Influence of Femininity and Masculinity Traits on Participation and Performance in Science, Technology, Engineering and Mathematics of Undergraduate Students in Tanzania

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Abstract

This study investigated whether women and men differed in terms of their femininity, masculinity, gender negatives stereotypes, persistence, self-efficacy and performance in Science, Technology, Engineering and Mathematics (STEM), and established the relationship among these variables. A sample of 721 undergraduate students majoring in STEM in a teacher education program was used. The study was conducted in one public university in Tanzania. The study reveals that there is a significant difference in two aspects only. Specifically, male students held gender negative stereotypes regarding females' abilities in STEM. They were also significantly self-officious as compared to female students. Surprisingly, it was revealed that females outperformed males in several masculinity traits. In addition, there was a significant correlation among variables, with notable differences across gender.

Keywords: *femininity, gender, masculinity, self-efficacy*, *STEM, Tanzania*

Introduction

Femininity and masculinity have played a key role as a framework for understanding females' underrepresentation in STEM (Francis et al. 2017; Simon, Wagner, and Killion 2017). This is partly because social roles assigned to women and men have been associated with the social construction of STEM (Simon, et al. 2017). Meanwhile, research has revealed that, generally, females tend to be underrepresented in STEM (Francis et al. 2017; Legewie and DiPrete 2014; Simon et al. 2017). With respect to types of STEM fields, generally women tend to be populated in STEM fields which are associated with femininity such as nursing and the life sciences while immensely underrepresented in STEM fields associated with masculinity such as engineering (Beutel, Burge & Borden, 2017; Stout, Grunberg & Ito, 2016). Consequently, the aforementioned trend has shifted the gender-STEM debate from gender differences in cognitive abilities to the socialization process as a framework for understanding why females continue to be underrepresented in STEM. Also, while the gender gap in STEM performance is closing in several developed countries (Dasgupta & Stout 2014; Hyde & Linn 2006), gender gaps in mathematics performance still persist in sub-Saharan Africa (Dickerson, Mcintosh & Valente, 2015). Overall, gender inequality in education is still persistent in the continent (Munene & Wambiya, 2019).

Despite many initiatives undertaken in Tanzania, the proportion of female participating in STEM is still very low. For example, while the total participation of females in universities has soared to 40% in the past ten years, things have not reciprocated in the domain of STEM (Bipa, 2010; Kasembe & Mashauri, 2011). Additionally, recent available comprehensive data (Table 1) show that twelve years ago women were enormously underrepresented in East Africa despite many efforts being taken to address the issue by national states and international organizations such as The United Nations Educational, Scientific and Cultural Organization (UNESCO).

Table 1:*2009 Status of Gender and Enrolment in East African Higher Learning Institutions*

HEI members of IUCEA		Total Students	Female Proportion of Total students	Female proportion of Science and Technology Students
10	Universities and Colleges in Kenya	77,921	41%	17%
11	Universities and Colleges in Tanzania	38,683	39%	24%
7	Universities and Colleges in Uganda	21,467	51%	18%
	National University of Rwanda (NUR)	12,796	29%	27%

Source: Extracted from IUCEA 2009 Year Book and Facts and Figures of NUR (In Masanja, 2010)

While the above data provide a glimpse of the scope of the problem of female's underrepresentation in STEM in Tanzania, they do account for a huge difference across specific STEM disciplines. Likewise, trends can be observed where women tend to be many in biological and the life sciences but few in the physical sciences and engineering. To illustrate, Bipa (2010) found that although females were generally outnumbered by males in Tanzania universities, variations could be observed across STEM fields. For example, in a university teacher education program, the proportions of females majoring in science and education (specializing in two subjects) accounted for 16.9% (mathematics and physics), 36% (chemistry and biology) and 55.2% (biology and geography) (Bipa, 2010: 69). Worse enough, at secondary school levels, women are underperforming in science and mathematics subjects (Kabote, Niboye & Nombo, 2014; Sanga, Magesa, Chingonikaya & Kayunze, 2013).

Table 2*: Percentage of Women in Various STEM Fields in One University in Tanzania in 2018*

STEM field	**Students (% Women)**
B.Sc. in Computer Engineering & Information Technology (4 years)	110 (19%)
B.Sc. in Chemical and Process Engineering (4 years)	109 (32%)
B.Sc. in Computer Science (3 years)	137 (25.5%)
B.Sc. in Electrical Engineering (4 years)	127 (16.5%)
B.Sc. in Electronic Science and Communication (3 years)	52 (32.7%)
B.Sc. in Engineering Geology (4 years)	26 (38.4%)
B.Sc. in Geology (4 years)	44 (16%)
B.Sc. in Mechanical Engineering (4 years)	108 (10%)
B.Sc. in Mining Engineering (4 years)	86 (21%)
B.Sc. in Molecular Biology and Biotechnology (3 years)	68 (46%)
B.Sc. in Telecommunications Engineering (4 years)	123 (26%)
B.Sc. in Wildlife Science and Conservation (3 years)	57 (38.6%)
Bachelor of Architecture (4 years)	53 (34%)
Bachelor of Science in Civil Engineering (4 years)	407 (22.8%)
Bachelor of Science in Food Science and Technology (3 years)	81 (40.7%)
Bachelor of Science in Industrial Engineering (4 years)	84 (16.7%)
Bachelor of Science in Microbiology	46 (52.2%)
B.Sc. in Textile Engineering	40 (20%)
B.Sc. General	84 (34.5%)
B.Sc. in Chemistry	12 (58.3%)
Bachelor of Science in Aquatic Sciences and Fisheries	66 (31.8%)

Source: Modified from Kinyota (2019)

Recent available data (2018), as indicated in Table 2, seem to suggest that women underrepresentation in STEM has persisted, with notable variations across STEM disciplines.

Despite the severity of females' underrepresentation, few or no studies have been conducted in Tanzania to investigate this phenomenon. Specifically, no study has been conducted in Tanzania to investigate how aspects of social and cultural constructions such as femininity and masculinity personality traits are related with important aspects of STEM such as self-efficacy, persistence, performance and gender stereotypes endorsement. By building up from different studies conducted elsewhere, this study intends to fill that gap. Moreover, given economic, social and cultural differences between Tanzania and developed countries where most of these studies were conducted, a need to conduct a similar study in Tanzania was felt. Indeed, as Jayachandran (2015) demonstrated, there is still gender inequality in areas of education, health and decision making and this is more prevalent in developing countries. Furthermore, he noted context-specific cultural norms that contribute to gender inequality. More importantly, femininity and masculinity personally traits have tended to vary across contexts (Ferrer-Perez & Bosch-Fiol 2014; Mehta & Dementieva, 2017; Zhang, Norvilitis, & Jin, 2001). Given these circumstances, this study addressed the following questions:

1. Do males and females differ with regard to their femininity, masculinity, gender negatives stereotypes, persistence, self-efficacy and performance in STEM?
2. What is the relationship among femininity, masculinity, gender negatives stereotypes, persistence, self-efficacy and performance in STEM?

Literature Review

Femininity and masculinity theories provide a relevant framework for understanding why female tend to be underrepresented in STEM. This is especially true as femininity and masculinity are linked with the cultural construction of STEM professions. Femininity and masculinity represent two-types of personality traits. While femininity is linked with behaviours such as empathy, friendliness, compassionate, and being unselfish; masculinity is associated with agentic behaviours such as being independent, masterful and competent (Pozzebon, Visser & Bogaert, 2015; Weisgram, Dinella & Fulcher, 2011). In relation to gender, femininity and masculinity are also associated with biological sex. That is to say, femininity is normally associated with womanhood while masculinity is associated with manhood (Banchefsky, Westfall, Park & Judd 2016; Simon et al., 2017). Indeed, according to Weisgram et al. (2011), core features of masculinity have remained stable with time. It is important to note that other scholars have disapproved the handling of femininity and masculinity as opposite extremes of personality traits. Instead, femininity and masculinity should be handled as traits that vary across individuals irrespective of their biological sex (Mehta & Dementieva, 2017; Savin-williams, Chivers & Bailey, 2016). Using other words, women and men can flexibly perform both femininity and masculinity in order to meet certain demands (Mehta & Dementieva, 2017).

Femininity and masculinity have been associated with occupational choices (Pozzebon et al., 2015; Simon et al., 2017). For instance, while femininity is associated with “people-oriented” occupations such as midwifery, masculinity is associated with “things-related” careers such as engineering (Simon et al., 2017: 292). Moreover, some STEM occupations such as engineering (Simon et al., 2017) and physics (Francis et al., 2017) seem to be incompatible with the social and cultural construction of femininity. Thus, the incompatibility between femininity and some STEM occupations, somewhat, explains why women are underrepresented in STEM (Francis et al., 2017; Simon et al., 2017). With regard to the socialization process, Simon et al. (2017) further argue that, often boys are, from early ages, encouraged to think and act scientifically. As a result, there is an unequal feeling of belongingness to STEM between males and females. Moreover, the positioning of femininity and masculinity in association with STEM contributes to negative stereotypes regarding women in STEM. For example, women are frequently seen as missing the qualities of scientists (Carli, Alawa, Lee, Zhao & Kim, 2016).

Considering that widespread stereotype negatively impacts the performance of individuals in some domains (Jones, Ruff & Paretti, 2013), females are more likely to experience an unfriendly stay in STEM occupations. Nevertheless, people differ in the degree to which they assimilate these stereotypes. Jones et al. (2013: 474) have coined the phrase “gender stereotype endorsement” to refer to this phenomenon of supporting gender stereotypes. As such perceiving stereotypes effects how people react to sexism (Wang & Dovidio, 2017). Also, Schmader, Johns and Forbes (2008) found that awareness of stigma resulted to impaired capability for self-control and performance. Likewise, there is substantial evidence to suggest that the more women perceived negative stereotypes in STEM, the less they aspired to participate in STEM (Casad, Petzel & Ingalls, 2019; Francis et al., 2017; Simon et al., 2017). Also, in Casad et al. (2019) recent study, they have found that, experiences of stereotype threat predicted women’s lower perceived control, which also predicted disengagement in STEM. In addition, they also found that disengagement in STEM predicted lower self-esteem. In all cases, they noted a significant difference between women in male-dominated as compared to women in female-dominated STEM fields.

With regard to the relationship between masculinity/femininity personality traits with other important variables used in this study, the research has produced mixed results. For instance, while enough evidence supports a positive association between self-efficacy and performance, choice of activity, efforts one devote to an activity and persistence in various domains (Duffin, French & Patrick 2012; McLennan, McIlveen & Perera, 2017) and in STEM (Mishkin, Wangrowicz, Dori & Judy, 2016; Stets, Brenner, Burke & Serpe, 2017) , less is known with respect to other variables. Specifically, self-efficacy has been found to have a positive association with persistence in STEM for both women and men (Mishkin et al., 2016; Stets et al., 2017). Higher scores on femininity traits were negatively associated with women's choice of STEM (Beutel et al., 2017; Simon et al., 2017). On the contrary, Simon et al. (2017) found that for both males and females, no association was found between masculinity and the odds of majoring in STEM. Also, Hayes, Bigler and Weisgram (2018) found that women were more likely to develop interest and persist in occupations that are performed by fellow women. Thus, given the underrepresentation of women in STEM, women persistence in STEM may be at jeopardy. In order to answer our research questions, the following hypotheses are formulated:

Research question 1

H1: Women and men will differ in terms of femininity and masculinity traits?, gender stereotype endorsement, persistence, self-efficacy and performance in STEM

H2: Women will have higher scores in femininity personality traits while men will have higher scores in masculinity personality traits

H3: Men will hold more negative stereotypes about women in STEM (gender stereotypes endorsement) as compared to women

Research question 2

H4: Gender stereotype endorsement will be negatively associated with self-efficacy, persistence and performance in STEM, with significant difference for women and men.

H5: Self efficacy, persistence and performance in STEM will be positively associated, with no significant difference for women and men.

H6: Conforming to masculinity will be positively associated with self-efficacy, persistence and performance in STEM.

H7: Conforming to femininity will be negatively associated with self-efficacy, persistence and performance in STEM

Methodology

Participants

Participants were selected from a sample of 721 undergraduate students majoring in STEM in a teacher education program from one public university in Tanzania. These students were enrolled into pre-service teacher education programs leading to a Bachelor of Science Education. While at the university, they study one or two natural science subjects selected from physics, chemistry, biology and mathematics. A total of 1200 questionnaires were physically distributed to three strata by years of study at a ratio of 427:604: 911 for first, second, and third years respectively according to their population. About 721 questionnaires were successfully turned in, making a yield rate of 60.25 per cent. Descriptive statistics indicated that of the 721 participants, 438 (67%) were male and 238 (33%) were female students. These figures reflect the general trend where female tend to be proportionally underrepresented in STEM. Also, the sample comprised only 7.9 per cent of third years due to poor response rates in returning the questionnaires by this group. A detailed demographic characteristic of sample is shown in Table 3.

Table 3: *Demographic Characteristics of Sample*

Characteristics	*N*	%
Sex (n=721)		
Male	*483*	67.0
Female	*238*	33.0
Year of study		
First	*228*	31.7
Second	*434*	60.4
Third	*57*	7.9
Background in STEM (Parent(s))		
Yes	*231*	34.0
No	*449*	66.0
Background in STEM (Family member(s))	*358*	56.0
Yes	*281*	44.0
No		
School type by sex		
Lower secondary		
Single sex	*98*	13.8
Mixed	*613*	86.2
High school		
Single sex	*440*	61.9
Mixed	*271*	38.1
School type by ownership		
Lower secondary		
Public	*535*	75.1
Private	*177*	24.9
High school		
Public	*589*	83.2
Private	*119*	16.8

Data collection

Dependent variables: Femininity and masculinity

The Bem Sex Role Inventory (BSRI) is a commonly used instrument for measuring gender orientation (masculinity, feminine and androgyny). Since its establishment in 1974 the BSRI has been used in diverse contexts and has proved to be a valid and reliable measure of gender orientation. However, its reliability has varied across diverse contexts. For instance, Zhang et al. (2001) obtained different scores from two different samples. Whereas for American sample the Cronbach's alphas were .85 and .81, for Chinese sample they were .68 and .81 for femininity and masculinity respectively. In another study, Ferrer-Perez and Bosch-Fiol (2014) who used the full version of BSRI consisting of 60 items to measure femininity and masculinity traits among college students in Spain found that male and female did not differ in most of the items. Generally, across studies and contexts the reliability (Cronbach's alpha) of the BSRI have ranged between .70 and .90 (Peng, 2006; Zhang et al., 2001). Thus, in the current study we adopted and slightly modified items from Norvilitis and Jin (2001). Femininity and masculinity personality traits were measured at a five-point scale (1 = strongly disagree, 5 = strongly disagree). A total of 14, seven (7) for each personality trait items were used. The reliability test resulted as shown in Table 4.

Independent variables

Items for other variables— gender stereotype endorsement, persistence intentions and self-efficacy were adopted from Jones et al. (2013) who investigated engineering identification among undergraduate students. This study was chosen because it provides a highly reliable instrument for measuring the variables of interest for this study. Given that this instrument was used to measure engineering identification, slight modifications were made. For instance, the term 'engineering' was replaced by science and mathematics. In addition, to provide more opportunities of choice, we replace a four-point scale with a five-point scale (1 = strongly disagree, 5 = strongly disagree) for variables of gender stereotype endorsement and persistence intentions. The variable "engineering ability perceptions" (Jones et al. 2013, p.479) was reworded to Self-efficacy while a measurement scale was retained at a seven-point scale (1 = not good at all, 7= very good). Examples of items and information related to reliability are shown in Table 6 and Table 4 respectively. We also asked students to include in the questionnaire a Grade Point Average (GPA) obtained during the last semester of studies. During these semesters, students take almost their entire course from science and mathematics departments. Thus, this GPA was assumed to represent STEM GPA. According to the grading policy of the university, GPA ranges from 2 to 5, with 5 representing the highest GPA (4.4 - 5.0 as first class, 3.5 – 4.3 upper second class, 2.7 – 3.4 lower second class and 2.0 – 2.6 pass).

Students were also asked to indicate their sex (0=male, 1=female) so that analysis by gender can be performed. Additionally, in order to control variables related to Socio-economic status (SES), we asked students to indicate if they attended private or public schools, whether their parent (s) have a background in STEM or not. Moreover, students were asked to indicate if they attended a girls/boys-only or mixed-sex secondary schools, a gendered school arrangement in Tanzania that we thought might influence students' gender stereotype endorsement. Finally, students were asked to indicate year of study so that the comparison can be made within several years of study.

Data analysis

With the help of SPSS (version 22), exploratory factor analysis was conducted using principal component (Oblimin). A cut-off point of 0.40 was established in order to eliminate items that did not load quite well. Thus, 25 out of 28 items were retained. Of the three items that were removed, one was from the dimension of femininity while the other two were from the dimension of gender stereotype endorsement.

Table 4: *Reliability Scores*

Dimension	Number of items	Cronbach's alpha from adopted study	Cronbach's alpha for current study
Femininity	7	.81	.71
Masculinity	7	.85	.59
STEM Self-efficacy	7	.87	.87
Gender stereotype endorsement	2	.91	.71
Persistence intentions	3	---	.67

Moreover, to support factor analysis, reliability tests (Table 4) were performed for each variable, where items that reduced reliability (the same items as above) were omitted. To attempt the research questions, descriptive statistics, correlations, Independent Samples T-Test and Analysis of Variance (ANOVA) were conducted.

Findings

This study investigated whether women and men differ with regard to their femininity, masculinity, gender negatives stereotypes, persistence, self-efficacy and performance in STEM. Additionally, the study aimed at establishing the relationship among these variables. We present the results according to our research questions and hypotheses.

Research question 1: Differences by gender

To address our first research question, we established whether there were significant differences between men and women with regard to our variables.

Table 5: *T-Test Results of Individual Dimensions by Gender*

Dimension	***T***	***df***	***p*-Value**
GPA	-.151	302.38	.880
Femininity	.099	421.49	.921
Masculinity	-.1.078	490.01	.282
Gender stereotype endorsement	6.527	471.62	.000*
Persistence intentions	1.214	672	.225
STEM Self-efficacy	2.857	493.06	.004*

*$p < .05$

Results (Table 5) indicated a significant difference (p <.01) between men and women on the aspects of STEM self-efficacy and gender stereotypes endorsement. Thus, we accepted our first hypothesis on the two aspects only. Given that there were no significant differences between women and men with regard to femininity and masculinity, the second hypothesis was also automatically rejected. Additionally, an aspect that showed significance, men had higher mean scores on STEM self-efficacy and gender stereotype endorsement as compared to men. Thus, we accept our third hypothesis that stated that men will hold more negative stereotypes about women abilities in STEM.

Table 6: *T-Test Results of Individual Items by Gender*

Item	***T***	***df***	***p-Value***
Femininity			
I consider myself to be a very shy person	-.624	686	.521
Always I don’t want to hurt other peoples’ feelings	-.482	630	.630
Generally, I am a very kind person	.155	693	.877
I am always willing to help others	.899	694	.369
Overall, I am a very sympathetic person	1.420	652	.156
I am always sensitive to the needs of others	.235	519.94	.814
I am a person who loves children	-1.533	533.12	.126
Masculinity			
Overall, I consider myself to be a very strong person	.837	402.70	.403
Always, I like to be an independent person	- 3.332	585.23	.001*

I am always willing to take risks	-.928	515.52	.354
I don’t give up easily; always fight to the end	-.632	684	.527
Often times, I am interested in leading others	.963	518.90	.336
Always I like to compete with others	2.191	418.61	.029*
I see myself as a very ambitious person	-2.399	682	.017*
Gender stereotype endorsement			
I think there is not any gender difference in science and math abilities	-2.273	694	.023*
In general, men may be better than women in science and mathematics	6.638	506.49	.000*
Many people believe that men have more abilities in science, technology and mathematics than women	4.387	432.36	.000*
For one to be a great scientist, being a man or woman matters a lot.	2.090	431.70	.037*
Persistence intentions			
I intend to pursue a career related to science, technology and mathematics	.383	682	.702
I intend to pursue a post-graduate course related to science, technology and mathematics	1.264	691	.207
In the future, my plan is to do something related to science, technology and mathematics	2.273	700	.023*
Self-efficacy			
How do you rate your mathematical and/or scientific abilities?	1.653	509.77	.099
How confident are you in solving problems that involve mathematical and/or scientific thinking in your current degree program?	4.164	663	.000*
In general, how good are you in completing your course assignments for your degree program?	-.1.458	522.63	.146
How confident are you in carrying out scientific practical involved in your degree program?	1.601	664	.110
All in all, how do you rate your academic abilities to succeed in this degree program	.663	666	.508
How good are you in reasoning scientifically?	2.819	659	.005*
In general, how would you compare your science and maths abilities with others	2.006	670	.045*

*$p < .05$

For the purpose of reporting more details on individual items, we performed a T-Test for individual items (Table 6). Results indicated significant differences on individual items even in dimensions with overall lack of significance. Remarkably, there were cases where women outperformed men in items measuring masculinity personality traits. For instance, women outperformed men on masculine items of being independent and that of being ambitious. Also, men outperformed women in all items measuring self-efficacy and gender stereotypes endorsement that showed significance.

Research question 2: Relationship among variables

To attempt to our second research question, we responded to several hypotheses (H4 to H7). Results (Table 7) indicated that stereotype endorsement was slightly but significantly positively associated to femininity only. However, analysis by gender indicated that stereotype endorsement showed a slight positive association for men only. For women, stereotype endorsement was negatively associated with STEM GPA while positively related to masculinity with STEM self-efficacy, persistence intentions and slightly associated with femininity. Thus, we reject the fourth hypothesis (H4) with exception of a negative association between GPA and stereotype endorsement for female only.

Table 7**:** *Correlations among Variables*

		1	2	3	4	5	6
1.	GPA	—					
2.	Femininity	.119*	—				
3.	Masculinity	.082	.614*	—			
4.	Gender stereotype endorsement	-.013	.084*	.067	—		
5.	Persistence intentions	-.023	.584*	.519*	.046	—	
6.	STEM Self-efficacy	.169*	.458*	.443*	.031	.472*	—

*. Correlations significant at the 0.05 level (2-tailed)

With regard to the fifth hypothesis (H5), results indicated that STEM GPA and self-efficacy were positively associated. Also, STEM self-efficacy was positively related to students' intentions to persist in STEM while there was not any significant association between GPA and students' intentions to persist in STEM. Nonetheless, analysis by gender revealed notable differences (Table 8). Notably, GPA was significantly correlated with self-efficacy for men only. Also, the association between self-efficacy and intentions to persist in STEM was stronger for men as compared to women as shown in Table 7. For each sex, GPA was not significantly associated with persistence. Thus, we accept our hypothesis with an exception of the aspect of the association between GPA and persistence and that of self-efficacy and GPA for women only.

Table 8**:** *Correlations among Variables by Gender*

		1	2	3	4	5	6
1.	GPA	—	**.161**	**.031**	**-.180***	**-.001**	**.105**
2.	Femininity	.098	—	**.626***	**.068**	**.499***	**.515***
3.	Masculinity	.107	.613*	—	**.155***	**.477***	**.497***
4.	Gender stereotype endorsement	.085	.097*	.045	—	**-.044**	**.038**
5.	Persistence intentions	-.029	.625*	.540*	.074	—	**.386***
6.	STEM Self-efficacy	.210*	.438*	.433*	-.012	.507*	—

*. Correlations significant at the 0.05 level (2-tailed)

Males (below diagonal), **Females (above diagonal, bolded)**

With the exception of STEM GPA, masculinity was positively associated with persistence intentions and STEM self-efficacy. The same associations are observed even after performing analysis by gender (Table 8), with the exception that the association between masculinity and persistence intentions is stronger for men than women. Thus, we accept the sixth hypothesis with exception of GPA. With respect to the seventh hypothesis (H7), we found a positive and significant association between femininity and GPA, self-efficacy and persistence intentions However, a weak association between GPA and femininity disappeared upon analysis by gender. Again, the association between femininity and persistence intentions was stronger for men as compared to women. Therefore, we rejected hypothesis (H7)

Table 9: *T-Test and ANOVA Results for Factors Influencing the Dimensions*

	Parents' STEM background	Close family members' STEM background	O-Level school type by sex	A-Level school type by sex	O-Level school type by ownership	A-Level school type by ownership	Year of study
GPA	.240	.088	.002*	.482	.928	.007*	.114
Femininity	.412	.666	.779	.263	.076	.818	.000*($\eta^2_{=.025}$)
Masculinity	.657	.744	.784	.603	.632	.077	.000*($\eta^2_{=.031}$)
Gender stereotype endorsement	.248	.425	.147	.071	.068	.002*	.386
Persistence intentions	.815	.095	.784	.873	.740	.188	.000* ($\eta^2_{=.047}$)
STEM self-efficacy	.357	.121	.041*	.203	.685	.158	.000* ($\eta^2_{=.081}$)

* $p < .05$

After controlling other variables (Table 9), generally, results indicated that our main findings remain stable. For instance, having close family relations and parents with a background in STEM did not have any significant effect on any of the variables included in our main hypotheses. Nonetheless, there are few exceptions worth noting. For example, there were significant relationships between year of study and femininity, masculinity, persistence intentions and STEM self-efficacy. However, further analysis indicated the effect size (η^2) were very weak (Muijs, 2004).

Also, we found that students who attended mixed sex schools during ordinary level secondary education had the highest mean scores on STEM GPA and self-efficacy. Meanwhile, students who attended mixed sex schools during high school held more negative stereotypes about women in STEM compare to students who attended single sex high schools. Finally, students who attended private high schools had significant higher mean scores on STEM GPA but held more negative stereotypes about women in STEM.

Discussion

Our findings revealed important aspects worth discussing. Firstly, we find that not only were men more self-officious but they also held negative stereotypes regarding women abilities in STEM. On one hand, our findings replicate Jones et al. (2013) who found that men significantly held negative stereotypes about women abilities in STEM. On the other hand, Jones et al. (2013) found out that women had significantly higher self-efficacies, thus contradicting our findings. Also, given that men and women did not differ with regard to STEM GPA consistent with other studies such as Jones et al. (2013), we concur with Depaepe and König (2018) that policy makers and researchers in Tanzania should also put more emphasis on addressing affective aspects (e.g., self-efficacy), the same way they do for cognitive aspects such as performance. Furthermore, the observed negative stereotypes that are held by men presents a threat to the efforts devoted to combat gender inequalities in STEM. Meanwhile, there is little doubt that stereotype threat negatively impacts women's well-being and sense of belongingness to STEM (Casad et al., 2019; Schmader, Johns & Forbes, 2008; Simon et al., 2017). Therefore, it is imperative for policy makers in Tanzania to respond to these negative stereotypes within academic environments. That is to say that, current initiatives to increase the number of women in STEM, should go hand in hand with making campus life happier for all women, including those majoring in STEM. Creating such an environment is even more urgent given the impacts of stigma on performance (Schmader, Johns, & Forbes, 2008). Indeed, our findings indicated that ascribing to gender stereotypes was significantly and negatively associated with STEM GPA for women only. In connection to these arguments, further studies are needed to account for the observed resilience among women who participated in our study. Specifically, the fact that there was no difference between women and men regarding their academic performance and intentions to persist in STEM calls for future studies, for instance, to investigate how these women are negotiating their identities with a male-dominated STEM in ways that offset the effects of stereotypes on their performance. Of course, one possible explanation could be that these women, just as men, must aspire to attain the extrinsic motivations associated with performance in STEM. For instance, in the context of Tanzania, performing well academically is linked to getting a lucrative job as a lecturer, as well as other opportunities offered on the basis of meritocratic principles.

With regard to femininity and masculinity, our findings also challenge the traditional view in which femininity and masculinity are treated as opposite poles of personality traits. Thus, our findings support Weisgram et al. (2011) argument that the two should not be viewed as opposite poles of traits. Indeed, our findings indicate that women significantly outperformed men in several items measuring traits associated with masculinity. For instance, women significantly felt more ambitious than men. Considering that Tanzania is a developing country whose cultures are unfriendly to women (Jayachandran, 2015), it was even expected that males will be more masculine. In other words, one would have expected a significant difference between women and men with regard to femininity and masculinity. While we leave room for future empirical studies especially on how masculinity and femininity are constructed in Tanzania, one possible explanation could be that our findings are reflecting recent changes in cultures resulting from globalization and technological changes.

Conclusion

The study concludes that femininity and masculinity can be used to explain the gender gap in STEM in the context of Tanzania because the sociocultural construction of some STEM fields seems to be gendered. Moreover, negative gender stereotypes create a hostile environment for female students as they attempt to pursue STEM careers. The fact that gender negative stereotypes did not affect females' performance and attentions to persist in the STEM pipeline calls for a culturally responsive approach to understanding females' underrepresentation in Tanzania. Doing so will help in creating a learning environment that enhances female's sense of belongingness to STEM.

Implications for further research

The present study fuels a debate on the subject of females' underrepresentation in STEM. However, it is not without limitations that are to be addressed through further research. For instance, the findings could not explain why STEM GPA and self-efficacy of STEM were positively and significantly correlated for men only. Thus, future research might also investigate what is behind this gendered association between performance and self-efficacy. Another major limitation is that our study did not establish the causation among the studied variables. Nevertheless, the study highlights future research areas in a context where no or only a few studies on this subject have been done. In addition, after controlling other variables such as parents' background in STEM, parents' economic conditions and school types; generally, our findings remain stable. However, future research could expand the scope and measurement scales of these variables. For instance, we limited our definition of parents' socio-economic conditions to whether or not students attended a private or public school during their secondary school years. Given the influence of family background on leaning in Tanzania (Jones & Schipper, 2015), future investigations could go further by including other indicators of socio-economic conditions such as parents' education and household income. Furthermore, since we covered only students majoring in the natural sciences, future research might extend the sample to other STEM majors such as engineering and the life sciences. This is particularly important given that the choice of STEM majors have been linked with the social construction of gender (Francis et al., 2017; Simon et al., 2017). Once more, may be the measure of GPA was not a self-sufficient measure of STEM performance since we have had an experience of people who do not excel in their grades but do in their practical aspects. Finally, we feel that future research is needed to establish and validate an instrument for measuring femininity and masculinity in the context of Tanzania.

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