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Original Research Article

Influence of Socio-Cultural Factors on Female Trainees' Enrollment in Electrical and Electronics Engineering Technician Courses in Bomet County, Kenya

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Abstract

In Kenya, technical fields are key for achieving the Vision 2030 which aims to transform Kenya into a middle-income country by promoting industrialization, technological innovation, and a skilled labor force. However, gender disparity in access to education and workplace participation remains a challenge in general and particularly in the subject areas of STEM. Socio-cultural barriers and stereotypes continue to hamper enrollment and retention in technical courses worldwide. In Bomet County, local perceptions further limit women's aspirations in engineering. This study therefore assessed the influence of socio-cultural factors on female trainees' enrollment in electrical and electronics engineering technician courses in Bomet County, Kenya. The study employed descriptive research design, targeting 159 female trainees in electrical and electronics courses and the 5 principals of public technical training institutions in Bomet County. Data were gathered through primary sources (questionnaire and interviews). Respondents were sampled using simple random sampling. Pilot study was conducted to determine validity and reliability of Research instruments. Quantitative data was coded into SPSS

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version 26 and analysed using descriptive and inferential statistics while qualitative data was analysed thematically. The findings indicated that parental education levels, chauvinistic attitudes, early marriages, teenage pregnancies and societal norms significantly impact female enrollment in TVET institutions. Further, results indicated that a negative between socio-cultural factors and enrollment of female trainees' (r=-.527, p=< 0.000). This implies that as negative socio-cultural factors become more prevalent, the enrollment of female trainees in technical courses decreases. To address low female enrollment in TVET courses, community sensitization, parental education, policies against early marriages, financial aid, promotion of female role model, and gender-sensitive learning environments are key strategies to challenge cultural stereotypes and support women in technical fields.

Keywords: **Female Enrollment, Technical Education, Engineering, Social factors, Cultural factors**

Introduction

Technical education is key in addressing and responding to energy access, climate change, and technological innovation challenges around the world (Marjoram, 2015; Ockwell et al., 2010). Its input in achieving the United Nations SDGs, especially in SDG 7, ensuring access to affordable, reliable, sustainable and modern energy for all (Liston, 2024; Kanga, 2021), and in SDG 9 on building resilient infrastructure and promotion of inclusive and sustainable industrialization, depends greatly upon the field of electrical engineering study and advancement (Nalathambi et al., 2023). In Kenya, the importance of these courses cannot be overstated, as the country aims to achieve its Vision 2030 objectives (Kiprono, Peter & Kanyeki, 2020). Vision 2030 is Kenya's long-term development blueprint, designed to transform the country into a newly industrializing, middle-income economy by the year 2030 (Fourie, 2014; Mwenzwa & Misati, 2014; Muturi, 2015). A key pillar of Vision 2030 is the development of the infrastructure and energy sectors, which are heavily reliant on skilled technicians in Electrical and Electronics Engineering (Kiplimo, 2018). Despite the growing demand for skilled technicians, engineering courses are characterized by gender disparities in enrolment (Opwora, 2013; Madara & Cherotich, 2016). UNESCO (2017) reports that cultural attitudes, gender stereotypes, and social expectations continue to shape subject choices made by students around the world, generally guiding girls and women away from technical fields. Thus, the labor force in engineering and related technical disciplines remains highly male-dominated globally, constraining the possible dividends of diversity and innovation. Additionally, the lack of female role models in these industries

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exacerbates the problem, as young women may not see themselves reflected in these professions.

Several empirical studies have identified socio-cultural factors as key contributors to the low enrollment of female students in technical education. For example, Khaguya (2014) evaluated factors affecting female enrollment in technical courses at Matili Technical Training Institute. The study found that cultural issues such as early marriages, female genital mutilation, cultural beliefs, and household chores left girls with little time for academics. Financial challenges, including high fees and costly learning materials, also led parents to discourage their daughters from pursuing technical courses. Additionally, girls lacked information about potential future salaries and their capabilities, resulting in low motivation to choose technical fields. Similarly, Nthuku and Muthima (2023) conducted a study in Kakamega County, Kenya, focusing on the social determinants of female enrollment in engineering courses. They reported that factors such as gender stereotypes, societal perceptions, lack of role models, and parental influence significantly deterred women from enrolling in technical courses. The study pointed out that many families and communities in Kenya still hold traditional views that technical education is not appropriate for women, which limits female participation in these fields. Other studies conducted in Africa by Magaji, Muthima and Ogeta, (2021) reported that enrolment of women in technical education in Nigeria remained low due to social factors such as gender stereotypes and poor societal perceptions of technical education.

In rural Kenya, the Bomet County included, cultural expectations regarding women's roles and responsibilities in society continue to prevail (Caroline, 2017; Mutai, 2015). Girls in Bomet County are often confined to domestic roles, while societal attitudes and practices such as early marriages and FGM further restrict their educational opportunities. As a result, parents are often hesitant to invest in expensive technical education for their daughters (Kilel, 2013). Hence this study assessed the influence of socio-cultural factors on female trainees' enrollment in electrical and electronics engineering technician courses in Bomet County, Kenya.

Methodology

This study is grounded in the constructivist philosophical worldview, which posits that both researchers and participants interpret phenomena subjectively, leading to constructed meanings (Kivunja & Kuyini, 2017). The study used a descriptive research design to describe the characteristics or behaviors of a specific population or phenomenon, focusing on answering "what" rather than "why" or "how" questions.

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The study was conducted in Bomet County which lies between latitudes 0º 29' and 1º 03' south and between longitudes 35º 05' and 35º 35' east. It is bordered by four counties, namely: Kericho to the north, Nyamira to the west, Narok to the south and Nakuru to the north-east covering an area of 2,037.4 Km^2 (Mwangagi, 2021). According to the 2019 census, Bomet County has a population of 875,689, with a density of 346 people per km^2 and an annual growth rate of 2.7% (Kenya National Bureau of Statistics, 2019). Bomet county have five public Technical and Vocational Education and Training (TVET) institutions, including Sotik, Sot, Konoin, Bomet Central, and Chepalungu Technical and Vocational College as indicated in figure 1 below.

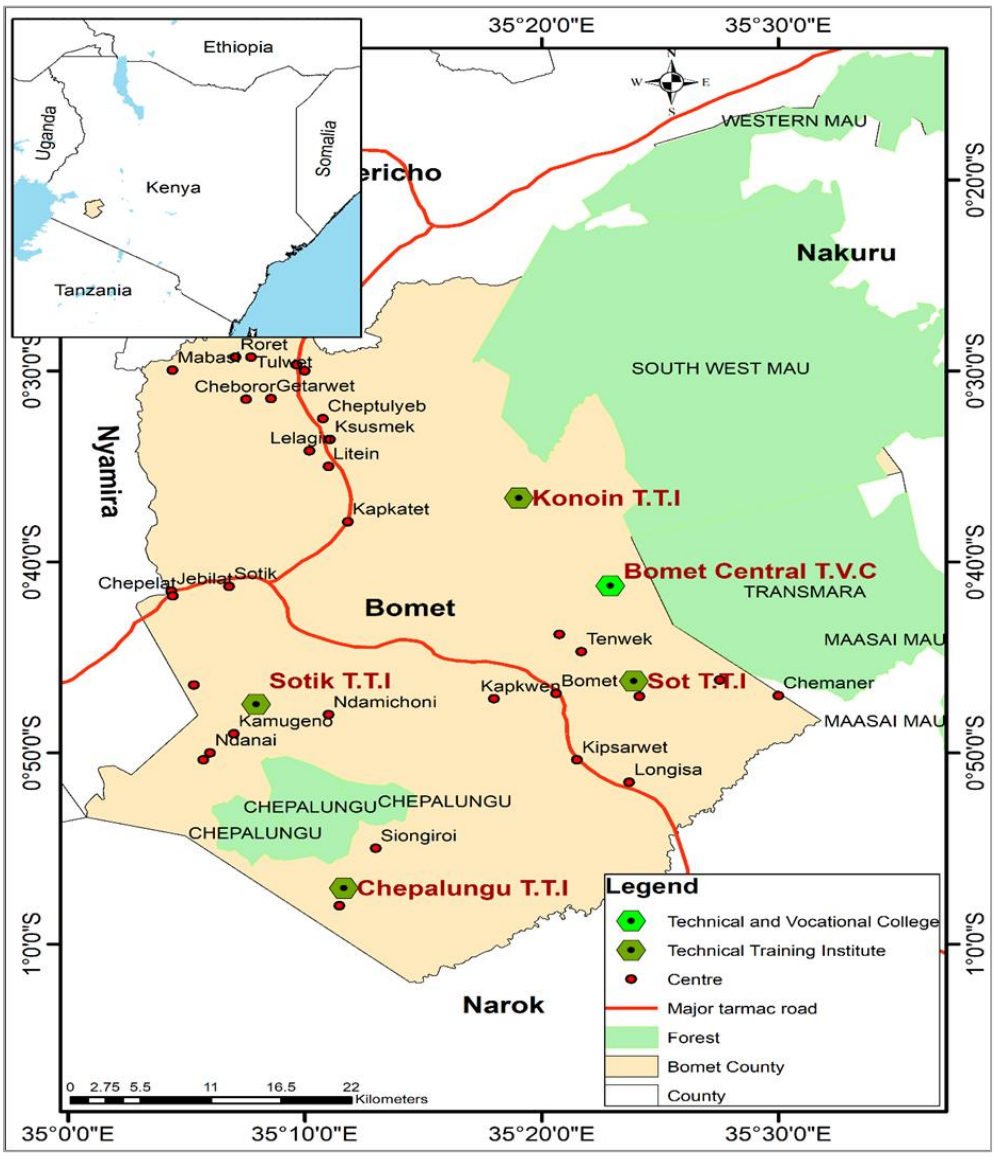

Figure 1: Study area map of Bomet County

Source; Author (2024)

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The study targeted 159 female trainees enrolled in electrical and electronics courses and the five principals of public technical training institutions in Bomet County, Kenya. The target population is detailed in Table 1.

Table 1: Target population

Code	TVET Institution	Population	
		Female trainees	**Principal**
1.	Sotik Technical Training Institute	32	1
2.	Sot Technical Training Institute	29	1
3.	Konoin Technical Training Institute	21	1
4.	Bomet Central Technical and Vocational College	35	1
5.	Chepalungu Technical and Vocational College	42	1
	Total	**159**	**5**

Source; Author (2022)

Census sampling was used to select 159 respondents. This method is ideal when the population is small and manageable or when a high degree of accuracy is needed. Census sampling is a sampling method where data is collected from every member of the population rather than selecting a subset. It involves studying the entire population to gather comprehensive information and ensures that no individual or group is excluded. Respondents were sampled using simple random sampling

Data collection involves gathering accurate information to test or challenge facts (Mugenda & Mugenda, 2013). Primary data was used to gathered questionnaires from female trainees and interview schedules from principals from five technical training institutions.

A pilot study was conducted with 15 female electrical engineering trainees and three principals from technical institutes in Kericho County to assess instrument validity and reliability. Validity was determined using content and face validity, while reliability was measured using Cronbach's alpha coefficient. The Cronbach's alpha value, calculated at 0.873, indicated high reliability for the instruments used**.**

Collected data was coded into SPSS version 26 for analysis. Descriptive statistics such as frequencies, percentages, means and standard deviations were employed, along with inferential techniques like Pearson Product Moment correlations. Qualitative data was analysed thematically.

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Results and Discussion

Return Rate

Table 2 presents the response rate of the study's participants, which consisted of female trainees. Out of 159 questionnaires distributed, 142 were returned, resulting in a high response rate of 89.3%. This percentage concurs with Creswell (2013) who argues that for generalization a response rate of 50% is adequate for analysis and a response rate of 70% and over is excellent, thus 89.3% was very good for an analysis

Table 2: Responses Rate

Respondent	Number of Questionnaires	Number Returned	Response Rate (%)
Female trainees	159	142	89.3%
Total	***159***	***142***	89.3%

Source; Author (2022)

Demographic information of respondents

The study evaluated demographic characteristics of the female trainees enrolled in Electrical and Electronics Engineering courses and presented the findings in table 3 below.

As shown in table 3, most of the female trainees were between the ages of 15-24 years. More precisely, 35.9% were in the age bracket of 15-19 years, while 38.7% fell within the bracket of 20-24 years. Only a paltry 15.5% was between ages 30-34 years, with no single trainee being above 34 years of age.

The year of completion of KCPE, 61.3% of the trainees completed their KCPE between the years 2018 and 2023, while 38.7% completed between 2017 and 2012. Marks scored in KCPE varied, with 45.1% of the biggest proportion scoring between 201-300 marks, followed by 28.2% who scored between 101-200 marks and 12.7% who scored 301-400 marks.

In regard to the transition rate from primary to secondary, 69% of the trainees successfully made the transition, while the rest did not. About their performance in the Kenya Certificate of Secondary Education examination, most of the trainees attained lower grades in the format of 44.9% obtaining the grade between C+ and D+, 23.5% obtained D to D-, while 31.6% obtained an E.

The main counties of the trainees showed that most were from Bomet County, followed by Kericho County (24.6%), Narok County (14.1%), Nyamira County (12.7%), Nakuru County (2.1%), while a small number (3.5%) were drawn from other counties. Data on whether socio-cultural factors influence

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female trainees' enrollment in electrical and electronics engineering courses Bomet County, Kenya.

Table 3: Demographic characteristics of female trainees'

Demographic profile	Characteristics	Frequency	Percentage
Age	15-19 years	51	35.9%
	20-24 years	55	38.7%
	25-29 years	14	9.9%
	30-34 years	22	15.5%
	35-39 years	-	-
	40-44 years	-	-
Year of completion of KCPE	2018-2023	87	61.3%
	2017-2012	55	38.7%
	2006-2011	-	-
	2000-2005	-	-
Marks scored in KCPE	1-100 marks	20	14.1%
	101-200 marks	40	28.2%
	201-300 marks	64	45.1%
	301-400 marks	18	12.7%
	401-500 marks	-	-
Transition rate from Primary to Secondary School	Yes	98	69.0%
	No	44	31.0%
KCSE grade	A to A-	-	-
	B+ to B-	-	-
	C+ to D+	44	44.9%
	D to D-	23	23.5%
	E	31	31.6%
Home County of the trainees	Bomet County	61	43%
	Kericho County	35	24.6%
	Nyamira County	18	12.7%
	Narok County	20	14.1%
	Nakuru County	3	2.1%
	Other Counties	5	3.5%

Source: Author (2022)

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Influence of socio-cultural factors on female trainees' enrollment in electrical and electronics engineering technician courses in Bomet County, Kenya

Using a 5-point Likert scale, the respondents were asked about the socio-cultural factors that affected their enrollment in electrical and electronics courses in Bomet County TVET institutions. Notable observations from interviews with the principals of Bomet County TVET institutions were also noted. Table 4 presents their summarized perception.

Table 4: Respondents opinions on whether socio-cultural factors had a significant impact on enrollment of female trainees' in electrical and electronics engineering courses in Bomet County, Kenya

Item	SA	A	N	D	SD
My parents' level of education influenced my enrollment in TVET institution	40 (28.2%)	46 (32.4 %)	12 (18.5 %)	34 (23.9 %)	10 (7.0%)
Chauvinistic male prevent female trainees enrolling in TVET institutions	49 (34.5%)	50 (35.2 %)	11 (7.7%)	28 (19.7 %)	4 (2.8%)
Early marriages prevent female trainees' enrollment in TVET	40 (28.2%)	47 (33.1 %)	10 (7.0%)	39 (27.5 %)	6 (4.2%)
Females early teenage pregnancies prevent their enrollment in TVET institutions	43 30.3%	44 31.0%	7 4.9%	41 28.9%	7 4.9%
Females are supposed to be family caretakers	14 9.9%	41 (28.9 %)	14 (9.9%)	66 (46.5 %)	7 (4.9%)
Engineering courses are generally considered manly	72 (50.7%)	57 (40.1 %)	7 (4.9%)	5 (3.5%)	1 (0.7%)
Society considers it a waste educating females because they get married elsewhere	69 (48.6%)	63 (44.4 %)	5 (3.5%)	3 (2.1%)	2 (1.4%)

Key: SA – Strongly Agree, A – Agree, N – Neutral, D – Disagree, SD - Strongly Disagree

Source: Author (2022)

The majority of the respondents (32.4%) agreed that parents' level of education influenced their enrollment in TVET institution, while 7.0% strongly disagreed. In addition, 28.2% of the respondents strongly agreed, 23.9% disagreed while 8.5% disagreed that their parents' level of education influenced their enrollment in TVET. This pattern aligns with findings from Kenyan studies that indicate parental influence in educational decisions.

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Mugalo (2022) evaluated influence of socio-economic factors on students' enrollment rates in public technical and vocational education institutions in Kilifi County and reported that parents with limited education may discourage enrollment in TVET institutions due to a lack of understanding of the potential career opportunities associated with technical courses.

When respondents were asked whether chauvinistic male prevent female trainees enrolling in TVET institutions, 35.2% agreed, 34.5% strongly agreed, 7.7% were neutral, 19.7% disagreed, while only 2.8% were strongly disagreed, as shown in Table 4. The masculine chauvinistic mentality that makes people believe engineering courses are only meant to be pursued by the male gender, who have strong command of mathematics (Bronte, 2022; Bray-Collins, Andrade & Wanjiru, 2022). . There is need to reduce discrimination against women and men in our TVET institutions.

Further, respondents were asked whether early marriages prevent female trainees' enrollment in TVET, the majority 33.1% agreed, 28.2% strongly agreed, 7.0% were neutral, 27.5% disagreed while 4.2% strongly disagree. When the respondents were asked whether females' early teenage pregnancies prevent their enrollment in TVET institutions, 30.3% strongly agreed, 31.0% agreed, 4.9% were neutral, 28.9% disagreed while 4.9% strongly disagreed. There is need to remove the current obstacles stopping females from obtaining TVET. The females fall prey to early marriage and childbearing thus are unable to proceed with their studies (Bray-Collins, Andrade & Wanjiru, 2022).

In addition, respondents were asked whether the females are supposed to be family caretakers, most of the female trainees' (46.5%) disagreed, 4.9% strongly disagreed, 9.9% strongly disagreed, 28.9% agreed, while 9.9% were neutral. Unlike male academics, the female gender is supposed to keep their job and family life separate, and not to take the role of primary caregiver for their family members (Parlak et al., 2021).

Furthermore, when the respondents were asked whether engineering courses are generally perceived as male-dominated, 50.7% strongly agreed, 40.1% agreed, 4.9% were neutral, 3.5% disagreed while 0.7% strongly disagreed. Studies in Kenya, such as those by Nthuku & Muthima (2023) who pointed out that the cultural belief that technical professions, including engineering, are "masculine" careers, which discourages female participation.

Lastly, the female trainees were asked whether society considers it a waste educating females because they get married elsewhere, 48.6% strongly agreed, 44.4% agreed, 3.5% were neutral, 2.1% disagreed. These findings resonate with studies like Khaguya (2014) and Nthuku and Muthima (2023), which highlight the significant role of cultural and societal perceptions in limiting female enrollment in technical courses. Khaguya's study found that early marriages, household chores, and other cultural practices leave girls with

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little time or encouragement to pursue education, while Nthuku and Muthima identified societal perceptions and gender stereotypes as barriers to female participation in engineering courses. The belief that educating women is not worthwhile because they will eventually marry out of their families perpetuates gender inequality and limits the economic empowerment of women in Kenya.

The principals were interviewed on the socio-cultural factors affecting enrollment of female trainees' in electrical and electronics courses. The majority of them cited that

> "*Parents are instrumental in decision making of their children. The trainees observe their parents progress in their profession and act has inspiration. Illiterate parents are not aware of the benefits of TVET and this does not help their children in their career development. Some parents educate males and neglect females. This leads to gender discrimination."*

Relationship between socio-cultural factors and enrollment of female trainees'

The research carried out correlation analysis between the variables of the study using Pearson product-moment correlation coefficient. Correlation coefficient of +1 indicates that two variables are perfectly related in a positive linear sense. Correlation Coefficient was used to test whether there existed relationship between socio-cultural factors and enrollment of female trainees'. Correlation coefficients range between 0.0 and 1.0. Values between 0.20 and 0.39 are considered very weak coefficients, between 0.40 and 0.59 are considered as weak, between 0.60 and 0.79 are considered as moderate while values of between 0.80 and 1.0 are considered very strong. Table 5 shows the correlation test results.

Table 5: Pearson's Correlations Coefficient Results

	Enrollment of female trainees'	**Socio-cultural factors**
Enrollment of female trainees'	1	
Socio-cultural factors	-.527** .000	1

***. Correlation is significant at the 0.01 level (2-tailed).*

Source: Author (2022)

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The findings show that there is a moderate negative correlation between socio-cultural factors and enrollment of female trainees' (r=-.527, p=< 0.000). This implies that as negative socio-cultural factors such as gender stereotypes, societal perceptions that undervalue female education, and traditional practices like early marriage become more prevalent, the enrollment of female trainees in technical courses decreases.

Conclusion and Recommendations

The study's findings reveal a significant impact of socio-cultural factors on the enrollment of female trainees in Electrical and Electronics Engineering Technician courses in Bomet County, Kenya. Parental education levels, chauvinistic attitudes, early marriages, teenage pregnancies, and societal norms significantly impact female enrollment in TVET institutions. Parents with higher education are more likely to support their daughters' technical training, while less-educated parents may not see its value. Chauvinistic beliefs that technical fields are for men, along with early marriages and teenage pregnancies, force young women to prioritize family responsibilities over education. Additionally, societal expectations that women should be primary caregivers and the perception of engineering as a male-dominated field further discourage female participation. Lastly, the belief that educating women is wasteful, as they will marry and leave, leads to limited investment in girls' technical education.

In addressing the low enrollment of females in the TVET courses, the community sensitization campaigns should be reached through challenging cultural stereotypes that view technical education as unsuitable for women. The approach should entail parental involvement through educating the parents about the benefits accruing from the courses and sharing success stories of women in such fields. Policies should target avoiding early marriages and facilitate readmission of teenage mothers into school. Financial assistance through scholarships and bursaries can overcome such economic obstacles. In addition, the need for female role models in technical fields and for gender-sensitive learning environments within the TVET institutions themselves will serve to motivate and support women into career paths considered technical.

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