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Gender Discourses in Civil Engineering TVET College programs: Marginalized Female Voices in the Learning of Engineering Concepts

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ABSTRACT

Collectively, the Engineering sector is still the most male-dominated field and most TVET College graduates are males. Why is this even a case when the fourth industrial revolution pushes all livelihood boundaries and ensures that males and females are exposed to similar opportunities in the sector? Of course, there can never be a comprehensive response to this patriarchal question. Hence, this study delved into this societal issue through classroom discourse in a Civil Engineering and Building Construction course at a TVET college in Limpopo Province. This study was premised on the fact that lecturers in the college use "male" examples more than those of women which affects how women perceived the Civil Engineering field. Moreover, this study laid bare the preferences of female students and how they want to be involved in discourses without making reference to gender roles. This study used a qualitative research approach for a case of eleven (11) female students. Data was collected through focused group interviews. The study employed the Social Identity Theory as its framework. The study found that indeed unconscious biases are happening during classroom discourses and that the lecturers seem to be unaware of this. As a recommendation, reskilling, and upskilling of TVET college lecturers is needed as a matter of urgency with a focus on their scholarship of teaching and learning. Universities as close partners to TVET colleges can facilitate these professional development programs. This study contributes to the global discourse on female inclusion in the engineering sector and the pedagogical practices of an engineering educator in a TVET college.

Keywords: *Classroom discourse, Civil Engineering, Female students, TVET colleges*

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INTRODUCTION

Yes, the global agenda and debate about the inclusion of women in the Engineering sector remains inconclusive. Strachan et al. opine that after nearly three decades, there is still a huge gender gap across the vocational technology, engineering, and physical sciences disciplines.[1] Despite this, Strachan et al. suggest that organisations that increase their women workforce are constantly becoming inventive and

[1] Rebecca Strachan et al., "Women in Engineering: Addressing the Gender Gap, Exploring Trust and Our Unconscious Bias," in *2018 IEEE Global Engineering Education Conference (EDUCON)* (IEEE, 2018), 2088–93.

ultimately perform better in their production.[2] So, what could possibly be the cause for the shortage of women participation in the engineering disciplines when it is beneficial for organisations to have them?

In an attempt to respond to this concern, this study unpacks the experiences of a group of eleven (11) female students studying Civil Engineering and Building Construction at a Technical, Vocational Education and Training (TVET) College in Limpopo province. These are young females at their exit level of the National Certificate (Vocational) [NC (V)] programme. It is important to indicate that they are a minority group at the exit level compared to males in the same programme. This is a testament to Najoli that relatively, there is low enrolment for female students in TVET Colleges.[3] Whilst Najoli suggests that the low enrolment is caused by the unavailability of space since most students come to TVET Colleges when they have been rejected by universities, this study, however, looks at a rare insight into this.[4]

This study is interested in those female students who are studying in a TVET College to share their experiences on instructional practices they are exposed to. A study by Beddoes and Panther claims that engineering lecturers are often unaware of the ways in which gender can influence instruction and assessment, resulting in no attempt to mitigate biases in their classrooms.[5] Given that this study will use female students who are taught by a male lecturer, it was crucial to understand if the assertion by Beddoes et al. is prevalent in the Civil Engineering and Building construction course.[6]

The researcher engaged with a minority group of female students to focus on the classroom discourse they engaged in during the teaching of the Civil Engineering and Building construction course. This is because there are more male students in the course which puts females at a relative disadvantage during classroom discussions. This study seeks to establish if there is a correlation between classroom discourse and the lack of motivation by female students to pursue their engineering careers. According to Liu and Le along with Yu Classroom discourse is generally an interaction between lecturers and students in the classroom.[7] It is a medium through which most teaching takes place, where a lecturer gives students clarity, and attention and directs how concepts should be understood and merged with students' social identities.

Social identity plays a huge role in the discourses that lecturers organise and facilitate in class.[8] For instance, lecturers make sense of the world through the eyes of their social experiences which affects how they think, understand and act.[9] Simply put means that the reaction of lecturers to the contents they teach to students is influenced by their social experiences. By extension, this may mean that male lecturers may have a different way of teaching males than females if they have been engaged with males more in their engineering careers than females. As such, this study is on the premise that the unconscious biases of the male lecturer and male students during classroom discourse affect how female students perceive their engineering careers.

LITERATURE REVIEW

Promoting Gender Representation to Constitute the Pedagogy of TVET

Following Shulman's view of pedagogical content knowledge (PCK), a teacher possesses PCK when they have mastered the integration of pedagogy and content, which essentially covers the "what" and "how" of teaching.[10] Most importantly, such a teacher should demonstrate an undeniable understanding of how to introduce effective ways of presenting ideas, provide persuasive analogies, and provide illustrations, demonstrations, explanations, or examples.[11] The resonance is that teachers should convey topics in a way

[2] Strachan et al., "Women in Engineering: Addressing the Gender Gap, Exploring Trust and Our Unconscious Bias."
[3] Eunice Kanaga Najoli, "The Effectiveness of Wited Programme on Enrollment of Women in Technical and Vocational Education and Training (TVET)," *EURASIA Journal of Mathematics, Science and Technology Education* 15, no. 3 (2019): em1682.
[4] Najoli, "The Effectiveness of Wited Programme on Enrollment of Women in Technical and Vocational Education and Training (TVET)."
[5] Kacey Beddoes and Grace Panther, "Engineering Professors' Perspectives on Gender and Assessment of Teamwork," *International Journal of Learning and Development* 7, no. 3 (2017).
[6] Beddoes and Panther, "Engineering Professors' Perspectives on Gender and Assessment of Teamwork."
[7] Jingxia Liu and Thao Le, "A Case Study on College English Classroom Discourse," *International Journal of Innovative Interdisciplinary Research* 2 (2012): 1–10; Weihua Yu, "An Analysis of College English Classroom Discourse," *Asian Social Science* 5, no.7(2009):152–59.
[8] Muhammad Ahmad and Syed Kazim Shah, "A Critical Discourse Analysis of Gender Representations in the Content of 5th Grade English Language Textbook," *International and Multidisciplinary Journal of Social Sciences* 8, no. 1 (2019): 1–24; Henri Tajfel and John C Turner, "The Social Identity Theory of Intergroup Behavior," in *Political Psychology* (Psychology Press, 2004), 276–93.
[9] Beddoes and Panther, "Engineering Professors' Perspectives on Gender and Assessment of Teamwork."
[10] Lee Shulman,"Knowledge and Teaching: Foundations of the New Reform," *Harvard Educational Review* 57,no.1(1987):1–23.
[11] Shulman, "Knowledge and Teaching: Foundations of the New Reform."

that is understandable to others.[12] Conversely, this means that lecturers of civil engineering at TVET colleges should practice their pedagogy in such a way that unconscious gender-specific prejudices are suppressed. Recognising the importance of gender equality in teaching engineering concepts, provision of analogies and demonstration is part of advancing the pedagogy of TVET.

TVET lecturers should prioritize getting to know their students and their learning styles. This means that they should be aware that concepts in civil engineering are not gender-specific and should be flexible in their explanations. For instance, male lecturers should be aware that it is their responsibility to teach female students just as they do male students. For example, male lecturers should know that it is their duty to teach female students in the same way they do to males vis-a-vis. the demonstrations, provision of potent analogies, demonstrations and etcetera, should promote ideas that are conceived similarly by male and female students. Indeed, the researcher has noted that this can be a challenging exercise for lecturers, but it is necessary for the advancement of TVET pedagogy.

Challenges Facing Female Students in Engineering Based TVET Colleges

There is a common stereotype that female students cannot handle heavy objects during hands-on experiences. Such stereotype materialises in most hands-on activities particularly when there are fewer females than males. This is substantiated by Bailey et al. that female students actively participate and earn higher marks when there are many females in that group.[13] Notwithstanding Bailey et al. claims, this study supposes that classroom discourses are meant to promote social cohesion, and contestation of ideas on a particular content when correctly facilitated and nullify gender supremacies during engineering classrooms.[14] There is a consensus suggesting that male voices dominate in engineering and science disciplines. Could this be emanating from classroom discourses on engineering concepts? According to Prieto-Rodriguez et al. women engineers in general, do not have the aptitude for materials, as such, their participation is mostly limited to theory.[15] Through the classroom discourse exercise – which is theory in nature, this study wishes to prove if Prieto-Rodriguez et al. claim is true or not. [16]

Many things have been said about women and their lack thereof, but Ngugi and Muthima insist that female participation in the TVET sector is hampered by the insufficient number of trainers they could identify with, and those who are there are pedagogically incompetent.[17] The position of women is further exacerbated by the fact that gender in South Africa is culturally segmented. The UKEssays state that by the time young girls contemplate their career choices, their parents would have already dictated for them.[18] As such, most of them get into engineering without family support which increases their self-doubts for not following a career chosen by parents on their behalf. So, they end up fighting psychological warfare even in content presentations, classroom discussions, assessments, and role play during hands-on learning – thereby failing modules.

As a mitigation strategy, Puyate is of the view that scrapping women's failure rate reports on data systems and leveraging the motivation for female students to take engineering-related studies can assist.[19] Also, Balakrishnan and Low add that the socio-cultural values of a society have strong influences on students' motivation to pursue engineering careers.[20] This means that strong social identification can provide females with a boost to self-identity rather than being compared.

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[12] Lee S Shulman, "Those Who Understand: Knowledge Growth in Teaching," *Educational Researcher* 15, no. 2 (1986): 4–14.
[13] Elizabeth G Bailey et al., "Female In-Class Participation and Performance Increase with More Female Peers and/or a Female Instructor in Life Sciences Courses," *CBE—Life Sciences Education* 19, no. 3 (2020): ar30.
[14] Bailey et al., "Female In-Class Participation and Performance Increase with More Female Peers and/or a Female Instructor in Life Sciences Courses."
[15] Elena Prieto-Rodriguez et al., "A Study of Factors Affecting Women's Lived Experiences in STEM," *Humanities and Social Sciences Communications* 9, no. 1 (2022): 1–11.
[16] Prieto-Rodriguez et al., "A Study of Factors Affecting Women's Lived Experiences in STEM."
[17] Margaret Ngugi and Purity Muthima, "Female Participation in Technical, Vocational Education and Training Institutions (TVET) Subsector. The Kenyan Experience," *Public Policy and Administration Research* 7, no. 4 (2017): 9–23.
[18] UKEssays. The role of women in the engineering profession. (2018, November). Retrieved from https://www.ukessays.com/essays/sociology/the-role-of-women-in-the-engineering-profession-sociology-essay.php?vref=1
[19] Suobere T Puyate, "Strategies for Improving Female Students' Enrolment in Technical-Vocational Education and Training (TVET) Programmes in Rivers and Bayelsa States," *Journal of Education in Developing Areas* 25, no. 1 (2017): 65–74.
[20] Balamuralithara Balakrishnan and Foon Siang Low, "Learning Experience and Socio-Cultural Influences on Female Engineering Students' Perspectives on Engineering Courses and Careers," *Minerva* 54 (2016): 219–39.

Discourses on Civil Engineering and Building Construction Content

As part of advancing the scholarship of teaching and learning, lecturers need to create classroom discourses that are relatable and promote technological problem-solving skills. According to Nkwanyane, Makgato and Ramaligela Civil Engineering and Building Construction requires high levels of collaborative learning which can be achieved through robust classroom discussions, attainment of relevant training resources and qualified teaching personnel.[21] Sadly, most TVET College lecturers in South Africa do not hold any professional teaching qualifications yet subscribe to various scholarships for teaching and learning.[22] This is because TVET colleges recruit lecturers based on industrial experience rather than pedagogical knowledge and professional qualifications.[23] As a result, a lecturer who lacks vocational pedagogy is hazardous in advancing the benefits of classroom discourse.

This study further argues that in the presence of pedagogical incompetence, unconscious biases continue to grapple with the motivation for female students into the engineering sector. It is key to remember that for an instructor to effectively employ classroom discourse, they should have sufficient understanding of the pedagogical aspect of the subject. The NC (V) programme is relatively for those students who need a more theoretical understanding of the trades they study and that demands a lecturer to employ various teaching methods (i.e., classroom discourse).

One rarely finds issues of teaching and learning methods discussed in the TVET colleges' literature. Masha, Mboweni and Mtshali indicate that it is in the teaching and learning methods where a skills foundation is built.[24] However, care needs to be taken not to promote gender biases and promote patriarchal roles when teaching male-dominated disciplines. Currently, most Civil Engineering textbooks' content demonstrations, video clips and posters have more male figures than women. This male symbolization in engineering teaching and learning resources affects female social identity – they also affect how lecturers create discourses in their classrooms. In fact, this has a direct impact on women's motivations to participate in engineering.[25] The fact that this study uses eleven female Civil Engineering and Building construction at an exit level indicates that there are gender disparities at play. The classroom evolution has taught that virtual reality is evident and gender inequality should not be the narrative now, however, there is a need to highlight this prevalent challenge. In fact, the United States of America records that less than 20% of women are actively involved in the engineering workforce immediately after graduation, while others branch elsewhere.[26] This global challenge cannot be ignored because even when women are professionally qualified as engineers, they still pursue careers in other fields.

This study is further driven by Social Identity Theory (SIT) as discussed in the following segment. This will assist in understanding female students' societal experiences that emerge in their professional training which affect how they perceive the current engineering sector.

THEORETICAL FRAMEWORK

Social Identity Theory

To understand the effects of classroom discourse on Civil Engineering TVET College female students, this study adapted the Tajfel and Turner Social Identity Theory (SIT).[27] SIT is about the identification of

[21] Themba Paulos Nkwanyane, Moses Makgato, and Sylvia Manto Ramaligela, "Inquiry into Students' Perceptions of Civil and Building Construction Curricula in South African TVET Colleges," *Universal Journal of Educational Research* 10, no. 6 (2022): 369–77.
[22] T Mtshali, M Makgato, and D Sephokgole, "Missed Opportunities: A Slow Motion On Innovative Ideas For Practical Activities In Technical Subjects," in *ICERI2023 Proceedings* (IATED, 2023), 1091–94; Vasidevan Naiker and Moses Makgato, "The Integration of ICT in TVET College Classrooms: A Case in Automotive Repair and Maintenance Teaching," *International Journal of Educational Sciences* 20, no. 1–3 (2018): 25–32.
[23] Thokozani Isaac Mtshali, "Occupational Training for TVET College Civil Engineering Students in the Modern Era: Has Anything Changed?," *Journal of Technical Education and Training* 13, no. 4 (2021): 82–91.
[24] Mmapake Florence Masha, Mdumo S J Mboweni, and Thokozani Isaac Mtshali, "Advanced Scholarship of Teaching and Learning in Agricultural Technology Among Technical Vocational Education and Training College Students," in *New Models for Technical and Vocational Education and Training* (IGI Global, 2021), 91–114.
[25] Edith Szanto, "Depicting Victims, Heroines, and Pawns in the Syrian Uprising," *Journal of Middle East Women's Studies* 12, no. 3 (2016): 306–22; Donna Milgram, "How to Recruit Women and Girls to the Science, Technology, Engineering, and Math (STEM) Classroom," *Technology and Engineering Teacher* 71, no. 3 (2011)..
[26] Peter Lee et al., "Preparing Engineers for 2035: Transforming Australia's Engineering Education for Emerging Roles and Expectations," in *Applied Degree Education and the Future of Learning* (Springer, 2022), 29–52.
[27] Tajfel and Turner, "The Social Identity Theory of Intergroup Behavior."

self-belonging and protection in a social group and such identification works to protect and boost self-identity. According to Liu, Cai, Li, Shi, and Fang (2013), SIT is reliant on social groups because when two social groups with different identities pose a threat to one another, the effects of identification increase.[28] That is why in SIT, one would have in groups where an individual has self-belonging and outgroups where an individual feels he or she does not belong.[29] Consequently, this study explores female students belonging to the Civil Engineering sector after their reflections on the classroom discourses they engage in during teaching and learning – which makes the theory relevant.

Indeed, there have been debates about this Social Identity Theory in social studies since its original inception in 1979. For instance, Hogg and Williams define SIT as an epistemic need for self-verification, Korte sees it as a stimulus for learning and performance in an organization and Hogg describes it as a way of understanding what makes an individual pleased and poignant.[30] Besides Tajfel and Turner's view on SIT, Korte's view is that how people think as members of a group affects the outcomes of learning interventions.[31] Simply put means that how female students think about how they are taught in engineering classrooms affects the outcomes of their learning interventions.

Nevertheless, there are three procedures through which a person decides which group he or she belongs to, that is, Social Categorization, Social Identification and Social comparison. According to Tajfel et al. along with Liu et al., Social Categorization is a method in which a person is categorized into a group based on their traits with others, and if the characteristics are similar the individuals will be categorized into a group.[32] Social Identification is a process where a person who believes and acts according to his social group believes others should also behave like them. Social Comparison pertains to a group comparing themselves with other groups on the basis of respect and social status (Epitropaki, Kark, Mainemelis & Lord, 2016; Trepte, 2006).[33] So, this study used social categorization to understand if female students believe that Civil Engineering lessons and classroom discourses do not segregate them as a minority social group in the engineering field. Social identification was used to explore if these students sometimes feel left behind when there are discussions on engineering concepts in their lectures, and Social comparison was used to determine if female students ever feel cared for in the ranks of Civil Engineering in terms of functionality and leadership roles.

METHODOLOGY

In order to solicit data from female students of the TVET College's Civil Engineering and Building Construction course, this study used a qualitative research approach. According to Teherani et al. mention that qualitative research approach deals with the understanding how people experience the world.[34] As such, the relevance of this approach to this study is that this study attempts to understand the biased world of female TVET College students. In addition, Creswell shares that this approach is about asking questions from the participants, therefore focused group interviews were employed.[35] This was because focused group interviews allowed the researcher to involve a small number of demographically similar people or participants who have common experiences.[36]

From the population of thirty-one (31) level 4 (exit level) Civil Engineering and Building Construction students, this study purposively sampled eleven (11) female students involved in the exit level in the NC (V) programme. Besides that, purposive sampling allowed the researcher to gather

[28] Zhiqiang Liu et al., "Leadership Style and Employee Turnover Intentions: A Social Identity Perspective," *Career Development International* 18, no. 3 (2013): 305–24.
[29] Matthew J Slater, Andrew L Evans, and Martin J Turner, "Implementing a Social Identity Approach for Effective Change Management," *Journal of Change Management* 16, no. 1 (2016): 18–37.
[30] Michael A Hogg, *Social Identity Theory* (Springer, 2016); Russell F Korte, "A Review of Social Identity Theory with Implications for Training and Development," *Journal of European Industrial Training* 31, no. 3 (2007): 166–80.
[31] Tajfel and Turner, "The Social Identity Theory of Intergroup Behavior"; Korte, "A Review of Social Identity Theory with Implications for Training and Development."
[32] Tajfel and Turner, "The Social Identity Theory of Intergroup Behavior"; Liu et al., "Leadership Style and Employee Turnover Intentions: A Social Identity Perspective."
[33] Olga Epitropaki et al., "Leadership and Followership Identity Processes: A Multilevel Review," *The Leadership Quarterly* 28, no. 1 (2017): 104–29; .
[34] Arianne Teherani et al., "Choosing a Qualitative Research Approach," *Journal of Graduate Medical Education* 7, no. 4 (2015): 669–70; .
[35] John W Creswell, *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (Pearson Education, Inc, 2012).
[36] Teherani et al., "Choosing a Qualitative Research Approach."

qualitative responses, the choice of exit-level female students was so that it led to better insights into their overall experience in the programme and more precise research results. Furthermore, this study conveniently used these TVET Colleges' students as there were very few of those in Limpopo province and interested in the contributions contained.

PRESENTATION OF FINDINGS

As indicated earlier, this study examines the views of female students who were engaged in a Civil Engineering course at a TVET College. The interest was to determine if the classroom discourses, they engage in with their lecturer and fellow male students who are dominant in their class affect how they perceive their Civil Engineering experience. While this is not the only interest, it is important to reiterate this as students at TVET Colleges learn to finally become expressive in their final years of study.[37] All interview questions were based on the Social Identity Theory themes. As a result, the first set of data came from Social Categorization followed by Social Identification and Social Comparison.

Social Categorization

a) In your view, do you think the lecturer's lessons are somehow geared towards a male perspective such that it makes you question your fitness in the Civil Engineering field?

The biggest challenge for most TVET college lecturers in South Africa is that they do not hold a professional qualification to teach at TVET Colleges, and their understanding of vocational pedagogy is still under construction.[38] As such, most of them draw from their previous working experience to explain, reason and transfer skills. It is at that time that most of them explain based on their previous exposure, which is male-dominated. The fact that instructional resources such as video clips and pictures in textbooks show males doing Civil Engineering work, has a bearing on how the female students actualize the field. It is to this end that the researcher asked the group of female students if they think their lecturer depends on "male reasoning" to introduce, explain concepts, and facilitate classroom discourses. This is how the group responded.

> *Our lecturer is male, and we understand that most Civil Engineering courses were done by males in the past. As such, he tends to draw from his experience when he is teaching and even the jokes he makes in class, are about how they learned practicals with his friends. We are used to it now and do see that as excluding females. However, the biggest challenge is during practicals where there are certain activities that are only given to males like roofing. Also, carrying heavy wood piles such as the 38mm x 114mm, is done by males and we get involved in cutting and joinery.*

Clearly from the above excerpt, there is evidence to prove that the lecturer's way of teaching is geared towards a "male" perspective. This then leaves female students to think that some activities are not good enough for them. Yes, the respondents do not express this as frustrating, but they notice the gender unconscious biases. According to Roldan, Hui, and Gerber, women are interested in engineering but they continuously face gender inequality, and they end up losing interest because there is a lack of female role models in the field.[39]

Social Identification

a) How actively involved are you in discussions happening in class?

One of the benefits of classroom discussion is to elicit prior knowledge which increases students' participation in the teaching events. The complexities of teaching Civil Engineering concepts to students who have little understanding of the field require careful background consciousness. NC (V) students at TVET colleges are usually younger than those in the NATED programme, so they largely depend on the lecturer to understand. Over and above, the lecturer needs to find ways to make students active participants

[37] C. D. M. Motai, " Motivation and Emotional Praxis: A Collaborative Autobiographical Narrative of TVET College Students from Lower Socio-Economic Backgrounds " (University of the Free State, 2020).
[38] Naiker and Makgato, "The Integration of ICT in TVET College Classrooms: A Case in Automotive Repair and Maintenance Teaching."
[39] Wendy Roldan, Julie Hui, and Elizabeth M Gerber, "University Makerspaces: Opportunities to Support Equitable Participation for Women in Engineering," *Int. J. Eng. Educ* 34, no. 2 (2018): 751–68.

during instructional delivery. Do female students see themselves as active participants in classroom discourses?

> *We participate, sir, because we study a lot. It is better now because we can find previous question papers online. Since COVID-19, our college has improved its online services which really help us with gaining knowledge. Besides, we enjoy all the lessons from our lecturer because he is friendly – making it easy to talk freely in the class.*

According to Khan et al. student active participation is key to successful instruction delivery, irrespective of the content and format of the content delivery mechanism.[40] Thus, creating an atmosphere that encourages participation is pertinent for all teachers. Taking from the above response, the lecturer's way of teaching and kindness gives students a sense of belonging.

Social Comparison

a) When it comes to groups, do you ever lead in a group activity?

Leading in a group can be a difficult proposition but providing leadership for future engineering teams involves several challenges. Settling competing ideas, ensuring that every voice is heard and respecting differences in the group always proves to be a major communication challenge. It is worse when novice personnel engage in such leadership positions. However, leadership skill is encouraged as it is one of the essential skills needed in Civil Engineering.[41] The following is the excerpt from the group interview.

> *In theory, we do not have group activities, there are only groups when we do practicals because all simulations here are done in groups. For the most part of this, people group each other based on friendships, not expertise. Sometimes students who speak the same language group each other as opposed to mixing. Even as minority females in our class we do not lead or form an only female group.*

Based on the above excerpt, female students do not get opportunities to lead in any group activities in their Civil Engineering lectures. Besides, those females do not lead in general when it comes to engineering-related tasks, but in this case, the researcher found that students group themselves based on ethnicity because they believe that they will be more comfortable expressing their views and skills when they are grouped with people of similar language. It is seriously worrying that students consider their home language mechanism to be part of a group when instructions are given in a neutral language (English). In South Africa, the language of instruction in public TVET colleges is English which bridges all ethical gaps. should be enforced by TVET colleges where English becomes the language of instruction. Yoon, Kim and Koo state that enrichment programs must be manifest in engineering students to develop strong leadership skills, scientific knowledge, and perspicuous visions for their future because minority groups always fall short of them.[42]

b) Given a chance, do you think females can lead equally and better than males in the Civil Engineering field?

We have always been ready to lead whether here or when we start to work. The engineering field has evolved over the years, and we use tools and machinery of advanced technology. They say we are in the Fourth Industrial Revolution now and I believe the machines and equipment used in different companies now can easily be operated by anyone. Can we also be included in leading simulation activities, not boys only just because they work faster? We believe that if there was a female lecturer here, we would be learning differently and prioritized. Here in South Africa, we celebrated the win from the Africa Cup of Nations (WAFCON) led by Coach Desiree Ellis who is a woman - this indicates that women are ready to lead in any field.

[40] Arshia Khan et al., "Active Learning: Engaging Students to Maximize Learning in an Online Course," *Electronic Journal of E-Learning* 15, no. 2 (2017): pp107-115.
[41] Mtshali, "Occupational Training for TVET College Civil Engineering Students in the Modern Era: Has Anything Changed?"
[42] Jiyoon Yoon, Kyoung Jin Kim, and Katie Koo, "Enrichment Program for the Ethnic Minority of Gifted and Talented Students in Science and Engineering," *International Journal of Science Education, Part B* 10, no. 1 (2020): 36–50.

DISCUSSION

To reiterate, this study investigated the effects of classroom discourse on Civil Engineering and Building Construction TVET College female students. This study discovered that the discourses students engage in with their lecturer and fellow male students affect their Social Identity. This study found that there are gender biases during Civil Engineering classroom discourses. Even though these female students do not regard that as disadvantaging them because their lecturer uses jokes in his teachings, they are aware that their lecturer is unaware of the male perspective instruction. The respondents also indicated that even the examples he shares from his work experience show that he has worked in a male-dominated environment. The students also cited that the handling of timber piles to the working station is done by males and that they only get involved in measuring, cutting, and joinery. This may be seen as a sign of kindness towards female students, however, the females perceive that as a sign of weakness upon them by the lecturer and male students.

Balakrishnan and Low state that engineering programs are dominated by male students, and such domination could create learning environments that are favourable to male students at the expense of female students.[43] Indeed, based on the findings in this chapter, the minority female students are somewhat excluded from doing activities because there are a lot of males who can do it in class such as carrying 38mm x 114mm timber piles. Bergvall adds that while female students get the courage to do equal activities to their male counterparts, the socio-cultural values of their societies put them back to the "assistant" role unconsciously.[44]

There is also an ethnic issue threatening the recognition of female students during simulations. In this study, it emerged that most students choose a group of people who speak the same language rather than looking at skills competency. This disposes of the opportunity for females to lead. Consequently, exacerbating further their chances of being part of the social group. According to Madara and Cherotich most often lecturers treat male students in engineering classes with higher considerations and expectations leaving female students with a sense of lower expectations and intimidation.[45] Of course, females in engineering need equal recognition but lack role models in the engineering field. The fact that they can easily make a reference to a women's football coach as an analysis of equal competency indicates that increasing the number of female students in engineering is still a colossal undertaking.[46]

Discussion Summary

This study was guided by the Social Identity Theory (SIT) which demonstrated that the sampled female engineering students are still considered "outgroup" in terms of Social Categorization, Social Identification, and Social comparison. For instance, the classroom discourses were socially categorised in that lecturers and instructional resources such as textbooks, activity scenarios, charts and video clips use male figures as a symbols to explain concepts. This puts male students at an advantage whilst leaving female students with thoughts of quitting to branch into "female" dominant fields. With reference to social identification, female students felt left behind when there were discussions on engineering concepts in their lectures. Also, the lecturer's failure to organise groups where female students could shine was problematic. No engineering student should choose ethnicity over expertise particularly because the world is very competitive and the skills economy needs no ethical consideration. Whilst female students felt they could grow over the ranks of their field; it was hard for them to point to an immediate role model of their field. As such, they lost social comparison on the grounds that male groups have no females they can compare themselves with and respect (role models) in the Civil Engineering field.

RECOMMENDATIONS

As a recommendation, reskilling, and upskilling of TVET college lecturers are needed as a matter of urgency particularly of how to deliver lessons that are cognisant of social realities. Universities as close

[43] Balakrishnan and Low, "Learning Experience and Socio-Cultural Influences on Female Engineering Students' Perspectives on Engineering Courses and Careers."
[44] Victoria L Bergvall, "Constructing and Enacting Gender through Discourse: Negotiating Multiple Roles as Female Engineering Students 1," in *Rethinking Language and Gender Research* (Routledge, 2014), 173–201.
[45] Diana Starovoytova Madara and Sharon Cherotich, "Challenges Faced by Female-Students in Engineering-Education.," *Journal of Education and Practice* 7, no. 25 (2016): 8–22.
[46] Madara and Cherotich, "Challenges Faced by Female-Students in Engineering-Education."

partners to TVET colleges can facilitate these professional development programs. The focus should be on advancing vocational pedagogy. Also, a relook into content coverage of Civil Engineering and Building construction is called upon, so that textbooks, controlled assessment tasks and educational technologies used can address gender unconscious biases.

CONCLUSION

This study discussed gender discourses happening in civil engineering classrooms in TVET colleges. The central issue was to highlight the existing marginalized female voices in the learning of engineering concepts and how lecturers fail to acknowledge female students in most hands-on activities in their classrooms. This study examined the content explanations made by lecturers as they delivered concepts and how female students reacted to them. Of particular importance was how female students reflected on how they have always been taught since their first year. The use of male-focused examples when demonstrating situations happening in the built environment made them perceive engineering as a space for males more than females. This study also highlighted the need for lecturers to reflect on their practice as they are at the grassroots of transformation in the engineering sector. This study opens a fresh yet appealing area of research for scholars who are interested in understanding how students encode all teaching events happening in their classrooms. It also encourages researchers to acknowledge current unconscious biases happening in both teaching and workplace environments. Future researchers who wish to explore how lecturers enact a female-focused engineering classroom and women's professional development in the built environment will find the study to be extremely valuable.

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