

Influence of Student Support Services on Implementation of CBET System in Electrical and Electronic Engineering Courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya

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Abstract: The crucial role of Technical and Vocational Education and Training (TVET) in developing human capital by equipping individuals with knowledge, skills, and capabilities needed to succeed in a rapidly changing world cannot be gainsaid. In Kenya, TVET sub-sector is currently implementing a new Competency-Based Education and Training (CBET) curriculum that focuses on 50% theory and 50% industrial training as a panacea. However, there has been increased reluctance to implement CBET courses. The purpose of this study was to examine the implementation of CBET in electrical and electronics engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya. In this regard, the study sought to determine the extent to which student support services affects implementation of CBET system in electrical engineering courses in Technical and Vocational Colleges in Uasin Gishu County. This study adopted a pragmatic paradigm with an explanatory research design. The target population was 119 respondents who were drawn from the Ziwa, Moiben, Rift Valley Technical Training Institute, Ngeria, Kipkabus, Turbo Technical Training Institute and Koshin Technical Training Institute in Uasin Gishu County. The study used census for the enumeration of all the 119 electrical and electronic engineering trainers and HoDs of the 7 TVET institutions. Questionnaire was used to collect the primary data and analyzed using inferential statistical techniques using Statistical Package for Social Sciences (SPSS) version 25 software. From the findings, the coefficient of determination (R square) of 0.489 indicated that student support services explained only 48.9% of the variation or change in implementation of CBET system in electrical and electronics engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya. The study findings further indicated that students support services significantly influence implementation of CBET system in electrical and electronics engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya. Therefore, TVET institutions should consider strengthening students support services in line with the CBET requirements using a policy framework to enhance implementation of CBET system. The findings of the study are of significance to TVET and the stakeholders in improving the implementation of CBET system.

Keywords: Student support, Competency-Based Education and Training

I. INTRODUCTION

The global interest in education systems reflects a shared commitment to harnessing the transformative power of education for the betterment of individuals, communities, and the world as a whole (Darling-Hammond et al., 2017). Thus, the crucial role of education in developing human capital by equipping individuals with knowledge, skills, and capabilities needed to succeed in a rapidly changing world cannot be gainsaid. This has invoked the role of TVET in providing students with practical skills and knowledge for a specific trade or vocation. Machogu (2023) notes that the responsibility for equipping young individuals with the essential skills they need to thrive, addressing the youth unemployment, and ensuring social-economic stability within the nation lies primarily with the education sector, notably TVET. However, Haolader, Foyso, and Clement (2017) decry lack of practice-oriented training and inadequate industry engagement as common challenges faced by many Technical and Vocational Education and Training (TVET) systems around the world. Besides, there has been low employability of the workforce churned out of the training institutions due to lack of compatibility with the market demand versus the quality and the content of the training that is offered in these institutions (Jabarullah & Iqbal Hussain, 2019). Additionally, the informal-sector skills acquisition and innovation-



sharing as they exist today are facing difficulties due to dynamics in technology landscape from mechanical and labour-intensive technologies to the fast-paced technologies (Adu-Gyamfi & Adjei, 2018).

In this regard, TVET has denounced Knowledge-Based Education and Training for Competency-Based Education and Training as a panacea (Adu-Gyamfi & Adjei, 2018). This gives credence to a strategic approach of synergizing the link between TVET and industry with the aim of maximizing returns in terms seamless transition of graduates to the world of work after training. Muoria (2023) adds that in the dual training model, if possible, the trainees should be up by 70% in the industry, up from the proposed 50-50 training model. Courtesy of the implementation of CBET, TVET institutions and their teachers are expected to 'transform' into collaborative, responsive, learning organizations to reflect the operating agility required by the formal and informal businesses environment within the knowledge economy. CBET can be defined as a training based on the participant's ability to demonstrate mastery of skills performed under certain conditions, to specific standards which he or she must acquire before moving to the next phase of learning or life. Thus, the essence of CBET-ization of electrical engineering training lies in its learner-centered, competency-based approach that equips students with the practical skills, technical knowledge, and industry-relevant competencies needed to succeed as electrical engineers in today's dynamic and rapidly evolving technological landscape.

Electrical engineers must keep pace with new developments, which can be challenging, leading to concerns about the relevance and currency of their skills (Yelamarthi et al., 2024). Engineers who do not possess the necessary skills or adaptability to navigate these changes may face challenges in finding suitable employment. This warrants effective implementation of CBET in electrical engineering. However, the successful implementation of Competency-Based Education and Training (CBET) is influenced by various institutional factors within educational institutions (Muthuri, 2023). Similarly, weak psychosocial and peer support frameworks limit students' capacity to adapt to the rigorous demands of CBET programs, thereby affecting instructional outcomes (Wanjohi & Mutiso, 2021). Therefore, strengthening student support services is critical for enhancing instructional management and ensuring that CBET achieves its intended goal of producing adaptable, competent, and industry-ready graduates. Properly institutionalized support systems not only improve academic success and learner resilience but also contribute significantly to national workforce readiness and competitiveness in the global economy (Mwangi, 2022).

Kenya's TVET sub-sector is currently implementing a new CBET curriculum that focuses on 50% theory and 50% industrial training to improve the competencies of graduates. Therefore, the government through TVET CDACC, embarked on developing demand-driven CBET curricula and equipping public institutions with state-of-the-art training equipment and hiring additional trainers to smoothen the CBET implementation process. Despite this, TVETA and TVET CDACC point increased reluctance to implement CBET courses by majority of TVET institutions (Jwan, 2022; Ododa & Kariuki, 2023; Onyango, 2023). Although existing studies have examined the role of student support services in higher education, limited research has specifically focused on how these services influence the implementation of Competency-Based Education and Training (CBET) within TVET institutions in Kenya and other developing countries. Addressing this gap will provide empirical evidence to guide policymakers, TVET administrators, and industry stakeholders in designing integrated student support models that enhance CBET effectiveness and workforce readiness. Hence, the study examined the influence of student support services on implementation of CBET system in electrical and electronic engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya.

II. LITERATURE REVIEW

Student support services refer to a range of services and programs designed to help students succeed academically, socially, and emotionally throughout their educational journey (Zuva & Zuva, 2020). These services play a crucial role in ensuring that students can thrive both inside and outside the classroom. Student support services are essential to ensuring a holistic learning experience, especially in systems like Competency-Based Education and Training (CBET) that demand practical engagement and individualized learning (Jwan, 2022). For CBET systems, student support services ensure that students can navigate the challenges of practical, hands-on learning while acquiring the necessary competencies for their future careers. Student support services encompass a wide range of assistance, including academic advising, tutoring, mentoring, financial aid, and personal counseling. Student support services aim to help students navigate the complexities of higher education and achieve their academic goals (Nartey, 2024). Leny, Medardo, and Melanie (2022) investigated the impact of student services and programs to student performance in the Philippines. The analysis of mean averages showed that the student support offices provided services and programs that had an impact on student performance. Also, the comparison of mean values revealed a significant difference in the perceived impact of the services and programs on student development when compared to the office regarding the areas of academic performance and student performance. The services and programs provided by the different student support offices of the university fostered student performance.

Johnson et al. (2022) investigated student support in higher education: campus service utilization, impact, and challenges in Qatar. Findings report a significant association between students' services and student success and persistence. A significant difference was reported between at-risk students' majors and at-risk students in STEM and non-STEM majors. Also, there was a difference in the help-seeking behavior among males and females, nationals and non-nationals, and student classifications. However, the focus was not on implementation of CBET. Makibinyane and Khumalo (2021) investigated factors that impede student support services and throughput rate. This study employed qualitative research methodology located within interpretive paradigm. Participants were student support services and academic staff at two TVET colleges in South Africa. The study found that there are various factors that influence the students' academic performance and the throughput rate such as students' family background, academic difficulties, poor class attendance, poor infrastructure, lack of professional development opportunities, lack of career guidance, lack of academic support and shortage of SSS staff. However, the study didn't focus on the implementation of CBET curriculum. Skakane-Masango, Mtshali, and Ngcobo (2022) investigated the availability and utilization of support services by undergraduate (UG) students in a nursing education institution in South Africa. The results showed high awareness of the remedial programs, availability of lecturers for appointments, medical services, and compulsory orientation. Positive correlations were observed between service utilization, school type, place of origin, and parent employment status. However, the study didn't focus on the implementation of CBET curriculum in TVET institutions. Besides, there are limited studies focusing on the influence of students support services on the implementation of CBET curriculum. These provided a gap for the current study on influence of student support services on the implementation of CBET system in electrical engineering courses in Technical and Vocational Colleges in Uasin Gishu County.

III. METHODOLOGY

The current study employed an explanatory research design. The target population comprised of trainers of electrical engineering departments representative of selected Technical and vocational institutions in Uasin Gishu County totaling to 119 respondents who were drawn from the Ziwa, Moiben, RVTTI, Ngeria, Kipkabus, Turbo TTI and Koshin Technical Training Institute in Uasin Gishu County. In determining the target population, the researcher took into account participants who can best share experiences and thoughts to address research objectives (Kumari, Lavanya, Vidhya, Premila, & Lawrence, 2023). In this study, census inquiry technique was adopted. MacDonald (2020) explains a census as an enumeration of all items in a population, which must be consistently defined for the purpose of study. Questionnaire was used to collect the primary data. Quantitative data was analyzed using multiple simple linear regression on dependent variable (implementation of CBET system) and coefficient of correlation using the Statistical Package for Social Sciences (SPSS) version 25.0 package. The beta (β) coefficients for the independent variable were generated from the model the regression model used, is given in equation 1

$$y = \beta_0 + \beta_1 X_1 + \epsilon \dots \dots \dots 1$$

Where y represented implementation of CBET systems in technical vocational training institutes which was the dependent variable x represented the student support services β is the standardized regression coefficient.

IV. RESULTS AND DISCUSSION

Effect of student support services on implementation of CBET system in electrical and electronics engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya

Simple Linear Regression analyses was performed to test the model fit and to establish the predictive power of the study models. Findings in Table 1 illustrate the model summary of standard multiple regression model.

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.699 ^a	.489	.482	.375	1.329

a. Predictors: (Constant), student support services

b. Dependent Variable: Implementation of CBET

Source: Research Data (2025)

The simple linear regression analysis revealed that student support services have a strong positive relationship ($R = .699$) with the implementation of Competency-Based Education and Training (CBET) in Electrical and Electronics Engineering in Technical and Vocational Colleges in Uasin Gishu County. The model explains approximately 48.9% ($R^2 = .489$) of the variance in CBET implementation, indicating that student support services is a significant driver of successful CBET delivery. The adjusted R^2 of .482 confirms the model's stability, while the Durbin-Watson statistic of 1.329 suggests no severe autocorrelation in the residuals. The significant p-value (Sig. F Change = 0.000) further supports the conclusion that improvements in student support services is critical for strengthening CBET implementation and enhancing graduates' job readiness. Thus, the model was fit to CBET implementation as explained by student support services. The regression model is a good fit for the data as shown in Table 2.

Table 2: ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.878	1	10.878	77.395	.000 ^b
	Residual	11.385	81	.141		
	Total	22.263	82			

a. Dependent Variable: Implementation of CBET

b. Predictors: (Constant), student support services

Source: Research Data, (2025)

The ANOVA results show that the overall regression model is statistically significant ($F(1, 2) = 77.395, p < 0.001$), indicating that student support services significantly predict the implementation of Competency-Based Education and Training in Electrical and Electronics Engineering in TVET institutions. The regression sum of squares (11.385) accounts for more than half of the total variance (22.263), further confirming that student support services explain a substantial proportion of the variation in CBET implementation. This implies that targeted improvements in student support services can meaningfully enhance the effectiveness of CBET implementation and Training in Electrical and Electronics Engineering in TVET institutions. Following the significant ANOVA results, the coefficients Table 3 provides unstandardized and standardized coefficients (Beta), the t-values, and their corresponding significance levels, which help determine the direction, strength, and significance of predictor effect on the dependent variable.

Table 3 Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	1.705	.246		6.930	.000		
Students Support	.582	.066	.699	8.797	.000	1.000	1.000

a Dependent Variable: Implementation of CBET

Source: Research Data, (2025)

From the findings, a unit increase in students support services would lead to increase in implementation of CBET system in electrical and electronic engineering courses in technical vocational education and training institutions by a factor of 0.582 ($\beta_2 = 0.582$). Besides, students support services significantly influence implementation of CBET system in electrical and electronic engineering courses in technical vocational education and training institutions ($t = 8.797; p\text{-value} = 0.000$) which is less than $\alpha = 0.05$). In this regard there is a statistically significant influence of students support services on implementation of CBET system in electrical and electronic engineering courses in technical vocational education and training institutions in Uasin Gishu County. This findings are in line with the findings of Leny, Medardo, and Melanie (2022) Johnson, et al., (2022) Makibinyane and Khumalo (2021) which consistently demonstrate that effective student support services such as academic advising, counselling, mentorship, and access to learning resources play a critical role in facilitating the successful implementation of the Competency-Based Education and Training (CBET) system in Technical and Vocational Colleges, particularly in electrical and electronic engineering courses where students must master complex theoretical concepts and practical skills. These studies collectively show that when students receive comprehensive support tailored to their academic and psychosocial needs, their engagement, retention, and competence levels improve significantly, thereby enhancing the achievement of CBET outcomes.

These findings align with Cognitive Learning Theory, which emphasizes that learning is an active, constructive process supported by appropriate guidance, resources, and scaffolding. According to this theory, students require not only instructional content but also supportive services such as academic advising, mentorship, counselling, and access to learning materials to effectively process, organize, and apply new knowledge and skills. The implication of this study is that robust student support systems are crucial for realizing the intended outcomes of CBET, particularly in technical disciplines that demand both theoretical mastery and practical competence. Based on this, the study recommends that: TVET institutions should strengthen personalized academic advising and mentorship programs for engineering students; policymakers should allocate adequate resources to establish well-equipped learning resource centers; institutions should implement regular counselling and psychosocial support services to address learners' non-academic challenges; capacity-building programs should be provided for staff involved in delivering student support services to enhance their effectiveness; and partnerships with industry and community stakeholders should be fostered to expand the range and quality of support services available to students. Collectively, these recommendations can help ensure that student support services effectively facilitate cognitive engagement and skill mastery, thereby improving the implementation and success of the CBET system in technical vocational education.

From the results (Table 3) the model was then specified as: -

$$y = \beta_0 + \beta_1 X_1 + \varepsilon \dots \dots \dots 2$$

Implementation of CBET = 1.705 + 0.582 Students Support + ε

The model suggests that students support services positively contribute the implementation and success of the CBET system in technical vocational education, students support services has (0.582). The constant (1.705) indicates the baseline level of implementation of CBET system in electrical engineering when the effects of the independent variables are not considered. This regression model indicates that improving in students support services enhances implementation of CBET system. Investments in these student support services is likely to yield positive outcomes in terms of equipping individuals with relevant industrial skills.

V. CONCLUSION

There is a statistically significant influence of students support services on implementation of CBET in electrical and electronics engineering courses in Technical and Vocational Colleges in Uasin Gishu County, Kenya. This highlights the need for targeted improvements to ensure that all learners, especially in the electrical engineering CBET program, can benefit fully from consistent and adequate academic, career, and financial support services. These findings are supported by Constructivist Learning Theory (CLT). Specifically, scholarships and grants were recognized as critical enablers of equitable access to education, while peer support programs enhanced students' coping strategies in navigating the rigorous demands of CBET. Moreover, career fairs and industry engagement events were highlighted as vital linkages between training institutions and labor markets, fostering employability and career preparedness. Similarly, academic advising was affirmed as essential in guiding learners to align their course choices with competency requirements in the electrical engineering discipline. These findings imply that institutionalizing structured student support systems within TVET institutions can significantly improve instructional outcomes and promote graduate readiness for industrial demands. Consequently, policymakers and institutional managers should prioritize strengthening financial, psychosocial, and career development support services as part of a holistic strategy for CBET implementation.

VI. RECOMMENDATIONS

In view of the findings of the study and the guidance from the literature review, it is apparent that strengthening student support services improves implementation of CBET in electrical and electronics engineering courses in Technical and Vocational Colleges. Therefore, the study makes the following recommendations:

- i. Regular monitoring and feedback mechanisms should be institutionalized to assess the effectiveness of support services and address any gaps in a timely manner.
- ii. Strengthen and standardize student support services to ensure equitable access and quality for all trainees, particularly in competency-based electrical engineering programs.
- iii. The TVET institutions should strengthen industry linkages, modernize training infrastructure, upskill instructors, enhance student support services, for improving CBET implementation in electrical engineering using a policy framework to enhance implementation of CBET system in electrical and electronics engineering courses in Technical and Vocational Colleges.
- iv. TVET institutions should strengthen personalized academic advising regular counselling, psychosocial support and mentorship programs for engineering students; policymakers should allocate adequate resources to establish well-equipped learning resource centers

- v. Capacity-building programs should be provided for staff involved in delivering student support services to enhance their effectiveness

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