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Effect Of Modular Syllabus Implementation Strategies On Performance Of Technical Courses In Technical Vocational Education Training In Nairobi County, Kenya

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Abstract
Quality education and training are essential for national progress, with Technical Education and Vocational Training institutions focusing on continuous improvement aligned with Sustainable Development Goals. However, rising unemployment and inadequate skills among Kenyan Technical Education and Vocational Training graduates, due to poor modular strategy implementation, threaten youth livelihoods. In this regard, the main objective of this study was to investigate the effect of modular syllabus implementation strategies on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya. The specific objectives of the study were to: determine the effect of modular partnership strategy, modular digitalization strategy and modular assessment strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya. Based on Constructivism Theory, this study employed a descriptive survey method targeting 5,633 participants, including 5,204 engineering students, 418 engineering tutors, and 11 principals from 11 Technical Education and Vocational Training institutions in Nairobi County that implemented modular syllabi. The sample size included 359 individuals: 11 principals, 26 tutors, and 322 students. The data was analyzed using SPSS version 28.0, where quantitative data underwent descriptive and inferential statistical analysis, and results were presented in tables. Qualitative data was analyzed for themes and sub-themes, and findings were illustrated with quotations. The study found significant positive effects of modular partnership, digitalization, and assessment on the performance of technical courses in Technical Education and Vocational Training. Moreover, modular digitalization strategy had the greatest effect on the performance of technical courses in Technical Education and Vocational Training, followed by modular partnership strategy, and lastly modular assessment strategy. The results suggest that enhancing digital tools, building strong partnerships, and improving assessment methods significantly boost the performance of technical courses, with digitalization having the most substantial impact in practical settings. The study concludes that modular partnership, digitalization, and assessment strategies all significantly affect the performance of technical courses in Technical Education and Vocational Training in Nairobi County, Kenya, with modular digitalization having the strongest impact.

Key Words: *modular syllabus, modular digitalization, modular partnership strategy and modular partnership*

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I. Background To The Study

Quality education and training are fundamental to national progress, with Technical Education and Vocational Training (TVET) institutions prioritizing continuous quality improvement efforts that align with the Sustainable Development Goals (SDG) (Edralin & Pastrana, 2023). Consequently, there is a growing recognition of the need to bridge the gap between the skills provided by educational institutions and the expectations of employers (Chitema, 2021). Nevertheless, significant concerns persist over education quality in TVET, which are attributed to inadequate modular partnership, digitalization and assessment within the modular syllabus implementation strategy (Siena, 2024). While most high-income countries have achieved or are nearing effective performance of technical courses at TVET, Sub-Saharan Africa still faces substantial gaps (Gyimah, 2020). This suggests that despite efforts to align TVET institutions with SDGs and bridge the skills gap for employability, concerns remain about the quality of education, particularly in Sub-Saharan Africa, due to challenges in modular syllabus implementation and disparities compared to high-income countries.

The performance of technical courses in TVET refers to the effectiveness and outcomes of educational programs aimed at equipping individuals with practical skills and knowledge necessary for technical courses (Alexander, 2021). Effective performance of technical courses in TVET include good grades in examination, employment of the graduates, student's enrollment rate, trainee completion rate and the quality of skills training

(Okelo, Matere, & Syonthi, 2021; Stander, Plooy, & Scheckle, 2022; Mlambo & Mkhwanazi, 2024). The significance of performance in technical courses within TVET lies in supplying skilled professionals crucial for technological advancement, industrial growth, and infrastructure development (Wahungu, Wawire, & Kirimi, 2023). Effective performance in technical courses within TVET require effective modular syllabus implementation strategies (Tshong & Yasin, 2023). This indicates that the effectiveness of technical courses in TVET is crucial, necessitating a focus on modular syllabus implementation to enhance graduation rates, job placements, employer satisfaction with technical skills, and student retention.

A modular syllabus has been deemed as an option to traditional teaching to improve the quality of education in higher learning institutions by increasing students' participation, motivation, responsibility and autonomy (Rahman, 2022). However, it faces challenges that necessitate strategies for effective implementation (Ndikumana, Mugabo, & Nsabimana, 2024). Accordingly, modular syllabus implementation strategies involve organizing curriculum content into distinct, self-contained units that allow for flexible learning paths and focused assessment (Zhang, 2020). Effective modular syllabus implementation strategies in TVET involve measures such as modular partnership, digitalization and modular assessment strategy (Olabiyi & Uzoka, 2020; Ministry of Labour and Human Resources, 2022). Partnership strategy comprise communication-based, advisory-based, cooperation-based and collaboration-based partnership (TIKA, Gowon, & Saidu, 2021). Additionally, modular digitalization strategy involves ensuring modular digital adaptation, fostering innovation, building competence, and accelerating progress (Ndikumana, Mugabo, & Nsabimana, 2024). Lastly, modular assessment strategy involves assessment competition, moderation, feedback and scheduling/timing (Dejene & Chen, 2019). This suggest that implementing a modular syllabus in TVET can enhance the quality of education, but it requires strategies such as modular partnership, digitalization, and assessment to address inherent challenges.

Vietnam's vocational education strategy (2021-2030, vision 2045) aligns with global SDG targets, emphasizing regional equity, lifelong learning, and education quality (Le, Phung, Nguyen, & Nguyen, 2022). Despite a decade of government efforts, industry remains critical of Vietnam's TVET performance (Nummela & Holm, 2023). In response the VET Renewal Program, with the German International Cooperation Agency, piloted modular training curriculums in vocational colleges (Nguyen, Pham, Tran, DO, & Pham, 2024). Similarly, China adopted modular syllabus based on German vocational training standards to enhance TVET performance (Wu & Liu, 2022). This indicates that despite aligning with global SDGs targets and piloting modular training curriculums with international collaboration, Vietnam's vocational education strategy faces industry criticism, similar to China's adoption of German standards to improve TVET performance.

Sub-Saharan Africa has significantly increased access to education, but VET still holds a lower status and faces challenges hindering modular syllabus implementation (Gewer, 2021). Particularly, the Ethiopian Ministry of Education (MoE) advocates modularization for syllabus implementation, but education quality remains low due to ongoing challenges, necessitating an evaluation of the strategies used (Dejene & Chen, 2019). Similarly, in Nigeria, despite government efforts, effective adoption of a modular syllabus in TVET remains unachieved, highlighting the need for strategies to overcome these challenges (TIKA, Gowon, & Saidu, 2021). In Uganda, the TVET policy aims to address constraints and reform the system (The Republic of Uganda, 2020), but challenges persist (Agole, Kerre, Okaka, & Ochieng, 2022). The MoE is implementing syllabus modularization from the 2016 National Curriculum Development Centre to improve TVET performance (The Republic of Uganda, 2022). This infers that challenges in Sub-Saharan Africa, Ethiopia, Nigeria, and Uganda highlight the urgent need for strategic reforms to improve the status and quality of TVET regionally.

Kenya Vision 2030 emphasizes training in Science, Engineering, and Technology (SET) skills, prompting significant changes in the TVET strategy, which replaced the 1999 edition (Riechi, 2021). The introduction of modular programs aims to align TVET with labor market needs, fostering a skilled and adaptable workforce crucial for economic growth. The establishment of the TVET Authority in 2013 by Parliament coordinates and oversees all aspects of TVET, ensuring accredited courses and updating the national skills inventory (Technical and Vocational Education and Training Authority (TVETA), 2020). Nevertheless, renewed interest in technical courses in TVET faces persistent obstacles such as graduate employability, curriculum quality, low enrollment rates, and inefficient resource utilization, often linked to challenges in implementing modular syllabi (Kirogo, Wawire, & Kirimi, 2023; Maina & Muathe, 2023; Osumbah & Wekesa, 2023; Ododa & Kariuki, 2023). Specifically, enrollment in practical courses like mechanical, automotive, and building construction trades is significantly lower in TVET institutions (Onyango, Sika, & Gogo, 2022). This implies that Kenya's focus on SET skills under Vision 2030, with modular TVET programs and the establishment of TVETA, aims to align TVET with labor market demands, yet challenges in graduate employability and enrollment rates indicate ongoing need for reforms and improvements.

Requisite skills training in TVET institutions in Nairobi is vital for workforce readiness, (Okemwa, Ferej, & Wanami, 2022). Nairobi County has high number of accredited TVET institutions and proximity to industrial hubs and significant presence of government and private sector training collaborations. Moreover, modular approach in Nairobi's urban-based TVET colleges has directly influenced students' acquisition of

employability skills, making it an ideal setting for such a study. However, the mismatch between technical skills acquired in these institutions and actual industry needs in the Nairobi urban labor market has been reported to be persistent despite curriculum reforms. Further research is recommended to explore strategies to enhance the employability of TVET graduates (Mwaura, Mugwe, Edabu, & Thinguri, 2022; Moustafa, Riungu, & Rintari, 2023). This suggest that skill training for TVET graduates in Nairobi County is crucial, necessitating government support for trainers' skills and aligning skills exposure during attachments with TVET program content. Ongoing lack of regular strategy reviews to enhance graduate employability underscores the need for further research.

Numerous studies, have highlighted the modular syllabus implementation strategy and course performance, Ndikumana, Mugabo and Nsabimana (2024) conducted a study exploring the challenges and strategies in a modularized context. However, the study based on data from a single institution with non-random samples, indicates a necessity for broader sampling to validate findings, with proposed strategies for teaching and learning improvement lacking empirical testing. Moreover, Omariba, Simiyu and Dimo (2023) examined influence of the Mode of Training particularly, modularization on the level of satisfaction of Marine Engineering TVET Graduates. Nevertheless, the study lacked triangulation as it solely relied on quantitative analysis using questionnaire. In this study, a mixed-method approach was employed to gather primary data from a larger sample size, aiming to comprehensively investigate the impact of modular syllabus implementation strategies on the performance of technical courses in TVET within Nairobi County, Kenya. This investigation encompassed syllabus implementation strategies like modular partnership, digitalization and assessment on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

Statement of the Problem

The significance of performance in engineering courses within TVET lies in supplying skilled professionals essential for employment, thereby enhancing the livelihoods of youths and their families (Wahungu, Wawire, & Kirimi, 2023). Effective performance in engineering courses within TVET require implementation of modular syllabus (Tshong & Yasin, 2023). The mismatch between technical skills acquired in TVET institutions and actual industry needs in the urban labor market, especially in Nairobi County has been reported to be persistent despite curriculum reforms, thus raises concern. The skills mismatch among TVET graduates in Kenya threaten youth livelihoods, attributed to poor implementation of modular strategies. Furthermore, further research is recommended to explore strategies to enhance the employability skills of TVET graduates (Mwaura, Mugwe, Edabu, & Thinguri, 2022; Moustafa, Riungu, & Rintari, 2023)

Despite government efforts to enhance TVET performance, there remains insufficient comprehensive empirical studies evaluating the combined effect of modular partnership, digitalization, and assessment strategies and their specific effects on the performance of technical courses across multiple TVET institutions using a mixed-methods approach and broader, randomized sampling. To bridge the gaps, the current study utilized a mixed-method approach, employed random sampling techniques, and gathered primary data from a larger sample size. Lastly, the study provided evidence-based insights on how modular partnership, digitalization, and assessment strategies affect the performance of technical courses, thereby informing targeted reforms that can enhance skill development, improve employability, and address rising unemployment among TVET graduates in Nairobi County.

Purpose of the study

The purpose of the study was to investigate modular syllabus delivery, by determining modular partnership, digitalization and assessment strategy and their effect on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

The main objective of the study

The main objective of the study was to investigate the effect of modular syllabus implementation strategies on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

The Specific Objectives

The specific objectives of the study were:

1. To determine the effect of modular partnership strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.
2. To assess the effect of modular digitalization strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.
3. To establish the effect of modular assessment strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

Research Hypotheses

The study was guided by the following research hypotheses

H_{01}: There is no statistically significant effect of modular partnership strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

H_{02}: There is no statistically significant effect of modular digitalization strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

H_{03}: There is no statistically significant effect of modular assessment strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

Theoretical Perspective

The present study, grounded in Constructivism Theory, aims to identify obstacles to and effective strategies for enhancing the teaching and learning of technical courses. According to constructivism, knowledge is constructed based on prior knowledge rather than being discovered or inherited outright (Acuña, et al., 1995). Constructivism theory posits that learning is an active process where learners construct new knowledge and understanding based on their prior experiences and interactions with the world (Saleem, Kausar, & Deeba, 2021). Constructivism Theory posits that learners actively build their understanding through experiences and reflection, integrating new information with existing knowledge. It emphasizes personal relevance and meaningfulness in learning, driven by connecting new concepts to prior experiences. Social interaction and collaboration are key, fostering shared understanding through dialogue and debate. The theory asserts that learning is a dynamic process of mental construction, where learners actively make sense of information rather than passively receiving it (Fosnot, 2013).

Constructivism Theory is criticized for its emphasis on subjective interpretation and individual knowledge construction, potentially leading to relativism and neglect of objective truth. Critics argue that learner-centered approaches may overlook the role of authoritative instruction and fail to provide adequate structure for all students, leaving gaps in foundational knowledge. Additionally, the theory's reliance on social interaction in learning may not sufficiently accommodate diverse learning styles, and its qualitative focus can pose challenges in assessing learning outcomes quantitatively (Riegler, 2011). Constructivism Theory is relevant to studying modular implementation in TVET, emphasizing that learners actively construct knowledge through interaction and experiences (Madimabe, Bunmi, & Cias, 2020). It suggests that modular education enhances engagement and understanding by allowing learners to explore at their own pace. This personalized approach supports the acquisition of technical skills and enables educators to optimize curriculum design and teaching methods for improved performance in TVET courses.

Conceptual Framework

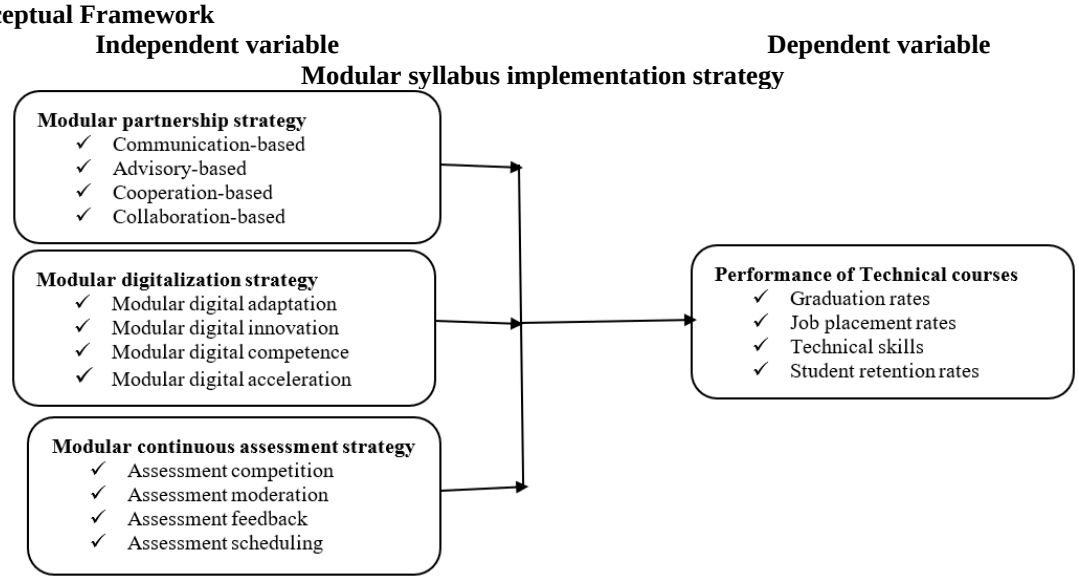

Figure 1. 1: Conceptual framework
Source: Researcher (2023)

II. Literature Review

Empirical Review of Variables

Modular partnership strategy

Partnership is defined as an active association among multiple parties who, while maintaining autonomy, collaborate to pool their efforts toward achieving a common objective related to a clearly identified problem or need that aligns with their respective roles, interests, responsibilities, motivations, or obligations. In vocational education and training (VET), partnerships entail shared responsibilities and ownership between governments and the private sector, supported by long-term agreements (Yaro & Shafak, 2024). The four types of partnership have been identified: communication-based, advisory-based, cooperation-based and collaboration-based (United Nations Educational Scientific and Cultural Organization (UNESCO), 2019).

A communication-based partnership approach involves exchanging information with other stakeholders through various channels, as well as exploring opportunities for collaboration without necessarily committing to specific actions (Aghlimoghadam, 2023). Lee, Kim and Woo (2021) examined a case study on professional development training in technical and vocational education and training during the untact era, with a focus on an official development assistance project in Botswana. The study found that ensuring effective education involves synchronized communication across various platforms. For successful project outcomes, close communication between donor and beneficiary countries throughout the ADDIE phases was emphasized, despite encountering communication challenges during design and implementation. Medina (2022) explored the practice of development communication through extension activities at Batangas State University, the Philippines' National Engineering University in CALABARZON. Using a descriptive-narrative research design within a qualitative approach, various documents were reviewed to address the research objectives. Interviews were also conducted with university extension officials and development communication faculty. The study revealed that to prepare students for real-life professions and instill a commitment to development through communication, they are actively engaged in various community projects oriented towards development, with extension activities serving as a key method for achieving this goal.

An advisory-based partnership approach involves seeking reasoned and expert opinions or recommendations from individuals or entities. It typically includes meetings or other methods to gather information initiated by the requester to gather input from those consulted (Tekle, Areaya, & Habtamu, 2024). Engel-Hills, Winberg, Nomgauza and Nduna (2023) suggested a pathway forward by addressing challenges, leveraging lessons learned, and enhancing the establishment and maintenance of college-industry partnerships through strategic data considerations. The advisory committee typically includes academic staff, senior administrative and management personnel overseeing Work-Integrated Learning (WIL) and Work Placement Learning (WPL), industry representatives from key partnerships, advocating broader industry perspectives, and student representatives. As needed, ad hoc committees are formed to tackle specific project requirements like curriculum renewal or securing funding. Cooperation-based partnership strategy involves discussions among multiple stakeholders aimed at reaching agreements and making decisions collectively for joint actions (Zhang, et al., 2023). Gebremariam, Kidane and Gillies (2023) examined the state of applications of cooperative learning and student diversity in polytechnic colleges in southwest Ethiopia. A qualitative research methodology, specifically grounded theory design was employed to achieve the research purpose. The empirical data was gathered from 20 educational officials through in-depth interviews at sample polytechnic colleges. Student diversity found to have a significant influence on how cooperative learning is implemented. It has also been found that the perception of department heads towards diversity has a significant influence on the application of cooperative learning. The study's findings also showed that managing diversity among students and interacting with peers within groups and from other groups has a positive influence on cooperative learning.

A collaborative partnership approach entails pooling resources, sharing responsibilities, and making joint decisions to achieve common goals or implement training programs. Partners work together to define project objectives and share financial and/or management responsibilities accordingly (Zhang, et al., 2023). Ramamuruthy, Alias and DeWitt (2021) explored the need for technical communication for 21st century learning in TVET institutions: Perceptions of industry experts. An interpretive qualitative approach was used to conduct interviews with five experts from diverse backgrounds in the automotive industry, selected based on specific criteria related to their supervision of graduate interns. Thematic analysis was applied to analyze the interview transcripts, revealing that collaboration between industry and training institutions is crucial for developing pedagogical modules on technical communication for the automotive sector. Jembere, Hybano and Jonsson (2023) investigated knowledge transfer in Technical and Vocational Education and Training (TVET), specifically focusing on stakeholders' experiences in Public-Private Development Partnerships (PPDP) in Ethiopia and Zambia. Data were gathered through semi-structured interviews using a narrative perspective, with key informants purposively selected from stakeholders directly involved in these initiatives. Thematic analysis was employed to analyze the data. The findings highlight the importance of aligning PPDP initiatives with national

ministries and expanding partnerships with the private sector to effectively transfer knowledge into national TVET systems.

Modular digitalization strategy

Digitalization is frequently associated with transformation, from the micro-transformation of processes to the transformation of nation-states' agendas. It is increasingly associated with progressive societies and modernization. A modular digitalization strategy includes digital innovation, digital adaptation, digital acceleration, and digital integration to enhance operational efficiency and flexibility (International Labour Organization (ILO), 2020). Digitalization has significantly transformed the skills required for work and life. To stay relevant and appealing, TVET institutions must identify and integrate digital skills and competencies that align with the evolving job market, while also leveraging opportunities like distance learning. The success of these institutions in embracing digitalization's benefits and overcoming its challenges heavily relies on the digital capabilities of TVET teachers and trainers. Modular digital innovation in TVET involves integrating digital technologies into distinct, self-contained units or modules within the curriculum. It includes incorporating digital tools, platforms, and resources to improve the delivery and accessibility of vocational training, ensuring that students acquire relevant digital skills and competencies for the evolving job market (Zeng, Chieng, & Liu, 2024). Razak and Khanan (2022) assesed digital Learning in Technical and Vocational Education and Training (TVET) in Public University, Malaysia. The instrument used in this study was an online questionnaire (Google Form) that was emailed to lecturers. The data was analysed using the Statistical Package for Social Science (SPSS) version 26.0. Descriptive statistical analysis was performed in the form of mean and percentage scores. A total of 51 lecturers answered this questionnaire. The findings revealed that lectures were proficient in using online tools when delivering lectures.

Modular digital adaptation in TVET involves the gradual and systematic integration of digital technologies into distinct, self-contained units or modules within the curriculum. This process includes adapting existing teaching methods, learning materials, and administrative processes to leverage digital tools and platforms (Diao & Qu, 2024). Chen and Chan (2024) investigated implementation of digital pedagogy in TVET: A Connectivist perspective. The findings indicated that, under Connectivism, digital pedagogies significantly enhance TVET's flexibility and effectiveness, offering richer and more personalized learning experiences. The study proposes potential strategies and recommendations to address these issues, providing valuable insights for future educational practices and research. Additionally, students need good self-management skills, and some struggle to adapt to online learning. Zhong and Juwaheer (2024) underscored the importance of advancing digital competence in TVET strategies by focusing on enhancing the digital skills of leaders and educators as TVET practitioners, and fostering the digital capabilities of students as TVET learners. Employing qualitative research methods, the study explores expected digital competencies among these groups by analyzing existing frameworks. Ultimately, it synthesizes the digital competency domains of TVET leaders, educators, and learners, highlighting their significance and advocating for a holistic, competency-based approach to digital competence development in TVET.

Modular digital acceleration in TVET refers to the strategic approach of rapidly advancing the adoption of digital technologies within specific modules or units of the curriculum (International Telecommunication Union, 2021). Yang and Yang (2024) assessed the Digital Transformation in Global TVET: Methodology and Practices. The study revealed that the adoption of digital platforms and technologies has accelerated, through escalation of existing policies. Moreover, the emergence of a digital economy and society further accelerates this digital transformation. Okelo, Matere and Syonthi (2021) assessed the influence of technological change on students' academic achievement and to assess the influence of curriculum realignment in relation to students' academic achievement. The study was guided by the social theory of transition and adopted a descriptive survey research design. The study established that TVET financial resources had a high influence on students' academic achievement in Uasin Gishu County Kenya. The study recommends that TVET institutions need to embraces modern technology that will increase productivity.

Modular assessment strategy

Assessment for Learning (AFL) is important in education and it is one aspect of the process in competency assessment. The assessment is based on the results of the final module examinations for modules 1 to 6, as well as on the assessment of the project work including its presentation for module 7 by the respective lecturers (Alvarez, Samary, & Wise, 2024). Rahman (2022) explored the transition from traditional curriculum to modular curriculum possible challenges. The study found that the modular approach should prioritize assessment tasks designed to facilitate learning and provide ongoing feedback to support students throughout their learning journey, rather than solely focusing on grading upon task completion. It also highlighted the importance of engaging students in organizing and monitoring their own learning processes. Nguyen, Pham, Tran, DO and Pham (2024) conducted a study on perceived impacts and challenges to the Modular Approach to Curriculum

Development in Viet Nam: Vocational Education and Training. Using a descriptive study design, data were collected from 40 technical vocational education colleges in Vietnam through a survey comprising 20 questions rated on a 5-level Likert scale. In-depth interviews were conducted to gather insights into the modular curriculum development approach. The research findings illuminate the current status of modular training curriculum implementation in surveyed vocational colleges and evaluate their perceptions regarding the effectiveness of GIZ Germany's modular training approach. The study also proposes policy recommendations for government management agencies and training institutions to encourage departments to transition to designing modular curricula for all curriculums within the institution, integrating this approach into evaluation criteria, competition assessments, and commendations.

Atukunda and Maja (2022) examined the Computer Practice Module Lecturers' Experiences of Internal Continuous Assessment at TVET Colleges. The study employed a qualitative multiple case study approach, selecting six lecturers purposively from three KwaZulu-Natal TVET colleges. Data collection utilized semi-structured interviews and document analysis. Findings indicated that lecturers often extended assessment schedules to accommodate students who missed or performed below average. Feedback was not considered as a critical aspect in assessment of learning. Pre-moderation and post-moderation of the ICASS was not considered as important by the lecturers as evidenced by document analysis which revealed that three lecturers did not have moderation reports in their files. Moreover, time allocated for assessment should ensure that the assessment process attained curriculum coverage. The study concludes that implementing diverse assessment methods is essential for enhancing students' outcomes. Usoro and Ezekiel (2024) examined the guidelines for a competency-based curriculum model for Technical Vocational Education and Training (TVET) in Nigeria. The paper considered need for the adoption of competency-based curriculum in Nigeria, the issue of assessment in competency-based training and evaluation. It concluded that Competence Based Education (CBE) is a systematic yet flexible approach. It focused on defining in measurable terms what students are to learn and then evaluating how well they can perform designated tasks after instruction. It further revealed that the teacher must employ the best methods in the assessment of taught materials, to ensure that the learners must have acquired skills. It recommended among others that Curriculum planners in TVET such as the National Board for Technical Education (NBTE) should adopt the competency-based curriculum approach for Nigerian schools.

III. Research Methodology

Research design : Research design represents a plan and structure for a study intended to provide solutions to research questions, serving as a blueprint for data collection, measurement, and analysis (Akhtar, 2016). The study utilized a descriptive survey research method, which was chosen to comprehensively understand the impact of modular syllabus implementation strategies on the performance of engineering courses within TVET in Nairobi County. Descriptive survey design was deemed suitable as it allows systematic exploration and description of phenomena, addressing key questions related to what, where, when, and how (Kumar, 2018).

Target population :is the collective of the entire cases that follow a specified set of the specification which the research will take a broad view of the results (Kasomo, 2006). The study targeted 5633 participants, consisting of 5204 students from engineering department, 418 engineering tutors and 11 principals from eleven TVET institutions in Nairobi County that implemented modular syllabi.

Sample size is defined as the element of a study that represents the actual population, or that elements to be examined within a study, from which, the inference was made to the entire population (Babbie, 2011). The sample size was determined through the use a formula by Fisher (1963, as cited by Kothari, 2004) as follows:

$n = z^2pq/d^2$

$n = \frac{(1.96^2)\ (0.5)\ (0.5)}{(0.05)^2}$

$n = 384$

Where:

n = the desired sample size

z = the standard normal deviation at the required C.I = 1.96

p = proportion in the target population is estimated to have characteristics of interest = 0.5

q=1-p=0.5, d=the level of statistical significance set = 0.05.

Since the target population was less than 10,000, the following formula was used to determine the actual sample size:

$n = \frac{n}{1+n/N}$

$n = \frac{384}{1+384/5633}$

= 359

The study utilized a stratified random sampling technique to further divide the population into three distinct strata (Principal, Tutors and students). Within the two strata (Tutors and student), simple random sampling was used to select the tutors and students to participate in the study. The selection of the 11 principals from eleven TVET institutions in Nairobi County that implemented modular syllabi for participation in the study was purposive, while the allocation of the remaining sample size of 348 engineering tutors and students from the engineering department was proportionate, as detailed in Table 3.2.

Table 3. 1 Sample size

Sampling Technique	Category	Target population	Proportional Allocation $n_i=(N_i/N)$ *n	Sample size (n)
Purposive	Principals	11	NA	11
	Sub Total	**11**		**11**
Stratified	Tutors	418	(418/5622) *348	26
	Students	5204	(5204/5622) *348	322
	Sub Total	**5622**	**(5622/5622) *348**	**348**
Grand Total		**5633**		**359**

Source: Researcher (2023)

Data collection Instruments: The study employed quantitative methods through questionnaire administration and literature review (Easterby-Smith, Thorpe, & Jackson, 2008). A five-point attitudinal scaling (1 - Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree and 5-Strongly agree) was used to measure levels of attitude towards questions involving closed ended questions. The questionnaires were answered by the engineering tutors and students in the engineering department, while, interviews were used to collect data from the principals.

Data analysis and Presentation: Data analysis utilized descriptive statistics (mean, standard deviation, frequencies, skewness, and kurtosis) and inferential statistical techniques. In inferential statistics, multiple regression was employed to assess the impact of independent variables (modular syllabus implementation strategy) on the dependent variable (performance of technical courses), and correlation coefficients were calculated using the Statistical Package for Social Sciences (SPSS) version 25.0.

The regression model was as follows:

$$y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \varepsilon$$ **…… Equation 3.1**

In the context where y denotes the performance of engineering courses as the dependent variable, x represents the modular syllabus implementation strategies, and β\betaβ stands for the standardized regression coefficient

X_1 represent Modular partnership strategy

X_2 represent Modular digitalization strategy

X_3 represent Modular assessment strategy

Quantitative data was extracted from the questionnaires by use of tables, graphs and figures and presented in chapter four. Meanwhile, qualitative data from interviews were analyzed thematically and presented in the form of quotations.

IV. Data Analysis, Results And Discussion

Multiple Regression Analysis

The study established combined effect of modular partnership strategy, modular digitalization strategy, modular assessment strategy on performance of technical courses in TVET in Nairobi County, Kenya. The results of multiple regression analysis shown in Table 4.1.

Table 4. 1: Effect of modular partnership, digitalization and assessment strategy on performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.880[a]	.775	.772	.24938	1.830
a. Predictors: (Constant), Modular assessment strategy, Modular partnership strategy, Modular digitalization strategy					
b. Dependent Variable: Performance of technical courses					

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.547	3	22.516	362.035	.000[b]

	Residual	19.653	316	.062		
	Total	87.200	319			
a. Dependent Variable: Performance of technical courses						
b. Predictors: (Constant), Modular assessment strategy, Modular partnership strategy, Modular digitalization strategy						

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.349	.113		3.075	.002
Modular partnership strategy	.296	.025	.403	11.915	.000
Modular digitalization strategy	.366	.030	.432	12.263	.000
Modular assessment strategy	.222	.033	.216	6.794	.000
a. Dependent Variable: Performance of technical courses					

Table 4.1, under Model Summary, shows that the Durbin-Watson's value was 1.830. Typically, DW test statistic values between 1.5 and 2.5 are considered normal, while values outside this range may raise concerns. Additionally, the adjusted R-squared measures the proportion of variation in the dependent variable explained by the independent variables. In the model summary (R = 0.880, R-squared = 0.775, Adjusted R-squared = 0.772), the adjusted R-squared of 0.772 indicates that 77.2% of the variation in performance of technical courses in TVET in Nairobi County, Kenya, is explained by the predictor variables (Modular partnership, assessment, digitalization strategy). This suggests that modular syllabus delivery has a strong positive effect on the performance of technical courses in TVET. However, it also implies that approximately 22.8% of the variation is influenced by factors not considered in this study.

Additionally, table 4.14, under ANOVA, shows a statistically significant effect of the independent variables on the dependent variable (F=362.035; p=0.00). This indicates that the multiple regression model was a good fit for the data. It also indicates that perception on modular syllabus deliver such as modular partnership strategy, modular digitalization strategy and modular assessment strategy all affect the performance of technical courses in TVET. Table 4.1, under Coefficients, indicate that effect of modular partnership strategy on the performance of technical courses in TVET was positive and significant ($\boldsymbol{B}_1$ = 0.403, p = 0.000). The effect of modular digitalization strategy is denoted by ($\boldsymbol{B}_2$ = 0.432, p = 0.000). The results also showed that the effect of modular assessment strategy was ($\boldsymbol{B}_3$ = 0.216, p = 0.000). The Equation 1 thus showed the regression equation for the regression model 1 in Table 4.14 as follows;

$$\mathbf{Y= 0.403\ X_1 + 0.432\ X_2 + 0.216\ X_3} \quad \textbf{Equation 1}$$
$$\mathbf{Y= 0.349 + 0.296\ X_1 + 0.366\ X_2 + 0.222\ X_3} \quad \textbf{Equation 2}$$

In equation 1, the coefficients refer to the slope of the regression line and amount of variance each predictor contributes to the general regression equation. Therefore, adjusting modular partnership strategy by 1 unit led to .403 units change in performance of technical courses in TVET. It is also noted that changing 1 unit of modular digitalization strategy would lead to .432 units change in performance of technical courses in TVET, and a 1-unit change in modular assessment strategy would lead to .216 units change in performance of technical courses in TVET. Consequently, all variables are statistically significant predictors of the dependent variable. The results implied that modular digitalization strategy (t =12.263) affected the performance of technical courses in TVET the most followed by modular partnership strategy (t =11.915) and lastly modular assessment strategy (t =6.794). Finally, the results in Equation 1 indicate that if TVET does not address perceptions of modular syllabus delivery, the outcome would remain constant at 0.349 units.

Hypotheses Testing of the Results

In this study, a t-test was used to assess the individual significance of the coefficients under the null hypothesis. The test was conducted at a 95% confidence level (α = 0.05) with a critical value of t = 1.96. The null hypothesis was rejected when the t-calculated exceeded the t-tabulated value. The results were as follows:

H_{01}: There is no statistically significant effect of modular partnership strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

The test was conducted at a 95% confidence level (α = 0.05). According to the model in Table 20, the p-value obtained for modular partnership strategy was less than 0.05 (p = 0.000). Therefore, this study rejected the null hypothesis, implying that there is a statistically significant effect of modular partnership strategy on the performance of technical courses in TVET in Nairobi County, Kenya.

H_{02}: There is no statistically significant effect of modular digitalization strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

The test was conducted at a 95% confidence level ($\alpha = 0.05$). According to the model in Table 20, the p-value obtained for modular digitalization strategy was less than 0.05 ($p = 0.000$). Therefore, this study rejected the null hypothesis, implying that there is a statistically significant effect of modular digitalization strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

H_{03}: There is no statistically significant effect of modular assessment strategy on the performance of technical courses in Technical Vocational Education Training in Nairobi County, Kenya.

The test was conducted at a 95% confidence level ($\alpha = 0.05$). According to the model in Table 4.2, the p-value obtained for modular assessment strategy was less than 0.05 ($p = 0.000$). Therefore, this study rejected the null hypothesis, implying that there is a statistically significant effect of modular assessment strategy on the performance of technical courses in TVET in Nairobi County, Kenya.

Table 4. 2: Summary of Results for Hypotheses Testing

Hypothesis	Statements	t	Sig	Decision rule
H_{01}	There is no statistically significant effect of modular partnership strategy on the performance of TVET in Nairobi County, Kenya.	11.915	.000	Null hypothesis rejected
H_{02}	There is no statistically significant effect of modular digitalization strategy on the performance of TVET in Nairobi County, Kenya.	12.263	.000	Null hypothesis rejected
H_{03}	There is no statistically significant effect of modular assessment strategy on the performance of TVET in Nairobi County, Kenya.	6.794	.000	Null hypothesis rejected

V. Conclusion

In conclusion, the implementation of modular syllabus strategies, such as modular partnership, modular digitalization, and modular assessment, significantly affect the performance of technical courses in TVET. Adopting these strategies leads to marked improvements in the effectiveness and outcomes of technical education programs within TVET institutions. The modular digitalization strategy has the most substantial effect on the performance of technical courses in TVET, followed by modular partnership strategy, and lastly modular assessment strategy.

Modular partnership strategies significantly affect the performance of technical courses in TVET. Tutors' perspective that when a communication-based partnership strategy is adopted, tutors effectively manage modular training as defined at the central level and provide crucial information on the implementation of the modular syllabus. An advisory-based partnership strategy somehow helps tutors run modular training programs in compliance with established norms. Cooperation-based partnership strategies somehow enable tutors to contribute to defining training organization norms, while collaboration-based partnership strategies tend to facilitate funding for the institution's modular syllabus. From the students' perspective, communication-based partnerships help them register for and enroll in modular training programs and somehow provide information on the modular syllabus. Advisory-based partnerships tend to somehow facilitate the signing of internship agreements. Cooperation-based partnerships somehow allow students to contribute to defining training organization norms, while collaboration-based partnerships enable students to undertake modular internships in companies.

Modular digitalization strategies significantly affect the performance of technical courses in TVET. Tutors perceive that they easily adapt to online modular learning and use online tools when delivering modular syllabus lectures. They strongly tend to employ a competency-based approach to developing modular digital competence and utilize online management systems for their lectures. Additionally, the adoption of modular digital platforms and technologies by tutors is accelerated by scaling up existing policies. From the students' perspective, they easily strongly tend to adapt to online modular learning and use online tools for attending modular classes. The institution strongly tends to adopt a competency-based approach to cultivate students' modular digital competence. Students also tend to utilize an online management system during modular classes, and their use of modular digital platforms and technologies is accelerated by scaling up existing policies.

Modular assessment strategies significantly affect the performance of technical courses in TVET. Tutors tend to recognize the importance of competitive aspects in modular assessments and value feedback as essential to the assessment process. Adequate time allocation for assessments ensures thorough coverage of the curriculum. Additionally, tutors prioritize moderation to maintain fairness in learners' modular assessments and frequently extend assessment schedules to support students who miss sessions or perform below average. From the students'

perspective, modular assessments tend to foster healthy competition, and ongoing feedback tend to help them improve and reach the required level of competency. Comprehensive modular syllabus coverage is often strongly tended to achieve through the time allocated for assessments. These assessments are somehow moderated to ensure fairness, and extended schedules accommodate students who miss sessions or perform below average.

VI. Recommendations

Based on the findings, institutions and policymakers should:

Prioritize the integration and enhancement of modular digitalization strategies within Technical Education and Vocational Training (TVET) programs, as it demonstrated the greatest effect on course performance. They should also strengthen modular partnerships by fostering collaboration with industry and stakeholders, and improve assessment strategies to ensure they are aligned with skill-based learning outcomes. By focusing on these areas especially digitalization, policy frameworks and institutional planning can be more effectively aligned with the goal of improving technical education outcomes and better preparing students for the evolving demands of the workforce.

Area for Further Research

Further research should focus:

Moderating effect on the relationship between modular syllabus strategies, such as modular partnership, modular digitalization, and modular assessment, and the performance of technical courses in TVET.

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