of international students (Higher Education Commission 2022:2).

Access to higher education is competitive in public higher education institutions, especially the University of Mauritius on account of the very nominal registration fees for undergraduate education and zero tuition fees (Ramtohol 2012:8). However, this does not necessarily mean that students' profile does not impact on their enrolments, persistence and success although there are no large-scale local studies that can provide the evidence for claims in relation to issues of social class and ethnicity.

Yet, despite these successes, Mauritius has had limited success in achieving gender parity in a crucial sector like education with Mauritius being ranked 110th among 156

countries on the Global Gender Gap Index (World Economic Forum 2021:275). While women constitute 40% of the country's labour force, they face higher unemployment rates and occupy only 20% of seats in parliament although they make up for half of the population (Statistics Mauritius 2021:13).

Similarly, the overall higher education track record appears impressive with a gross tertiary enrolment ratio of 48% (Higher Education Commission 2022:3), and achievement of gender parity in Science, Technology and Engineering remains still a distant dream. Madhou et al. (2019) indicated a gender gap hovering around 12% in Science, Technology, Engineering and Mathematics (STEM) fields at higher education level and attributed it to gender prejudices and the perception that science may be too difficult for girls. However, they also noted that as women climbed the academic and professional ladder, they reported fewer instances of discrimination at the University of Mauritius concluding that:

Apart from cultural factors, a favourable academic institution-centered culture can also impact on gender bias (Khondker 2001). This could be an indication that the University of Mauritius has promoted a positive culture and environment where the girls could thrive. (Madhou et al. 2019:14)

The University of Mauritius, as the flagship higher education institution, is closely connected to the development of engineering education since 1968 and aims at improving women's uptake of STEM options through adoption of the National Gender Policy (Ministry of Gender Equality and Family Welfare 2022:22). A study by Tandrayen-Ragoobur and Gokulsing (2022) surveying 209 students at the same university indicated the importance of environmental factors at all levels of the education sector working against a positive choice and experience of women in STEM careers. Women faculty at the same university commented on what they considered to be an inherent gendered bias in the ways in which they are treated. The transformative power of the organisation is thus emphasised.

While the contextual literature focused on the gender gap in STEM and women making a career in this field, there is a dearth in research on the actual learning experience on the actual learning experience of women in the STEM field in general and in engineering in particular although the gaps were more marked in the latter (Madhou et al. 2019). Access to these experiences would enable a more fine-grained understanding of the processes at play within the micro-community of the engineering class to surface practices that may persistently affect women's entry and retention in the profession. We focus particularly on Civil Engineering because this is an engineering strand where female uptake is one of the highest across all engineering fields (Higher Education Commission 2022:38). More importantly, the theoretical frames used so far for studies in Mauritius have been located mainly within environmental, social and personal factors that do not allow for an analysis of how acceptance of and resistance to gendered bias and regimes

may be constructed and enacted, of how gender relations are lived and how power plays out.

To achieve this deeper insight, we conducted a case study on the learning experiences of five aspiring women engineers to:

- explore, through their perception and understanding, the nature of gender relations focusing on the gender division of labour and gender division of power;
- analyse how these relations and interactions are interpreted and integrated in the ways the participants are choosing to 'do gender';
- reflect critically on what this reveals about acceptance and resistance by aspiring women engineers.

Gender regimes and gender relations

'Gender regime' is an analytical construct for understanding how gender inequality is produced, sustained and reproduced through a complex set of structural, cultural and processual elements (Walby 2004). It has often been used to gain understanding of the mechanisms through which gender hierarchies and inequalities are reproduced within organisations. Gender regime is thus an assemblage of gender relations within a specific context. Connell (2006:839) provided a template to identify the pattern of gender relations in any organisation. These are:

- the gender division of labour and the designation of particular occupations or activities as being particularly (un)suitable to either men or women;
- the gender division of power, including the ways in which authority is exercised and legitimised along gender lines;
- gendered emotions, meaning the ways in which feelings of solidarity, attraction and repulsion are expressed by and in relation to gendered individuals and groups;
- gender culture and attitudes, referring to prevailing symbols and beliefs about gender.

Gender relations approach adopted as a concept in this study views gender 'as a structure of social relations which may alternatively be seen as a social institution' (Connell 2005:6). The inter-connections between gender division of labour, gender relations of power, emotion and human relations, and gender culture and symbolism are complex and interconnected. While the complexity of gender regimes in higher educational contexts could be viewed through the lens of 'intersectionality', which highlights forms of discrimination and oppression that prevent individuals to act through an institutional puzzle that cannot be solved (Crenshaw 1989), we have found it more useful to initially surface the complexity through the notion of hegemonic masculinity. We have privileged this approach given our interest in focusing on how these are experienced within an institution and within an academic programme that foregrounds notions of masculinity and femininity.

Engineering has been constructed as a gendered occupational field (Acker 1990), and the professional preparation of

engineers occurs within a space of universities which themselves institutionalise 'definitions femininity' and masculinity, arrange gender hierarchies, construct gendered cultures and define gender-appropriate jobs (Connell 2005:1). Gender regime refers to the pattern of gender relations that frame relationships and individual practices that are captured through close up experiential issues, which have been the focus of data collection, analysis and interpretation.

This lens has been used to read organisations in higher education as workplaces but rarely as learning spaces. Research on gender inequality in STEM areas has indicated that socialisation and learning about the engineering culture are key to explain how women who choose engineering as a major often select another profession after they have earned their degrees (Silbey 2016). Other studies reveal the hostile gender-stereotyped environments women experience in colleges which later extends to the workplace (Powell et al. 2009:414; Thurairajah, Amaratunga & Haigh 2007:4-5). Yet, women who persist appear to have internalised the gendered culture of engineering seeing it as neutral and based only on meritocracy and individualism. The uncritical acceptance of masculine culture which structures the power relations leads to what Faulkner calls 'doing gender' in ways that adhere to the masculine norms set by the profession (Faulkner 2009). Vera-Gajardo (2021) drew on Carter and Kirkup (1990), who described engineering classrooms as places where 'male engineering students are involved in the process of masculinization of the thematic area, and therefore marginalize female students'. 'Aggressive self-promotion, abrasive discourse styles and confrontational interaction routines' (Vera-Gajardo 2021:5) have been reported as being part of the engineering culture in the workplace and at university. For women who wish to succeed, conforming is not an option but a necessity causing them to project an impression of self which is compatible with such cultures. The idea of 'honorary men' conveys the achievement of women who manage their conduct and identity in such a way to conform to masculine hegemony (Powell et al. 2009).

We argue that, although women students may have experienced anticipatory socialisation at the school level which has shaped the way they understood technology as being tough and abstract, it is at the university that women students are professionalised into engineering and its culture. The Mauritian reality is that many students who accede to engineering majors have been through single sex elite secondary schools, and thus, university experience is the first context where they are confronted with the realities of engineering and learn to 'do' or 'undo' gender in ways that are either compliant or disruptive of the existing culture.

Research design and methodology

This study draws its data from the empirical work of a Doctor of Philosophy (PhD) study, which was a qualitative case study designed in the form of a single instrumental case study used to engage deeply with the phenomenon (Creswell 2007:74).

The unit of analysis (VanWynsberghe & Khan 2007) is gender regimes as expressed through gender relations and its link to gender performances in engineering. This means that a fine-grained understanding of this link is developed through the learning experiences of those who are and were registered on a civil engineering programme. By means of critical conversations spread over 10 semi-structured interviews (two interviews for each participant), we analysed how they experienced the engineering curriculum, how they developed relationships across a variety of learning contexts and how they coped with pressure and tensions and succeeded.

The chosen institution is a pioneer in offering engineering programmes in Mauritius. It is a long-standing public university that made history in Mauritius when it appointed the first woman as Vice-Chancellor in 2013, for a period of 3 years (UNISA Garmin Conference 2021). Women faculty occupy a range of senior management positions that appear to be coherent with a more progressive agenda (Statistics Mauritius 2020:21). The engineering courses delivered on site meet a few quality assurance requirements set out by a range of professional bodies and thus offer an early professional learning of engineers on the island. Currently, 838 students are registered on seven undergraduate engineering courses, out of which 293 are women (Higher Education Commission 2022).

Participant selection and data collection tools

The participants were selected from the most popular engineering specialisation on campus, which accounts for 17% of the total intake. The choice was guided by the fact that the specialisation registered a below-average recruitment of 30% for women as compared to a 35% average recruitment in other fields. Currently, 146 students are on the civil engineering course out of which 45 are women (Higher Education Commission 2022:38). More so, civil engineering is a diverse branch of engineering that includes a number of sub-specialisations all of which involve industrial placement (fieldwork) integrated in the curriculum which has been considered as being physically challenging for women (Pandya & Maheta 2018:1082).

We adopted a three-stage participant selection for the critical individual conversations. From a sample frame of 25 female civil engineering students in the chosen data production site, 12 students agreed to participate by responding to a qualitative questionnaire documenting their reasons to join the course, their general experience and the understanding of their prospects in the field. They are women of Asian origin of Muslim and Hindu faith mostly aged between 20 and 25 years old hailing from high-achieving public secondary high schools. Most of them have joined university just after completing their secondary education, which is very characteristic of many middle-class students in Mauritius. They represent in some way the best of what Mauritian education has to offer in terms of a successful science high school student now aspiring to earn a professional qualification.

Based on the analysis of their response in terms of diversity of experience and the issues they raised, nine participants were chosen for the focus group discussions that specifically then sought information about their experience of the curriculum and the issues around relationship with faculty and peers. The analysis of the focus group discussions enabled the selection of six participants for the critical individual conversations. Six participants performed the critical individual conversation, however, the findings were only from five. These participants were purposively chosen, considering their answers from the qualitative questionnaire. Their participation in the focus group and critical individual discussions allowed the generation of rich raw data. Inclusion criteria related to the range of perspectives offered. The narrative interviewing technique was used during the critical individual conversations where students were invited to talk about both their curricular and co-curricular experiences on campus.

Methodological triangulation was achieved in this study through the production of data from four different methods (qualitative questionnaire, focus group discussion, critical individual conversation and document analysis). Triangulation allowed for the convergence of data from various sources as well as provided rich, in-depth data that at times showed multiple versions of the same phenomenon. Credibility of the interpretation was established through a process of triangulating with existing theoretical and empirical studies.

Ethical considerations

Ethical clearance was obtained from the Social Science and Humanities Research Ethics Committee of the University of KwaZulu-Natal in 2019 (HSS/1175/015D). Fieldwork was completed in 2019, and female engineering students who participated in this study provided their informed consent. Details pertaining to the study and methods of data collection (qualitative questionnaire, critical individual conversation) were clearly outlined in the invitation letter to the participants. To adhere to the ethics requirements, an application for ethical clearance was granted by the higher education institution where the participants were studying. An information sheet was given and explained to the participants. This information sheet provided ethical information about the participants' rights, such as their confidentiality, volunteering and right to withdraw during the research process. All names used are pseudonyms to maintain anonymity.

Data analysis process

We used Braun and Clarke's (2006) six-step approach to thematic analysis involving a process of familiarisation with the data through transcription, reading and re-reading to note down initial ideas. This enabled the generation of around 20 initial codes both deductively and inductively. The codes were then collated into four themes in relation to gender relations and different forms of power. Iteratively, the coded extracts were then re-organised and compared to the themes to ensure their semantic content (the words and their literal meaning) and their latent content (the meaning

assigned by the researcher which is the interpretation). The next phase focused on identifying nuances, patterns, similarities and differences across cases and examining what they meant in relation to the theoretical lens. This critical analysis is then reported to provide new insights on the phenomenon.

Data presentation and interpretation

We present here the data on only two of the four divisions of gender relations and then analyse what this means for the ways in which these relations maintain or disrupt the gender regimes in place through gendered performances as seen through the eyes of the five participants. All participants were female students enrolled on an engineering programme. Pseudonyms were used to identify the participants.

Gender division of labour (engineering is unsuitable for women)

Many participants reported the general feeling of being unwelcomed in classes or feeling the odd one out. This feeling was on account of the cold reception by male peers who were quick to indicate there was an expected profile of the engineer and 'girls' do not necessarily fit in that idealised profile. The stereotyped belief that engineering was not meant for women was depicted by Mia indicating that male classmates often argued that engineering required physical strength. She narrated the following:

'Once a boy told me that girls should look pretty in their short dresses and be capable of taking care of the family later. I told him that girls can do everything. It gets me mad, but as long as I stick to it, I will show them women can do these jobs.' (Mia, Female, Student)

The conception that engineering is 'tough' is maintained in the discourse of male students and requires one to 'get one's hands dirty' which is incompatible with 'normal' femininity and family roles.

On occasion, the male students doubted the ability of female students with the use of tools on the construction site or their inability to lift heavy objects like bricks 'How will you carry the bricks?' they asked. 'How will you talk to the construction workers?' On the field placement which is part of the curriculum, the male students intervened and tried to assist their classmates. The gender performance was reinforced in the real-life context of work placement by both men and women. While the male students had their opinions about women's unsuitability, the latter conformed with the expectations by accepting and being appreciative that the more 'physical' aspects of their work were taken care of by their colleagues as indicated below:

'During fieldwork, which I find extremely exhaustive as I had to stand for hours in hot sun while wearing a hard hat, the boys helped me to lift a brick. I was happy as they were very helpful on the construction site.' (Mia, Female, Student)

The male students saw Nisha as unfit to work in the field of engineering. According to the male students, a 'weak and feminine' physique was not appropriate for engineering. As Nisha reported:

'Yes, they make me feel uncomfortable, unhappy and unwanted in class, for example once they told me that as I am very slim, it will be difficult for me to do field work ... They used to make jokes on [sic] my physique – that I look like a primary school pupil. I tried my best to ignore such comments and to concentrate on my studies ...' (Nisha, Female, Student)

The participants appear to accept the deficit reading offered by male counterparts who could be the 'real nut and bolts' engineers capable of managing fieldwork where the culture prevalent among construction workers is rough and confrontational. It was deemed that female students would not be able to 'take on these workers' because of their frail appearance and soft voice which immediately disqualify them. This was reported by Emma in the extract below:

'... girls in a man's world – that is what the boys think by saying that on field work it will be difficult for me to talk to masons.' (Emma, Female, Student)

However, the case of one student stands out. She undid gender choosing to earn acceptance in the male-dominated field of engineering by embracing male characteristics in terms of language, keeping the company of man and doing 'man's' work. Salima made use of a certain type of language (usually used by male students) to replicate, change and oppose the gendered borders of the engineering field and to gain acceptance into the engineering field illustrated by Salima:

'... the language used by boys is quite different from that of girls – that's what usually people say. But I also talk like these boys.' (Salima, Female, Student)

But more importantly, she saw that she was able to be like them and perform all the tasks that befit an engineer as normalised in the discourse of her peers. Salima was physically active, confident, found ways to socialise with male students, was physically strong and stood up for herself. She believed that female students could be on a par with male students, even on the football ground:

'Sometimes I join them on the playground when they play football. I have beautiful experiences especially when I scored goals. Then the boys are so proud of me ... they make me feel that I am part of their team for example, they would call me "nou zouer" – our player.' (Salima, Female, Student)

Salima considers it an achievement that male students did not associate her with the other female students. She felt flattered when the male students told her that she was fit for fieldwork, as she was physically strong. She is very proud of her track record of doing 'male' jobs such as helping a male classmate to change a tyre. Her ultimate reward for having performed a weak form of femininity is encapsulated in the final acceptance:

'The boys of my class usually tell me that I am not like the other girls.' (Salima, Female, Student)

Salima's discourse showed that the male students were receptive towards female students who adhered to the norms set by them. The coarse language adopted by women or rough activities engaged in by women are also discussed by O'Dea et al. (2018:4), who argue that many women in STEM challenge gendered stereotypes and adopt manly behaviours in order to gain acceptance.

Although the participants were convinced that they could, through their hard work and persistence, overcome the academic aspects of their learning, the industrial placement appears to have crystallised an essentialist view that women do not perform well in field activities, thereby reinforcing a gender division of labour. This was shown by Emma as follows:

'I do not appreciate when sometimes the boys say that girls are not earning their grades, lecturers favour girls, because I work very hard to earn good grades, sometimes better than the boys. It is all hard work.' (Emma, Female, Student)

According to the participants, industrial placement in engineering was an important aspect of the programme, where students were trained to carry out land surveys and engage in measurement work on land elevations, measuring levels, either with a dumpy level or automatic level, and communicating with masons. Students' enthusiasm and engagement in the activities increased during fieldwork (Rahmawati & Koul 2016:157). Male academic teaching staff mediated the transition to fieldwork differently for male and female students. This sought to position the world of engineering as a man's arena with a specific language, social code and authority embodied by the male figure.

During fieldwork, the participants experienced special attention from the male academic teaching staff, as reported by Olivia, Mia and Salima. Both Olivia and Mia experienced 'special' supportive treatment. For example, the male academic teaching staff would explain twice to the participants some technical aspects on fieldwork, whereas no second explanation would be given to the male students. Like Mia, Olivia experienced special treatment from the academic teaching staff as reported below:

'On fieldwork, the lecturer would come round to me and ask me twice whether I was fine. Once, one of the boys asked for help from a lecturer that he wanted to know the difference between the different types of bricks used in construction and the latter told him that he just showed him how to do it. But when I asked the question to the lecturer, he showed me again.' (Mia, Female, Student)

The male academic teaching staff sought to demonstrate care; however, this care was linked to masculinity and power. They projected the dominant images of masculinity associated with protective paternalism under the guise of chivalry.

The male academic teaching staff had the belief that Mia would not be able to deal with masons on fieldwork as shown below:

'During fieldwork, the academic teaching staff asked the masons to avoid using foul language in front of me and to listen to what I say. My supervisor, who is a male academic teaching staff, is very supportive.' (Mia, Female, Student)

While the favourable treatment assisted students individually, what it illustrates is the reinforcement of the perception that women cannot handle the challenge and need to be assisted. Contrary to some male students who demonstrate hostile sexism, it appears that some male staff assume traditionally protective roles which could also be interpreted as a form of benevolent sexism with equally deleterious effects on the participants (Gaunt 2013). The behaviour of both male staff and male students during fieldwork is demonstrably consistent with existing literature indicating that women in STEM are more likely to experience benevolent sexism in the form of protective paternalism (Kuchynka et al. 2018:72).

The gender division of power (how authority is exercised and legitimised along gender lines)

While current literature tends to highlight how men exercise and legitimised their power in the workplace, the findings reveal how such practices occur in higher education contexts. Epistemic power is expressed by asserting dominance over academic knowledge of the curriculum as exemplified in Emma's discourse, through the control, sense of superiority and over-confidence of the male students towards female students:

'The boys did not talk to girls at the beginning. They could understand the concepts explained in class and were able to give correct answers to the lecturer whenever he asked questions in the class. Once a lecturer asked my friend a question, she was not able to give the correct answer because the concepts were not clear to her ... After the class, one of the boys told my friend that the answer was so easy and that he did something like that before in Higher School Certificate. He said that he could not understand how she could not give the correct answer ... He even added that if she could not give a correct answer to such an easy question, how would she be able to understand more complex concepts or work in a place where there would be only men.' (Emma, Female, Student)

Like Emma, Nisha also experienced open hostility, competitiveness and derogatory gendered comments from the male students. She also noted that she developed the courage to face her male counterparts and ignore their negative comments:

'Most of the time, during group work, they make as if they did not hear what I said ... During group work, they also make nasty and sexist conversation among some boys but I pretend to be deaf. Not all the boys in the group make such conversations, which make them respectful towards girls and I feel good.' (Nisha, Female, Student)

While both Emma and Nisha recognised different masculinities were at play, they identified the dominant model of hegemonic masculinity in learning spaces and how it affected and inhibited their learning experiences. Class discussion, according to some participants, was a male-driven practice, as the female students did not join class

discussions, fearing that they may be ridiculed. As Hirshfield and Koretsky (2018) indicated, male students talked more and were more likely to answer questions and discuss technical issues in the classroom compared to female students.

The last sentence of the above extract clearly indicates that Emma felt excluded from a long one-to-one conversation between male students and the lecturer and could be interpreted as a form of passive hostility. The opinions and views of female students were given less credit, and male students were asked higher-order questions, whereas more factual lower-order questions resulted in feelings of ridicule and incompetence (Madara & Cherotich 2016:18).

The attitude of the male students created a gendered environment, which made female students realise that they were in a field perceived to be intellectually meant for men. Men dominated the learning space, conscious of their majority status and their affinity with engineering, and although they increasingly integrated the women socially, Emma had this to say:

'I felt conscious that I belonged to the minority group being surrounded by the opposite gender. I have got used to it now. After some weeks, the boys started talking to the girls in class. I have gradually accepted this situation and it seems that the boys have started to accept me as sometimes they talk to me during lunchtime.' (Emma, Female, Student)

Seeking and obtaining male acceptance appear to be an important milestone for women to be integrated in the engineering classroom. As highlighted in literature, the attribution of male characteristics to science and technology is experienced across all levels of education and becomes explicitly expressed through hostile sexism.

But male identity is not only about success but also comes with a host of attributes such as the use of offensive practices often exemplified as teasing, jokes and use of foul language that was resented by Emma as shown below:

'I did not appreciate the way some of the boys reacted in class. Their language was so rough when they talked amongst themselves ... For example, the boys were using foul language in most of their conversation. Now I am used to their behaviour or language used. I think that at the beginning, that is in Year 1, they wanted to show us the girls that they are more intelligent than us and that they are the majority in class by showing us they were superior.' (Emma, Female, Student)

Emma's discourse showed that in many instances, male students were unfriendly, unsupportive, arrogant, over-confident and vulgar towards the female students. However, it is not clear whether familiarity made sharing easier by a process of 'getting used to' or accepting that it was men's ways of being or whether the attitude of male students mended with time.

There was some indication of a minority group of male students who chose to perform gender otherwise to challenge

the dominant model. Equally, it seems that some women students also challenged male hegemony by achieving success and 'beating the boys' which elicited a reaction revealing of how success in engineering was considered as a male preserve as Nisha revealed:

'... once I scored the highest marks an assignment; two boys told me that I did not deserve that. I presume that they think that I may be a threat to their achievement in their studies, as I could do better than them, that is why they told me that.' (Nisha, Female, Student)

The role of academic teaching staff in mediating those power dynamics has been under-documented in extant literature. This aspect surfaced in this study. While some faculty did not appear to be sensitive to the power dynamics at play, others made a deliberate effort to support girls often by praise such as the episode reported below:

'Sometimes I know the answers of the questions asked to the boys and I raise my hand to answer. When I gave the correct answer then the lecturer said to the boys, "you must learn from her." I feel happy then. But the boys do not appreciate because they would reply back by saying "Sir, we will learn from you and books not from her".' (Emma, Female, Student)

However, these good intentions can also lead to a variety of interpretations as good grades earned by female students were often associated with such preference instead of hard work and intelligence, as mentioned by Emma:

'By treating us like that, the lecturer does not realise that such situation creates division amongst boys and girls because afterwards in every conversation, the boys would say that "Girls can replace books now".' (Emma, Female, Student)

The participants explained that women's success is always 'explained away' and located outside women's ability and preferably as a sign of male benevolence. However, there were more discriminatory practices also reported in the learning experiences of the participants such as the one illustrated below:

'Last year, whenever a lecturer used to explain something quite technical, he used to look at me and ask whether I understood what he just explained. I did not like it because then the whole class would turn around to look at me. This made me feel uncomfortable and I wonder whether I should say yes or no to the lecturer. I wondered whether I should say yes so to get him off my back or if I say no, he will ask me complicated questions.' (Mia, Female, Student)

According to Olivia, academic teaching staff seemed to assume that ideas of a technical nature would add more of a challenge for female students. It appeared that the attention of the academic teaching staff emanating from a positive intention was not always interpreted as help, as it made Olivia feel conscious of a perceived 'disability' or 'difficulty' that she might not experience. What passes off as care and chivalry may in fact be disguised and unconscious forms of benevolent sexism and protective paternalism whereby men consider the women are in need of assistance because of their perceived weaknesses.

Discussion

By attending to the conversations of the participants, we discovered that the inter-connections between gender division of labour and gender relations of power are diverse and complex. As revealed by the findings, there is an acute awareness in terms of both discourse and practices that the under-representation of women in engineering needs to be contested by achieving a persistently high performance of female students in their studies, which puts additional pressure on the participants to succeed at 'beating the boys'.

The findings revealed that 'there is a gendered hierarchy within the micro community of the classroom in terms of the relationship among students themselves and between students and staff' (Baguant 2020). For example, women often find themselves excluded in class discussions when male students and male academic teaching staff are involved in the discussions. Such type of gendered hierarchy can be understood through the theory of hegemonic masculinity and its operations in the ways in which gender relations and interactions are constructed. One notable outcome of this study was how dominance was perceived and enacted by participants in various spaces. Compliance and dominance did not reside in individuals but were situationally enacted. While some aspects of the experiences were construed as being compliant and submissive, agentic power was reclaimed in another domain as illustrated powerfully in how female participants contested male power through high achievement on assessment tasks.

This study showed that some male students legitimised their power by foregrounding all the reasons why engineering is a male field. This included apart from foregrounding the physical inadequacy of their female classmate, the cultural barriers associated with the rough vocabulary of builders that are certain to cause discomfort to female engineers and the physically strenuous working environments, all of which are designed to assert a male reading of what engineering work is about.

What is, however, also evident is the acceptance of these views by some female participants who feel compelled to accept and conform to these views by accepting 'male help' designed to enforce some form of control and superiority on the field. Showing compliance is a way of getting access and acceptance. By adopting the ways of the dominant group, some women practised assimilation as a strategy; another key aspect of the institutional gender regime in a male-dominated field, segregationism (women who do not conform to male-established patterns of behaviour) keeps women in a corner, whereas assimilationism is about speaking on the same line as the majority group (Banchefsky & Park 2018:17). Therefore, instead of adding the feminine perspective to the engineering field, some women assimilated to the masculine culture by trying to fit into the male-dominated culture of engineering, where men are

over-valued over women. Gender discrimination, which is a dominant feature of gender hierarchy, is perpetuated when women assimilate to the masculine culture of engineering.

Resistance by female students is expressed not so much in fieldwork as it is in the classroom. 'Beating the boys' on their own preferred terrain of abstract thinking appears to be a way for some participants to level the field despite again attempts to represent engineering knowledge as 'male'. The findings reveal that keeping this knowledge within male circles or only allowing privileged female students to access such understandings is a common gatekeeping exercise endorsed by male classmates.

The experiences of participants revealed that the male students were often successful in the theory parts of the engineering curriculum (Baguant 2020). Female students seem to:

[B]elieve that their male peers were more comfortable with certain aspects of the curriculum than they were. The concept of 'internalised subordination' was depicted by female students who saw themselves as under-privileged and who saw victims to the curriculum. (eds. Adams et al. 2000:12; Baguant 2020)

The teaching approaches and methods appeared to have comforted female students in their understanding that the compliance learned as students could be transferred from secondary schools to university and produce the same outcomes. How far these useful qualities are in the world of engineering is another matter. The curriculum reproduced gender relations of power (Connell 2002), where the students had to adhere to what was offered to them as pedagogy, content, assessment and field-based work. The curriculum bears 'significant residues of inequities' that give rise to 'questions among women about whether they can or want to "fit" into this culture' (Baguant 2020; Seron et al. 2016:3).

However, while there could be high educational value in urging female students along, the strategy of teachers appears to work in favour of an 'us and them' situation that did not challenge existing patterns of gendered relationships but rather appeared to have perpetuated them by drawing attention to the normative power of masculinity.

Conclusion

The four dimensions of Connell's theory of gender relations (2002) became manifest in the relationship between the male and female engineering students, the relations of the participants with the academic teaching staff and in the curriculum of the engineering major. The gender order, behaviours and practices are perpetuated in this particular higher education context through practices in its classroom, on-site industrial training, practical and informal set-ups on campus. The power in the gender order creates unequal

opportunities between men and women and the patriarchal inheritance of wealth and organisational control of men over women (Connell 2009). The privileged behaviours of men frequently stay unseen, as do the patriarchal social norms that perpetuate gender regimes (Coston & Kimmel 2012; McIntosh 2012).

This study shows the deep transformations that need to be brought about in higher education settings, particularly in small island contexts where the dominant culture is often silently resistant to the progressive equality agenda. Creating an enabling and inclusive environment for women to flourish in male-dominated disciplines and professions requires sustained and meticulous attention to the micro-processes of the classrooms where representations and enactment of masculinities and femininities are played out. These tend to be underscored if the emphasis is placed solely at the level of higher education policy without setting up mechanisms and structures that will keep at bay the cancelling effects of patriarchal practices that are disguised as positive discrimination.

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Authors' contributions

The article derives from N.D.B.'s PhD thesis that was co-supervised by T.M. and H.M. N.D.B. was involved in data production, data analysis and theoretical framing, and she came up with a first draft of the article. H.M. and T.M. were involved in the conceptualisation, structure and editing of the article.

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