



Influence of Career Guidance on Female Students' Enrollment in Electrical Engineering Programs in TVET Institutions in Nairobi City County, Kenya

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Abstract: *Female enrollment in Electrical Engineering programmes in Technical and Vocational Education and Training (TVET) institutions in Nairobi City County remains persistently low, despite national efforts to promote gender equity in technical fields. This disparity raises concern given the sector's importance to industrial growth and the underrepresentation of women in engineering careers. The study was guided by the purpose of assessing the influence of career guidance on female students' enrollment in Electrical Engineering programmes in TVET institutions in Nairobi City County, anchored on the Social Cognitive Career Theory, which explains how self-efficacy beliefs and outcome expectations shape career interests and choices. The study adopted a descriptive survey design with a mixed-methods approach. The target population comprised female trainees, trainers, and principals across TVET institutions in Nairobi City County, from which a sample of 211 female trainees, 102 trainers, and 10 principals across 15 institutions was drawn. Data were collected using structured questionnaires, semi-structured interviews, and focus group discussion guides. Instrument validity was established through expert review, while reliability was confirmed through Cronbach's alpha ($\alpha = 0.857$). Quantitative data were analyzed using descriptive and inferential statistics, including Pearson correlation and multiple regression, while qualitative data underwent thematic analysis. Findings indicated that mentorship, exposure to female engineers, and parental support were associated with higher enrollment interest, while inadequate information, gender-biased counseling, and inconsistent guidance were associated with lower enrollment. The study concludes that career guidance is associated with female students' enrollment decisions and recommends institutionalizing gender-responsive, mentorship-driven guidance frameworks.*

Keywords: *Career Guidance, Female enrollment, Electrical Engineering, Technical and Vocational Education and Training, Nairobi City County, Kenya*

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1. Introduction

Career guidance is a structured process of informing, advising, and supporting learners as they make decisions about subject choices, training pathways, and occupations,

while enrollment denotes the formal registration of a student into a specified academic or technical programme. Technical and Vocational Education and Training (TVET) constitutes post-basic education oriented toward the acquisition of practical skills and competencies for specific trades, including electrical engineering, which trains

learners in the generation, transmission, and application of electrical power and control systems. The interplay between career guidance and enrollment patterns has become a central concern in efforts to diversify technical fields that remain numerically dominated by men.

Globally, the underrepresentation of women in engineering has persisted despite decades of policy attention. In OECD and other developed-economy contexts, women constituted only about 16% of engineers and architects in the United States as of 2023, and roughly 34% of the broader STEM workforce despite a gender disparity remaining in STEM fields, with women making up 34 percent of the workforce, and engineering showing an even more pronounced gap, with women comprising roughly 16 percent of engineers and architects in 2023 (American Society of Mechanical Engineers, 2024). At the tertiary level, women make up over half of all students enrolled globally in tertiary education, yet between 2018 and 2023 they accounted for only 35% of STEM graduates, a figure that had not improved over the preceding decade (UNESCO, 2024, as cited in ScienceDirect, 2025). Mentorship and structured career guidance have been identified as key levers for narrowing this gap in high-income settings (World Economic Forum, 2024).

Within Africa, the disparity is more acute. In South Africa, women remain underrepresented in engineering globally, comprising less than 30% of the profession, while in South Africa only 13% of registered engineers are women (Sikhosana et al., 2023). Regionally, UNESCO (2024) reports that across sub-Saharan Africa only 30% of STEM professionals are women, reflecting systemic challenges in gender equity, and research attributes this partly to biased career guidance and gender-insensitive pedagogy within TVET colleges that discourage female persistence in engineering fields (Nxumalo & Peterson, 2022, as cited in Journal of Technical Education and Training, 2025).

In Kenya, the Technical and Vocational Education and Training Authority's 2023 annual returns show that female trainees graduating from STEM courses at the Kenya School of TVET stood at 34%, against 32% for males, yet this parity masks persistent underrepresentation in specific engineering trades such as electrical engineering (TVET Authority, 2024). The Kenya Universities and Colleges Central Placement Service (KUCCPS) is mandated to provide career guidance during subject and institutional placement (KUCCPS, 2024), and recent national efforts led by UNESCO, the ILO, and GIZ have sought to strengthen career guidance and counselling capacity across TVET institutions, including in Nairobi (UNESCO, 2025). Despite these interventions, evidence on whether such guidance meaningfully shifts female enrollment specifically into electrical engineering programmes in

Nairobi City County's TVET institutions remains limited, warranting closer empirical investigation.

1.1 Research objective

- To assess the influence of career guidance on female students' enrollment in electrical engineering programs in TVET institutions in Nairobi City County.

1.2 Research question

- How does career guidance influence female students' enrollment in electrical engineering programs in TVET institutions in Nairobi City County?

2. Literature Review

Career choice research has been dominated by frameworks that link psychological and contextual factors to occupational decision-making. Social Cognitive Career Theory (SCCT), developed by Lent, Brown, and Hackett (1994) and later extended by Lent and Brown (2019), remains the most widely applied lens for understanding how self-efficacy, outcome expectations, and personal goals interact with environmental supports and barriers to shape career interests and choices (Springer Nature, 2025). Within SCCT, self-efficacy functions as a central mechanism: when learners believe they are capable of succeeding in a domain such as electrical engineering, they are more likely to develop interest and pursue enrollment, whereas low self-efficacy often produced by inadequate exposure or discouraging guidance suppresses that interest regardless of underlying ability (Frontiers in Psychology, 2024). Career guidance interventions are understood within this framework as environmental supports capable of shifting self-efficacy beliefs and outcome expectations, particularly for groups, such as female students, who face additional socio-cultural barriers to entering technical fields (Avargil, Shwartz-Asher, Reiss, & Dori, 2023). This theoretical grounding is important for the present study because it positions career guidance not as a neutral information service but as a potential lever for correcting skewed enrollment patterns in male-dominated programmes such as electrical engineering.

Empirical literature from developed economies demonstrates a persistent, if narrowing, gender gap in engineering enrollment despite decades of guidance-oriented interventions. In the United States, women comprised roughly 16% of engineers and architects in 2023, a gap notably wider than their 34% share of the

broader STEM workforce (American Society of Mechanical Engineers, 2024). Mentorship-based career guidance has repeatedly been identified as a mechanism for narrowing this gap; structured mentorship programmes that connect female students with STEM professionals have been shown to provide inspiration and practical pathways into technical fields by exposing learners to role models who have navigated similar barriers (World Economic Forum, 2024). A case study of female engineering students in the United Arab Emirates similarly found that career decisions were shaped by a combination of internal drivers curiosity, problem-solving interest and external factors such as family expectations and perceived job security, with the balance between these often determined by the quality and timing of career guidance received (Frontiers in Education, 2026). Complementing this, research on role models in STEM higher education found that few studies had examined the specific characteristics of role models that motivate women toward technical careers, indicating that guidance interventions rooted in exposure to relatable role models remain undertheorized despite their apparent practical importance (Springer Nature, 2024).

Within the African context, the underrepresentation of women in engineering is more severe and is explicitly linked in the literature to deficiencies in career guidance. A qualitative study of female engineering students at a South African TVET college found that participants' decisions to enroll were shaped positively by school exposure to engineering, supportive teachers, and family influence, while their persistence was undermined by gender bias in practical instruction and a scarcity of female role models (Machaka & Singh-Pillay, 2025). This same body of work draws on earlier findings that biased career guidance and foundational gaps in STEM preparation actively deter female students from pursuing and persisting in engineering programmes at the TVET level (Nxumalo & Peterson, 2022, as cited in Machaka & Singh-Pillay, 2025). The scale of the disparity is stark: only 13% of registered engineers in South Africa are women (Sikhosana, Malatji, & Munyoro, 2023, as cited in Machaka & Singh-Pillay, 2025), and TVET colleges specifically continue to face gender-insensitive pedagogy and unsupportive learning environments that blunt the effect of any guidance efforts that do exist (Blake & Mavuso, 2024, as cited in Machaka & Singh-Pillay, 2025). In Ghana, the Forum for African Women Educationalists reported that only 36% of TVET enrollees nationally are female, attributing the gap partly to weak gender-policy implementation and a lack of gender-responsive career pedagogy rather than to disinterest among girls themselves (Graphic Online, 2026). Collectively, this regional literature suggests that career guidance in Africa's TVET systems is frequently under-resourced, gender-blind in design, or delivered too late in a student's educational trajectory to meaningfully redirect enrollment decisions.

Because TVET enrollment decisions in Kenya are substantially pre-shaped by secondary school experiences, literature on gendered subject choice at that level is directly relevant. Kithyo and Petrina, in a study of technical college transitions in Kenya, found that gender was the most persistent and pervasive factor shaping students' choice of career programmes, with gender norms underwriting school facilities, guidance practices, and labour-market orientation simultaneously (Kithyo, *Journal of Industrial Teacher Education*). A related study on secondary students found that certain technical subjects, such as woodwork and metalwork, were perceived as male-appropriate, while home science was perceived as female-appropriate, and that schools' own streaming practices reinforced these divisions independent of individual student interest or aptitude (Academia.edu, *Influence of Secondary School Students' Gender on their Subject Choices*). Kinyua (2025), in a desk-based review of gender roles and career choice in Kenya, similarly concluded that traditional gender roles steer men toward fields like engineering while steering women toward caregiving-oriented occupations, and recommended gender-neutral career counselling programmes as a corrective policy measure. This finding is reinforced by a separate study reporting that roughly 70% of surveyed participants felt their career paths had been shaped by gender expectations rather than personal interest or ability (*International Journal of Psychology*, 2024). Notably, a study in Nandi North Sub-County found that rural students relied more heavily on parental and teacher guidance than urban students, suggesting that the influence and potential corrective power of career guidance may vary by locality, a consideration relevant to Nairobi's distinctly urban TVET context (Academia.edu, *Nandi North Sub-County study*). Together, these studies establish that gendered career guidance, or its absence, operates well before the point of TVET enrollment, embedding disparities that later manifest as skewed enrollment in electrical engineering and similar technical programmes.

At the TVET level specifically, research in Kenya demonstrates both the scale of gendered enrollment imbalance and the specific role attributed to career guidance in addressing it. A study of TVET institutions in Uasin Gishu County in Kenya's North Rift found that enrollment in market-driven courses such as engineering had remained below capacity despite government investment, and identified role models, parental influence, and peer influence as the three strongest predictors of trainees' course selection, ahead of institutional marketing or facilities (Obwoye & Kibor, 2016). That same study found that the availability of bursaries specifically targeted at female students in engineering courses was viewed by respondents as an important enabling factor, suggesting that financial incentives interact with, rather than substitute for, guidance and exposure in shaping female enrollment decisions. National-level data reinforce the persistence of

this gender skew: the Technical and Vocational Education and Training Authority's 2023 annual returns show that although female trainees graduating from STEM courses at the Kenya School of TVET slightly outnumbered males overall (34% versus 32%), this aggregate figure masks substantial variation across specific STEM disciplines, with technical trades such as electrical engineering remaining more heavily male-dominated than the STEM category as a whole (TVET Authority, 2024). At the level of national policy, the Kenya Universities and Colleges Central Placement Service is formally mandated to provide career guidance during subject and institutional placement, including for TVET pathways (KUCCPS, 2024), yet mandate alone does not guarantee gender-responsive delivery. Recognising this gap, the Ministry of Education, in partnership with UNESCO, the International Labour Organization, and the Deutsche Gesellschaft für Internationale Zusammenarbeit, launched a national capacity-building initiative in 2025 to strengthen career guidance and counselling services across TVET institutions in Kenya, training 170 career guidance officers drawn from National Polytechnics, Technical Training Institutes, and Vocational Training Centres, including those based in Nairobi (UNESCO, 2025). This initiative's own framing that trainees risk graduating without a clear pathway or confidence in their next step in the absence of consistent professional guidance implicitly acknowledges that career guidance provision in TVET institutions in Kenya has historically been inconsistent, a condition plausibly contributing to the persistent underrepresentation of female students in electrical engineering specifically.

Across the reviewed literature, three convergent findings emerge. First, theoretical models such as SCCT establish a credible mechanism by which career guidance could influence female enrollment in technical fields, primarily through its effects on self-efficacy and outcome expectations (Lent, Brown, & Hackett, 1994; *Frontiers in Psychology*, 2024). Second, empirical studies from both developed and African contexts consistently find that where career guidance is gender-responsive, well-resourced, and delivered through role models and mentorship, female enrollment and persistence in engineering improve; where it is absent, generic, or delivered too late, gendered enrollment patterns persist largely unchanged (World Economic Forum, 2024; Machaka & Singh-Pillay, 2025). Third, studies confirm that gendered career guidance dynamics visible internationally are replicated locally, from secondary school subject streaming (Kithyo, *Journal of Industrial Teacher Education*) through to TVET-level course selection (Obwoye & Kibor, 2016), and that national bodies have only recently begun to formalise interventions aimed at correcting this (UNESCO, 2025).

Despite this body of work, a specific gap remains. Existing studies on career guidance and gendered enrollment in Kenya have concentrated on secondary schools generally (Kinyua, 2025), on TVET enrollment broadly across the North Rift region without disaggregating by specific engineering discipline (Obwoye & Kibor, 2016), or on national aggregate STEM statistics that obscure discipline-specific patterns (TVET Authority, 2024). No identified study has examined, with contemporary and discipline-specific data, how career guidance specifically influences female enrollment in electrical engineering programmes within Nairobi City County's TVET institutions an urban context whose guidance dynamics, per the rural-urban distinction noted in secondary school literature in Kenya, may differ meaningfully from those documented elsewhere in the country. This gap justifies the present study's focus.

2.1 Theoretical Underpinning

This study was anchored on the Social Cognitive Career Theory (SCCT), developed by Lent, Brown, and Hackett (1994) as an extension of Bandura's (1986) Social Cognitive Theory. SCCT was selected as the guiding framework because it offers a comprehensive explanation of how personal, environmental, and behavioral factors interact to shape career-related interests, choices, and outcomes, an explanatory scope well suited to understanding the underrepresentation of female students in Electrical Engineering programmes within TVET institutions. SCCT identifies three interlocking variables that drive career development: self-efficacy beliefs, outcome expectations, and personal goals. Self-efficacy refers to an individual's judgment of their own capability to successfully perform tasks associated with a given career path. Outcome expectations refer to the beliefs an individual holds about the consequences of pursuing a particular career, including anticipated social approval, financial reward, or personal satisfaction. Personal goals represent an individual's intention to engage in a particular activity or to achieve a specific future outcome. According to the theory, these three variables do not operate in isolation but are shaped by learning experiences, which are in turn influenced by background contextual factors such as gender, socio-economic status, and cultural environment.

The relevance of SCCT to this study is based in its treatment of learning experiences as the mechanism through which career self-efficacy and outcome expectations are formed. The theory identifies four primary sources of learning experience: personal performance accomplishments, vicarious learning through observing others, verbal persuasion from others, and physiological or affective states. Within the context of this study, career guidance, mentorship, exposure to female engineers as role

models, and parental support can each be understood as distinct sources of learning experience that shape female students' self-efficacy beliefs regarding their capacity to succeed in Electrical Engineering, and their expectations regarding the outcomes of pursuing such a career. For instance, exposure to practicing female engineers functions as a vicarious learning experience, allowing female students to observe that success in engineering is attainable for individuals who share their gender identity, thereby strengthening self-efficacy through a mechanism the theory terms vicarious reinforcement.

SCCT further incorporates contextual affordances and barriers as moderating influences on the relationship between career interests and career choice actions. This is particularly relevant to the socio-cultural factors, financial constraints, and institutional policies examined in this study, all of which function as contextual variables that can either support or obstruct the translation of career interest into actual enrollment. The theory proposes that even when self-efficacy and outcome expectations are favorable, restrictive contextual factors, such as financial barriers or gender-biased institutional environments, may prevent interest from being converted into enrollment behavior. This aspect of the theory is directly applicable to the study's examination of financial constraints and institutional policies as independent variables alongside career guidance and socio-cultural factors.

3. Methodology

The study employed a descriptive survey design with a mixed-methods approach. Data were collected from 211 female trainees, 102 trainers, and 10 principals across 15 TVET institutions in Nairobi City County. Krejcie and Morgan's formula was used to determine the sample size of the trainees and trainers, while purposive sampling was used to select principals from the TVET institutions. Data were collected using structured questionnaires, semi-

structured interviews, and focus group discussions. Quantitative data were analyzed using descriptive and inferential statistics, including Pearson correlation and multiple regression analysis, while qualitative data underwent thematic analysis. Instrument reliability was established through Cronbach's alpha coefficient ($\alpha = 0.857$).

Before data collection began, the researcher obtained authorization from the University of Eldoret, which served as official approval to conduct the study. Additionally, clearance was sought from the National Commission for Science, Technology, and Innovation (NACOSTI), the regulatory body responsible for research oversight in Kenya. Ethical considerations were observed by obtaining informed consent from all participants and ensuring that their participation was voluntary. The respondents were also assured of confidentiality and anonymity, and the information collected was used strictly for academic purposes.

4. Results and Discussion

4.1 Influence of Career Guidance on female student enrolment

The purpose of the study was to assess the influence of career guidance on female students' enrollment in Electrical Engineering programmes in TVET institutions in Nairobi City County. The analysis focused on respondents' perceptions of the adequacy, quality, and effectiveness of career guidance services. The constructs included exposure to information on Electrical Engineering careers, mentorship programmes, parental or guardian support, gender bias in career counseling, exposure to female engineers as role models, and the overall effectiveness and consistency of career guidance services. Table 1 summarized these findings.

Table 1: Career Guidance on female student enrolment

Statement	SD f	SD %	D f	D %	U f	U %	A f	A %	SA f	SA %
Career guidance in schools encourages female students to consider electrical engineering programs.	107	34.2	79	25.2	28	8.9	63	20.1	36	11.5
Students receive adequate information about career opportunities in electrical engineering.	101	32.3	84	26.8	24	7.7	62	19.8	42	13.4
Mentorship programs influence female students' decisions to pursue engineering courses.	22	7.0	27	8.6	18	5.7	143	45.7	103	32.9
Parents or guardians often support female students in choosing technical courses.	61	19.5	57	18.2	33	10.5	97	31.0	65	20.8
Career guidance information provided to students is generally free from gender bias.	117	37.4	90	28.8	21	6.7	55	17.6	30	9.6
Exposure to female engineers motivates female students to enroll in engineering programs.	16	5.1	21	6.7	14	4.5	129	41.2	133	42.5
Inconsistent or inadequate career counseling discourages female students from enrolling in electrical engineering.	25	8.0	33	10.5	22	7.0	130	41.5	103	32.9

(*n*=313)

The findings presented in Table 4.8 showed that a majority of the respondents, 107 (34.2%), strongly disagreed that career guidance in schools encourages female students to consider Electrical Engineering programmes, 79 (25.2%) disagreed, 63 (20.1%) agreed, 36 (11.5%) strongly agreed, while 28 (8.9%) were undecided. The findings suggest that respondents generally perceived existing career guidance systems as providing limited encouragement for female students to pursue engineering careers. This indicates that career guidance services may not adequately challenge prevailing gender stereotypes or actively promote technical careers among girls. These findings are consistent with Kariuki and Waweru (2022), who observed that career counseling in secondary schools in Kenya and TVET institutions often remains generic and insufficiently responsive to gender disparities in technical education. From the perspective of the Social Cognitive Career Theory (SCCT), inadequate career guidance represents a limitation that may reduce opportunities for female students to develop positive career expectations and confidence in pursuing engineering-related careers.

Similarly, a majority of the respondents, 101 (32.3%), strongly disagreed that students receive adequate information about career opportunities in Electrical Engineering, 84 (26.8%) disagreed, 62 (19.8%) agreed, 42 (13.4%) strongly agreed, while 24 (7.7%) were undecided. These findings indicate that respondents associated limited access to career information with reduced awareness of engineering opportunities among female students. Access to comprehensive and accurate career information is important because it enables students to make informed educational choices based on realistic knowledge of available career pathways. These findings concur with Nthuku, D. M., & Muthima, P. (2023), who reported that inadequate dissemination of engineering career

information contributes to limited awareness and lower participation of female students in technical programmes. The findings also support SCCT by demonstrating that access to career information forms part of the learning experiences that influence career interests and outcome expectations.

Additionally, a majority of the respondents, 143 (45.7%), agreed that mentorship programmes influence female students' decisions to pursue engineering courses, 103 (32.9%) strongly agreed, 27 (8.6%) disagreed, 22 (7.0%) strongly disagreed, while 18 (5.7%) were undecided. The findings suggest that mentorship is widely perceived as an important source of encouragement for female students considering engineering careers. Exposure to mentors may enhance students' confidence by providing practical guidance, emotional support, and examples of successful women in engineering professions. These findings are consistent with Muthima, P., Mwangi, M., Karanja, F., Mutuku, W., Muna, W., Muniu, J., Wanjau, R., Ndungo, C., Ngina, R., & Wamalwa, E. G. N. (2023) who reported that mentorship initiatives involving practicing female engineers are positively associated with increased participation of women in engineering education. Within SCCT, mentorship provides observational learning experiences that strengthen self-efficacy beliefs and positive career expectations, thereby supporting interest in technical careers.

Furthermore, regarding whether parents or guardians often support female students in choosing technical courses, 97 (31.0%) agreed, 65 (20.8%) strongly agreed, 57 (18.2%) disagreed, 61 (19.5%) strongly disagreed, while 33 (10.5%) were undecided. The findings indicate that respondents held relatively mixed views regarding parental support, although a slight majority perceived parents as

supportive of girls pursuing technical education. The substantial proportion of respondents expressing disagreement suggests that parental support varies considerably across families and socioeconomic backgrounds. This observation is consistent with Nyambura and Ochieng (2022), who found that parental attitudes towards technical education differ according to family characteristics and economic circumstances. These findings imply that parental influence should be viewed as an important but context-dependent factor associated with Female students' enrollment in engineering programmes.

Moreover, a majority of the respondents, 117 (37.4%), strongly disagreed that career guidance information provided to students is generally free from gender bias, 90 (28.8%) disagreed, 55 (17.6%) agreed, 30 (9.6%) strongly agreed, while 21 (6.7%) were undecided. The findings suggest that respondents perceived career guidance materials and counseling practices as containing gender-related biases that may discourage Female students' enrollment in engineering. Such perceptions imply that career guidance may unintentionally reinforce traditional occupational stereotypes rather than broaden career aspirations. These findings are consistent with Maina and Gitau (2023), who established that implicit gender bias within career guidance practices often directs girls away from science and engineering careers. Within the SCCT framework, biased career guidance may negatively influence students' self-efficacy and expectations regarding success in engineering professions.

In addition, a majority of the respondents, 133 (42.5%) strongly agreed that exposure to female engineers motivates female students to enroll in engineering programmes, 129 (41.2%) agreed, 21 (6.7%) disagreed, 16 (5.1%) strongly disagreed, while 14 (4.5%) were undecided. These findings indicate that respondents strongly associated exposure to female engineering professionals with increased interest in engineering education. Visible role models may encourage female students by demonstrating that engineering careers are attainable and compatible with women's aspirations. Similar findings were reported by Nthuku, D. M., & Muthima, P. (2023), who found that interactions with practicing female engineers enhanced girls' confidence and interest in engineering programmes in TVET institutions in Kenya. These findings align closely with SCCT, which emphasizes observational learning and vicarious experiences as important mechanisms for developing career self-efficacy and positive outcome expectations.

Further, a majority of the respondents, 130 (41.5%) agreed that inconsistent or inadequate career counseling discourages female students from enrolling in Electrical Engineering, 103 (32.9%) strongly agreed, 33 (10.5%) disagreed, 25 (8.0%) strongly disagreed, while 22 (7.0%)

were undecided. The findings suggest that respondents viewed the quality and consistency of career counseling as important factors associated with female students' educational choices. Inconsistent counseling may leave students without adequate guidance during critical career decision-making periods, thereby reducing awareness of opportunities within engineering education. These findings concur with Ouma and Wafula (2022), who recommended strengthening professional training for career counselors to improve gender-responsive guidance in TVET institutions in Kenya. The findings imply that improving the quality of career counseling may contribute to better-informed educational decisions among female students.

The findings therefore indicate that respondents associated limited career information, inadequate encouragement, gender-biased guidance, and inconsistent counseling with lower Female students' enrollment in Electrical Engineering programmes, while mentorship initiatives, exposure to female engineers, and parental support were perceived as important sources of encouragement. These findings generally support previous empirical studies and suggest that career guidance encompasses more than the provision of occupational information; it also includes mentorship, role modelling, counseling quality, and family engagement. However, because the study employed a cross-sectional design, the findings demonstrate statistically supported associations rather than causal relationships. Consistent with the Social Cognitive Career Theory, the findings suggest that career guidance provides important learning experiences that shape self-efficacy beliefs, outcome expectations, and career interests, thereby being associated with female students' enrollment decisions in Electrical Engineering programmes within TVET institutions in Nairobi City County.

When principals were asked about career guidance for female students, most described institutional career guidance units, orientation programs for new students, and integration of career counseling into the student support services framework.

"We have a career guidance office that runs orientation sessions for all new students. For female students specifically, we have sessions that highlight career opportunities in electrical engineering, including emerging fields like renewable energy and smart technologies."

P4 noted that career guidance at the institutional level is often generalized and does not specifically address the unique barriers facing female students in technical programs, calling for more targeted and gender-responsive guidance.

"Our career guidance sessions are helpful but general. Female students in electrical engineering need guidance that directly addresses

the concerns they have workplace discrimination, family expectations, safety on the job not just general career information."

Several principals emphasized the need for guidance that begins before enrollment, targeting secondary school girls to raise their awareness of and interest in electrical engineering as a viable career option.

"We need to reach girls while they are still in secondary school. By the time they are applying for courses, their career preferences are already formed. Early guidance is more effective than guidance after enrollment."

The principals' perspectives highlight a gap between the availability of career guidance services and their responsiveness to the specific needs of female students in technical programs. Generic career guidance may be insufficient to address the layered barriers that deter girls from electrical engineering. UNESCO-UNEVOC's 2022 program sought to mitigate barriers faced by girls in STEM by equipping TVET trainers with career guidance frameworks focused on increasing participation, completion, and progression of young women and girls in STEM TVET into the workforce (UNESCO-UNEVOC, 2022). Research on gender disparities in STEM-related education consistently shows that women face challenges in accessing quality education and career guidance services, which may influence their decisions to pursue or abandon TVET courses (Nwanna, 2024).

Principals were also asked to describe any mentorship or outreach programs aimed at encouraging female students to pursue electrical engineering. They described several mentorship initiatives, including industry visits, alumni engagement, peer mentorship programs, and partnerships with professional engineering bodies. However, they noted that these programs are not yet systematic or institutionalized.

"We organize industry visits where female students visit electrical firms and interact with female engineers. These visits are very

motivating, but we only manage to do them once or twice a year due to budget constraints."

P7 highlighted an alumni mentorship program where former female graduates periodically visit the institution to mentor current students, sharing their career journeys and providing guidance on navigating professional challenges.

"Our female alumni have been very supportive. They come back to share their experiences and mentor current students. We would like to formalize this into a structured mentorship program, but we need resources and coordination support."

Several principals also mentioned community outreach programs targeting secondary schools, in which the institution conducts awareness sessions to attract more female students into electrical engineering.

"We visit secondary schools in our catchment area especially girls' schools to talk about our electrical engineering program. We bring along female students to speak to their peers. This peer outreach has shown some positive results."

The responses reveal that while outreach and mentorship initiatives exist, they are largely informal, underfunded, and inconsistent. Institutionalizing these programs would enhance their impact and reach. In 2022, the Society of Women Engineers hosted roundtable discussions across multiple countries that highlighted the significant impact effective mentorship programs have in supporting women in STEM, recognizing mentorship as a powerful tool for empowerment and support (Society of Women Engineers, 2022). Evidence from Africa further shows that structured mentorship programs for girls and women in STEM and TVET, developed in collaboration with international partners, have been implemented in multiple countries with promising results in boosting Female students' enrollment in technical fields (Institution of Engineering and Technology Ghana, 2023).

4.2 Correlation Analysis

Table 2: Correlation Coefficient Career Guidance and Female Students' Enrollment

Variable	Career Guidance	Female Students' Enrollment
Career Guidance	1	
Female Students' Enrollment	.584**	1

* $p < 0.01$ (2-tailed)

As indicated in table 2, Pearson correlation analysis indicated a moderate, significant positive relationship between career guidance and female students' enrollment

in Electrical Engineering programmes in TVET institutions in Nairobi City County, Kenya ($r = .584$, $p < 0.01$) This indicates that the quality, consistency, and gender-

responsiveness of career guidance services available to female students is associated with their awareness of, and orientation toward, Electrical Engineering as a viable career pathway. Where career counselors present engineering as an accessible option for female students, facilitate exposure to female engineering professionals, and provide unbiased information about career opportunities in the field, female students appear more likely to make informed enrollment decisions. This finding is consistent with Hooley et al. (2021), who established that career guidance interventions explicitly addressing gender bias and incorporating role model exposure are associated with increases in female students' interest and enrollment in

technical and engineering programmes across multiple national settings. It is further supported by Sultana (2018), who found that career guidance systems in developing countries frequently reproduce gender inequalities by steering female students toward traditionally feminine occupations, and that reforming guidance practices to be gender-transformative is associated with expanding female students' enrollment in non-traditional fields such as Electrical Engineering.

4.3 Regression Analysis

Table 3: Regression Coefficient

Variable	B	Std. Error	Beta	t	Sig.
Career Guidance	.261	.051	.247	5.118	.000

As shown in table 3, the regression results indicated that career guidance was a significant predictor of female students' enrollment in Electrical Engineering programmes in TVET institutions in Nairobi City County, Kenya ($B = .261$, $\beta = .247$, $t = 5.118$, $p < .000$). The positive unstandardized coefficient suggests that a one-unit improvement in career guidance is associated with a .261-unit increase in female students' enrollment, holding the other predictor variables constant. The standardized coefficient ($\beta = .247$) indicates that career guidance ranked third among the four predictors in relative contribution, behind socio-cultural factors ($\beta = .318$) and financial constraints ($\beta = .284$), and ahead of institutional policies ($\beta = .209$). The associated t-value (5.118) and significance level ($p < .000$) confirm that this contribution is statistically significant and not attributable to chance. This finding reinforces the correlation results reported earlier, indicating that career guidance is independently associated with enrollment outcomes even after accounting for socio-cultural, financial, and institutional factors within the same model.

5. Conclusions and Recommendations

5.1 Conclusions

The findings lead to the conclusion that career guidance, in TVET institutions in Nairobi City County, is associated with limited encouragement for female students' enrollment in Electrical Engineering programmes, largely due to insufficient career information, perceived gender

bias in counseling content, and inconsistency in service delivery. At the same time, mentorship, exposure to female engineers as role models, and parental support emerge as factors associated with stronger enrollment interest among female students, suggesting that guidance extends beyond information provision to encompass relational and observational elements of career development. The qualitative accounts from principals reinforce this picture, pointing to career guidance systems that remain largely generalized rather than gender-responsive, and to mentorship and outreach initiatives that, while valued, remain informal and under-resourced.

5.2 Recommendations

Based on the findings, this paper makes the following recommendations

1. TVET institutions in Nairobi City County should design and deliver a gender-responsive career guidance curriculum for career guidance officers, addressing workplace discrimination, family expectations, and safety concerns specific to female students, by revising the existing generic orientation framework into a targeted module rolled out during student induction.
2. The Ministry of Education, in partnership with TVET institution management, should extend structured career guidance to secondary school level, targeting girls before subject and career

choices are finalized, through partnerships between TVET institutions and feeder secondary schools for early awareness sessions on Electrical Engineering pathways.

3. TVET institution leadership and professional engineering bodies should formalize and institutionalize existing mentorship initiatives, including alumni engagement and industry visits, by establishing a structured mentorship framework with dedicated budget lines and coordination staff rather than relying on ad hoc annual events.
4. Career guidance departments should increase female students' exposure to practicing female engineers as role models, by scheduling regular (rather than occasional) industry visits and inviting female engineers as recurring guest speakers within the academic calendar.

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