

**Institutional Preparedness for the Implementation of Competency-Based
Education and Training Curriculum in Public Technical Institutions in Mt.**

Kenya East, Kenya

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**A Thesis Submitted to the School of Education and Social Sciences in Partial
Fulfilment of the Requirements for the Conferment of the Degree of Doctor
of Philosophy in Educational Leadership and Management of Kenya
Methodist University**

OCTOBER, 2025

DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented for the award of a degree or any other award in any other university.

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Recommendation

We confirm that the candidate carried out the work reported in this thesis under our supervision.

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DEDICATION

This thesis is dedicated to my parents Late Festus M’Ringera and Mary Ntibuka M’Ringera, my husband James Muguna and our children Victor Mwirigi and Patience Nkirote.

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ABSTRACT

An ideal Competency-Based Education and Training (CBET) curriculum requires adequate financing, modern infrastructure, qualified trainers, and active stakeholders' involvement to ensure industry relevance and effective skills development. In practice, Technical and Vocational Education and Training (TVET) institutions in Kenya are facing unprecedented challenges in implementing CBET, posing question on level of preparedness. This study investigated the level of preparedness in curriculum implementation on CBET in public TVETs in Mt. Kenya East Region. The purpose of the study was to examine critical indicators of preparedness for CBET curriculum implementation. The specific objectives were to determine the availability of CBET curriculum, assess the adequacy of financial allocation, examine the adequacy of infrastructure, evaluate the readiness of trainers and technical staff, and examine the extent to which the Board of Governors moderate curriculum implementation readiness. The study was guided by Systems Theory. A mixed-methods approach was employed and used an exploratory research design. The study was conducted in 19 public TVET institutions located in Mt. Kenya East Region, which were selected purposively for having functional Building and Civil Engineering Departments. The target population comprised 70,591 individuals, including 21 principals, 21 Board of Governors chairpersons, 128 heads of department (HODs), 1,263 trainers, and 69,158 trainees. Sampling techniques used included purposive sampling for institutions, principals, BOG chairpersons, and HODs; convenience sampling for 19 trainees; and Krejcie and Morgan's formula for determining a sample of 154 trainers, proportionally distributed and sampled using simple random method. Data was collected using questionnaires for trainers and HODs, interview schedules for principals, BOG chairpersons, and trainees, and document analysis guides. Pre-testing was conducted to enhance instrument validity and reliability. Quantitative data were analyzed by applying descriptive statistics namely frequencies, percentage, mean, standard deviation, and inferential analysis namely Pearson correlation and multiple linear regression. Qualitative data were analyzed thematically and reported in themes, sub-themes, and verbatim in some cases. The overall response rate exceeded 90%. The study found that although the CBET curriculum was available, some were outdated and poorly disseminated; financial resources and infrastructure remained inadequate; and trainers lacked sufficient re-skilling programs. While BOG played a limited supportive role, they had no moderating effect, although all the preparedness indicators significantly influenced implementation success. The study concluded that successful implementation of CBET requires updated and accessible curriculum, increased financial investment, modernized infrastructure, and continuous capacity building of trainers. The BOG must be empowered to play a more proactive oversight and support role. Recommendations include enhanced curriculum review cycles, adequate government funding for CBET, strategic investments in infrastructure, trainer re-skilling programs, and governance reforms to strengthen BOG involvement. This study has indicated systemic gaps in CBET implementation readiness and has suggested change in policy and practices to actualize Kenya's skills development agenda.

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LIST OF ABBREVIATIONS AND ACRONYMS

BOG	Board of Governors
CBET	Competency-Based Education and Training
CDACC	Curriculum Development, Assessment and Certification Council
CUE	Commission for University Education
EAC	East African Community
GDP	Gross Domestic Product
GOK	Government of Kenya
HOD	Head of Department
HRM	Human Resource Management
ICT	Information Communication Technology
ILO	International Labour Organization
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examinations Council
KNQA	Kenya National Qualifications Authority
KSA	Knowledge, Skills, and Attitudes
KUCCPS	Kenya Universities and Colleges Central Placement Service
MOE	Ministry of Education
MTP	Medium-Term Plan
NACOSTI	National Commission for Science, Technology and Innovation
NEMIS	National Education Management Information System
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
STEM	Science, Technology, Engineering, and Mathematics
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
UNEVOC	International Centre for Technical and Vocational Education and Training (UNESCO-UNEVOC)
WEF	World Economic Forum

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

This introductory chapter establishes the research foundation by presenting the background, problem statement, and methodology for studying Competency-Based Education and Training (CBET) curriculum implementation in public Technical and Vocational Education and Training (TVET) institutions within Mt. Kenya East Region. It identifies the gap between intended CBET reform outcomes and institutional realities, outlines research objectives, questions, and hypotheses, and discusses the study's significance for various stakeholders. The chapter systematically covers the research scope, assumptions, limitations, and operational definitions, providing a comprehensive framework that guides the entire thesis investigation from global, regional, and local perspectives.

Competency-Based Education and Training (CBET) is an approach to education and training that emphasis on the development of specific competencies or skills rather than just accumulation of knowledge so as to fit the employers' demands (KICD, 2018: ROK, 2023). Competency-Based Education and Training is a method of training and assessment that is directed towards achieving specific learning outcomes with emphasis on acquisition of competencies so as to meet the demands of the industry and business, learner-centered teaching and learning, and learner demonstration of the required vocational skills and knowledge. The CBET approach entails breaking down the course requirements into

specific sets of competencies that trainees are expected to master to be declared competent (Mutungi & Muriuki, 2021). Though CBET is resource intensive, it assists individuals to acquire attitude, skills and competencies in order to carry out a task to a specified standard under particular situation as required by the workplace (Mutungi et al., 2021). This approach focuses on practical outcomes and real-world applications and emphasizes on what trainees must be able to do upon completion. This begins with needs analysis to design curricula that align with industry demands, integrating active industry participation to shape relevant training. The CBET training approach needs to address the issues of accessibility, inclusivity, quality and relevance by offering market demand-driven programmes so as to include opportunities for the contemporary and imminent skill needs of the global labour market needs.

The implementation of curriculum refers to the actual execution or carrying out of the education plan or program (MOE, 2018). This involves putting into practice the designed curriculum, including training materials, methods, and assessments to ensure that trainees receive the intended training experiences. A curriculum may be defined and prescribed as the course of studies, which trainees must fulfill in order to pass a certain level of education (Kelly, 2009). A syllabus is an organized plan or framework that outlines the learning content, goals, learning outcomes, training methods, assessments and materials to be used in a training environment. A syllabus is anticipated to serve as a guide to the trainees and trainers detailing what should be taught (content), how it should be taught (methodology) and how learning will be assessed. According to the KICD (2018), outcome of any curriculum is successful transfer and/or development of knowledge, skills and attitudes. The objective of implementing CBET curriculum is to ensure the curriculum is closely

aligned to the skills and competencies needed by the job marketplace and industries. ROK, 2019 and Mutungi et al. (2021) posits that graduates to be more employable because of the emphasis on hands-on practical. Workplace skills and competencies enable the trainees to perform real-world tasks effectively and address skills gap in various industries and reduce the disparity between training outcomes and workforce requirements.

The study focused on CBET curriculum implementation as the dependent variable, measured through indicators such as curriculum availability, trainer readiness, adequacy of infrastructure, financial support, governance practices, and actual adoption in teaching and learning (UNESCO-UNEVOC, 2021). Governance was assessed in terms of the Board of Governors' role in policy formulation, oversight, and decision-making processes (Mutiso & Nzoka, 2022). Financial allocation was evaluated based on adequacy, timeliness, and prioritization of CBET activities as argued by OECD, (2021). Infrastructure adequacy was measured by the availability of workshops, laboratories, ICT facilities, and emerging building technologies (World Bank, 2022). Trainer readiness was captured through professional development, pedagogical competence, and certification as assessors (Oketch & Atieno, 2021). Trainee preparedness was examined in terms of awareness, participation, and adaptability to competency-based learning (Kivuva, 2020). These measurable elements provided a clear operationalization of the constructs, ensuring that each variable was empirically observable and relevant to the context of public TVET institutions.

According to Makunja (2016) and Ford (2014), use of Competence-Based Education and Training (CBET) is not a novel idea in the globe. In 1957, the United States of America (USA) was one of the first countries to adopt CBET (Hodge 2007). The CBET concept

influenced numerous occupation education and training programs in the late 1980s and has lately regained prominence in the United States. As noted by Harris et al. (1995), in order to solve the problem of high unemployment rates, particularly among young people, Germany implemented CBET at the vocational level in the 1970s. Ten years later, the UK adopted CBET.

In Canada, Johnstone and Soares (2014) posit that Competency-Based Education (CBE) is preferred over traditional models as it enhances access to post-secondary degrees and diploma acquisition to employees, addressing the skills gap in the labour market. This increases employability and graduates are better prepared for the world of work (Abner et al., 2014). Competency-Based Education accreditation is popular in Canada and a number of professional bodies such as the Police Sector Council, Canadian Association of Schools of Nursing and Chartered Professional Accountants have adopted the competency approach. Johnstone and Soares (2014) further argue in Canada, collaboration with local educational authorities, industry partners, and government agencies is key to successful implementation. According to Mulder (2012), other countries that have adopted CBE are South Korea and Finland where CBE is intended to enhance accountability whilst providing flexibility and reduced cost. Some characteristics that make it differ from the traditional model include set of competencies, curriculum, and assessment and mastery.

In 1998, South Africa became the first country in Africa to adopt the CBET strategy. To solve the severe lack of experts including engineers, technicians, and artisans, CBET was put into place (ROSA, 2010). Following suit were other African nations like Malawi, Ghana, Ethiopia, Tanzania, and Rwanda. The implementation of CBET in Ethiopia was

fraught with difficulties, such as a shortage of resources and trainers with the necessary training, frequent curriculum modifications, a lack of employer collaboration, and dissatisfaction among administrators and trainers (Solomon, 2016). Tanzania began using the CBET approach in technical colleges in 2002, but encountered a number of difficulties, including a lack of institutional management support for facilities and resources, a high number of trainees in classrooms, admonishing working situation, and low trainees' cooperation mental attitude. Although the goal was to create an economy based on knowledge with a focus on science and technology as a development engine, Rwanda implemented the CBET strategy in 2015 (Tambwe, 2019, as cited in Jwan, 2023). However, Rwanda encountered a number of difficulties, including a lack of parental support, huge class sizes, a deficiency of training and educational resources, and a shortage of trained instructors (Urunana, 2018). These issues are common to many Sub-Saharan African nations and indicate inadequate government support or poor implementation techniques for carrying out CBET in those nations (ROSA, 2010). This provides the study's incentive.

The development of human capital through TVET promotion must be prioritized if Kenya is to meet its goals for social development and economic progress (ROK, 2005). According to a number of stakeholder reports, technical education in Kenya was not relevant to industry expectations (GOK, 2003b, 2003a & 2007). Technical institutions were recognized by the Vision 2030 secretariat as important providers of Science, Technology, and Innovation (STI) for the social pillars (ROK, 2007). At all levels of the educational system, the Vision 2030 blueprint also noted that it was difficult to match the skills

acquired in technical institutions with market demand. It attributed this situation to lack of relevance, inadequate facilities, and subpar methods of needs identification (ROK, 2007).

If a national curriculum does not generate sufficient skills that support the macroeconomic and social goals of the economy, such as income, growth, and equity, it may be deemed irrelevant. Likewise, if the curriculum fails to adapt to shifting economic conditions, particularly those pertaining to the labor market (ROK, 2017). Therefore, for the curriculum to be relevant, it must be driven by demand in order to meet the country's macroeconomic demands, the employer's current and impending skill needs, and the quick advancements in technology. This is the goal of Kenya's adoption and application of CBET.

Expanding trainees' knowledge, experiences, and creative understanding, as well as cultivating a sense of moral values and the ability to study throughout their lives, are the main objectives of the National Goals of Education, which are expressed in Vision 2030 (ROK, 2006). The CBET curriculum, which is at the core of this vision, will equip trainees with the attitudes, skills, competencies, and values necessary to transition smoothly from the educational system into the workforce. Additional academic, technical, and vocational education will enhance the knowledge gained through the educational system (MOE, 2012). But because the current curriculum is objective rather than competency-based, it does not place much emphasis on patriotism, values, and attitudes. The emotive and psychomotor domains have been overemphasized in favor of the cognitive domain (ROK, 1999).

The government must implement the curriculum reform guidelines and policies outlined in the relevant sections of the Kenyan Constitution (2010), the aspirations of Kenya Vision

2030, the TVET Act, 2013 CAP 210A, the KNQF Act CAP 214, Session Paper No. 1 of 2019, TVET Act Regulations, 2015, the CBETA Policy Framework, 2018, the RPL Policy Framework, 2024, international standards, and the nation's needs in order to address these issues. This will guarantee that every TVET course is competency-based, driven by the market, and meets workplace demands while fostering employability. National policies, strategies, standards, and guidelines must be enacted so as to advance and enable the successful execution of the CBET curriculum (TVET ACT, 2013).

By restructuring TVET administration to implement the CBET model, the Kenyan government, acting through the MOE, achieved significant strides in this area in 2016. As a result, numerous organizations with specialized roles were established to guarantee the successful use of the CBET methodology. These organizations consist of the Sector Skills Advisory Committees (SSACs), Kenya National Qualifications Authority (KNQA), Technical and Vocational Education and Training Curriculum Development, Assessment and Certification Council (TVET CDACC), and Technical and Vocational Education and Training Authority (TVETA) (MOE, 2020a).

A body corporate created under the Technical and Vocational Education and Training (TVET) Act, No. 29 of 2013, the Technical and Vocational Education and Training Curriculum Development, Assessment and Certification Council (TVET CDACC) was established in 2017. The Council's responsibilities include designing and developing curricula for technical training institutes, overseeing competency certification and evaluation, and advising the government on related issues. This aligns with the Competency Based Education and Training (CBET) system, which is supported by

Sessional Paper No. 1 of 2019, PWPER, 2023, and CBETA Standards, 2024 (TVETA, 2024).

In order to carry out the aforementioned policies, the government will employ the following tactics: supply-led to demand-driven training; a framework for reforming TVET to move from time-bound curriculum-based training to flexible, competency-based training; and the introduction and mainstreaming of competence-based training to enable TVET graduates to acquire the skills, competencies, and proper attitudes to perform jobs to the required standard in collaboration with industry. increase trainers' ability to incorporate and utilize ICT into curriculum design, delivery, and evaluation; create and evaluate training programs on a regular basis in partnership with industry by keeping an eye on labor market demands; increase techno-preneurship and entrepreneurship in all TVET programs to encourage independence; Ensure that the curriculum is globally competitive by connecting it to the National Qualification Framework (NQF) and provide a framework for TVET trainers and trainees to be deployed in the industry to acquire practical skills (MOE, 2020a).

According to the TVET Act of 2013, the TVET CDACC Council was also charged with identifying and designating Sector Skills Advisory Committees (SSACs), approving applications for the development of assessment tools, supervising the printing, publishing, and distribution of curricula and curricula support materials, and evaluating the curriculum and materials for TVET institutions. For a variety of programs, TVET CDACC has been able to handle the design and development of CBET curricula, assessment, and competency certification. The Council was successful in creating 446 (four hundred and forty-six)

occupational standards (OS) and curricular for different programs at different levels namely 4,5 and 6 in 2018.

The Council assessed 250 mentoring tools and all basic components for different programs at different levels in 2024. Ongoing projects include reviewing 164 courses and creating new occupational standards and curriculum for different programs at different levels (CDACC Website). Through the Sector Skills Advisory Committees (SSAC), TVET CDACC continuously coordinates industry development of CBET curriculum and profession standards in accordance with TVETA Standards. Competence, performance method, assessment, and information on training resources (trainer credentials, tools, instrumentation, materials, and infrastructure) needed to deliver the program are all included in the standards, which were created in consultation with experts (MOE, 2020b). During curriculum implementation, leader are the key change agents.

Building the ability of the technical staff and trainers is essential for the successful implementation of any curriculum (Langat et al., 2021). TVET CDACC is responsible for organizing and carrying out training for tool developers, verifiers, and assessors on competency-based curriculum creation and assessment. To give them the skills they need, TVET institutions have trained their trainers in the creation of curricula and assessment instruments.

To provide guidance for the execution of CBET programs, the MOE introduced the CBET Policy Framework in 2018 (MOE, 2020a). Although the CBET training for principals, CBET champions, HoDs and trainer was initially conducted nationwide in 2018 and 2019, the CBET Approach was not widely adopted until much later in 2023. With effect from

December 2023, the Kenya School of TVET has taken up the teachers' training through the partnership with the Canadian partners. In September 2023, the CBET curriculum was implemented nationwide (PWPER, 2023). This provides the study's incentive.

As instructed, CBET programs have been implemented in all public TVET institutions at different levels (PWPER, 2023). By giving students, the problem-solving skills and competences that employers are looking for, TVET institutions at advanced learning levels hope to change trainees' attitudes and capacities (Hassan & Awan, 2019). Since these institutions have varying degrees of implementation competence, the study aims to determine the degree of readiness for CBET curriculum execution in public TVET institutions in Kenya's Mount Kenya East Region.

According to MOE (2018), assessment is a process that judge individual performance against the performance requirements. In CBET, assessment shall be conducted when the trainee is ready and it is performance based irrespective of how the skill is acquired. Assessment of trainees pursuing various programmes is guided by Training Performance Criteria (TPC) and Production.

Mt. Kenya East Region is a strategically significant context for examining CBET curriculum implementation due to its socio-economic challenges particularly its higher youth unemployment, which stands at approximately 38.9%, compared to the 5.4% national unemployment rate (Afrobarometer, 2023; Macrotrends, 2024). This disparity is compounded by the region's lower industrial absorption and lack of diverse employment opportunities, amplifying the need for a well-implemented CBET approach to equip trainees with practical competencies needed in emerging sectors (Afrobarometer, 2023).

Consequently, assessing CBET preparedness in Mt. Kenya East provides valuable insights for regional development and aligns with Kenya's broader agenda of reducing youth joblessness through skilled technical education.

The middle-level human resources needed to meet the demands of national development have not yet been produced via technical and vocational education and training. However, TVET has been given extra pressure by goal 2030 since it is the main engine on which the economy must basically rely in order to generate the sufficient numbers of middle-level professionals required to propel the economy toward realizing the goal (MOE, 2015). This study therefore sought to examine the preparedness in curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya.

1.2 Statement of the Problem

Ideally, the implementation of Competency-Based Education and Training (CBET) requires strong collaboration among key stakeholders, including industry players in developing occupational standards, regulators, and qualification-awarding institutions, to ensure curricula are demand-driven and industry-aligned (UNESCO-UNEVOC, 2021). An effective CBET curriculum should be adequately financed, outcome-based, and supported by modern infrastructure to equip learners with practical skills for employment and entrepreneurship (ILO, 2020). Availability of state-of-the-art training facilities, such as workshops, laboratories, and ICT infrastructure together with qualified and continuously re-skilled trainers, is critical for producing a highly competent workforce (TVETA, 2022). In this scenario, TVET institutions would be well-resourced, industry-linked, and capable of addressing youth unemployment and driving Kenya's industrialization agenda.

However, in actual situation, public TVET institutions in Kenya face persistent challenges of underfunding, outdated infrastructure, and governance constraints, undermining effective CBET implementation. Despite government funding, no dedicated financial policy exists to sustain CBET roll-out, forcing institutions to rely heavily on inadequate internally generated revenue (World Bank, 2021). As a result, many colleges continue to use obsolete tools and machinery, while inadequate ICT facilities such as unreliable internet, insufficient computers, and lack of software limit digital readiness (MoE, 2022). Governance challenges, including weak institutional leadership and inconsistent policy direction, further constrain preparedness (Oduor & Aluko, 2021). Moreover, the adequacy of trainers remains a major concern: although TVET CDACC organized initial Trainer-of-Trainers (ToT) sessions in 2019, no structured re-skilling or re-tooling programs have followed, leaving gaps in trainer capacity for CBET delivery (TVET CDACC, 2020).

The severity of the problem is demonstrated by the alarming youth unemployment rate of 38.9% in Kenya, compared to a 5.4% national unemployment rate (Afrobarometer, 2023; Macrotrends, 2024). Despite increased enrollment in TVET institutions, their absorption rate into formal employment remains below 30%, reflecting limited alignment between training and labor market demands (KNBS, 2022). This situation has left many graduates underemployed, self-employed in low-paying ventures, or jobless altogether, further entrenching socio-economic disparities.

Past studies have addressed selected aspects of TVET and CBET in Kenya, such as financing challenges Mupa et al. (2020), trainer capacity building Kinyanjui (2021), and curriculum relevance (Chepkemei & Misoi, 2022). However, these studies have not

comprehensively examined the institutional preparedness for CBET implementation across critical dimensions such as financing, infrastructure, trainer readiness, governance, and curriculum delivery within specific regions such as Mt. Kenya East. This gap highlights the need for a focused investigation to determine how these factors collectively influence the extent of CBET curriculum implementation in public TVET institutions, thereby addressing the pressing issue of youth unemployment and skills mismatch in Kenya.

1.3 Purpose of the Study

To examine the preparedness in curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya.

1.4 Objectives of the Study

The study was guided by the following objectives:

- i) To determine the availability of CBET curriculum in preparedness in implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya.
- ii) To assess availability of financial allocation in preparedness in curriculum implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya.
- iii) To examine the adequacy of infrastructure in preparedness in curriculum implementation of CBET in public technical institutions in Mt. Kenya East, Kenya.
- iv) To assess the readiness of trainers in implementation of CBET in public technical institutions in Mt. Kenya East, Kenya.

- v) To investigate the extent to which Board of Governors moderate the preparedness in curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya

1.5 Research Questions

- i) To what extent does the availability of CBET curriculum influence the preparedness of implementation of CBET curriculum in public technical institutions in Mt. Kenya East Region, Kenya?
- ii) How does availability of financial allocation influence preparedness for CBET curriculum implementation in public technical institutions in Mt. Kenya East Region, Kenya?
- iii) To what extent does adequacy of infrastructure contribute to preparedness for CBET curriculum implementation in public technical institutions in Mt. Kenya East Region, Kenya?
- iv) How does the readiness of trainers affect the implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya?
- v) To what extent does the Board of Governors moderate the preparedness for CBET curriculum implementation in public technical institutions in Mt. Kenya East Region, Kenya?

1.6 Hypothesis

- i. H_{01} : There is no significant relationship between curriculum availability and preparedness for CBET implementation.

- ii. H₀₂: Financial allocation does not significantly affect preparedness for CBET curriculum implementation.
- iii. H₀₃: There is no significant relationship between infrastructure adequacy and preparedness for CBET curriculum implementation.
- iv. H₀₄: Readiness of trainers does not significantly influence CBET implementation.
- v. H₀₅: The Board of Governors does not significantly moderate the preparedness for CBET curriculum implementation.

1.7 Justification of the Study

Competency-Based Education and Training (CBET) is a transformative approach to education and training that emphasizes the acquisition of measurable competencies, skills, and attitudes rather than mere knowledge accumulation (MoE, 2018). Its implementation in Kenya is both a national policy priority and a strategic response to persistent challenges of unemployment, skills mismatch, and low industrial absorption of TVET graduates. The TVET Act (2013) provides the legal framework mandating TVET institutions to adopt CBET for enhancing relevance and quality of training. Similarly, Kenya Vision 2030 identifies technical and vocational training as a critical driver for industrialization and middle-income economic status, requiring highly skilled graduates aligned with labor market demands (Republic of Kenya, 2018). Furthermore, the Bottom-Up Economic Transformation Agenda (BETA, 2022–2027) prioritizes job creation, affordable housing, manufacturing, and digital transformation, which cannot be realized without a workforce trained under a competency-based framework.

To institutionalize CBET, the Ministry of Education (MoE) established specialized bodies with clear mandates, including the TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), the Technical and Vocational Education and Training Authority (TVETA), the Kenya National Qualifications Authority (KNQA), and the Sector Skills Advisory Committees (SSACs). These agencies are tasked with curriculum design, quality assurance, standardization, and alignment of occupational standards to industry needs. By 2019, TVET CDACC had developed 446 occupational standards and curricula, trained trainers, rolled out CBET programs, and evaluated trainees (MoE, 2018).

Despite these policy frameworks and institutional mechanisms, implementation of CBET across public TVETs in regions such as Mt. Kenya East remains limited and uneven, mainly due to underfunding, inadequate infrastructure, and insufficient trainer capacity. This study is justified in seeking to provide empirical evidence on the determinants of CBET implementation in public TVET institutions within the region. The findings will inform policy reforms, institutional practices, and resource allocation strategies, ensuring that CBET objectives are realized in line with Kenya's Vision 2030, TVET Act (2013), and the Bottom-Up Economic Transformation Agenda (BETA).

1.8 Significance of the Study

The overall objective of this study was to provide a comprehensive understanding of the preparedness in implementing curriculum on CBET in public technological institutions in Mt. Kenya East Region, Kenya. The study is significant to the policymakers because it directly influences the success of education policies.

Adequate preparedness ensures effective execution CBET, aligning education with the industry needs, fostering skill development, and contributing to economic growth. Policymakers aim for seamless integration of CBET into educational systems, and its successful implementation relies on careful planning, resource allocation and continuous evaluation. This will help in achieving policy goals related to workforce development and addressing the develop supply of the job market.

The study is going to be of significant to educators as it directly impacts their ability to deliver effective and trainee-centered instruction. Educators rely on well-prepared curriculum to tailor teaching strategies, assessments and learning materials to the competencies emphasized in CBET. Adequate preparedness ensures that educators have necessary training and resources to facilitate a dynamic learning environment, promoting skill acquisition and practical application hence, improved quality of education, support student success and professional development of the educator.

Stakeholders include the employers, community leaders and parents who have vested interest in the relevance and effectiveness of CBET in preparing individuals for workforce. A well-prepared curriculum ensures that the trainee acquire the necessary skills aligned with the industry needs. For employers, this means a better workforce that can contribute immediately to the workplace. Community leaders benefit from a more skilled and adaptable populace, fostering economic development. Parents are reassured that their children are receiving education that prepares them for real-world challenges. Therefore, there will be building of confidence among stakeholders, promoting collaboration between education and industry and fostering positive outcomes for individuals and the community.

Trainees will receive targeted and relevant instruction, allowing them to develop practical skills and competencies sought by employers. The study will facilitate a learner-centric environment, enabling them to progress at their own pace and demonstrating mastery of competencies. This prepares them more effectively for the workforce by emphasizing hands-on experience and application of knowledge.

Researchers get opportunities for valuable studies and insights into the effectiveness of this educational approach. This forms the foundation for research that advances understanding of effective educational practices and their implications for individuals and societies. This study provides new insights by linking governance with CBET implementation in a Kenyan regional context. It also implicates policy on funding allocation models, trainer capacity building, governance reforms.

1.9 Scope and Delimitation

The study was carried out in 19 public TVET institutions in Mt. Kenya East Region because the public TVET institutions have similar characteristics. This includes being financed and audited by the government, regulated by TVETA, governed by the TVET Act, 2013 and are under the State Department of TVET. The results will be generalized to other eight (8) Kenya Association of Technical Training Institutes (KATTI) regions namely: Nairobi, Western, Nyanza, North Rift, South Rift, Mt. Kenya West, Coast and North Eastern regions. The study is limited to the public TVET institutions that have programmes in building and civil engineering. The courses in building and civil engineering are practical bound and necessitate a lot of hands-on experience.

The department was selected because it includes general construction and specialized construction of new work, fix & modification, the structure of prefabricated buildings and construction of temporary structures. The growth of residential and commercial construction has been the fastest followed by the transport infrastructure. This sector largely depends on manual labour hence offering highest employment in informal jobs. Kenya Vision 2030 and Kenya Kwanza Plan has known housing as one of the 'Big Four' initiatives which targets to construct affordable and decent homes for Kenyans hence addressing the unemployment among the youth and providing shelter as a basic need. Further the department has been selected to address the high cost of construction that is a threat of higher inflation affecting growth and employment in the sector, hence forms the basis of formal training in advanced technology and design engineering to address the frequent collapsing of the buildings in Nairobi and its environs.

The study further targeted those public TVET institutions that are registered and licensed by TVETA to train building and civil engineering programmes. Institutions that lacked the department were not considered. The institutions included: The Meru National Polytechnic (NP), The Jeremiah Nyagah NP, The Mitunguu NP, Karumo Technical Training Institute (TTI), Mukiria TTI, Kiirua TTI, Tharaka TTI, Nkabune TTI, Chuka Technical & Vocational College (TVC), Kaelo TVC, Muraga TVC, Tigania East TVC, Manyatta TVC, Mbeere North TVC, Runyenjes TVC, Samburu East TVC, Samburu North TVC, North Horr TVC and Laisamis TVC.

The programs in building and civil engineering include masonry, plumbing, quantity survey, land survey, building technician, road transport, water engineering and structures. The choice of the department was justified by the relevance and demand to

alleviate the unemployment problem among the youth, achieve the Big Four initiative and steer economic development (GOK, 2008: BETA, 2023).

The conceptual scope of the study focused on CBET curriculum implementation as the dependent variable, and examined its relationship with financing, infrastructure, trainer preparedness, and governance as the independent variables. The population scope comprised principals, trainers, heads of departments (HoDs), trainees, and Boards of Governors (BOGs) drawn from public TVET institutions in Mt. Kenya East region.

1.10 Limitations

Despite its methodological rigor, the study faced several limitations that may have influenced the scope and generalizability of its findings. First, the research was confined to public technical institutions within the Mt. Kenya East Region, which may not fully represent the diversity of CBET implementation experiences across other regions in Kenya. Institutional variations in resource allocation, governance structures, and trainer competencies could limit the applicability of the results beyond the selected context. To mitigate this, triangulation of data sources (questionnaires, interviews, and document analysis) was applied to enhance credibility and reduce context-specific bias.

Additionally, the reliance on self-reported data through questionnaires and interviews introduced potential biases, including social desirability and subjective interpretation of preparedness indicators. This was minimized by assuring anonymity and confidentiality to respondents and cross-checking self-reported responses with institutional records.

Further, unforeseen contextual factors—such as institutional disruptions or policy shifts during the data collection period—may have affected participant responses. To mitigate this, the study carefully documented contextual events during data collection to aid interpretation of findings. Finally, the cross-sectional design captured preparedness at a single point in time, limiting insights into longitudinal changes; this was addressed by recommending longitudinal studies in future to track evolving CBET implementation dynamics.

1.11 Assumption of the Study

The study was conducted on the presumption that respondents will answer all questions honestly and that they are informed about the topic. The study made the following assumptions: the procedure of curriculum development is duly followed, trainers have been trained and orientated in CBET, and CBET has been implemented in all public technical institutions. It was assumed that all public technical institutions that have functional Building and Civil Engineering Department have four (4) sections namely: plumbing, masonry, building construction and civil engineering.

1.12 Operational Definition of Terms

Term	Operational Definition
Board of Governors	Members nominated by the Cabinet Secretary and gazette to govern public technical institutions. They define the role, mission, and vision of the institution, setting its strategic direction.
Building and Civil Engineering Department	A technical education program concerned with training trainees on construction of buildings and roads, pipe fitting, land survey, quantity survey, and architecture.
Competency-Based Education and Training	A teaching approach that emphasizes the development of practical, industry-driven skills and abilities.
Curriculum	A document detailing learning outcome, content areas, assessment methods, required tools and equipment, and the notional hours for each unit of competence. It guides learning plans, session plans, and session notes.
Curriculum Design	The process of developing a curriculum that outlines methodologies, learning objectives, content, assessment techniques, and the overall structure of a training program.
Curriculum Development, Assessment and Certification Council (CDACC)	A public corporate organization established under the TVET Act of 2013 responsible for developing CBET curriculum, conducting assessments, and certifying TVET competencies.
Curriculum Implementation	The process of translating approved curriculum objectives, materials, and strategies into practical training and learning activities.
ICT Infrastructure	Internet services, hardware, software, computer devices, external devices, and systems enabling data

Term	Operational Definition
	manipulation, communication, presentations, and collaboration.
Implementation	The act of executing the approved curriculum.
Institution	An academic training organization.
Instructional Leadership	The principal's role in improving the learning environment by overseeing curriculum and instruction, resolving operational issues, providing resources, and evaluating trainers.
Physical Infrastructure	Classrooms, laboratories, libraries, workshops, equipment, facilities, information resources, and specialized spaces for effective training.
Public Technical Institutions	Technical schools funded and maintained by the exchequer under the State Department of TVET, Ministry of Education. They provide vocational courses and training programs to prepare individuals with practical skills and knowledge.
Preparedness	The process of setting learning objectives, training materials, and assessment techniques, and creating session plans, guides, trainers' notes, attendance records, and learning aids.
Readiness	A mental and physical state of being prepared to teach and learn.
Technical	Courses involving engineering and applied sciences with practical, industry-related methods.
TVET	Education and training programs that equip individuals with relevant skills, knowledge, and competencies for specific crafts or jobs.

Term	Operational Definition
Technical Education	Courses and programs focusing on practical skills and knowledge in specialized occupations to meet labor market demands.
Trainees' Employability Skills	Values, interpersonal, technical, marketing, thinking, and negotiation skills that enhance graduates' employability, work performance, and relevance in the workplace.
Training	Informal education aimed at reskilling, upskilling, or retooling the TVET workforce to improve knowledge and abilities.
TVETA	A public corporate organization established under the TVET Act of 2013 tasked with regulating TVET by promoting quality, setting standards, accrediting institutions, trainers, and programs.
Vocational	Courses emphasizing practical, hands-on training in professional trades.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The concept of competency-based education and training, curriculum availability, funding allocations, infrastructure availability, support services for trainers, and the influence of Board of Governor's chairpersons on the implementation of CBET curriculum are the headings under which the literature will be reviewed. The theoretical framework that analyzes Systems Theory and how it might be applied to the issue being studied is also included. A part on the conceptual framework and a synopsis of the study's literary study review round out the section.

2.2 Competency-Based Education and Training

Instead of only emphasizing the acquisition of knowledge, competency-based education and training, or CBET, focuses on the development of certain competencies or skills (Tambwe, 2019). In order to execute the ideal CBET in Kenya, policy development is necessary. The government and pertinent authorities, including the Ministry of Education, may create rules and regulations for CBET implementation. Curriculum development is the methodical activity of creating and refining the educational programs that are provided at training facilities.

Session plan development is also a systematic procedure of designing, instrumenting and evaluating learning experiences. Competence-based education and training that emphasize competencies and skills relevant to the specific fields or industries requires the curriculum developed from Occupational Standards. Training of trainers to deliver CBET effectively,

focusing on competency assessment and skills development. Resource allocation which includes funds and materials to support CBET programs and infrastructure. Assessment and certification where methods that evaluate trainees' competencies and skills are developed, and a certification system is established. Stakeholder engagement that is, collaboration with business enterprise partners, employers, and other stakeholders is crucial to align CBET programs with the needs of the job market. Pilot programs are done to test their effectiveness and make necessary adjustments. Once successful, CBET programs are scaled up to reach a broader population. Monitoring and evaluation is a continuous process to ensure the quality and relevance of CBET programs is observed. Regular reviews and adjustments are made to keep CBET programs up to date and allied with changing industry needs (CDACC, 2020). Competency-Based Education and Training initiatives in Kenya have been explored and implemented in various sectors, such as specialized and occupation education and training (TVET) programs, healthcare training, hospitality and other fields where specific skills and competencies are essential.

2.3 Availability of Curriculum

In this research the term "curriculum" Mean the subject matter covered in courses as well as the instructional strategies, learning opportunities, and evaluation techniques employed by TVET institutions. A good curriculum helps trainees to learn how to cope with dispute and prepares them for long life acquisition (Muriuki & Dominic, 2022). TVET curricula has not been relevant to the labor market leading to skill mismatch causing the employers to retrain the graduates (Republic of Kenya, 2022). Though graduate attributes are becoming significant, the attribute of industry linked curriculum is not emphasized in TVET institutions. Curriculum is not frequently reviewed and there are complains of those

involved in the review especially in many developing countries like Kenya. To overcome this, employers need to be actively involved in curriculum development. According to TVETA and KICD, curriculum should be reviewed and up scaled after every five years where the industry should be involved. Numerous studies show that in order to improve graduates' employability, soft skills as well as personal attributes must be incorporated to the curriculum. There is inadequate research on how personal attributes can be incorporated in the curriculum.

One of the elements of education that plays a crucial part in the system itself is the curriculum. According to John Dewey, the goal of education is to foster growth. Rebuilding experiences and information is necessary for progress, he says, and educational experiences are judged on their ability to promote growth; negative experiences hinder or slow it down, while positive experiences accelerate it (Bradea & Blandul, 2020).

Additionally, the curriculum, which Guantai (2023) defines as a collection of disciplines, has a far easier work than the school, which assumes responsibility for the experiences of the students both inside and outside of the classroom. The presence of a curriculum is further shown to the observer by a documented plan. According to Franklin Bobbit, a curriculum is "a set of activities that children and teenagers must do and experience in order to develop the skills necessary to perform the tasks that comprise adult life effectively and to be in every manner what adults should be." According to Hilda Taba, "a curriculum is a strategy for learning" (Oliva & Gordon, 2013, p. 4).

A curriculum is a strategy or program that covers every experience a trainee has while being supervised by the institution (Mwaniki & Guantai, 2023). One way to think about

curriculum is as an educational plan that dictates how education is designed. The process and outcomes of the actual schooling are then determined by the educational design. The goal of instruction is to get students ready for the working world. The goal of teaching is to prepare students for the realities of the workplace (Mwaniki et al., 2023). In actuality, the curriculum is made up of several tactics that specify the intended training experiences, primarily in written form and with differing scopes.

As instructed by the institution's staff, the curriculum can be a unit, a course, a sequence of courses, or the complete training program of the institute. It can also be encountered both within and outside of the classroom or institute. Four sources of principles are suggested for curriculum development: research data, common sense, traditional curriculum narratives, and experiential data (Guantai, 2023). The theoretical underpinnings of the transaction stance may be found in investigative pragmatism, namely in John Dewey's work, which serves as the theoretical basis for curriculum review techniques (Bradea & Blandul, 2020).

The four pillars of curriculum are learning theory, society and culture, the individual, attitude and the nature of knowledge, and Dan (Mwaniki et al., 2023). In addition to attitude, which is a way of life, curriculum should be created with the needs of the group in mind. This orientation's collaborative thrust has potential as well. According to Mwaniki et al. (2023), there are multiple engagements striving for smaller, more adaptable economic and social institutions.

The curriculum is a product of its era. Social forces, theoretical stances, psychological philosophies, information acquisition, and educational leadership at a given time all

influence and alter curricula (Guantai, 2023). Therefore, in order to address any issues and satisfy all of the needs of the group, curriculum creation must be in line with the current standards. Stated differently, the development of the CBET curriculum must also take into account the demands of the present and the future. As a result, CBET is able to generate and fulfill sustainable human resources.

2.3.1 Curriculum Development

According to Guantai (2023), a curriculum is expected to provide preliminary information and details of curriculum competency units which are developed by a mandated agency and in reference to an occupational standard that is validated by industry. Curriculum preliminary information includes the curriculum title which reflects a given occupation and level of training as per Kenya National Qualification Framework (KNQF), the programme qualification level which reflect total course duration of training and industrial training as per the KNQF and curriculum code as per International Standard Classification of Education (ISCED) framework similar to the respective occupational standard code. Therefore, curriculum description is a description of competencies to be developed by a trainee in line with the requirements for performance of a specified job which indicate skills, knowledge and behavior necessary to perform a specified job. Curriculum description should reflect core duties to be performed by a trainee upon successful completion of training. A well-developed CBET curriculum should help the trainee learn how to handle challenges, prepare them for long life learning as well as how to navigate from one job to another (Muriuki & Dominic, 2022). The trainee's acquisition of knowledge, desired skills and behaviour are the emphasized in the TVET program which should be aligned to the industry demand. The courses offered and training experiences in

TVET institutions give trainees opportunities to acquired relevant skills that lead to employment thus conducive to socio system development of a nation (Muchira et al., 2023).

Curriculum development is a more detailed process that takes into account gender and diversity inclusion in the development of curricular, training materials, training delivery and conduct of assessments. Further curriculum development provides the qualification of a trainer(s) requirements such as a trainer should be licensed by TVETA, possess a pedagogical training and a qualification higher than that of the curriculum being implemented (Muchira et al., 2023). The trainee entry requirements are provided as per the KNQF and adhered to set cluster subjects requirements, professional bodies and regulator's requirements. This means that the TVET institution is guided on admission of trainees and registration of courses by the regulator and professional bodies. Industrial training forms an integral part of training programme and therefore guidelines are as well provided. Industrial training involves the mentor from the industry working with the trainee as a mentee to ensure the trainee get the skills required at the workplace and close any gap that the trainee may have (Muchira et al., 2023). The study, therefore, seeks to establish if industrial training is conducted as per the requirements of KNQF, professional bodies and regulators.

Curriculum development reflects training learning outcomes, theoretical and practical skills, knowledge and attitude to be acquired by the trainee, represent a discrete and measurable unit of work, aligned to the description of the respective Occupational Standards. The training content should be aligned to the learnedness outcomes, provide the improvement of skills, knowledge and attitudes needed to achieve respective learning

outcomes, adequately address performance criteria of all the elements of competency in the respective Occupational Standards and logically organized (CBETA, 2023). The curriculum should provide suggested assessment methods that adequately measure ability of the trainees to perform job tasks reflected in the respective learning outcomes and provide for assessment of acquired skills, knowledge and attitudes necessary for performance of job tasks (TVETS 07, 2022). The curriculum should also provide training delivery method to enable the trainee to achieve intended learning outcomes, cater for different learning experience, promote individualized and self-paced learning, and allow for clear identification of training and learning activities. Each training programme should provide the range of training resources required for successful implementation which include list of tools, equipment and machines, theory rooms, workshops and laboratories (CBETA, 2023).

Two general requirements must be met for a curriculum designed for industrial education: the discourse and learning goals, which are produced in a logical order, with the context difference looking at the learning needs of the trainees in different programs. The learning requirements of novices, experienced learners, and experts form the foundation of the TVET program. An emphasis on experience, in-depth information, functional knowledge, contextual knowledge, and the orientation of what the occupation is all about is made possible by occupational working knowledge and result orientation (George & Casey, 2020).

The curriculum indicators for TVET institutions are based on the market needs and competences required for the labor market, as well as student learning assessment, which is represented in the performance exams given in formatively. The design of the TVET

curriculum is also influenced by the employment objectives of TVET graduates, who typically seek out formal work or self-employment. Additionally, interactions between graduates and employers in their particular fields of concentration continue to serve as a guide for what should be covered in the curriculum (Mohammad et al., 2021).

Research shows graduates in the US, UK, and Australia lack general abilities, which are highly valued in the industry. In essence, the TVET curriculum serves as a real tool for advancing skills, technology and the economy. TVET is typically created to satisfy the social and economic needs of youth who wish to improve their skills competencies and uphold performance values at their workplace (CDACC, 2023). As a result, there is a consensus that these skills should be taught in the curriculum. It has been determined that conventional seminar and lecture methodologies are ineffective at promoting graduate employability (CDACC, 2023). Graduates need usable skills in the rapidly evolving job market, claims (Kiogora, 2023). This posits the need for national curriculum and qualification standards of the subject matter be revised by developers.

In China, the TVET system is demand driven. Programs that are less skills-based and with low rate of employment are abolished or modified while highly skills-based programs that is relevant to the industry are developed in collaboration with the industry (Nathaniel, 2020). The industry is not passive in setting standards and developing the occupational standards leading to production of competent trainees who have ability, cognition and attitudes applicable to the labour market. The curriculum is institution-based practical with applicable preparation in the industry setting as work and training are combined together.

According to George (2023), there is a shortage of talent in Asia as well as a discrepancy between the demand for workers and the labor supply. The study created a curriculum design model that considered the impact of the program's vision, methodology, delivery, and evaluation on employability. The study used a sample size of 299 working trainees to study about graduates' perspectives. Version 3 of Smart PLS was used to analyze the data. To balance the theoretical and practical methods to training, the study proposed adjusting the curriculum's design. Aboagye and Puoza (2021) evaluated the issues affecting graduates' employability in Ghana. Random stratified sampling was employed with purpose. Lack of practical knowledge was discovered to be a problem because of the erroneous teaching strategies and curriculum. The report suggested changing the curriculum to provide graduates more useful skills. Additional industrial exposure and internships were suggested as a factor crucial to graduate employment.

Personal competences should be part of the curriculum for trainees completing project management courses, according to (Siddique et al., 2022). They said that trainees lacked interpersonal and managerial abilities. The current curriculum was lacking in soft skills like teamwork, creativity, critical thinking, and communication. Another study found a significant disconnects between the competences learned and what was taught in technical institutes. While many other courses are offered in some TVET colleges, the project management course was the focus of this study. They suggested adding personal competencies to the course content. Knowing which personal competencies to include and how to apply them to the curriculum are critical if personal competencies must be included in the curriculum.

Varghese and Khare (2021) contend that TVET institutions must adapt to the knowledge-based economy's dynamic business environment. For graduates to be globally competitive, curricula must be rigorous and updated frequently. This is possible if TVET stakeholders, such as trainers, governments, and business leaders, work together to modify curricula and create regulations that support teamwork. Many countries keep developing and changing the education systems which include the curriculum. New policies are developed to meet the changing industry demands but many times failure arises at the implementation level. Trainers are the main stakeholders in curriculum implementation. When they are not involved in the development of the curriculum, implantation becomes a challenge. Inadequate and unavailability of instruction and learning materials also hinders effective enforcement of the curriculum. Hence the reason for this study.

A study in Pakistan, 141 trainers provided information for Ahmad and Shah (2017), which looked at the employability of graduates of vocational education programs. The data was analyzed using the factor analysis method, which identified policy skills training, relevant experience, and course mismatch with industry needs as the main factors of employability. The trainees themselves, who were being prepared for the workforce, were not included; only trainers were. Component and factor analysis are quantitative measures, hence a mixed-method study including instructors and trainees is required. Similarly, the study promoted curriculum revisions that prioritize applied knowledge and hands-on training. The curriculum must be related to the labor market in order to prepare trainees for entering the workforce, and training outcomes should be established based on occupational standards so as to improve trainees' skill development. The majority of research found a dearth of theory-to-practice connections in TVET institute courses. In order to guarantee

quality, the learning environment also needed to be changed. It suggested use of government funding to decrease gender gaps and boost enrollment.

A study by Odondi et al. (2020), noted an increase in access to TVET with continuing gender disparity in both gender access and competences of male and female trainees. According to SDG 4, educating both males and females improves their social economic status and increases opportunities and other benefits such as increased earning, reduction of crime, delayed girl child marriages and better life outcomes. The survey was carried out in 182 TVET institutions in 9 counties in Kenya targeting youth of between 15-25 years. The results revealed gender disparities to TVET access, enrolment, skills and competencies acquisition that favored the male gender. The trainer response rate in the study showed high disparity as male trainers were 61% while 39% were female. The study concluded engendering in recruitment in terms of TVET branding, training methods, timing and course duration for all gender trainees. The study recommended the Ministry of Education to develop policies and provide funding of females to reduce gender inequality. It also recommended review of pedagogy from male centric to one that is more inclusive and gender sensitive.

A study conducted in Kenya by Kigwilu et al. (2016) looked at the difficulties in establishing craftsman and craft courses in Nairobi's Catholic-sponsored community TVET institutions. The research design was mixed method. Cross-sectional survey approach to gather both qualitative and quantitative data. 331 trainees, 25 trainers, and 4 directors were the target population.

The respondents sampled were; 172 trainees, 18 trainers and 4 directors. Questionnaires and interview guides were used for data collection. Analysis for quantitative data was descriptive while for qualitative data was summarized by narratives and excerpts. Inadequate resources, inadequate materials for practical's, trainee's negative attitudes and outdated instructional methods among others hindered effectual implementation artisan and craft courses. The study recommended continuous monitoring, recruitment of qualified trainers, stakeholder networks and collaborations as well as increased funding. This research was done on private community college thus another research needed to be done focusing on public TVET institutions using mixed research method, thus the need for this study.

A study by Muthomi et al. (2024) sought to examine the importance of TVET curriculum to the labor market showed different ways of technical and soft skills coverage. The study engaged a cross-sectional research design; data was collected and analyzed using mixed method research method. The target population included 3452 trainees, 347 trainers, 171 principals, 14 focus groups and 8 key informants. The results of the study included; TVET institutions had inadequate resources, lacked modern tools and equipment, theoretical training which limited skill acquisition which affects employability. The study recommended TVET institution partnership with the industry to increase skill acquisition and youth employability.

2.3.2 Occupational Standards

Occupational Standards is the area of learning outcomes and the skill or knowledge within those areas in a curriculum program that the industry practitioner expects the trainee to attain in order to be declared competent. Occupational standards define the duties, activities

and tasks to be performed by the job-holder/worker in the world of work. It is critical aspect of competency that the trainee needs to acquire and achieve competence in a skill. Occupational standards are developed by the industry players and professional bodies to ascertain learning competencies and guide the employers in preparing job descriptions, determine recruitment criteria and set standards for workforce performance and procedures (TVETA, 2020). In order to ensure that the quality and relevance of training delivery align with industry expectations, TVET training institutes use occupational standards to construct their curricula and training materials. This is the case for the building and civil engineering curriculum.

Occupational training standards offer the criteria to approve, accredit, and audit designed programs, and they also help determine the criteria to issue certifications. After monitoring and evaluation, it also helps identify training needs and skills gaps (TVETA, 2020). Teane (2021) examined how the curricula offered at South African TVET colleges matched the needs of the labor market.

Data was gathered from seven lecturers and seven students of an electrical engineering course utilizing the snowball sampling technique for the qualitative research design. The results showed that written examinations were insufficient to evaluate the acquired technical knowledge, and they suggested the use of a dual assessment method that combines written and practical evaluations. However, the study only addressed assessment methods and did not consider other curriculum elements like content or teaching approaches.

The research conducted by Mesuwini and Bomani (2021) in South Africa examined employer attitudes, sustainable employability competencies, and employer perspectives on the sustainable employability of TVET engineering students using human capital theory. Twelve employers from the sector were specifically contacted for semi-structured interviews. Employers employed content analysis, and they recognized that graduates needed to have both soft skills and technical skills to improve their sustainability as employees. It was urged that industries and TVET institutions work together. Although the study did not address the significance of curriculum, it did suggest that future research should look at how well a TVET curriculum meets industry needs.

According to a study conducted in South African high education institutions by Ramnund-Mansingh and Reddy (2021), graduate skills are necessary to support the industrial revolution. Because of distinct political environment and structural history, South African higher education (HE) cannot be compared with HE systems in other nations. Geressu (2017) conducted a study that looked at how competency training affected the skills of 89 graduates, 162 technicians, and 123 automotive engineering trainees in six TVET colleges. The study's independent variable was CBC, and the dependent variable was the skills of graduate trainees. Their investigation might have missed other explanatory factors for skills, even if the employment criteria were clearly defined.

According to the study, competency-based curriculum training needs to be improved to meet industry demands. To guarantee that graduates acquire hands-on skills, consultations with stakeholders are also required when establishing the learning outcomes, teaching strategies, and learning guides.

According to Okolie et al. (2020), TVET institutions in Nigeria have not succeeded in creating skills that will adequately prepare graduates for the workforce. While many researches concentrated on skill development, there were relatively few studies that concentrated particularly on aspects related to the curriculum and graduates' hands-on skills. In a study of Nigerian university finalist trainees, it was discovered that instructors lacked practical teaching expertise and that a heavy emphasis was placed on theory rather than practice. Although 361 were found in Teng et al (2019) study in China and Malaysia, which focused on universities there, goldsmiths emphasized the importance of including soft skills into the curriculum. It was discovered that soft skills are crucial for graduate job preparedness. Although it is not the goal of the current study, given that the context of the study was in highly developed nations, it would be fascinating to learn whether specific soft skills are regarded as crucial by employers in a developing nation like Kenya. This study aimed at determining the preparedness in curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya.

Purposive sampling and a questionnaire were used in Pitan and Muller's (2021) study in South Africa to evaluate how 402 TVET final-year trainees improved employable abilities. According to the report, the curriculum has the biggest impact on how employable graduates are. The employability of graduates was not shown to be significantly impacted by other criteria such as work prospects, practical problem-solving or extra-curricular activities. They concurred with earlier research that theory and practice must be linked so as to generate graduates who are prepared for the workforce. To stratify the trainees from various departments and subsequently collect data from them, a stratified random sample

method may be perfect. In a similar vein, Mabunda and Frick (2020) found out that internships and apprenticeships raise the likelihood of employment for the trainee.

The majority of firm's screen apprentice trainees based on their talents and skills, allowing for the selection and hiring of desirable candidates. Graduates with the necessary skills, however, frequently lack real-world experience. Because they do not educate graduates for greater career options, most curricula are regarded as absolute therefore, need for CBET curriculum.

2.3.3 Skills

The curriculum must be created in a way that gives trainees more hands-on experience through apprenticeship and internship programs (Mutungi et al., 2021). A curriculum can be designed in such a way that trainees are continuously exposed to practical learning in the industry to improve skills instead of a summative affiliation with the industry experience (Hossain et al., 2020; Kovacs & Zarandne, 2022; Nusrat & Sultana, 2019). This will eliminate the myth that graduates from the TVET institutions are of low quality and lack practical skills.

In order to lower youth unemployment, the Republic of Zambia has been operating and establishing Vocational Education and Training Institutions (VETI). Studies on the suitability and sufficiency of the teaching and training resources provided by an institution for trainees in connection to the industrial training those trainees are sent on. The responses were randomly selected college deans and professors from various VETI. The findings demonstrated that TVET institutions faced a variety of difficulties, such as inadequate contemporary workshop facilities and a shortage of reading materials. The study suggested creating an environment that is conducive to learning so that graduates may pick up the

necessary technical skills for the market (Mulenga & Chileshe, 2020). This is the core subjective of this study to find out the availability and adequacy of infrastructure in readiness to implement CBET curriculum.

Competency-Based Education and Training curriculum can only be used in settings with suitable and applicable workshop facilities, tools, equipment, and machines. The availability of suitable workshop facilities improves trainees training by enabling them to participate in demonstrations and practice, which aid in their ongoing skill-building. The dilapidated condition of workplace tools and instrumentality in TVET institutions in Nigeria is one of the topics of much debate among TVET technicians (Okolie et al., 2019). According to Umar and Ma'aji (2020), the bulk of TVET institutions in Nigeria are forced to perform below expectations since the facilities needed in the workshops for efficient skill development are purportedly unavailable, poorly managed, or completely neglected. Consequently, there is a requirement to give enough machines, tools, and workshop supplies to carry out TVE activities and hands-on practice in Nigeria effectively.

Munishi (2016) found that graduates from Tanzania lacked soft skills as a result of inadequate curricula that did not adequately equip them. The study suggested using appropriate training strategies and including soft accomplishment like teamwork, connectedness, leaders, and critical thinking (Fadhil et al., 2021; Lozovoy et al., 2019). Adams (2019) study on the factors affecting TVET graduates' employability in South Africa further blamed curricular inconsistencies and a lack of resources for graduates' lack of workplace preparedness. The most crucial element in establishing graduates' preparedness for employment was work-based training, which had not been updated in a long time.

In East Africa, a study on graduate employability looked at the perception of the academic community, industries and civil servants with a focus on skill mismatch acquired in higher education and those demanded by the industries. A total of 89 respondents who comprised of 18 from Kenya, 44 from Tanzania, 25 from Uganda and 2 whose origin was not revealed participated in the study. A mixed method approach was used where a survey to explore whether the graduates were equipped with right skills for deeper understanding of the hands-on skills and gaps that exist. A questionnaire based on convenience sampling on the skills was administered among the stakeholders. The Open Day event was organized by the three East African Higher Education Institutions which included; University of Tanzania, Makerere University of Uganda and Maseno University of Kenya. The questionnaire that was on a four-point Likert scale was used to establish whether graduates were equipped with the right skills for employment. Data was analyzed through principal component analysis. The result of the study showed that the skills were insufficiently developed in the course of the trainee's study years hence skills acquired were not the skills required by the industry (Guàrdia & Maina, 2021). The study indicated outdated programmes with a curriculum that is reviewed in a dynamic labor market and unqualified staff as the cause of skill gap. The study agreed with other researchers on institutional factors and development of hands-on skills in institutions of higher learning which include TVETs (Fox & Gandhi, 2021; Bhorat et al., 2017; Leopold et al., 2017; McCowan, 2015). These are part of this study which will also use mixed methods approach in data collection and analysis. According to Njeg'ere & Ji (2017), trainees in Kenya cited outdated curriculum as a major reason behind the problem of graduates' competency. Kalufya and Mwakajinga (2016) opined the need to link the curriculum with the industry demands and

to place employment as part of teaching and training to ensure trainees get hands-on skills. The review concludes that the studies conducted thoroughly analyzed curriculum elements and employment.

It is evident that the curricula utilized in TVET institutions are out-of-date and must be integrated with business requirements (Guàrdia et al., 2021). Inadequate and unavailable materials for carrying out practical sessions during training are lacking in TVET institutions thus denying the trainees experiential (Kigwilu et al., 2016). Additionally, curricula lack soft skills, practical abilities, and personal competences, leaving graduates unprepared for the workforce (Mtawa et al., 2021). According to the study by Muriuki and Dominic (2022), there is need for a paradigm shift from exam-oriented training to skill-oriented training with TVET institutions sticking to their core mandate of instilling technical accomplishment and knowledge required by the trainees to solve problems and communicate effectively. Theory and practice must be connected, thus those involved in TVET must work with the industry to form advantageous alliances that boost graduate employability (Ochieng & Ngware, 2021). There is scanty of data that put these variables together specifically in Kenya and therefore there is need for this study.

2.3.4 Industrial Engagement

Technical sector has the ability to develop human capital across the countries because it supports industries by providing skilled steady workforce supply thus boosting economic development. According to African Development Bank (ADB) the constraint to development of relevant skills include; mismatch in skills, poor quality and lack of relevant skills to industry needs which lead to high levels of unemployment among graduates (AfDB, 2022). Employers have always expressed their dissatisfaction of low-level

competencies from majority of the TVET graduates due to the rapid technological changes in the industry as well as TVET institutions hesitance to pervade these skills into prospective trainees (Muriuki & Dominic, 2022). Hands-on skill gap is a major problem facing the employer, employee and those seeking employment (Meta, 2022). In a market economy that is becoming more industrialized, industrial engagements is key to addressing the existing skills gap between TVET institutions and the labor market. The relationships are positive and mutually beneficial, with trainees gaining from TVET institutions in terms of employment opportunities, skill development, and economic growth. The workforce gains from the influx of new talent, inventions, and highly trained laborers in specialized fields of engineering, computer science, and other related fields (Muthuri, 2023).

The industrial engagements take many different forms, such as field excursions, apprenticeship to the partner organizations; training and educational activities through the offer of internships, which give trainees some job experience and help in transitioning to the world of work (Latif, 2022). Quality and relevant skills development worldwide is achieved through industrial involvement mainly coordinated by chambers of commerce and industry in respective countries. Sustainable Development Goal (SDG) 4, which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, perfectly summarizes the vision for education and training. To convince the employers and industry to get involved significantly in TVET, there should be a systematic development of TVET trainers as well as a TVET system that will keep pace with technological changes and apply appropriate technology in technical education and training. The industry should be involved in curriculum development and allow TVET

institutions to access their training equipment to ensure trainees have to up-to date equipment experience (ROK, 2022).

In the UK, TVET system is employer centered as workers play a key role in designing, delivery and assessment of TVETs which ensures relevance, flexibility and quality. The industry approval instrument and instrumentality, expertise, preparation venues and the training outcomes are not measured against passing exams but against employee-based outcomes (British Council, 2022). This is what the study seeks to achieve if CBET is well implemented. Employers willingly engage and work with the trainers to ensure the skills being taught are industry driven for competitive advantage. Employers participate in apprenticeship and internship programs, host work placements for full time trainees and advise on curriculum development and trainer development programs (British Council, 2022).

Since any economy that needs sustainable growth must prioritize TVET, a study by Nathaniel (2020) evaluated TVETs' impact on global economic development. Three continents. Africa, Asia, and Europe were chosen for the study, which focused on TVET developments since the beginning of the global economy's development. The study used a case study methodology, and the primary source of data was secondary sources. Newspapers, publications, and both published and unpublished theses provided the data. Data analysis was done using content analysis and qualitative research. The report made several important recommendations for industrial participation in TVET. This entails having stronger ties at the institutional and national levels, participating in the creation and execution of policies, and include work placements in the curriculum. TVET institutions

in China collaborate with industries, and the mechanisms for industry-school collaboration are deeply ingrained in TVET.

Africa needs a skilled labor force thus shortage of high and low level technical and vocational skills is a threat for sustained economic growth, transformation and industrialization (AfDB, 2020b). Approximately 46 % of employed youth in Africa believe there is a mismatch of their skills and their jobs and 21% of the leading employers seeking inadequate skilled workers which affects their operations (Mursy et al., 2019).

According to Lukalo (2019), most countries' TVET institutes struggle because their curricula do not integrate theory and practice. Lack of industrial engagements and linkages with vocational colleges hinder graduates' capacity to find employment. Various points of view exist about the value of industrial engagement for graduate competency. Numerous studies have found that exposing trainees to a real work environment improves their skills and gives them work experience. In other instances of industrial involvement, specialists are hired to train the staff by giving them internships and working on collaborative initiatives that improve their prospects of finding employment (Aboagye & Puoza, 2021; Adeosun et al., 2022; Lozovoy et al., 2019; Teng et al., 2019). However, majority of studies back industry involvement, whether through internships, hiring skilled workers as trainers, receiving donations from the industry, or the government's role in fostering collaborations between TVET institutions and industry through various incentives (Aboagye & Puoza, 2021).

Many countries especially in Europe have succeeded in involving the industry in the TVET system while there is minimal involvement and industry linkage of TVET programs in

Kenya hence disparity between TVET programs and labour market needs. Though there are a number of pilot projects and policy programs to bridge the disparity between industry and TVET in Kenya, the linkages between research, industry and TVET has not been strong (TVETA, 2020).

2.3.5 Internships and Industrial Trainings

Internships and industrial trainings are critical aspects of skill acquisition for TVET trainees and graduates. Through industrial training, trainees have the opportunity to go through practical, get exposed to opportunities and also get a clear understanding of the industry. According to the trainees, employers and TVET institutions benefit from industrial training. The trainees' benefits include personal development like communicating skills, team work, and difficulty solving skills, resilience and other attributes. Employers benefit from competent labor of well-trained trainees. Mostly, the industry lacks personnel in some departments which are easily filled by those on industrial training and internship thus solving the problem of staff shortage. TVET institutions are supplemented in areas they have weaknesses hence bridging the gap between the produced graduates and industry needs. The institutions also benefit from strong linkages with the industry

A curriculum that calls for internships and hands-on training after meeting specific training outcomes, improve the trainees' acquisition of practical skills (Bassah, 2022). Oswald-Egg & Renold (2021) assert that because of their high production and low training costs, experienced personnel are more desirable than inexperienced ones. Internships are therefore necessary to broaden work experience and give trainees marketable skills.

According to Muchlemann and Wolter (2020), trainees anticipate being exposed to real workplace experience in the industries they attend internships and industrial trainings.

The development of technical and vocational skills has been given a lot of focus. Kenya's Vision 2030 lays new requirements on TVET as a driving factor behind the economy's reliance on it to generate a sufficient and qualified middle-level labor force. Further highlighting the importance of quality education and training as a fundamental human right and a crucial component of the government's overall development objectives in the 2010 Kenyan Constitution (Government of Kenya, 2010).

The link between training and education and the labor market, the need to cultivate independent abilities and skills, and the integration of natural values into learning and training through successful public-private partnerships are all highly valued in Kenya's Vision 2030 (Government of Kenya, 2013). Furthermore, the OECD (2017) suggests that TVET can provide the skills needed by the industries, especially if there is enough employer participation to ensure that the curriculum satisfies labor market demands (OECD, 2017). More significantly, enhancing the caliber and applicability of TVET is a goal for Kenya in light of the current investments in the industry as demonstrated by government frameworks and policies.

The competencies graduate of TVET programs hold determine their relevance in the twenty-first century. Trainers are cautioned to assess how trainees fare in terms of practical and theoretical skills, and trainees can be given questionnaires to ascertain the desired skills, attitudes, and traits that trainees possess before they are integrated into the industry, in order to measure the relevance of TVET graduates (Ismail & Mohammed, 2021).

Analytical analyses of TVET programs provided by universities help identify additional areas that require attention and reinforcement (Kintu, 2019). The proportion of TVET graduates who continue with their education, those who get employed immediately, and the remaining graduates who are job-hunting or working for themselves can all be used to gauge the competency of graduates (Khirotidin, 2019).

Studies from throughout the world point to the importance of industrial trainings because they boost trainee productivity and labor market competitiveness. As a result, it is crucial that training institutions invest in alliances that facilitate on-the-job training (Chepkemei, 2022). To improve the practical experience, hotels and restaurants in these nations offer small-scale training in housekeeping, bar attendance and front office services (Asian Development Bank, 2022). This strategy is especially excellent for the tourism sector, as trainees work as tour guides they pick up useful skills, which apply to construction companies that provide training to Building and Civil Engineering trainees (Varghese & Khare, 2021).

In a study carried out in West Africa, Adeosun et al. (2022) looked at the impact of training and exposure gained through trainee work experience on trainees' competency. Using a mixed research approach, the study assessed internship programs in the fourth industrial revolution. The questionnaires received responses from at least 249 trainees, and 45 respondents including 25 industry employers (key informants) and 20 lecturers were subjected to in-depth interviews. It demonstrates that, depending on the internship location, internship programs increase productivity and broaden knowledge, exposing young people to mastery of the competency. While acknowledging that internships increase graduates' relevance, the study was carried out in a Nigerian university.

In Nairobi TVET institutions, Mwaura (2022) carried a study on the efficiency of industry trainings in enhancing trainees' capabilities. The study used a combination of methods and was informed by the skill acquisition theory. They employed a concurrent triangulation architecture. 3480 trainees, 174 liaison officers, 261 trainers, and 25 industrial managers made up the target population of 3940 participants. There were 180 trainees, 20 liaison officers, 10 industrial managers, and 20 trainers among the 230 responses in the sample. Liaison officers and industrial supervisors were chosen using purposive sample, whereas trainees and trainers were chosen through random sampling.

Questionnaires for trainees and liaison officers, interview guides for industry supervisors, and focus groups for trainers were the tools used to collect the data. Cronbach's alpha was used to assess reliability, while face and content validity were used to validate the instruments. Inferential and descriptive statistics were used to examine quantitative data, which was then displayed in tables, percentages, and frequencies. Thematic analysis and narrative presentation were used to present the qualitative data. According to the study's findings, exposure to industrial training impacted the development of competences. It was suggested that the degree of skills exposure during industrial training be harmonized, and that industry and TVET institutions collaborate to increase skills exposure. There are several lessons to be learned from this study for the current one, which will employ an exploratory research design and mixed method approach.

Muthomi et al. (2018) conducted a study in Kenya on the impact of industrial training on trainers' and trainees' competencies in fostering innovative ideas for industrialization. The research design used in the study was a cross-sectional descriptive survey. Among the research instruments were questionnaires given to 13 industry supervisors, 23 trainers, and

50 trainees. Frequencies, charts, and percentages were used to display the results. According to the report, trainees face several difficulties during industrial training, such as a lack of knowledge and abilities to handle evolving industry demands, a lack of interest from professional assessors, and a failure to take into account different perspectives on the issue. According to the study's findings, industrial training creates connections with the industry and introduces instructors and students to cutting-edge tools, technology, and equipment.

Finding internships and industrial trainings possibilities in Kenya can be difficult because the industries are expanding slowly. A study by Otieno and Onyango, (2020) indicates most trainees and graduates encounter various challenges such as; getting places for industrial trainings and internships, transport, food and accommodation costs as well as insurance covers hence employers failing to take them in for industrial trainings and internships. According to their study, 59% of the trainee respondents looked for placements for industrial training while 20% was through the Liaison offices and National Industrial Training Authority (NITA) and 21% was through friends and relatives. The study concluded that industrial trainings had several benefits to TVET trainees which included; helping the trainee apply classroom theory with practical training in the industry; attaining workplace experience, being exposed to industry and understanding work place experiences. The study recommended TVET institutions to foster partnerships with the industry to aid industrial training placements. Training institutions must keep a steady line of communication open with the corporate world in order to foster these skills and provide trainees with access to internship opportunities. According to Chepkemei (2022), the government must establish connections with firms to give apprenticeships and work

experience because these connections are crucial for graduate relevance. Due to the high expense of employer training and the absence of corporate social responsibility and incentives, they highlighted lack of government engagement.

Inadequate internship programs and government rules, such as tax breaks for small and medium enterprises, make it difficult to offer trainees the opportunity and skills they need (Huang et al., 2022).

2.3.6 Dual Vocation System

Dual vocational system means training and learning taking place in two settings which include the education institution and the work place. Institutions and the industry share obligation in providing theory and practice thus preparing the trainees for effective participation in the labor market (Shafi et al., 2021). Nusrat and Sultana, (2019) in their article points out that 80% of training is done in industries and only 20% of training takes place at institution; as a result, trainees are equipped with right skills required by the industry. Therefore, hands on skills gained in the industry makes the graduates more competent (Nusrat & Sultana, 2019). This enables the trainees to get technical skills, occupational competences, characteristics and qualities required by the industry thus guaranteeing employment (Latif, 2022). The dual vocational system helps graduates to adapt to the ever-changing economic demands on skills that match the industry (Kenayathulla, 2021). The dual vocation system enables trainees to practice industrial work which increases their confidence and improve their experiences. Development of personal attributes in addition to trade area specialization and skills by the TVET institutions while the industry improves graduate competency (Nurjanah & Ana, 2021; Remington, 2018; Oviawe, 2018).

In Europe the Dual Vocational System has taken root and is applauded for producing skilled workforce that has gone through on-job training in the industry and theoretical training in the vocational schools (Kithinji, 2022). The Dual vocational system has been adopted in European nations such as Germany, Austria and Netherlands (Erica, 2016 Haslaar, 2020). Balancing theoretical and practical learning in vocational institutions increases competency of the graduates. In Germany TVET trainees are exposed to dual vocational training leading to over 77% rate of transfer to employment (Federal Ministry of Education and Research 2021). Though Germany advocates for Dual vocation system, a study by Melesse et al. (2020) companies rarely collaborate with the vocational institutions with 72.4% not coordinating with the institutions and 93% not cooperating with the institutions. The German Dual training system has increased training opportunities, reduced youth unemployment and led to the country's economic growth (TVETA, 2020). Their dual vocational training has made Germany to have a high performing economy.

In Canada, vocational courses typically run two years, while apprenticeship programs last four years. Apprentices spend 20% of their time learning theoretical ideas at educational institutions and 80% of their time training at their places of employment. East and South-East Asian labor markets were contrasted to those in South Asia in research undertaken in Asia by Mehrotra (2016). The study's findings showed that South Asian TVET systems did not sufficiently meet the needs of the labour market. According to the report, market reform requires public, private, and joint private and public measures. The industry sector would be more accountable for making sure the suggested actions are considered. Studies of this kind help TVET graduates fit in in the job market.

Studies conducted in India show that there is a demand for skilled workers thus much focus has been put on the competency of TVET graduates. The unsuitability between central governments, training institutes and the industry; the study found that there is less clarity on the concept and components of TVET graduates competency based on the elements that promote skills. A frame work was developed based on personal factors and circumstances, external elements and institutional factors which provided a unifying structure to direct and put together agents in the Indian TVET system so as to enhance competencies of TVET graduates. The framework which is made up of four parts, each further subdivided into categories: individual variables, personal situations, external influences, and institutional aspects. This framework gives many agents in the Indian VET system a common framework to guide and organize them. Consequently, it contributes to improving graduates' competency in a comprehensive way (Ismail & Mohammed, 2015). The central government, industry stakeholders, and TVET institutions performed studies in India to better understand the expected type of TVET graduates that will be available to the market.

The comprehensive study of TVET graduate competency work-based learning strategy identifies the understanding and relationship between graduates' skill and aptitude development. To accomplish work-based learning, TVET programmes must be changed to permit intern placement in order to increase level of competency. Competency has received attention in current literature, although there are few studies that connect learning activity to a desired graduation capability (Arshad et al., 2020). China has increased the value placed on skills in its economy in order to support innovation that is fueled by the accelerating pace of technological change and greater global engagement. The needed abilities are those attained through graduate studies and technical-vocational education. In

China, the government provides incentives as well as comprehensive and contractual protection for workers, resulting in job stability and professional advancement. TVET graduates must pass exams administered by organizations that certify their knowledge of their fields.

According to Kenayathulla (2021), due to the industry's rapid changes, trainees starting school may be taught material that is unrelated to the jobs they will hold in the future. Due to the industrial revolution in fields like genetics, artificial intelligence, 3D printing, biotechnology, robotics, and nanotechnology, dual training is necessary to help people take advantage of the opportunities that will arise in the future as a result of these trends. Through their experience and knowledge of future projections, employers may take the lead in developing curricula to support trainees' global competitiveness. Olojuolawe et al. (2019) claims that curriculum development is necessary to close the skills gap between TVET institutes and industry.

A study of five employer led dual internship trainings in Mombasa and Nairobi affirmed that the dual vocational system of vocational training can offer sustainable solution to increasing youth unemployment in Kenya as it equips the trainees with relevant market driven skills (Kithinji, 2022). This was a desk review of documents and secondary data carried out to identify dual internship training programs in Kenya. A document analysis guide was used to collect secondary data on five donor funded internship projects. The study affirmed hands-on training should be more employer led and less institution focused.

Kenya has been embracing dual apprenticeships but its adoption has been very slow. A major concern has been the industry not being involved in curriculum development and

trainers not have the pedagogical skills and professional experience to deliver the relevant training. This has made it difficult for employers to get qualified skilled workers who are able to meet the employers' expectations of delivering quality work (Ochieng & Ngware, 2021). In order for their employees to effectively contribute to economic growth, the majority of employers require a specific set of knowledge, talents, and attitudes. According to Cheng et al. (2022), trainees must have the ability to work in groups, solve problems, communicate well, and be motivated. There is no study that has been carried on in Mt. Kenya, East Region, Kenya in reference to the dual vocational system thus this study will fill that gap.

2.4 Available Financial Support by Stakeholders

Fiscal support is indeed a critical factor that assists public technical institutions in effectively implementing CBET programs (KAM, 2017). Developing and updating CBET curriculum to meet industry standards and workforce demands requires funding. Financial support ensures that institutions can create relevant and up-to-date educational materials (Johnstone et al., 2014). Adequate funding allows institutions to improve physical facilities, workshops, laboratories, and classrooms, providing trainees with the necessary hands-on training environments, acquire and maintain modern equipment, technology, and teaching resources, including textbooks, e-learning platforms, and software. Funding enables institutions to engage in research and development activities, ensuring that CBET programs remain aligned with emerging industry trends and innovations. Hence, Public technical institutions can collaborate with industry partners, other educational institutions, and government bodies to enhance CBET programs (Oviawe, 2018). Therefore, financial support is integral to the effective execution of CBET in public technical institutions

because it allows these institutions to provide high-quality education and training, align their programs with commercial enterprise needs, and ensure that novice acquire the competencies required for the job market.

One effective way to influence the TVET system's social and economic effects is through financing. The quality, effectiveness, and relevance of the nation's TVET system are greatly impacted by the way it chooses to fund it. This will have an impact on TVET's capacity to promote equitable social and economic growth and, eventually, lower unemployment. Due to smaller workshop class sizes, equipment, maintenance, and supply expenses, Technical Vocational Education and Training is significantly more expensive than general education (UNESCO-UNEVOC, 2017). The expenses are higher for both the original investment and ongoing operations.

Thus, in the majority of nations where TVET funding is exclusively the responsibility of the public sector, it presents a significant challenge to governments and typically results in a severe lack of funding needed for high-quality training that keeps up with industry's constant technological advancements (UNESCO, 2019). While data on training organizations' results indicate that TVET trainees integrate into the workforce more quickly, funding for TVET frequently amounts to a negligible portion of the education budget as compared to general education (UNESCO-UNEVOC-MOE, 2018). TVET tends to draw trainees from lower socioeconomic categories, which restricts access, according to studies. In order to solve concerns of equality, market failures, unemployment, and strategic development, the public sector must make a commitment to actively subsidize TVET. Due to financial limitations, the government must also collaborate with the private body and improvement partners to make up the difference in funding.

2.4.1 Public Budgetary Allocation

It is important to remember that most TVET institutions are supported by government grants. However, as private financing options might not be easily available, government funding for TVET colleges needs to be better allocated. Lack of funds may result in insufficient resources for both maintaining and acquiring essential equipment (Glory, 2023). Glory also notes that the lack of funding makes it harder to find and keep skilled technicians and trainers, as well as the requirement to stay up to date with evolving technologies. TVET colleges should adopt the latest technological in order to stay competitive. Since more resources are required to acquire and integrate new technologies as required by the curriculum, this might be challenging for institutions. Furthermore, it might be costly to update and maintain technology. Modern technological equipment and the accessibility of physical facilities have a significant role in creating the training environment, which might influence how the CBET curriculum is implemented.

Public TVET institutions are funded through budgetary allocations in Kenya. The Kenyan government provides funds for infrastructural development, equipment purchases as well as remuneration of trainers (MOE, 2018). In 2018, Kenya National Treasury enhanced the allocated funding for TVET institutions by 30% from the previous financial year and also capped the tuition fees to be paid by TVET trainees at Ksh. 56,420 per year in order to gain access to TVET programs. Further the trainees can apply for Higher Education Loan Board (HELB) to supplement their school fees. Applicants are able to access up to Ksh. 40,000 per year (MOE, 2019). Additionally, the trainees are eligible to apply for CDF and County Government bursaries.

The cost of preparation is one of the issues that public TVET institutes are worried about. According to Palmer (2017), one factor contributing to the high cost of TVET is the requirement for pricey premises, training materials, and equipment. Since public TVET institutions are expected to perform more with less funding and spend more on operations and development, budgetary allocations for technical vocational education and training are insufficient to leverage and underfund them (The Star, 2019). Additionally, inadequate funding in institutions will lead to insufficient training because of missing or inadequately equipped equipment, which will hinder trainees from gaining practical experience and result in the learning of impractical and inapplicable abilities. This is the impetus of the study.

2.4.2 Private Sector

In order for TVET to fulfill its crucial role in economic development, it became necessary to look for additional funding resources. Since the business sector directly benefits from well-developed TVET system outcomes, funding it has emerged as a key component of genuine collaboration with TVET institutions. Employers' active involvement in directing and delivering effective training mechanisms is ensured by the private sector's involvement in TVET funding, which also strengthens a competitive, result-oriented system (UNESCO, 2019). Around the world, many funding techniques are employed to supply extra funds for the TVET system through private sector participation. Levies, tax breaks, vouchers, and student loans are a few examples.

2.4.3 Development Partners

Since governments in underdeveloped nations are unable to supply all the resources needed in the field, TVET receives money from development partners. In order to finance

Technical and Vocational Education and Training (TVET), governments in developing nations may collaborate with bilateral and multilateral donor organizations. In certain countries, donor funding may be crucial for both starting and expanding training capabilities (Adrian, 2016). Development partners support TVET through the provision of cutting-edge technology, infrastructure development, trainer capacity building, and technical assistance. Instead of taking the place of public finance for training institutions, donor aid should be viewed as a complement to it.

The World Bank, Department of International Development (DFID), Netherlands government, NEPAD, JICA, China, German Cooperation, African Development Bank (AfDB), MasterCard Foundation, and the Department of International Development (DFID) are among the development partners financing TVET in Kenya. Since 2015, the AfDB has provided various forms of funding for the acquisition of equipment and the construction of infrastructure in TVET institutions. As a result, equipment for engineering and applied sciences was installed in a number of TVET institutions, TVET trainers were trained, and engineering workshops and laboratories were built in a number of TTIs.

2.4.4 Income Generating Activities

These are business enterprises created by TVET institutions to give trainees the opportunity to add practical experience while also bringing in money for the institution. The selling of services, facility rentals, and consulting are additional ways that public TVET institutions can make money. In order for TVET institutions to become self-sufficient in the future, the Kenyan government intends to use them as incubation hubs for inventions that could eventually develop into production facilities (UNESCO-UNEVOC, 2017). Offer training provides additional advantages in addition to improving their main revenue stream. This

helps them build relationships with businesses, better understand the request of the labor activity, and give their trainees chance to encounter real-world situations.

2.4.5 Collaborations and Partnerships

TVET is in high demand worldwide as a result of the drive for economic expansion, industrialization, technical advancement, and rising unemployment rates. In the 21st century, most nations have seen a steady gain in the demand for teaching for economic reasons as a result of modernization and technological advancement. International comparisons have long emphasized the value of investing in education and raising human resource productivity. Both the necessity of training those involved in the economy to use the new technology to develop and the relationship between the quality of human intervention and the rate of technological advancement have grown more apparent.

New skills are needed by supply not only the stripped of vocational preparation but also preparation for the industry (UNESCO, 2002). Additionally, the high rate of unemployment and other economic hardship in developing countries like Kenya have become of great concern (GoK, 2011). Graduates from TVET institutions are not left in this evil of unemployment yet report of specialized establishment is dependent on their ability to produce competent graduates who will be straightaway functional in the work place (World Bank, 1991). There is need to strengthen public-private partnerships to address the rapidly changing world of technology (Nurjanah & Ana, 2021). Public-Private Partnerships (PPP) and collaborations are important components of financing TVETs in many developing countries given the current budgetary and resource constraints of various governments and educational institutions (Mutungi et al., 2021). Ngeera (2015) noted that African government's deficiency beginning due to predominant poorness across the

Continent. Partnerships and cooperation between the TVET establishment and the industry will help the TVET institutions to deliver quality and relevant curriculum and training which is sensitive to the changing needs of the commercial enterprise hence addressing competency and unemployment gaps (UNESCO, 2016).

Through collaborations with Asian textile industry associations, trainees are supplied with the skill sets needed by the sector. Other partners provide the training institutes with sewing machines and educational tools in addition to offering the trainees trainer-of-trainer courses (Halim & Binti, 2019; Rajadurai et al., 2018a). Additionally, businesses send knowledgeable staff members to share their knowledge, give equipment which increase graduates' production and employability.

In Malaysia's current situation, officials from different ministry and education administrators make judgments about TVET projects and implementations based on ongoing methods that restrict the roles that industry participants can play in promoting TVET activities (Chin & Menon, 2018). Despite numerous reports of this problem on other platforms, a workable solution to address the issue has not yet surfaced. In order to meet the demand for a highly trained workforce, it is imperative that mechanisms be developed to transition from a supply-involuntary to a demand-driven economy and to retrain and upskill workers through lifelong learning (Kazmi, 2012).

To a certain degree, industry-institution partnerships will save money while making it simpler to retain talent (Bridgeford & Aman, 2017). Working together could help people develop flexible abilities that will help them survive the quickly evolving global economy and technology advancements (Mandvivalla et al., 2015). However, conflicting objectives

about the employee's or trainee's professional goals may cause relationships to fall apart. As a result, partnerships necessitate well defined roles and procedures for logical collaboration and significant work from the government, trainers, and educators (Taylor, 2006). This study will identify potential avenues for collaboration between academic institutions and industry.

In Bangladesh, there is a gap in skill development and employment of TVET graduates in the industrial sector despite the fact that TVET is essential for economic growth. As a result, research has been done to identify supporting policies that would link TVET with the industrial sector. Studies done revealed that TVET institutions and industry collaborate, and that supportive policies are required to provide the desired linkages. Industries and TVET institutions collaborate on joint projects and share responsibilities for promoting formal and non-formal TVET in keeping with labor market demands; taking technical advancements into consideration (Siddiky, 2020).

The perspectives of several stakeholders (community, government, employers, and civil employees) regarding graduates' competencies are examined by East African Guàrdia et al. (2021). The article discussed a study that looked at how academics, employers, and government officials in East Africa felt about graduates' competencies. It specifically examined factors impacting the gap between skills obtained in higher education (HE) and those in demand by industries. A survey and focus groups were used as part of a mixed-methods approach. The regional stakeholders were given the competency questionnaire, which was also utilized for group discussion during an open forum. The study found that preparing trainees for the workforce only through education was insufficient. To ensure trainees' skill development and program success, it is advised that ongoing industry

involvement be used. However, this research was done at African universities. To identify issues and recommend solutions for TVET institutes in sub-Saharan countries, more research is necessary.

Most researchers including Ngware (2021) contend that the mismatch between graduates skills and the industry requirement is major cause of youth unemployment. Skills development in the SSA region therefore becomes very critical in enhancing competency (Evans & Santos, 2019; Guàrdia et al., 2021).

According to Kamuhabwa's (2019) study in Tanzania on graduates from TVET institutions, graduates lacked skills as a result of ineffective training strategies, inadequate facilities and equipment, and ineffective educational policies. Even when there were sound educational regulations in place, the implementation of those policies by uninspired trainers prevented trainees from acquiring marketable abilities. But there was no mention of industrial engagement in the study.

As an illustration, the participation of industry participants in Singapore has resulted in the creation of boards with employer representatives and instructors from the sector, as well as donations of equipment and modernized tools to the VET institutes. In collaboration with trainees and industry leaders, confirmations have sparked the creation of technology and breakthroughs. The work experience acquired is crucial for potential future employment. They also mentioned how crucial it is for the government to engage the industry by offering incentives like tax breaks, among others, in order to bring about these collaborations. The planning of the institute's curriculum must involve both partners.

Geressu (2017) assessed the impact of competency-based curricula on graduates' employability in Ethiopia. Using a mixed-methods approach, the study involved 162 trainers, 123 automotive engineering trainees, 24 staff members including business owners, college deans, and industry experts and trainees. The study critically examined how competency-based training affected the competency of Ethiopian technical and vocational college graduates. Intentional sampling was utilized to assess the replies through focus groups and interviews, and the results were presented using both prescriptive and inferential statistics. It was found that the shortage of funding prevented the TVET institutions from effectively teaching their trainees the necessary information and skills. They suggested include stakeholders in the creation of competency-based learning, instructional methodologies, and learning outcomes.

The viewpoints of stakeholders on employability in the public and private sectors were examined by (Cheng et al., 2021). The assessment disputed that the employability strategy was solely about converting universities into training facilities and instead stressed the significance of trainees comprehending the subject matter. Competency is a contentious topic since stakeholders' perspectives might vary depending on institutional disparities and national regulations on competency. However, since they are the end users of TVET products, the industries are crucial in improving the sustainability of TVET institutes (Ayonmike, 2014). They concluded that the best way to deliver the competency problem is for businesses to pinpoint their own areas of need in order to train and retrain trainees in more pertinent skills for sustainable development.

The industry and TVET institutions in Kenya do not have a strong enough connection (Glory et al., 2021). According to the current state of the TVET collaboration, rigorous

planning must be done on a regular basis in order to make the program more adaptable, responsive, and available to Kenyan industry and the general public. To increase the efficacy of the TVET training program, the private sector should be involved at every stage of training. In order to make the abilities that the trainees acquire more applicable to the sector, the CBET Approach requires cooperation with the industries during training (Kufaine & Chitera, 2013).

Therefore, curriculum development in collaboration with the industry player is essential in the implementation of CBET in TVET institutions in Kenya because it ensures that educational programs are relevant, responsive to industry needs, and focused on developing the competencies required for trainees' success in the job market. It promotes a learner-centered, outcome-driven, and flexible educational approach that can significantly benefit both trainees and the nation's economy.

2.5 Adequacy of Infrastructure

To effectively implement the CBET curriculum, TVET institutions require a robust and specialized form of infrastructure. The blend of physical, technological and Information and Communication Technology infrastructure plays a crucial role in the preparedness of TVET institutions for the implementation of a CBET curriculum in Kenya. Well-equipped classrooms and workshops are essential for hands-on training and practical skill development, which are at the core of CBET programs. To give trainees access to contemporary tools and technology, specialized labs are required, including computer labs, virtual labs, scientific labs, libraries, and engineering labs. Availability and sufficient infrastructure are crucial determinants of TVET institutions' preparedness to successfully execute CBET curricula in this digital age. The current state of infrastructure in TVET

institution setup and its function in ready institutions for program delivery on CBET are examined in this study of the literature.

2.5.1 Physical infrastructure

For any form of TVET program to be implemented successfully, adequate physical infrastructure is crucial. TVET institutions make use of the institution's physical resources, including classrooms, laboratories, power and water supply, libraries, workshops, auditoriums, and leisure areas. Availability of physical infrastructure enhances academic performance. According to Ogundu et al. (2019), the problem-solving and critical thinking skills that may be fostered by the use of practical tools in the workshop are what Africa, and specifically Nigeria, need today. According to Umar and Ma'aji (2020), a number of TVET institutions in Nigeria are forced to perform below expectations since the facilities needed in the workshops for efficient skill development are purportedly unavailable, poorly managed, or completely neglected. Consequently, there is a requirement to give enough machines, tools, and workshop supplies to carry out TVE activities in Nigeria effectively.

In line with the aforementioned, Akeke and Eyo (2018) found that due to a lack of sufficient tools and equipment, trainees were forced to complete practice activities in groups. Also discovered was how infrequently functional the few pieces of equipment and tools were. They also noted that lack of funding is frequently cited as a problem impeding the effective implementation of TVE programs in Nigeria, since this has resulted in a dearth of resources and supplies needed to do efficient practical work in the schools' workshop.

The availability of suitable tools and equipment in the workshop improves trainee learning by enabling him to participate in practical and practice, which aid in their ongoing skill-building required by the labour market. The unsuitable condition of shop tools and

instrumentality in TVET institutions in Nigeria, however, is one of the topics of much debate among TVET instructors today (Okolie et al., 2019). Consequently, there is a requirement to give enough machines, tools, and workshop supplies to carry out TVE activities in Nigeria effectively.

According to Mbata (2019), several workshop tools and equipment were subpar and could not be easily maintained to make them functional again. According to Audu (2013), it is infeasible for the trainees to acquire preparation that fits the requirements for employ in manufacture or linked organizations due to non-useful workshop tools and instrumentality. The nontechnical trainer is limited in his use of the demonstration method of instruction without operable workshop tools and equipment. Technical Vocational Education (TVE) has a theoretical cap; if teaching and learning go beyond that cap, skill acquisition is hindered and TVE turns into "theoretical education." Therefore, it is not unexpected that Ayonmike and Okeke (2017) lamented the fact that TVE program graduates were being turned down by industries because they had received the incorrect kind of training in TVE institutions. The incorrect type of education suggests that TVE graduates were actually lacking in practical experience, making them unable to meet market expectations. Therefore, the primary obstacle to the development of skills in Nigeria is the absence of suitable and functioning training facilities, including tools and equipment for workshops.

A study on the impact of contemporary training and educational resources in TVETs in Kenya examined how they raised employment rates and the caliber of technical education (Musyimi, 2021). In order to sample 172 trainees from three TVET institutions that had acquired contemporary training and learning resources, a cross-sectional survey research design was utilized, along with proportional stratified random sampling. To gather data, a

survey questionnaire was used. The analysis of both quantitative and qualitative data was done using descriptive statistics. The data was examined via the fictitious perspectives of vocationalism and globalization.

The findings demonstrated that the availability of contemporary equipment enhanced TVET classrooms to satisfy industrial demands and enabled the development of critical skills as a result of high-quality training that leads to employment. Additionally, better industry engagement resulted in the offering of industrial attachments, which exposed trainees to the real labor market while they were still enrolled in school. With higher-quality programs, the availability of contemporary teaching and learning tools has altered the perception of TVET colleges. As the TVET trainees gained employment skills, their self-confidence also increased.

Adequate physical infrastructure is essential to the successful implementation of any TVET program. Classrooms, laboratories, power and water supplies, libraries, workshops, auditoriums, and recreation facilities are among the physical resources used by TVET institutions. Academic achievement is improved when physical infrastructure is available. The majority of TVETs in Kenya run with workshop facilities and few training resources, claims (Maingi, 2019). The absence of training facilities jeopardizes the ability of trained skills to meet market skill needs in industries and commercial organizations. The quality assurance manual in Kenya states any technical training institution should have adequate offices, classrooms, laboratories, sanitation facilities, utilities, storage space, workshops and library space depending on the programs being offered.

Technical Vocational Education and Training require adequate resources in order to have market ready trainees who match the industry needs. High quality skills require appropriate modern training tools and equipment, adequate training materials, relevant textbooks and training manual and practical by the learners (Nathaniel, 2020; Muriuki & Dominic, 2022). Teaching and learning materials are referred to as learning resources. The number of trainees already enrolled and anticipated, as well as the best teaching methods for all learners, defines the teaching-learning resources in TVET institutions. The theoretical lessons and the anticipated practical abilities establish the learning environment and space. Depending on the training requirements of the trainees, some TVET institutions may decide to pool or lease equipment. Given that TVET learning is practical and industry-focused, some institutions choose to move workshop experiences from the institute to employer locations as part of the learning process (Mbatha, 2021). Educational resources are divided into the following categories at TVET institutions: human, material, physical, financial, time, and information resources (Yigezu, 2017).

Trainers, support personnel, trainees, and stakeholders who directly or indirectly oversee the institution make up the TVET institutions' human resources. Organizing, coordinating, and controlling resources are the primary function of human resource management (Usman, 2016). Print and electronic textbooks as well as ICT teaching tools are examples of materials resources. TVET institutions make use of the institution's physical resources, including classrooms, labs, libraries, workshops, auditoriums, and leisure areas. Time spent in a TVET institution is crucial for carrying out learning activities and is necessary to ensure learning occurs on both at personal and institutional level (Msimanga, 2019).

Materials on inclusion or behavior policies in schools, instructions for administering tests, and information for new instructors are examples of institution-specific resources. For teachers to utilize in a library or specific part of the staff room, some organizations supply books or journals about teacher development. Additionally, all teachers have access to online materials, particularly publications on teaching and education.

Trainers use a number of intriguing and engaging methods to teach the concepts outlined in the curriculum in order to guarantee that trainees are fully engaged in their learning. By making learning more enjoyable, dynamic, and engaging, these tools or resources can assist trainees in turning theoretical knowledge into practical application. Through the efforts of the government to equip technical institutes with modern equipment (PSCU, 2019), the teaching-learning materials are available but inadequate in TVET institutions in the coastal region (Mwashighadi et al., 2023). This forms the basis of the research to find out if the same state applies in Mt. Kenya East Region, Kenya.

Studies carried out in Zambia by Mulenga and Chileshe (2020) on the suitability and sufficiency of teaching and learning materials, 74% of the trainers said that the infrastructure and modern equipment were insufficient to give the trainees the necessary skills. Convergent concurrent design and a mixed strategy were employed in the investigation. After being gathered and examined independently, the quantitative and qualitative data were compared and evaluated. Two directors and six principals were sampled using purposeful sampling. Sixty trainers were selected using stratified and simple random sampling. In agreement with the findings of Kigwilu and Akala (2017), the trainers retorted that the instruction and learning resources were insufficient for both theoretical and practical learning.

A mean score of 2.57 and a standard deviation of 0.620, the trainers in the study disagreed that knowledgeable mentors during industrial training assisted trainees in gaining information that prepared them for employment. The study also found that the institutions (1.84 and 0.779) were not doing tracer studies. According to the study's findings, TVET institutions lacked the teaching-learning resources that students needed for hands-on training in order to develop the competencies and abilities that businesses demand. In order to produce competent graduates, the study advised TVET colleges to have sufficient, pertinent teaching-learning materials.

The impact of the accessibility of learning information in youth polytechnics in Kakamega County was examined by Barasa and Kwasira (2019) in Kenya. With 105 participants, the descriptive research design used the human capital theory. Utilizing SPSS version 24, the quantitative data was evaluated, and the study found that the accessibility of resources is what accounts for the youths' economic empowerment in Kakamega County. Economic empowerment served as the study's dependent variable, and the only independent variable included was learning resources. Other factors that explain youth empowerment are made difficult to comprehend by this. The report suggested that counties, the federal government, and donors support funding for the provision of teaching and learning tools for polytechnics. Ndile (2018) used 229 students from technical learning institutions in Nairobi to assess the impact of CBET method delivery on allowing employability. The quantitative study sampled the responses using questionnaires and stratified random sampling techniques. The study also discovered that competency-based education was successful in enhancing graduates' skills and industry-related abilities.

Orangi et al. (2016) used a sample size of 452 respondents in the clothing and textile sector among TVET institutes in Kenya to investigate the infrastructural capability and trainer characteristics. The assessment concluded that the resources needed to be upgraded because they were insufficient and out-of-date. Additionally, the study only included graduates from the textile industry school and gave priority to those who were enrolled in other courses. Similar to this, Kibwami (2021) studies asserted that the availability of tools, resources, and equipment for learning ensures the success of any educational system by facilitating high-quality instruction and curriculum implementation.

With a sample of 172 students and 18 teachers, Kigwilu and Akala (2017) employed a mixed research design technique to examine Catholic-sponsored community colleges in Nairobi. Although there were workshops, equipment, lecture halls, laboratories, and raw materials accessible, the investigation revealed that they were not being used to their full potential. This made it difficult for those institutions to effectively teach and learn. According to the study's findings, the following conclusions were made: The majority of research concluded that learning resources were insufficient and those that were available were being underused. This made it more difficult for trainees to learn new things and develop new skills. However, the majority of studies did not show how the learning resources affected the graduates' ability to find employment (Kigwilu & Akala, 2017). This study was carried out in a private college and therefore there is need for a study in public TVET institution which the proposed study seeks to undertake.

In Butula Sub-county, Busia County, Kenya, Ongulu and Ibrahim (2021) undertook an investigation of the impact of satisfactory instruction and acquisition tools on students' enrollment in technical, vocational teaching and training establishment. The target

population for the study was principals who were chosen through census; tutors were stratified; proportionate random sampling was used; and trainees were systematically sampled from technical institutions in Butula sub-county. The study used a prescriptive design with the adoption of a case study. The study's collection indicated that the adequateness of training resources has an impact on trainees' decision to enroll in TVET institutions. The research instruments employed were questionnaires and interviews. Since the study's focus was on TVET institutions in the Butula sub-county, which is comparable to the consequently, when gathering information from the respondents, the proposed study will use questionnaires and interviews to collect data.

Skillfulness and instrumentality of training in TVET institutions are not adequate, obsolete and cannot be compared to those in manufacture where graduates are likely to work after graduation (Muriuki & Dominic, 2022; Chepkoech, 2021)

2.5.2 Tools and Equipment

The accessibility of suitable workshop facilities improves trainee learning by enabling them to participate in illustrations and practice, which aid in their ongoing skill-building required by the labour market. The deprived condition of workplace tools and equipment in TVET institutions in Nigeria, however, is one of the topics of much debate among TVET instructors today (Okolie et al., 2019). According to Umar and Ma'aji (2020), the majority of TVET institutions in Nigeria are obliged to perform below expectations since the facilities needed in the workshops for efficient skill development are purportedly unavailable, poorly managed, or completely neglected. Consequently, there is a requirement to give enough machines, tools, and workshop supplies to carry out TVE activities in Nigeria effectively.

According to Mbata (2019), several workshop tools and instrumentation were subpar and could not be easily maintained to make them functional again. According to Audu (2013), it is difficult for the trainees to acquire preparation that fits the requirements for occupation in industries or linked organizations due to a shortage of workshop tools and equipment. The technical trainer is limited in his use of the demonstration method of instruction without operable workshop tools and equipment. Technical vocational education (TVE) has a theoretical cap; if teaching and learning go beyond that cap, skill acquisition is hindered and TVE turns into "theoretical education." Therefore, it is not unexpected that Ayonmike and Okeke (2017) bemoaned the fact that TVE program graduates were being turned down by industries because they had received the incorrect kind of training in institutions. The incorrect type of education suggests that TVE graduates were sufficiently lacking in practical experience, making them unable to meet market expectations. Therefore, the primary obstacle to the development of TVE in Nigeria is the absence of suitable and functioning training facilities, including Tools and equipment for workshops.

In a research published in 2021, Musyimi examined the impact of contemporary teaching and training tools on TVET quality and employment rates in Kenya. 172 trainees from three TVET institutions that had obtained state-of-the-art teaching and learning equipment were chosen using proportional stratified random sampling and a cross-sectional survey research methodology. Data was gathered through the use of survey questions. Open-ended questions were assessed qualitatively, while quantitative data was analyzed using descriptive statistics. The theoretical frameworks of vocationalism and globalization were used to analyze the data. The findings demonstrated that the availability of contemporary equipment enhanced TVET rooms to satisfy industrial demands and enabled the

improvement of critical skills as a result of high-quality training that leads to employment. Additionally, enhanced industry engagement resulted in the delivery of industrial training, exposing students to the real labor market while they are still enrolled in school. With higher-quality programs, the handiness of contemporary teaching and learning tools has altered the perception of TVET colleges. As the TVET learners gained practical skills, their self-confidence also increased.

2.5.3 Availability of Information Communication Technology (ICT) Resources

The CBET curriculum was introduced in the TVET sub-sector in Kenya to address concerns of industry players who stated that graduates from Tertiary Institutions possessed skills that were not relevant to the job market. Secondly, it was noted that a large number of youths were dropping out of school and ending up in the informal sector where they worked as Apprentice for very low wages. In a quest to realize the objectives of vision 2030, there was need to carry out reforms in TVET training in order to produce globally competitive human capital. The government of Kenya has heavily invested in education including Information Communication Technologies (ICTs). The Ministry of Education through the State Department of TVET has signed a partnership with Huawei, Google and Ministry of ICT to enhance ICT development within TVET by initiating Open, Distance and E-Learning (ODEL) since 2021 following the Covid-19 pandemic (Yano, 2024). With the help of ICT, trainees can improve their creativity, receive access to their study materials through digital learning resources, acquire insights into their study subject, and produce original learning materials through game-based activities (<https://www.kenyanews.go.ke>). It is well known that incorporating ICT into the teaching process inspires both instructors and students. It also helps them to understand abstract ideas, save time, actively involve the students, and make the trainer's job easier (Najjuma, 2024).

The ICT infrastructure which includes hardware infrastructure like computers & laptops, smartboards, projectors, servers and networking equipment for trainers and trainees to access digital learning materials and assessment. Software and platforms like Learning Management Systems (LMS), e-portfolios for monitoring trainee's skill development, AI-based assessment tools and digital content creation software for developing interactive training materials are crucial in curriculum implementation on CBET. Internet connectivity like Wi-Fi infrastructure, broadband internet for online learning, assessment and research, Cloud-Based services for remote access to learning materials and digital collaboration. All this is meant to enhance access to information, support online & remote learning, research and streamline content delivery & assessment processes (Yano, 2024). These are essential for ensuring that TVET institutions are well-prepared to deliver a CBET curriculum that meets the evolving needs of trainees and the job market in Kenya.

The availability and sufficiency of ICT infrastructure will alter how people live, work, and conduct business. One crucial trend in education for the twenty-first century is the use of ICT. To succeed in a global market, the trainees must be able to communicate, work together, analyze, develop, innovate, and solve problems using their ICT knowledge. UNESCO states that in order for trainees to acquire "Twenty-first (21st) Century Skills," educational system improvements are required. The skills, aptitudes, and learning styles that educators, corporate executives, scholars, and government organizations have determined are necessary for success in 21st-century society and businesses are known as 21st century skills (Mutungi et al., 2021). Mutungi went on to say that 21st century skills are the information, life skills, professional skills, habits, and characteristics that are vital to a trainee's success in the fast-paced world of today, especially when it comes to the

transition to college, the workforce, and adulthood. As a result, the skills are necessary to guarantee relevance throughout one's life in the information economy and to become responsible citizens in a learning society.

Enhancing human knowledge is the justification for educational equipment. Implementing educational ICTs in the classroom and using advanced testing and assessment methods are critical to addressing the numerous issues confronting the education sector (Najjuma, 2024). To stay up with rich countries, the participants in the education sector in emerging countries must embrace and become proficient in ICT. Therefore, educational technology can be used to expedite and facilitate both the numeric expansion and the qualitative development of education (UNESCO, 2022).

The robust information and communication technology (ICT) infrastructure of Japan's Technical and Vocational Education and Training (TVET) schools includes new computer labs, learning platforms, interactive classroom technologies, a large e-library, and online resources. TVET programs also include ICT training to equip students with the necessary digital literacy and ICT skills. By providing students with practical experience with cutting-edge technologies and contemporary market situations, partnerships with corporate partners further improve the educational process (MEXT, 2024).

Use of technology is critical for acquisition of relevant skills in the world of globalization and industrialization. To work with new technologies and the rapidly changing technology, TVET graduates require relevant hands-on skills (Omotayo & Collen, 2023). Introduction of ICT and E-learning methodologies can lead to quality trainings, innovations and increased access to learning opportunities (Nathaniel, 2020). Incorporating ICT in TVET institutions calls for a curriculum that has digital content, accessibility to electricity,

internet connectivity, trainer's digital skills, adequate computers, pedagogical culture changes and budget provision for operational and maintenance costs (ILO,2021). Investment in technology in TVET sector will enable Africa to catch up with developed countries (Afeti, 2017). In China, TVET institutions use technology in training delivery in order to meet the demand for skilled labour force required in the manufacturing technologies. This has made it easy for TVET graduates to secure employment immediately after graduation where 90% of TVET graduates find gainful employment within six months of graduation (Nathaniel, 2020).

Graduates who can design, monitor, and set up computer and device networks are in great demand as society's need for connectivity rises in the digital era. The Open Networking Lab is a brand-new initiative that the traditional classroom teaching approach is attempting to catch up with in the UK. By incorporating a web-based simulation package into learning resources, the open networking lab introduces networking skills without the requirement for hardware. This enables trainers to conduct training events in which trainees gain industry relevant skills (Mbuthu, 2023).

Technical and vocational education is utilized in Africa to train individuals for professions as technicians, craftsmen, and technologists in a range of sectors. Because of the training, they are capable of working in both the public and private sectors of the economy. According to Ndomi (2005), both industries need the help of skilled workers who can operate and maintain the equipment and modern tools at their disposal. There is a need for high-quality TVET training to produce graduates who can function well in their skill area of competence without the need for pre-employment training. Preparing trainees for effective employment in the labor market is TVET's primary objective through CBET

(Kintu & Ferej, 2019). This requirement can be satisfied by a curriculum that is practical-oriented and up-to-date, a workshop that is well-equipped with the state-of-art equipment to expose the trainee to the current technological changes like Internet of Things and Artificial Intelligence. The use of Augmented Reality (AR) and Virtual Reality (VR) provide immersive, hands-on experiences for skill-based training like in technical, medical and engineering skills area.

In order to lower youth unemployment, Zambia has been operating and establishing Vocational Education and Training Institutions (VETI). Studies were carried out on the suitability and sufficiency of the teaching and learning resources provided by an institution for trainees in connection to the industrial attachment those students are sent on. The responses were randomly selected from college deans and professors from various VETI. The findings demonstrated that TVET institutions faced a variety of difficulties, such as inadequate contemporary workshop facilities and a lack of reading materials. The study suggested creating an environment that is conducive to learning so that graduates may pick up the necessary technical skills for the market (Mulenga & Chileshe, 2020).

Maingi (2019) found that the majority of the training tools used at TVETs aren't technologically compatible with tools used in businesses and workplace. The study compared the equipment utilized in businesses and industries, and the training equipment. The current state of training technology is obsolete and are rarely used in the industry thus making taught abilities less relevant to market skill requirements (Muriuki & Dominic 2022). To ensure that graduates of TVETs gain skills relevant to the skill needs of industries and workplace, it is urgently necessary to equip the workshops and laboratories with state-of-art equipment, install reliable internet, electricity and advanced technologies. This will

affect the curriculum implementation on CBET positively and therefore the government needs to embrace improving ICT infrastructure in public TVET institutions.

In Kenya, TVET has faced challenges in adopting digital technology and online learning. For a very long time, TVET institutions have been imparting practical skills through the traditional way of training. A study by Chepkoech (2021) indicates that there is a challenge of ICT laboratories in the TVET institutions where one ICT lab served over 500 trainees. Newer technologies like Augmented Technology and Virtue Reality should be embraced as alternative to the traditional ways of training. Other technologies like 3D printing, artificial intelligent, drone technology, robotics, nanotechnology and renewable energy technology are being mainstreamed at the work place thus replacing old jobs and creating new ones. Having these technologies remains a challenge in TVET institutions (World Bank, 2019; OECD, 2018). Most TVETs experience technological challenges like; internet connectivity, high costs of internet, electricity blackouts, illiteracy in ICT skills which lead to poor participation of the trainers and trainees (TVETA, 2024).

Inadequate and insufficient infrastructure is a major constraint in quality and quantity development of competencies of TVET graduates (AfDB, 2022). It is the infrastructure that the institutions have available that supports reading, learning, dissemination of information and practical skills to trainees. Insufficient modern and quality infrastructure for skill development is a major challenge thus forcing Africans to seek the skills outside the continent (AfDB, 2020). The inadequacy of ICT infrastructure and connectivity affects quality service delivery, accessibility to remote areas hence reduction in enrolment of trainees in TVET institutions. Low penetration of internet connectivity in most African countries has affected the youth acquisition of digital skills (AfDB 2020a, AfDB 2020b).

2.6 Preparedness of Trainers

The role of trainer's capacity building is pivotal in the successful implementation of CBET curriculum. Trainers need to be well-versed in the CBET curriculum, its learning outcomes and the specific competencies it aims to develop. Trainers play a vital role in delivering the curriculum effectively to trainees, ensuring that they acquire the necessary workplace skills and knowledge (Muthuri, 2023). The trainers actively engage trainees in the training process, foster and sustain motivation for learning and utilize creative technique (Muraraneza & Mtshali, 2018). The trainers and technical staff need to keep up with industry trends and technological advancements and therefore require continuous learning and professional development. This enables them to incorporate the latest practices and technologies into the curriculum, ensuring that trainees are prepared for real-world demands. Trainers are in the front line of delivering and one of the priorities of UNESCO-UNEVOC is to develop the capacity of trainers in TVET institutions through skilling and upskilling on what the industry requires as they impact the same to the trainees (UNESCO, 2022).

Technical staff play an important role in ensuring the quality of practical training. The technical staff need to maintain equipment, laboratories, and workshops to high standards, which directly impacts the quality of hands-on training while Trainers often serve as mentors to trainees guiding them through their educational journey, providing career advice, and helping them bridge the gap between training at the institution and the workforce (Sitienei, 2020).

Trainers and technical staff play a multi-faceted role in the successful implementation of CBET curriculum. Their continuous capacity building and commitment to staying current

with industry developments are vital to providing trainees with a high-quality, competency-based education that prepares them for the workforce (Muthomi et al., 2023).

Trainers are the major stakeholders in delivering Technical and Vocational Education Training and are tasked with delivering key skills to trainees and quality work force as development of workplace skills falls upon TVET trainers (Muriuki & Dominic, 2022). Nothing much can be achieved without experienced and qualified trainers who plan and execute TVET programs. According to Muriuki and Dominic (2022), TVET trainers should be supported to improve their capacity, subject matter knowledge as well as exposure to the latest industry trends and technologies. Quality education is determined by the quality of trainers, how knowledgeable they are, their subject matter mastery, professionalism as well as the methods of instruction. TVET trainers need competencies based around knowledge, technical and personal attributes and the ability to impart those competencies on their trainees. A poor teacher instructs, a good teacher explains, a superior teacher exhibits, and a great teacher inspires (Arthur 2022). In the ever-complex changes in the world, where trainers are required to be innovative in their teaching and learning ways to meet the 21st Century skills (Arif et al., 2021), the demands of TVET trainers are speedily growing, thus requiring support and training from the employer and the industry. The challenge most TVET institutions have is inadequate trainers and inadequate support staff which leads to trainees ending up with theoretical knowledge as opposed to practical and interpersonal skills (Mwashinghadi & Kitainge 2023; Anindo, 2016). Sifuna (2020) argues TVET teacher training in Kenya do not provide adequate training in the practical skills that TVET trainers are later expected to teach.

Approximately 29.15 million trainees attended vocational schools and colleges in 2022. However, by 2025, China is expected to have a 30 million manpower shortage in manufacturing (Zhang et al., 2023). Great-caliber VET graduates will be in great demand due to rising economic and industrial changes, necessitating the need for highly skilled professional labor. Zhang et al. (2023) conducted empirical research on the factors impacting the professional competency of instructors in vocational education and training. To prove professional competence, a comprehensive diagnostic approach was employed.

Over a ten-year period, 601 VET teachers in 39 Chinese vocational colleges were given questionnaires. To investigate the trainers' professional competency, pathway analysis was used. The study discovered that professional competency was influenced by skill awards, the highest level of professional qualification, the kind of course (practical or theoretical), and the highest academic degree.

To ensure quality training in Kenya, TVETA was given the responsibility of accrediting all TVET trainers according to TVET Act of 2013. A TVET qualifications framework advance training flexibleness and cohesion, lifelong learning and acknowledgment of prior acquisition within the TVET system which are significant to skill development (Afeti, 2017, Nathaniel, 2020). From the quality assurance manual of TVETs in Kenya, a minimum TVET trainer qualifications and compulsory industrial training needs to be enforced so that they can be able to prepare trainees for the industry.

On retraining TVET trainers in Kenya, it was noted industries are dissatisfied with inadequate skills among prospective TVET graduates due to the technological changes yet TVET institutions are not keen in infusing the same to trainees. In order to determine the

viewpoint, difficulties, and solutions that address the development of skills for the dynamic industry, the study used desktop research and the quantitative survey approach. The data was gathered via the questionnaire. 550 long-serving TVET trainers and recently hired trainers pursuing in-service training at KSTVET are the target population. According to the survey, TVET instructors struggle to adopt the skills required for the rapidly evolving technology in the workplace, lack sufficient industry exposure, and prioritize exam success over trainees' academic performance.

The study recommended industry to be involved in teacher training. The recommendations were; trainer qualifications should be purely technical, demonstrating industrial experience before employment, retraining and up skilling of trainers, equipping TVET institutions with adequate and relevant training equipment, infusing of workplace skills in the curriculum, a shift from exam to skill-oriented training and enhanced industrial collaborations and partnerships.

A TVET program is distinguished by having highly trained, experienced, technically competent, experienced and enthusiastic trainers who prepare the trainees with quality workplace skills for the world of work (Mohamed, 2022). There is need to develop policies and frameworks that to ensure highly qualified TVET trainers and instructors (UNESCO, 2022). According to Muriuki and Dominic (2022) and Muthomi et al. (2023), the majority of TVET institutions in Kenya, including Meru, lack suitably skilled trainers with the fundamental technical abilities necessary to run basic workshop machinery and training equipment. They also pointed out that the chaos in TVET skills delivery is a result of poor planning and trainer recruiting. This is attributed to a number of factors, including a lack

of upskilling trainer skills, a lack of industry involvement, existing shortcomings in TVET teaching pedagogy, and a lack of workplace skills in the curriculum.

Before being hired, TVET trainers should have only technical credentials that demonstrate industrial expertise, according to (Muriuki & Dominic, 2022). Additionally, the study suggested that workplace skills be prioritized and integrated into the curriculum at all levels. Therefore, it is crucial to comprehend how trainer capabilities affect the implementation of CBET in order to establish professional development programs that effectively support trainers and raise the standard of CBET as a whole. Thus, the purpose of this study is to examine how trainer characteristics such as educational background, work experience, job expertise, and trainer attitudes affect TVET graduates' development of workplace skills in Mt. Kenya East Region, Kenya.

2.6.1 Educational Level

A TVET trainer who has received the necessary pedagogical training and certification in their area of specialization is considered fully trained. For TVET trainees to adopt the proper attitude and aspirations during all the crucial phases of their academic journey, TVET trainers must have the necessary personal, ethical, professional, and instructional qualities (Muriuki & Muguti, 2022). Standards established for trainers in the nations instructing blueprint help determine the qualities of TVET instructors. The role of trainers is based on skilled instruction, goal-oriented, technical planning, and good organizational skills that reflect the instructional process and include a methodical evaluation of the instructor.

A good trainer is one who comprehends the curriculum thoroughly, employs a range of teaching techniques, uses new technology and is aware of the interests and skills of the learners (Mansour, 2021; UNESCO-UNEVOC, 2020). While TVET institutions may not have as much of an impact on the education sector as other higher education institutions do, they nonetheless have a bigger impact and more value than all the other institutions put together. TVET trainers are crucial in ensuring that their trainees acquire the necessary workplace skills to meet the demands of the industry as they deliver knowledge and transfer experience during induction and training (Omar, Zahar & Rashid, 2020). The trainers need training and retraining to regularly upgrade their skills and knowledge to meet the ever-evolving needs of the industry in the world of work (UNESCO-UNEVOC, 2020; Muriuki & Muguti, 2022).

By examining the caliber of the instructions, one can gauge the quality of the trainer. In addition to enhancing competencies, ongoing professional development for trainers improve their effectiveness and also helps them build relationships with industries (Langat et al., 2021). Trainers are expected to creatively engage trainees in order to promote learning, which necessitates having the necessary skills and instructional resources (Omar et al., 2020). South Asian studies revealed that, based on their performance, more seasoned trainers are pleased with their trainees' academic results (Asian Development Bank, 2022). India now ranks among the top education hubs in the world thanks to reforms to its educational system. The most crucial human resource needed to build India and make it competitive in the global market is an educated and talented workforce. Since trainers are the change-agents in the knowledge society, TVET trainers must not only be academically qualified but also have a working knowledge of global systems and processes. The Indian

government recognized the necessity to guarantee TVET instructors have the necessary knowledge, abilities, and attitude to work in the field through re-skilling and up-skilling of TVET trainers (Asian Development Bank, 2022).

In Kenya, a trainer in a TVET institution is required to apply for a trainer's license from the TVET Authority. For implementation of Competency-Based Education and Training (CBET) curricula, the trainer must have the following competences; competency to plan for a training session, deliver the training, conduct assessment as well as maintain the training facilities. Prior to gaining adequate technical and industrial experience, the majority of trainers in TVET institutions are hired directly from Kenya School of Technical Vocational Education and Training College (KSTVET) and nearby universities; they lack sufficient practical exposure in the industries they are expected to train in (Muriuki and Dominic 2022). According to Akala and Changilwa (2018), the majority of trainers lack pedagogical aptitude, which results in improper teaching and instructional approaches. This serves as the foundation for the investigation into the trainers' preparedness to implement the CBET program.

A study by Selina et al. (2021) sought to examine the capacity of trainers in quantity and quality in western Kenya. Correlation study design was employed. Data collection tool were questionnaires and interview guides administered to trainers (400) and principals (15) respectively. The findings revealed that 79% of trainers agreed TVET institutions had inadequate staff thus the institution hired part time trainers who did not have practical experience with training and industry. The study found out majority (63.4%) of the trainers had the first degree and did not have experience of CBET curriculum. The study

recommended TVET institutions to be adequately staffed with qualified trainers. This is the impetus of the study.

2.6.2 Experience

Through lifelong learning the skills of trainers can be continually upgraded to sharpen their skills in tandem with technological changes. A great trainer keeps learning. Such a trainer transfers knowledge and new skill, boosts morale and ensures the objectives of the training are met. An experience trainer has knowledge and understanding of many teaching methodologies and can develop and use diverse training materials. The competence of trainers depends on how they continue to learn and upgrade their knowledge and skills (TVETA, 2020). Globally, training of trainers is highly recognized and encouraged as per the curriculum requirements so as to meet the demands of the labor market. The United States Bureau of Labor Occupations classifies TVET instructors based on fundamental duties such educating trainees one-on-one and in groups, creating lesson plans and activities, and choosing teaching strategies that work best for their trainees. TVET trainers want to make sure that all trainees achieve the specified objectives for each lesson. The ability to communicate with key stakeholders, collaborate on projects with important stakeholders, and work through challenging concepts that their trainees are unable to understand are among the key competencies for TVET trainers. The ability of the instructors to be understanding of trainees who struggle to grasp concepts quickly is a crucial factor. Although some nations have created their own trainer competence frameworks that are in line with their country's industrial needs and trainee assignment, studies conducted in the USA show that TVET trainer competence frameworks are well-known compared to trainers in general education. Governments need to allocate adequate

resources to training and continuous professional development of trainers which boosts their experiences (Nathaniel, 2020).

In Kenya, Muriuki and Dominic (2022), noted most of the TVET trainers had cumulatively below three years' prior experience working in related industry. Majority of the respondents had less than one year of prior work in the industry. That confirmed most TVET trainers lacked adequate industry exposure thus cannot transfer the required workplace skills to those they train.

2.6.3 Job Knowledge

Every career has certain required knowledge, skills and abilities that are essential for its success. It is believed that the quality of a product is determined by the producers' level of knowledge, skills and abilities. Consequently, TVET trainees can be competent if the trainers have been adequately equipped with the workplace skills (Muriuki & Dominic, 2022). Job knowledge is about the trainers understanding their responsibilities of the job of training. Clarity of one's roles and responsibilities impacts work motivation, satisfaction and performance of the trainers. In TVET, the trainers are required to have both technical skills and soft skills to accomplish their training roles thus they need to upgrade their technical and practical knowledge and promote trainee-centered training approach (Nathaniel, 2020). It is a requirement in Korea for instructors who teach practical skills to have completed practical skills programs at accredited universities and scored highly on examinations in their specialist fields. Accredited instructors are required to complete theoretical and practical examinations as well as have significant professional experience in their fields of specialization under the Workers and Skills Development Act of 2004. In

Latvia, TVET instructors must carry out educational programs in accordance with industry standards to encourage trainees' freedom and innovation. A minimum professional qualification of postsecondary education in a related discipline is needed of teachers of vocational topics (Daija et al., 2019).

Furthermore, Ali et al. (2017) proposed that graduate competency and occupational knowledge are influenced by the trainer's skills and knowledge of the subject matter. Trainers need to have in-depth knowledge and understanding of the unit of competence. Real world experience is necessary to be able to transfer the knowledge and train a skill on an appropriate level. The Asians advocated for the necessity of hiring qualified workers in order to increase businesses' profitability. However, the focus of this study was on the institution's profitability and trainer characteristics. These studies were all conducted in an Asian setting and only looked at student academic test performance and teacher effectiveness. TVET trainees' competency is largely shaped by trainer preparation programs and ongoing professional development, claim (Bünning et al., 2022).

Studies conducted in Europe on the impression of teacher quality on Dutch Twins' academic achievement was evaluated using an experimental methodology (Gerritsen et al., 2016). The test results were controlled using teacher traits like experience, and the twins entered the school at the same time. According to the study, instructor experience increased student performance. This study was so focused on the grade-point test scores of twins that it may not be applicable to all students, even though the effect was moderated by class size and peer composition. The study placed a strong emphasis on job training for teachers to advance their skills.

The career success of 418 apprentices in central Europe who had made the transition to the labor market was the focus of a study by Hofmann et al. (2021). The experimental study was divided into three phases: pre-training, training, and apprenticeship. Using multinomial logistic regression, the study discovered that career performance was influenced by training context, career options, and personality traits. To improve students' professional performance, it suggested providing the VET educators with ongoing on-the-job training. The study, meanwhile, concentrated on pupils with special needs, thus it might not be applicable to other TVET students in Africa, particularly in Kenya. According to the majority of research conducted in Europe (Bünning et al., 2022), teacher competence is a crucial factor in explaining students' academic accomplishment.

In the knowledge-driven job market of the twenty-first century, studies performed in the United States of America imply that teachers require soft skills to model trainees in a professional way (Kiruga et al., 2018). To understand what and how students learn best, teachers must dedicate themselves to ongoing professional development, promoting teamwork and building trust in the educational process. Due to their hectic class schedules, exam environments, and focus on helping students pass exams, most teachers do not have the time or energy to invest in developing these abilities. The stakeholders must therefore be deliberate when choosing programs to improve teachers' skills (Kiruga et al., 2018).

The competency framework for TVET trainers in Tunisia is built on competencies related to closely related care tasks, such as training sessions, the creation of pedagogical resources, and the use of pedagogical techniques in teamwork. Additional training updates, instructional resources, and assessment tools evaluation of learning outcomes the competence is connected to extracurricular activities like keeping track of and helping to

improve TVET systems. The techniques used to create systems involve hiring and orienting new employees. TVET instructors are hired in Tunisia based on their credentials and test results (Ambiyar et al. 2018).

In Kenya, the study by Muriuki and Dominic (2022) underscored that most TVET trainers had challenges with the technological changes in the industry with 17.74% of the respondents admitting that some trainees understood latest technology and knew the industry expectation more than them.

2.6.4 Attitudes

An effective trainer is one that cares about the success of the trainees. Attitude is the core of the trainer because that is what the trainees see, feel and connect with. The trainer's attitude towards self and others are the elements that make a good trainer. It's the responsibility of trainers to know that their trainees are contrastive, have different mental attitude, different ways of learning, different need and representation of the world that is completely different from theirs. According to Maurice-Takerei (2017), the profile of a normal TVET trainee is their socio-economic background and lower mental ability and the task of a TVET trainer is "a combination of educational work, social development and career development combined with a strong measure of care, patience and understanding".

According to Okolie et al. (2020), graduates in Africa who want to become TVET trainers must have relevant skills. In their study, 35 TVET instructors from 19 different African nations were used in the qualitative study. Thematic analysis of the study's findings revealed that African trainers do not help trainees develop workplace skills. The study suggested that trainers pursue ongoing professional development to increase graduate

trainees' productivity and marketability. As they acquire new skills and technologies in various industries, TVET trainers can enhance their attitudes through training and retraining, which will make them more industry-relevant. TVET trainers can be trained and retrained by participating in conferences, workshops, seminars, and in-service training. Trainers' efficacy and performance are enhanced by training and retraining, which also shapes their personalities, attitudes, and habits (Muriuki & Muguti, 2022).

Ghana as a case study, Kissi et al. (2020) investigated TVET institutions in Africa and discovered that the instructors' educational preparation was out of step with modern technological advancements, making it difficult for them to pass on their knowledge to the trainers.

The need to raise awareness and the caliber of TVET institutions in Nigeria was underlined by Ayonmike and Okeke (2020). The study highlighted teacher training opportunities while also conducting a thorough examination of the TVET institutions in Nigeria. The employability of graduates would increase as a result. Despite the fact that the majority of trainers in TVET institutions in Africa find it difficult to conduct psychomotor tasks, such as operating machines, their study was mute regarding the trainer qualities that facilitate the transfer of knowledge and workplace skills (Ayonmike, 2014). Munishi (2016) conducted research in Tanzania to determine why candidates lacked soft skills. Among other things, the study concluded that ineffective trainers prevented TVET graduates from acquiring workplace abilities.

In Kenya, Langat et al. (2021) conducted a study on the effects of trainer competencies with three goals in mind: the impact of the trainer's educational background, ongoing

professional growth, and pedagogical expertise. With a sample size of 55 and a target population of 181 registrars, deputy principals, and principals, they utilized a descriptive survey approach. The institutions were sampled using a stratified sampling technique. Questionnaires were used for data collection, and descriptive and inferential statistics were used for analysis. According to the study, there is a strong link between the three objectives and efficient training. The report suggested spending money on professional trainer development for Kenyan TVET institutions to provide excellent training. However, the survey did not address the issues that this study intends to address, such as trainer experience, work knowledge, and attitudes. A study by Orangi et al. (2016) looked at the characteristics of the trainers in 18 TVET institutes in Kenya. The study used a descriptive survey approach with 452 respondents, and the findings showed that trainers need to be better trained. Trainers need to be experts in their fields, be able to articulate concepts clearly, inspire trainees, and foster meaningful learning engagement. Studies on the textile sector in Kenya concur that trainers' content expertise and teaching prowess have a positive impact on trainees' academic progress. While the majority of research concentrates on academic success, few identify the type of trainee achievement that was examined (Gerritsen et al., 2016; Okolie et al., 2020).

In addition, Mutua et al. (2019) investigated the influence of CBET implementation on the skill acquisition of visually impaired students in Machakos County, Kenya, as well as the qualifications of trainers. 70 trainers, 20 department heads, and 2 principals participated in FGDs and questionnaires using a mixed design methodology. According to the report, there are not enough trainers who are capable of working with visually impaired trainees, and those who are accessible lack critical credentials. The degree to which trainers' credentials

influenced the visually impaired trainees' ability to pick up abilities was largely discovered. The study was limited to visually challenged trainees and may not be generalizable to other TVET trainees, so it is unclear whether the learners' capacity to find employment was increased as a result of their skill acquisition.

On the other side, Kimathi et al. (2020) evaluated trainer characteristics on their capacity to foster entrepreneurship; 329 alumni from six public TVET institutes responded to the questionnaire. A substantial favorable association between trainer traits and creating entrepreneurs among Kenyan TVET graduates was discovered by the study. The importance of understanding and applying the listed trainer traits has not been stressed. It is feasible to draw the conclusion that a trainer needs a certain set of qualities in order to impart knowledge and skills to trainees. For instructors to learn new abilities, continuous professional development is also crucial (Shute, 2019). Trainers need to possess the necessary topic knowledge, skills, and disposition. The trainer must have sufficient expertise in teaching techniques and be able to use a variety of learning strategies that interest and engage the trainees. They should also be able to take advantage of technology, such as using tablets, cellphones, and computer laboratories, to gain quick access to information on the internet (Kimathi et al., 2020). Therefore, if Kenya has to become industrialized, TVET institutions must have sufficient supply of qualified trainers who are well equipped with a wealth of expertise using instructional strategies that maximize the transfer of skills to the trainees (Langat et al., 2021).

2.7 Board of Governors Moderating Variable

The Board of Governors (BOG) are appointed by the Cabinet secretary of Education to govern the public TVET institution. The role of the BOG is to mobilize resources,

approve curriculum to be implemented, make and approve policies to govern the institution, allocate funds and approve budget for implementation of the approved curriculum. Secondly, BOG members are expected to lobby for resources and formulate policies that govern the institution (TVET Act, 2013). In this regard therefore, the board is anticipated to act on behalf of the authorities and ensure the policies of the government are implemented. The occurrence of the curriculum implementation on CBET depends on the power of the BOG to lobby for resources and enforce curriculum implementation on CBET.

2.8 Preparedness of Public TVET Institutions for Implementation of CBET Curriculum

Preparedness for curriculum implementation is a critical factor in the successful rollout of educational reforms, particularly in Competency-Based Education and Training (CBET) systems. Effective preparedness ensures that institutions, educators, and students are equipped to meet the demands of a competency-driven learning model. Competency-Based Education and Training (CBET) has been adopted in Kenya to align technical and vocational education with industry demands, focusing on practical skills and competencies over theoretical knowledge. This shift aims to address skill mismatches and enhance employability among graduates. The preparedness of public Technical and Vocational Education and Training (TVET) institutions is pivotal for the successful implementation of CBET (<https://journals.co.za/doi/10.29086/2519-5476/2022/sp39a13>). This review synthesizes the existing literature on preparedness for CBET implementation, exploring the factors that contribute to readiness, common challenges, and best practices. The adoption of CBET is supported by the TVET Act No. 29, 2013 which established TVETA,

KNQA and TVET CDACC that collaborate to ensure TVET institutions align with CBET standards, emphasizing industry relevance and quality assurance.

The CBET curricula is designed in collaboration with industry stakeholders to ensure relevance. Sector Skills Advisory Committees (SSACs) play a role in identifying industry needs and advising on curriculum development. Despite these efforts, gaps persist between curriculum content and industry requirements. For example, in the electrical installation sector, inconsistencies in instructional design processes have led to low-quality CBET implementation Kogo et al. (2022). Strengthening partnerships between TVET institutions and industries is essential to enhance curriculum relevance and provide students with practical exposure.

Adequate infrastructure is crucial for CBET implementation. However, many TVET institutions face challenges such as outdated equipment, insufficient learning materials, and inadequate facilities. These limitations hinder the delivery of practical, competency-based training (Miseda & Kitainge, 2021). The government has made efforts to address these issues by investing in modern equipment and expanding facilities. Nevertheless, disparities remain, particularly in rural areas, affecting the uniformity of CBET implementation across the country.

The effectiveness of CBET largely depends on the competencies of trainers. Studies indicate that while some trainers have undergone CBET training, many lack adequate exposure to industry practices and modern instructional methodologies. For instance, a study in the North Rift Region highlighted that facilities and resources for capacity building

were insufficient, and appraisals to identify training gaps were not effectively conducted .(Kenya National Examination Council KNEC.

In response, the government has initiated retooling programs. As of September 2023, 924 TVET trainers had been retooled, with an additional 580 undergoing training. These programs aim to equip trainers with the necessary skills to deliver CBET effectively (KNEC, 2023). Competency-based assessment (CBA) is integral to CBET, focusing on evaluating learners' ability to perform specific tasks. TVET-CDACC has trained over 13,000 trainers to conduct CBA. However, challenges such as limited assessment tools and inconsistent evaluation standards affect the reliability of certifications (Kogo et al., 2022). Efforts are ongoing to standardize assessment procedures and ensure that certifications accurately reflect learners' competencies.

The transition to CBET in Kenya's public TVET institutions is a strategic move to enhance the quality and relevance of vocational education. While significant strides have been made in policy formulation and initial implementation, challenges persist in curriculum alignment, financial allocation, adequate infrastructure, trainer preparedness and assessment processes. Addressing these issues through concerted efforts by the government, industry stakeholders, and educational institutions is crucial for the successful realization of CBET objectives.

2.9 Theoretical Framework

A theoretical framework provides the conceptual lens through which a study is designed and interpreted, ensuring coherence, clarity, and a strong scholarly foundation for analysis (Miller, 2024). This study is underpinned by Systems Theory, advanced by Ludwig von

Bertalanffy in the 1940s and 1950s, which emphasizes that the functioning of any system can only be fully understood when its components are examined in relation to one another and the broader environment. Systems Theory identifies four interrelated elements—inputs, processes, outputs, and feedback—as central to the functioning of an effective system (von Bertalanffy, 1968).

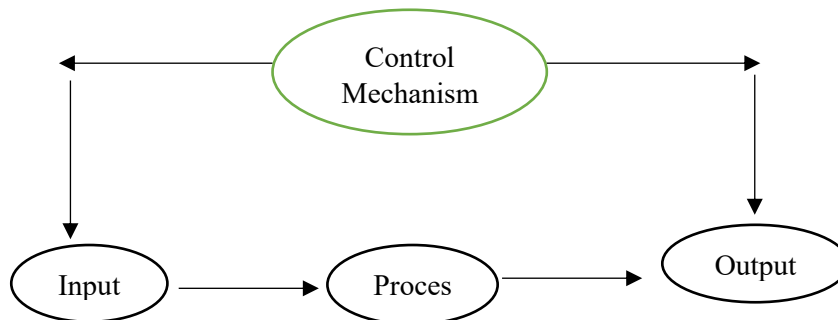
In the context of this study, the inputs comprise financing, infrastructure, governance practices, and trainer preparedness, while the process entails the actual delivery of the competency-based education and training (CBET) curriculum in technical and vocational institutions. The outputs are graduates equipped with relevant competencies demanded by industry, whereas the feedback arises from employers, regulators, and other stakeholders whose evaluation informs adjustments in curriculum design and institutional practice.

The theory is particularly relevant in explaining how each independent variable contributes to the dependent variable, CBET curriculum implementation. Adequate financing provides the resources necessary for acquiring modern tools, equipment, and teaching materials. Infrastructure, both physical and ICT, enables the smooth delivery of training programs that are practice-oriented and outcome-based. Trainer preparedness ensures that human capital is skilled and capable of transmitting competencies in line with occupational standards. Governance, on the other hand, offers the structures and processes that regulate and coordinate resources, accountability, and policy compliance. All these inputs converge in the implementation process, whose effectiveness determines whether trainees acquire industry-relevant competencies.

Systems Theory, therefore, demonstrates that the successful implementation of the CBET curriculum is not a result of isolated factors but rather of the interaction and balance of multiple inputs. Weakness in financing, inadequacy of infrastructure, unprepared trainers, or governance gaps inevitably compromises the entire system, resulting in poorly skilled graduates who cannot meet labor market demands. Despite its usefulness, the theory has a limitation in that it assumes systems operate rationally and linearly, thereby overlooking the unpredictable socio-political, economic, and cultural influences that can disrupt CBET implementation. Nonetheless, Systems Theory remains highly suitable for this study as it provides a holistic and analytical framework that captures how multiple institutional and systemic factors interact to influence CBET curriculum implementation in public TVET institutions in the Mt. Kenya East Region.

Figure 2. 1

System Theory



2.10 Conceptual Framework

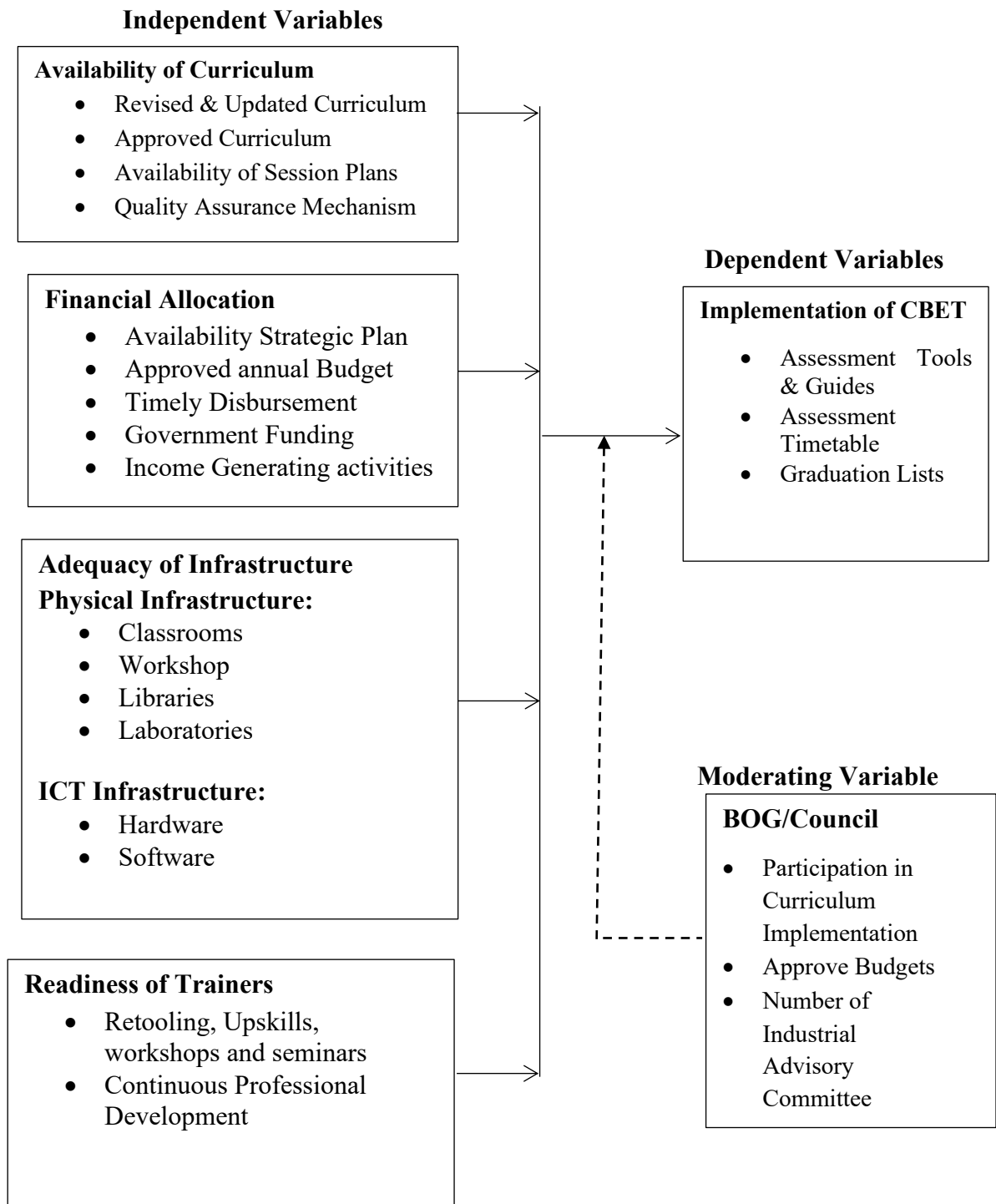
This section presents the conceptual framework that shows how the variables in this study are interrelated. The development of the study's constructs was based on the system theory. The implementation of the curriculum, which happens as the trainee acquires the specific experiences, knowledge, skills, concepts, and attitudes intended

to support his or her successful functioning in society, is the dependent variable in this study. Curriculum implementation is the process by which a trainer converts a planned or formally structured course of study into work plans, syllabuses, and lessons that were taught to trainees (Alebiosu, 2005).

The study's independent variables are availability of CBET curriculum, financial allocation, adequacy of infrastructure and readiness of trainers and technical staff. A conceptual framework that captures the variables under study is formulated and presented on Figure 2.2.

Figure 2. 2

Conceptual Framework



2.11.1 Operationalization of conceptual framework

The study conceptualizes the preparedness for curriculum implementation of Competency-Based Education and Training (CBET) in public technical institutions in Mt. Kenya East Region as the dependent variable, which is influenced by several independent variables, and moderated by the role of the Board of Governors.

The first independent variable is the availability of curriculum, which is operationalized through indicators such as whether the curriculum has been reviewed and whether it is tailored to CBET requirements. These indicators were measured on an ordinal scale using a Likert-based questionnaire and document review, with data collected from trainers and curriculum officers.

The second independent variable is financial allocation. This was assessed based on the presence of specific funds allocated for CBET activities and the timeliness of their disbursement. Data was collected using questionnaires and document analysis from finance officers and institutional administrators, and responses were measured on a Likert scale.

The third independent variable, infrastructure, was examined through the availability of physical resources such as workshops, laboratories, and relevant equipment. Observational checklists were used to assess these facilities, and the findings were recorded on an ordinal scale.

The fourth independent variable is the readiness of trainers which includes indicators such as the number of trainers who have undergone CBET training and the extent of certification

among trainers. This variable was measured using questionnaires and human resource records, targeting trainers and Human Resource officers.

The dependent variable, which is the preparedness for implementation of CBET, was evaluated using indicators such as the existence of implementation plans, evidence of curriculum rollout, and the availability of training resources. Data was obtained from the principals and heads of departments using interviews and questionnaires respectively, and responses were measured using an ordinal scale.

Finally, the moderating variable is the role of the Board of Governors, which was assessed through their involvement in decision-making, policy formulation, and facilitation of resources. This was measured qualitatively and quantitatively using interviews and document reviews, focusing on input from board members and management committees.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methods and processes that were employed to find and examine the study's data are described in this chapter. Research design, study location, target population, sampling procedures, sample size, data collection tools like questionnaires, interview guides, and document analysis, pre-test of the research tools to assess their validity and reliability, data collection methods for both qualitative and quantitative data, information analysis, and ethical considerations are all included in this.

3.2 Location of the Study

The study was carried out in Mt. Kenya East Region, Kenya which is part of the nine (9) KATTI regions in Kenya. The other KATTI regions include Nairobi, Mt Kenya West, Western, Nyanza, North Rift Valley, Coast, South Rift Valley and North Eastern Regions. Mt. Kenya East Region was selected for this study because the other KATTI regions have similar characteristics in terms of categories, governance and organization structure. However, results for this study can be generalized to cover other KATTI regions in Kenya. The counties that make up Mt. Kenya East Region include; Meru, Isiolo, Samburu, Marsabit, Embu and Tharaka Nithi Counties. The 21 public TVET institutions in Mt. Kenya East Region, Kenya represented the three categories: National Polytechnics (NP), Technical Institutes (TTI) and Technical & Vocational Colleges (TVC), of the public technical institutions in Kenya.

The Mt. Kenya East Region hosts a significant number of established TVET institutions offering diverse programs in engineering, technology, and applied sciences, making it an appropriate setting for examining preparedness in implementing Competency-Based Education and Training (CBET). Furthermore, the region is characterized by a blend of rural and semi-urban socio-economic contexts, providing a representative case for understanding how institutional resources, governance, and trainer readiness influence CBET adoption across varied environments. The selection of this location was therefore justified by its relevance, diversity, and potential to generate findings that can be generalized to other regions with similar institutional and socio-economic characteristics.

3.3 Philosophy Underpinning

This study investigated both measurable factors such as availability of curriculum, financial allocation, infrastructure adequacy, trainer readiness and qualitative dimensions like institutional perceptions and governance dynamics. A pragmatist philosophy aptly underpins this mixed-methods design because it privileges practical consequences and emphasizes aligning research methods to the nature of the research question rather than to ideological purity. Pragmatism rejects the strict dichotomy between positivism and constructivism, allowing the researcher to draw on what works, both quantitative metrics and narrative insights as needed to address the complex, context-specific research problem (Dube et al., 2024; Liu, 2022).

The study aligned with pragmatic philosophy by treating research questions, not methods, as the pivot for methodological choices—a hallmark of pragmatism as advocated by Johnson and Onwuegbuzie (2004, as cited in Liu, 2022). This pragmatic positioning enabled the current study to integrate regression analysis and thematic interpretation in a complementary manner, thereby enhancing validity through triangulation and ensuring findings were both generalizable and deeply contextual (Liu, 2022). Moreover, pragmatism emphasizes problem situatedness and reflexivity—qualities evident in how the study situated CBET implementation within Kenya’s TVET institutional realities and navigated between inductive and deductive reasoning as the research unfolded (Dube et al., 2024).

In sum, adopting a pragmatism research philosophy served the study’s dual purpose of measuring readiness indicators and understanding stakeholder experiences within their socio-institutional context. It enabled this study to employ methodological pluralism, focus on actionable insights, and address educational policy needs with both breadth and depth. This philosophical orientation enhanced the practicality, credibility, and relevance of the research outcomes, guiding recommendations that are evidence-based and practically grounded (Dube et al., 2024; Liu, 2022).

3.4 Research Approach

The study sought to assess preparedness in implementing competency-based education and training (CBET) in public technical institutions, focusing on curriculum availability, financial allocation, infrastructure adequacy, trainer readiness, and the moderating role of Boards of Governors. This complex, multidimensional problem required both numerical measurement and contextual explanation. A mixed-methods research approach was therefore appropriate, as it facilitated the collection and integration of quantitative data and

qualitative evidence. As argued by Asghar (2025), mixed-methods research is especially suited for studies where phenomena are too complex to be captured by a single methodology, enabling both “breadth through quantitative data” and “depth through qualitative inquiry.”

3.5 Research Design

The research design is the main strategy a researcher uses to logically and properly bring together different parts of the study to effectively tackle the research problem through gathering, analyzing, and interpreting data (Creswell & Creswell, 2018). For this study, an exploratory research plan within a mixed method approach was employed to gather both quantitative and qualitative data. In this approach, qualitative and quantitative data were collected at the same time, and data analysis, integration, and interpretation were utilized to derive conclusions (Bhandari, 2023).

This enabled the researcher to collect information from a huge number of people and do in-depth research on a select few. To ascertain the level of readiness for CBET curriculum execution in public technical establishment in Kenya's Mt. Kenya East Region, the study would thus employ a combination of research methodologies. This design assisted in determining the current state of TVET institutions' readiness to execute the CBET curriculum.

3.6 Target Population

According to Mbuthu (2023), the target population is a sizable group of people who are the focus of a technical inquiry. Research is carried out for the benefit of the public (Creswell, 2014). The study targeted 21 public TVET institutions comprising of 21 principals, 21

Board of Governors Chairpersons, 128 Heads of Departments, 1,263 trainers, and 69,158 trainees (see Table 3.1). The public TVET institutions in Kenya are governed by Kenya Association of Technical Training Institutes (KATTI) Council which has divided them 9 regions namely Coast, Nairobi, Western, Nyanza, North Rift, South Rift, North Eastern, Mt. Kenya West and Mt. Kenya East Regions. All public TVET institutions are governed by TVET Act, 2013, Board of Governors/Councils, offer similar curriculum, receive trainers from the Public Service Board and have 10 approved academic departments which is headed by a Head of Department. The 10 approved academic departments include Computing & Informatics, Electrical Engineering, Mechanical Engineering, Liberal Studies, Business Studies, Applied Science, Special Needs, Building & Civil Engineering, Agriculture, and Hospitality & Institutional Management.

The study targeted Principals, Boards of Governors (BOG) chairpersons, Heads of Departments (HODs), trainers, and trainees because each category plays a distinct and complementary role in the implementation of Competency-Based Education and Training (CBET). Principals provided strategic leadership perspectives and insights on institutional readiness, while BOG chairpersons offered governance and policy oversight views crucial for understanding decision-making and resource allocation. HODs were instrumental in highlighting departmental-level preparedness, curriculum adoption, and trainer support systems. Trainers contributed first-hand accounts of instructional practices, professional development, and challenges in adapting to CBET pedagogy, whereas trainees provided critical feedback on learning experiences, resource adequacy, and perceptions of the new curriculum. The inclusion of these diverse stakeholders ensured a holistic understanding of

CBET preparedness by integrating leadership, governance, instructional, and learner perspectives. The composition of the study's target group is summarized in Table 3.1.

Table 3. 1

Mt. Kenya East Region Data: Target Population

S/N	Institution	Trainee Enrolment	No. of Trainers	No. of Heads of Department	BoG/Council Chairpersons	No. of Principals
1.	The Meru N P	12,019	252	9	1	1
2.	The Jeremiah Nyagah N P	8,194	147	9	1	1
3.	Karumo TTI	7,886	87	8	1	1
4.	Nkabune TTI	6,443	108	8	1	1
5.	Kiirua TTI	5,496	63	8	1	1
6.	Mukiiria TTI	5,096	85	8	1	1
7.	Chuka TVC	4,815	45	7	1	1
8.	The Mitunguu N P	4,429	124	7	1	1
9.	Samburu TVC	2,573	32	7	1	1
10.	Muraga TVC	2,496	56	7	1	1
11.	Tharaka TTI	2,139	61	8	1	1
12.	Mbeere North TVC	2,048	25	6	1	1
13.	Runyenjes TVC	1,892	28	6	1	1
14.	Tigania East TVC	1,344	29	6	1	1
15.	Kaelo TVC	828	30	4	1	1
16.	Laisamis TVC	616	27	5	1	1
17.	Manyatta TVC	367	11	5	1	1
18.	North Horr TVC	269	24	3	1	1
19.	Merti TVC	119	9	4	1	1
20.	Samburu North TVC	89	20	3	1	1
21.	Igembe South TVC	0	1	0	1	1
	TOTAL	69,158	1,263	128	21	21

3.7 Sampling Procedures and Sample Size

The process of choosing a certain number of people or objects from a community whose traits are typical of the full collective is known as sampling (Heath, 2023). It is not feasible

to collect data on the complete population due to the size of the group and the researcher's time constraints; therefore, a small sample of representatives was chosen. According to Bryman and Bell (2015), a sample size needs to be manageable and sufficiently representative of the research population.

The research purposively sampled Mt. Kenya East Region as a representative of the total population. The region has 21 public TVET institutions comprising of 3 National polytechnics, 5 Technical Training Institutes and 13 Technical Vocational Colleges. Kenya continues to experience recurrent building collapses, highlighting persistent challenges in construction quality and safety. Between 2009 and 2019, a total of 86 buildings collapsed—resulting in significant human and economic losses—while over 70% of sampled structures were deemed unsafe by the National Building Inspectorate (KIPPRA, 2023). Concurrently, the government has prioritized housing as part of its Bottom-up Economic Transformation Agenda, aiming to produce 200,000 affordable housing units annually and elevate affordable housing availability from 2% to 50%. This underscores an urgent need for effective, innovative building technologies and skilled practitioners to support safe, sustainable infrastructure. As such, focusing on the Building & Civil Engineering Department is strategically relevant, addressing both societal needs and emerging policy imperatives. The researcher used purposive sampling to identify 19 public TVET institutions that have functional Building & civil Engineering Department. The study had a sample size of 230 comprising of 19 principals, 19 Board of Governors Chairperson, 19 HoDs, 19 class representatives and 154 trainers as shown in Table 3.2.

Table 3. 2***Sample Size***

S/N	Name of the Institution	Type	No. of Trainers	No. of HoDs	Principals	BoG	Class Rep (key Informant)	Total
1.	Laisamis	TVC	2	1	1	1	1	6
2	North Horr	TVC	1	1	1	1	1	4
3	Merti	STVC	0	0	0	1	0	0
4	Meru National	NP	28	1	1	1	1	49
5	Nkabune	TTI	5	1	1	1	1	11
6	Mukiria	TTI	15	1	1	1	1	27
7	Kiirua	TTI	12	1	1	1	1	22
8	Karumo	TTI	21	1	1	1	1	38
9	Mitunguu	TTI	11	1	1	1	1	21
10	Kaelo	TVC	4	1	1	1	1	9
11	Tigania East	TVC	4	1	1	1	1	9
12	Muraga	TVC	4	1	1	1	1	9
13	Chuka	TVC	7	1	1	1	1	15
14	Tharaka	TTI	6	1	1	1	1	13
15	Jeremiah Nyaga	NP	14	1	1	1	1	26
16	Runyenjes	TVC	5	1	1	1	1	12
17	Manyatta	TVC	5	1	1	1	1	11
18	Mbeere North	TVC	3	1	1	1	1	8
19	Samburu East	TVC	5	1	1	1	1	11
20	Samburu North	STVC	2	1	1	1	1	6
21	Igembe South	STVC	0	0	1	1	0	1
Total			154	19	19	19	19	230

3.7.1 Sampling of Public Technical Institutions

The study used a stratified sampling technique for all of the public technical institutions which are categorized into: Technical and Vocational Colleges (TVC), Technical Training Institutes (TTI), and National Polytechnics (NP). Stratified sampling is the best way to get a representative sample from a community when a researcher needs one. This involved dividing the population into groups that do not overlap and include all members. When the sample being studied is more varied than the defined groups, stratified sampling methods can lead to better accuracy in the results. This approach helped the researcher figure out the correct precision levels needed for each group and also improves management efficiency. Heath (2023) asserts that the approach's main advantage is that it offers the most representative sample of a population. Purposeful sampling was used to sample all institutions with active Building and Civil engineering departments. Using the non-probability method of deliberate sampling, the researcher chose the sample based on who they think would be a good fit for the study.

The aim of purposeful sampling is to choose a sample that can adequately meet the goals of the investigation. In order to pick a sample that is representative of a cross-section of the population in a non-random manner, purposeful sample selection is commonly accomplished by applying expert knowledge of the population of interest (Mbuthu, 2023). Because of the uncertainty of the selection process, purposeful sampling is often seen to be best suited for choosing small samples, often from a narrow population definition (Mbuthu, 2023). In this case, 19 technical institutes provide building and civil engineering programs.

3.7.2 Sampling of Principals

The study further used census sampling to sample Principals from the 19 sampled TVET institutions with functional Building and Civil Engineering. The principals are key custodians of the information and agents of the ministry to the institutions. Principals hold a key role of accountability and contact person to any internal and external communication. The principals are also Secretaries to the Board of Governors and accountable of the finances, human resource, property and implementation of the policies & curriculum approved by the Board. These are principals from 3 NP, 5 T.T. Is and 11 TVCs in Mt. Kenya East Region, Kenya. This is recommended by Mugenda and Mugenda (2003), and Kumar (2019).

3.7.3 Sampling of the Heads of Departments

To find the 19 Heads of Departments (HoDs) in charge of the Building & Civil Engineering department among the 19 institutions, the study employed purposive sampling. On a daily basis, the HoDs are actively involved in the management of their departments. This method works especially well for qualitative research, such case studies, where original insights are crucial, like putting CBET policies into practice. In addition to interacting with trainers and trainees, the HoDs also inform top management of critical issues pertaining to the implementation of CBET programs. This deliberate participant selection is in line with the specific objectives of the study as well as the special function that the HoDs provide in the context of implementing the CBET Approach.

3.7.4 Sampling of Trainers

The researcher used the Krejcie and Morgan table to determine the sample size of 153 of the total population of 250 trainers in the 19 institutions. The Krejcie & Morgan table is a table commonly used for estimating sampling size in research studies. It is used in mixed research and it provides a straight-forward and easy-to-use method for determining sample size.

After then, a proportionate sample of the 153-person sample was taken. The trainers in the Building & Civil Engineering Department's 19 technical institutions were sampled using the proportionate sampling technique. When the population is made up of multiple subgroups with significantly varied numbers, the proportionate sampling technique is employed as a sampling strategy. Either number in relation to the total population determines the number of members in each subgroup. The researcher administered the instrument tools using a simple sample strategy after determining the number of people participating in each subgroup.

The study's trainers were chosen because they are essential to properly delivering the curriculum to trainees by making sure, they gain the required information and abilities (Harriet, 2021). Convenient sampling was used to identify the 153 trainers. A non-probability sampling technique called convenience sampling selects units for the sample based on how easy it is for the researcher to obtain them. Because the researchers choose the sample rather than selecting it at random, not every member of the general population has an equal chance of participating in the study when using non-probability sampling (Simkus, 2023).

Geographical proximity, availability at a specific moment, or participation willingness may be the cause of this (Stratton, 2021). The sample size of the trainers is illustrated in Table 3.3

Table 3. 3

Trainer's sampling matrix

S/N	Name of the Institution	Type	No. of Trainers (x)	Sampling Technique	Proportionate sampling $\{(n/N) x\}$	Sample Size
1.	Laisamis	TVC	3	Convenient	0.608×3	2
2	North Horr	TVC	1	Convenient	0.608×1	1
3	Merti	TVC	0	-	-	0
4	Meru National	NP	46		0.608×46	28
5	Nkabune	TTI	8	Convenient	0.608×8	5
6	Mukiria	TTI	24	Convenient	0.608×24	15
7	Kiirua	TTI	19	Convenient	0.608×19	12
8	Karumo	TTI	35	Convenient	0.608×35	21
9	Mitunguu	NP	18	Convenient	0.608×18	11
10	Kaelo	TVC	6	Convenient	0.608×6	4
11	Tigania East	TVC	6	Convenient	0.608×6	4
12	Muraga	TVC	6	Convenient	0.608×6	4
13	Chuka	TVC	12	Convenient	0.608×12	7
14	Tharaka	TTI	10	Convenient	0.608×10	6
15	Jeremiah Nyaga	NP	23	Convenient	0.608×23	14
16	Runyenjes	TVC	9	Convenient	0.608×9	5
17	Manyatta	TVC	8	Convenient	0.608×8	5
18	Mbeere North	TVC	5	Convenient	0.608×5	3
19	Samburu East	TVC	8	Convenient	0.608×8	5
20	Samburu North	TVC	3	Convenient	0.608×3	2
21	Igembe South	TVC	0	-	0	0
Total			250			154

3.7.5: Sampling of BOG Chairpersons

Purposive sampling was used to sample the 19 Board of Governors Chairpersons in the 19 technical institutions with functional Building & Civil Engineering Department. The BOG

Chairpersons are selected for the role they play in formulation of policies, annual budgets approval, curriculum implementation approval and oversight role.

3.7.6 Sampling of the Key Informants (Trainees Class Representatives)

Purposive sampling was used to select the 19 key informants who were Trainees Class Representatives in the 19 technical institutions. The Representatives were drawn from the Building & Civil Department of the sampled institutions. The Trainees Class Representatives was used as key informant because they are the main beneficiaries/recipients of the CBET programs being implemented. These informants were very important to the researcher in determining the extent and effectiveness of the implementation of the programs. Key informants play a major in research because they serve as doorkeeper regulation access to people and information and as cultural experts explaining culture to an outsider. People with pertinent knowledge and insight provide the information. They enable the emergence of novel and unexpected problems and concepts. Key informants assist in revealing delicate and secret topics that may not be easily revealed using other approaches. Although they are not directly involved in the curriculum's execution, trainees are its consumers and are able to reveal delicate research topics. The 19 Trainees Class Representatives represented the trainees and were purposively sampled from the 19 public technical institutions.

3.8 Data Collection Instruments

Data is a collection of information gathered by investigation, analysis, measurements, or observations. Facts, figures, statistics, and even descriptions of objects can all be considered data. Data is arranged using tables, charts, or graphs. For research projects and well-informed decision-making, data is an essential starting point. To get this information,

researcher employed a variety of data collection techniques. Chairpersons of the Board of Governors, principals, department heads, trainers, and trainees were all to provide data to the investigator. Based on the research gaps found during the literature analysis, the researcher created the research tools. Questionnaires, interviews, and document analysis were all used as study tools.

3.8.1 Questionnaire

The study used a questionnaire to collect information from department heads and trainers. Furthermore, a survey is a tool that asks respondents a series of open-ended, scale-scored questions in order to directly collect primary data from them (Kanai, 2022). Kombo and Tromp (2006) claim that surveys are less expensive, require less time to conduct, and give respondents the freedom to independently express their thoughts and feelings, removing the potential for interviewer bias.

Given the aforementioned advantages, a questionnaire is thus suitable for this investigation. Both were included in the questionnaire. A questionnaire was therefore appropriate for this study based on the above strengths. The questionnaire had both closed-ended and open-ended questions. While open-ended questions elicited qualitative comments regarding the respondents' opinions on the topic being studied, closed-ended questions aided in the collecting of quantitative data for statistical analysis. Questionnaires derived from the constructs specified in the study's literature review portion were used by the researcher. The survey was divided into two sections: Part A asked about the respondents' general background, and Part B asked questions about the variables being studied. The survey was structured and include closed-ended questions with a 5-point Likert scale for scoring. The researcher presented the self-

administered questionnaires to the participants. After a week, the questionnaires were picked up.

Questionnaires were administered to two categories of respondents: Heads of Departments (HoDs) and Trainers in the Building and Civil Engineering departments. Both instruments were structured and organized into two parts: Part A captured respondents' general background information, while Part B addressed questions related to the study variables. The HoDs' questionnaire (Appendix III) was designed to capture their leadership roles in overseeing departmental operations, setting departmental objectives, and ensuring smooth implementation of daily activities. It also gathered information on the extent of the Board of Governors' intervention in preparing for CBET curriculum implementation.

The Trainers' questionnaire (Appendix IV) focused on their central role in curriculum delivery and classroom instruction, providing insights into how trainers applied CBET principles and addressed factors influencing its implementation. Together, these questionnaires generated structured data on departmental leadership and instructional practices, enriching the study's assessment of institutional preparedness for CBET implementation.

3.8.2 Interview Guides

An interview guide was employed as a qualitative research instrument to collect in-depth information from selected respondents. Given the hybrid design of the study, both structured and unstructured questions were used to enhance comparability across participants while allowing flexibility for deeper exploration. The interview guides were organized into two parts: Part A captured respondents' demographic or

background information, while Part B contained structured and unstructured questions related to the study variables.

Interviews were conducted with three categories of respondents. First, Board of Governors (BOG) Chairpersons (n = 19) were interviewed because of their critical role in providing leadership, approving curriculum, making institutional policies, supervising principals, and ensuring effective governance. Their perspectives offered valuable insights into the extent to which governance structures prepare institutions for CBET implementation.

Second, Principals (n = 19) were interviewed since they serve as accounting officers and representatives of the Ministry of Education at the institutional level. Their interviews provided detailed information on resource mobilization, curriculum readiness, and institutional management practices related to CBET.

Finally, Class Representatives of trainees (n = 19) were engaged as key informants. Although not directly involved in implementation, they are recipients of the CBET programs and offered critical insights into learner experiences, hidden challenges, and perceptions of program outcomes. The use of interview guides with these three groups enriched the study by generating contextualized perspectives that supplemented questionnaire data, ensuring a comprehensive understanding of CBET preparedness in public technical institutions within Mt. Kenya East Region.

3.8.3 Document Analysis Guide

A document analysis guide was systematically used to collect secondary data relevant to CBET implementation. This tool was instrumental in triangulating findings from

interviews and questionnaires, thereby enhancing the validity and contextual richness of the study. In the social sciences, document analysis is a qualitative research method that involves reviewing and interpreting official records to uncover patterns, insights, and contextual understanding of the phenomenon under investigation (Thomas, 2023). For this study, the guide facilitated the examination of both national and institutional documents that reflect the preparedness of public technical institutions in implementing CBET.

The study also employed document analysis to supplement data from questionnaires and interviews. Key documents reviewed included Kenya's National CBET Policy, which provided the government's strategic direction, objectives, and implementation mechanisms at the national level. The CBET Curriculum Framework was examined to assess curriculum availability, structure, and alignment with institutional practices. At the institutional level, CBET policy documents were analyzed to understand how individual institutions localized and implemented the national framework. In addition, policy briefs and circulars issued by the Ministry of Education and regulatory bodies were reviewed to capture evolving directives and clarify implementation guidelines. Finally, council documents such as curriculum development reports, assessment protocols, and certification guidelines from TVET CDACC and related agencies were analyzed to evaluate technical and procedural readiness for CBET implementation. Collectively, these documents offered a comprehensive view of policy coherence, institutional preparedness, and regulatory support for CBET in public technical institutions.

To further enrich the analysis, the researcher examined a range of internal documents from public technical institutions, including: Performance evaluation reports, training manuals

and program outlines, attendance records and institutional schedules, learning plans and guides, and assessment instruments and assessor's guides. These materials provided granular insights into infrastructure adequacy, trainer readiness, and operational preparedness—directly informing the study's objectives.

The document analysis guide (Appendix VI) was instrumental in linking documents to the study objectives by reviewing curriculum frameworks and institutional policies to assess the availability and alignment of CBET curricula, analyzing budgetary records and circulars to establish financial allocation, examining institutional schedules and facility documentation to evaluate infrastructure adequacy, assessing training manuals and evaluation reports to determine trainer readiness, and reviewing Board of Governors' minutes and policy directives to capture governance influence.

3.9 Piloting of the Research Instruments

Before the commencement of the main data collection phase, the researcher conducted a pilot test to evaluate the reliability, validity, and clarity of the research instruments developed for the study. Pilot testing, as emphasized by Allen (2024), serves as a methodological rehearsal that allows researchers to critique and refine their study design, ensuring that the instruments are well-structured, contextually appropriate, and free from bias. The pilot test was designed to assess the clarity, relevance, and coherence of both the questionnaire items and interview protocols. It enabled the identification of ambiguous, redundant, or inadequate questions, and facilitated improvements in the length, flow, and structure of the instruments. Furthermore, the pilot ensured that all questions conveyed consistent meaning across diverse respondent categories and that the data collection procedures were feasible in terms of timing and task comprehension.

To ensure contextual relevance, the Nairobi Technical Training Institute was selected as the pilot site. The institute was purposively but strategically, given its functional Building and Civil Engineering Department, which shares similar characteristics with the public technical institutions in the Mt. Kenya East Region. This selection provided a suitable environment for testing the instruments under conditions comparable to those of the actual study sites.

The pilot test involved a cross-section of stakeholders reflective of the target study population. Questionnaires were administered to 3 Heads of Department, 5 Trainers within the Building and Civil Engineering Department. In addition, structured interviews were conducted with the 2 Board of Governors Chairperson, the 2 Principal, and a Student Class Representative. This diverse sample allowed the researcher to assess the effectiveness of the instruments across different institutional roles and perspectives.

The pilot test yielded valuable insights that informed the refinement of the research instruments. Vague or misleading questions were identified and rephrased to enhance clarity. The logical flow of the instruments was improved, and adjustments were made to ensure that all items were interpreted uniformly by respondents. The pilot also confirmed the appropriateness of the instruments for the study context and enhanced their overall quality and usability for full-scale deployment.

As supported by Allen (2024) and Mutungi (2023), pilot testing is a critical step in ensuring methodological rigor. It helps researchers refine their study protocols and procedures, identify misunderstandings and ambiguities, and eliminate ineffective or inadequate items.

Ultimately, the pilot test contributed to the development of robust and reliable instruments that were well-suited to the objectives and scope of the study.

3.9.1 Validity of research instruments

The extent to which a test measures what it is intended to measure is known as validity, according to Gichohi and Kathuri (2023). The study's validity is determined by how well the results among study participants correspond to those among similar people outside the study (Heath, 2023). The study ensured content validity by developing data collection tools grounded in comprehensive literature review and the study's research objectives (e.g., assessing CBET preparedness across curriculum, finance, infrastructure, trainer readiness, and governance). Expert review of instruments, including subject-matter specialists in CBET and educational measurement, verified that all items appropriately represented the full scope of constructs being measured. As recommended in recent methodological literature, such systematic expert evaluation ensures that instruments fully capture the theoretical domain (Montes et al., 2024).

To establish construct validity, the study aligned the instruments with clearly defined constructs and examined whether responses behaved as theoretically expected. For example, quantitative items measuring financial and infrastructure readiness were tested for internal consistency and correlations with implementation success indicators, while qualitative questions probed trainers' readiness and governance roles in depth. This approach mirrors best practices wherein content and face validity serve as evidence toward construct validity (Heffernan, 2025), ensuring that instruments measure the constructs they intend to capture.

Finally, face validity was assured by piloting the instruments with a small sample of representative respondents and peers, confirming that questions appeared clear, relevant, and appropriate. This step helped confirm that participants and experts perceived the tools as aligned with their intended purpose, increasing respondent trust and engagement. While face validity is considered a more subjective form of validity, it serves as a vital initial check that supports further validation processes (Bhandari, 2023).

3.9.2 Reliability of research instruments

Reliability refers to the consistency of a research instrument in yielding stable and repeatable results across different applications (Gichohi & Kathuri, 2023). It ensures that the data collected truly reflects the constructs under investigation and can be trusted for drawing valid conclusions. In this study, reliability was ensured across the three main instruments: questionnaires, interview guides, and document analysis.

For the questionnaires, reliability was enhanced through a pilot test conducted on a small group of respondents drawn from institutions outside the actual study sample but with similar characteristics. The pilot enabled refinement of ambiguous items and improved clarity of questions. Internal consistency was then measured using Cronbach's Alpha coefficient, where a threshold of 0.7 and above was considered acceptable for reliability. This statistical test ensured that related items measured the same construct consistently across respondents.

For the interview guides, reliability was ensured by standardizing the sequence and structure of questions across respondents while allowing flexibility for probing. This reduced interviewer bias and improved comparability of responses. Additionally, uniform

interview conditions were maintained, and detailed notes were kept to enhance consistency in interpretation.

For the document analysis, reliability was promoted through the use of a structured document analysis guide with well-defined categories and evaluation criteria. This checklist approach minimized subjectivity and ensured documents such as policies, curricula, financial records, and institutional directives were reviewed systematically and consistently across all sampled institutions.

3.10 Data Collection Procedures

In order to submit authorization request to do research to the National Commission for Science, Technology, and Innovation (NACOSTI), the researcher acquired a cover letter from Kenya Methodist University. Further the researcher sought permission from the County Directors of TVET from the various counties where the 19 TVET institutions are situated. The Counties include Meru, Isiolo, Samburu, Marsabit, Tharaka Nithi and Embu. The researcher also sought authority and approval from the principals of the institutions identified to carry out the study. Once the authority was granted, the researcher booked an appointment with the principals to allow administration of the instruments to the respondents. A letter is issued to the respondents to assure them of the privacy and condition of the study. The researcher also sought permission from the principals to access all available documents related to the study and conduct interviews.

3.10.1 Procedure for administering questionnaires

The researcher administered structured questionnaires to collect quantitative data from Heads of Departments, trainers, and technical staff in the Building and Civil Engineering departments. The questionnaires contained closed-ended questions, ranking scales, and

rating matrices designed to capture consistent and measurable responses on the variables under study. The instruments were distributed to respondents in person during scheduled visits to the institutions, and adequate time was provided for completion. Completed questionnaires were collected immediately to ensure a high response rate and to minimize the risk of data loss or contamination. This procedure ensured the collection of reliable data that could be analyzed statistically and generalized to the wider study population.

3.10.2 Procedure for conducting interviews

The researcher used interview guides to collect qualitative data from Principals, BOG Chairpersons, and Class Representatives of trainees. Prior to the interviews, respondents were briefed about the purpose of the study, assured of confidentiality, and asked to provide informed consent. Appointments were scheduled with each participant to ensure convenience and adequate preparation. During the interviews, open-ended questions were posed to allow respondents to provide detailed insights into the preparedness of TVET institutions for implementing CBET. The sessions were conducted face-to-face, and responses were recorded accurately to capture rich and comprehensive information. This procedure ensured that the interviews provided in-depth perspectives from leadership, governance, and learner representatives, which complemented the quantitative findings of the study.

3.10.3 Procedure for conducting document analysis

The researcher employed a structured document analysis guide to systematically review relevant documents, including national CBET policies, institutional policies, curricula, financial records, circulars, and Board of Governors' minutes. The procedure involved identifying and collecting documents from institutional offices and regulatory bodies,

verifying their authenticity, and examining them against predefined categories aligned with the study objectives. Key information was extracted on curriculum availability, financial allocation, infrastructure adequacy, trainer preparedness, and governance support. To ensure consistency and reliability, the same checklist was applied across all institutions, and notes were taken to capture emerging themes. This process enabled the researcher to triangulate data from documents with findings from questionnaires and interviews, thereby strengthening the validity of the study outcomes.

3.11 Data Analysis and Presentation

In order to assess replies and draw insightful conclusions, data analysis involved the following steps: Trouble identification, data collection, data cleansing, data analysis, and data interpretation (Bryman & Bell, 2015). Analyzing data entails turning unprocessed information into useful insights for defensible choices. This entailed gathering and analyzing data in order to provide answers, support theories, or validate hypotheses. Therefore, data analysis examines, purifies, modifies, and models data in order to glean insights and aid in decision-making.

Both quantitative and qualitative data analysis are used to examine the data. The researcher performed data cleaning, which entails locating and fixing mistakes, missing values, and discrepancies in the dataset, after gathering the data from many sources and guaranteeing its quality and integrity. Following cleaning, the researcher scaled features, handle outliers if needed, and encode categorical variables to get the data ready for analysis. The most recent version of the Statistical Package for Social Sciences (SPSS), 29.0, was used to enter the data into the computer for investigation.

3.11.1 Quantitative Data Analysis

Quantitative data analysis involves the systematic examination, interpretation, and derivation of meaningful conclusions from numerical information by identifying patterns, correlations, and trends within datasets. In this study, quantitative data were collected through structured questionnaires and closed-ended interview guides, cleaned to remove errors, omissions, duplicates, and outliers, and then analyzed using the Statistical Package for Social Sciences (SPSS, Version 29.0). This ensured that the dataset was accurate, consistent, and ready for analysis.

The study applied both descriptive and inferential statistical techniques. Descriptive analysis was used to summarize and present the key characteristics of the data. Specifically, percentages, means, and standard deviations were calculated to describe the demographic characteristics of respondents and to assess the level of preparedness across variables such as curriculum availability, financial allocation, infrastructure adequacy, trainer readiness, and governance. These descriptive measures provided an overview of the distribution and central tendencies in the dataset (frequencies, percentage, mean, and standard deviation, offering a clear picture of the general trends.

For inferential analysis, two techniques were employed in line with the study objectives and hypotheses. Pearson correlation analysis was used to test the hypotheses by examining the strength and direction of the relationships between the independent variables (curriculum, financial allocation, infrastructure, and trainer readiness) and the dependent variable (preparedness for CBET implementation). In addition, multiple linear regression analysis was conducted to test the moderating effect of governance on the relationship

between the independent variables and CBET preparedness. Before running these tests, key statistical assumptions such as normality, linearity, autocorrelation, multicollinearity, and heteroscedasticity were checked to ensure the validity and reliability of the findings. Together, these analyses enabled the researcher to both describe the dataset comprehensively and draw robust conclusions regarding the relationships and moderating effects central to the study.

The study adopted a three-level hierarchical multiple regression model to analyze the preparedness in curriculum implementation of Competency-Based Education and Training (CBET) in public technical institutions in Mt. Kenya East Region, Kenya:

General Model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_j Z_j + \beta_{ij} X_i Z_j + \varepsilon$$

Level 1: Main Effects Only

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \text{ ----- (i)}$$

Level 2: Main Effects with Moderator

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_j Z_j + \varepsilon \text{ ----- (ii)}$$

Level 3: Moderated Effects (Interaction Terms Included)

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_j Z_j + \beta_{ij} X_i Z_j + \varepsilon \text{ ----- (iii)}$$

Where:

- Y: Preparedness in curriculum implementation on CBET in public technical institutions (dependent variable)
- β_0 : Constant/intercept term
- X_1 : Availability of CBET curriculum
- X_2 : Availability of financial allocation for CBET implementation
- X_3 : Adequacy of infrastructure for CBET implementation
- X_4 : Readiness of trainers to implement CBET

- $\beta_1, \beta_2, \beta_3, \beta_4$: Coefficients corresponding to the independent variables X_1 through X_4
- Z_j : Moderating variable – Influence of Board of Governors (BoG)
- β_j : Coefficient of the moderating variable (BoG)
- $X_i Z_j$: Interaction term between each independent variable and the moderating variable (i.e., curriculum $\times$ BoG, finance $\times$ BoG, etc.)
- β_{ij} : Coefficients of the interaction terms
- ε : Error term (residual)

The above models' levels had distinct purpose as described below.

- Model (i): Tests the direct influence of the four key preparedness indicators (curriculum, finance, infrastructure, and trainer readiness) on CBET implementation.
- Model (ii): Adds the moderating role of Board of Governors to observe its independent contribution.
- Model (iii): Explores whether the Board of Governors moderates the relationship between each of the four preparedness indicators and CBET implementation.

The findings were displayed as frequency tables, charts, and graphs.

3.11.2 Qualitative Data Analysis

Qualitative data in this study consisted of descriptive information that could not be expressed numerically, drawn from interviews with BOG Chairpersons, Principals, and Class Representatives, as well as responses to open-ended questions in the questionnaires and institutional documents. The analysis followed a thematic technique, beginning with the transcription of interviews, extraction of responses from open-ended items, and the

systematic review of documents such as CBET policies, institutional frameworks, financial circulars, and BOG minutes.

The researcher organized all data into text format suitable for coding, after which information was categorized and labeled into meaningful patterns and themes aligned with the research objectives and questions. Coding allowed the identification of recurring ideas, relationships, and concepts across data sources. Themes such as curriculum alignment, financial allocation, infrastructure adequacy, trainer readiness, and governance influence emerged consistently across interviews, questionnaires, and documents, offering a holistic view of institutional preparedness for CBET implementation.

To ensure rigor and accuracy, the researcher verified data at each stage of the analysis, reducing error and enhancing dependability. Thematic analysis enabled integration of insights from different qualitative sources, moving beyond individual responses to uncover broader patterns and institutional practices. This approach generated a deeper understanding of the issues under study and, when combined with quantitative findings, provided well-grounded conclusions and recommendations.

3.12 Ethical Considerations

This study adhered to strict ethical standards to ensure the protection of participants' rights, academic integrity, and the credibility of findings. Prior to data collection, the researcher obtained ethical clearance from the Kenya Methodist University (KeMU) Ethics Review Committee, an introduction letter from the Directorate of Postgraduate Studies, and a research license from the National Commission for Science, Technology, and Innovation

(NACOSTI). Formal letters seeking permission were also written to the County Directors of the 19 public TVET institutions where the research was conducted.

Participation in the study was entirely voluntary. Respondents were provided with consent forms, which explained the study objectives, their rights, and the voluntary nature of participation. Participants were free to withdraw at any stage without penalty. During the administration of questionnaires, anonymity was guaranteed by excluding names and other personal identifiers, while confidentiality was assured by securely storing responses and reporting them only in aggregate form. Privacy was also maintained by ensuring that only relevant information was collected, and questionnaires were completed in settings that minimized interruptions.

For the interviews, ethical considerations included informing participants about the purpose of the study, assuring them of confidentiality, and respecting their time and dignity throughout the process. Interviews were conducted in a professional and private manner, and informed consent was obtained before beginning. Participants were also reminded that they had the right to decline answering questions they found uncomfortable.

When conducting document analysis, the researcher ensured that only relevant institutional and policy documents were reviewed with proper authorization. Sensitive information contained in these documents was handled confidentially and reported only in a generalized manner to avoid any institutional exposure.

During data analysis, objectivity was maintained by minimizing researcher bias and adhering strictly to methodological procedures. Data integrity was ensured by carefully cleaning, coding, and analyzing the information without manipulation, guaranteeing

accuracy and authenticity of results. In the reporting of findings, the researcher presented results truthfully and transparently, while acknowledging institutions and individuals who provided support during fieldwork. To uphold academic integrity and avoid plagiarism, all sources of information were properly cited and referenced in accordance with APA, 7th edition guidelines. Through above measures, the study safeguarded the welfare, rights, and dignity of participants while ensuring the reliability, transparency, and academic credibility of the research process.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and findings of the study on preparedness in curriculum implementation of Competency-Based Education and Training (CBET) in public technical institutions in Mt. Kenya East Region, Kenya. It is organized according to the study objectives, beginning with the availability of the CBET curriculum, followed by adequacy of financial allocation, adequacy of infrastructure, and readiness of trainers. It also highlights the moderating role of Boards of Governors (BOG) in curriculum implementation readiness. Both quantitative and qualitative findings are presented and discussed under each objective. The presentation and discussion of the findings start by response rate, followed by demographic characteristics of respondents, diagnostic tests of the study data, and then findings based on each objective.

4.2 Response Rate

A high response rate is critical in ensuring the validity, reliability, and generalizability of findings in social science research. This study sought to evaluate the preparedness in curriculum implementation on competency-based education and training in public TVETs in Mt. Kenya East Region, Kenya. Data was collected from five categories of respondents mainly TVET Trainers, Heads of Departments (HoDs), Principals, Board of Governors (BoG)/Council Members, and Trainees using questionnaires and interview guides. Table 4.1 summarizes the response rates achieved in the study.

Table 4. 1***Response Rate***

Respondents	Trainers	HoDs	Principals	BoG/Council	Trainees	Total
Sample size	154	19	19	18	19	301
Actual	146	19	16	12	19	229
Response rate	94.8%	100%	84.2%	66.7%	100%	84.6%

The findings demonstrate a strong overall response rate of 84.6% (229 out of 301 respondents). Notably, response rates were exceptionally high among TVET trainers (N=146, 94.8%), Heads of Departments (HoDs) (N=19, 100%), and trainees (N=19, 100%). Principals and Board of Governors (BoG)/Council members posted slightly lower rates of (N=16, 84.2%) and (N=12, 66.7%), respectively. According to Babbie (2020), a response rate above 70% is generally considered robust in research, suggesting that this study's data collection was effective and yielded a solid foundation for analysis.

The 100% participation from HoDs and trainees is particularly noteworthy, ensuring full representation of these critical stakeholders in CBET implementation. Their feedback was instrumental in assessing aspects such as infrastructure adequacy, trainer preparedness, and the actual delivery of CBET in both classroom and workshop settings. Likewise, the high response rate from trainers (N=146, 94.8%) enhances the study's capacity to derive credible insights into instructional approaches and curriculum practices within TVET institutions. Although BoG/Council members had the lowest participation rate at (N=12, 66.7%), this still exceeds the 60% threshold commonly accepted for qualitative interview-based research, as outlined by Creswell and Poth (2018).

These high levels of participation supported the achievement of the study's core objectives: assessing CBET curriculum availability; evaluating financial allocations for implementation; examining infrastructure adequacy; and determining trainer readiness. The comprehensive dataset inspires confidence in the representativeness of the findings and reduces the likelihood of non-response bias. Parallel studies, including those by Mwangi et al. (2021) and Njeru and Gathigia (2023), have emphasized that strong response rates among key educational stakeholders enhance the accuracy and applicability of findings in implementation research. As such, the response rate outcomes in this study reinforce the reliability of the data and underscore the high level of stakeholder engagement in the Mt. Kenya East region. They also highlight the commitment of CBET actors to contributing meaningfully to efforts aimed at improving curriculum implementation in technical training institutions.

4.3 Reliability of the Data

The reliability of data in this study was assessed using Cronbach's Alpha coefficient for each main construct. The findings reveal high internal consistency across all variables as shown in Table 4.2.

Table 4. 2***Reliability of Data Based on Main Variables of the Study***

Main constructs of the study	Cronbach's Alpha (HOD's Data)	Cronbach's Alpha (Trainers' Data)
Availability of Curriculum (X1)	0.929	0.739
Financial Allocation (X2)	0.910	0.838
Adequacy of Infrastructure (X3)	0.877	0.813
Readiness of Trainers (X4)	0. 734	0.718
BOG/Council (M)	0.838	0.862
Implementation of CBET (Y)	0.915	0.818

Based on the widely referenced threshold by Nunnally and Bernstein (1994), a Cronbach's Alpha value of 0.70 or higher is considered acceptable for social science research, with values above 0.90 indicating excellent internal consistency. In this study, all constructs surpassed the minimum benchmark, confirming that the measurement items reliably and consistently captured their respective latent variables.

These results affirm the robustness and dependability of the questionnaire tools used to examine the preparedness in curriculum implementation of CBET in public technical institutions in Mt. Kenya East Region. The consistency in participant responses across items under each construct strengthens the credibility of the findings and supports the validity of the subsequent data analysis. This level of reliability is especially important in behavioural and educational research, where subjective interpretations can vary significantly. The strong internal consistency also minimizes the risk of measurement error

influencing observed relationships in inferential analysis, thereby enhancing the trustworthiness of the study's conclusions. Moreover, the findings indicate that the tools were well-suited for replication or application in comparable regions with similar educational contexts.

The reliability results are consistent with trends observed in recent educational research within Kenya and across Sub-Saharan Africa. For instance, Gathumbi et al. (2021), in a study focused on behavioural interventions in Kenyan public schools, reported Cronbach's Alpha values exceeding 0.80 for most constructs, reinforcing the validity of psychometric tools for evaluating behavioural dynamics in primary schools. Similarly, Chesimet and Too (2020) recorded Alpha values ranging from 0.81 to 0.93 when analyzing the relationship between school climate and student discipline, further supporting the reliability of instruments designed to explore behavioural factors in educational settings. Additionally, Tuyisenge and Kimeu (2023) emphasized the critical role of high Alpha coefficients in behavioural studies, noting that values above 0.90 significantly boost researcher confidence in the reliability and applicability of their findings.

4.4 Demographic Characteristics of Respondents

Understanding the demographic characteristics of respondents was essential in assessing institutional preparedness for curriculum implementation under the Competency-Based Education and Training (CBET) framework. In this study, demographic data from various respondents namely; trainers, Heads of Department (HoDs), principals, Board of Governors (BoG) members, and class representatives (trainees) were collected across 19 public TVET institutions in the Mt. Kenya East Region. These categories represent the core

institutional actors involved in planning, facilitating, and overseeing CBET curriculum implementation, and background information of each group is provided below.

4.4.1 Demographic Characteristics of heads of department

Heads of Department, all of whom (n = 19) participated in the study, provide vital leadership in departmental planning and resource allocation, which are critical for infrastructure adequacy and curriculum oversight. Table 4.3 summarizes background information of heads of department.

Table 4. 3

Demographic Characteristics of HODs of public TVETs in Mt. Kenya East Region

Highest academic qualification	Frequency	Percent
Masters	2	10.5
Bachelor's	13	68.4
Higher Diploma	2	10.5
Diploma	2	10.5
Total	19	100.0
Years of experience in TVET training	Frequency	Percent
1–5	7	36.8
6–10	8	42.1
11–15	4	21.1
Total	19	100.0
Years of experience as HOD	Frequency	Percent
0-2	5	26.3
3-5	7	36.8
6-10	7	36.8
Total	19	100.0

The data reveals that a majority of HoDs (n=8, 42.1%) had between 6–10 years of experience in TVET training, followed by (n=7, 36.8%) with 1–5 years, and (n=4, 21.1%) with 11–15 years of experience. Regarding academic qualifications, most HoDs (n=13, 68.4%) held a Bachelor's degree, while a smaller percentage had a Master's degree (n=2, 10.5%), Higher Diploma (n=2, 10.5%), or Diploma (n=2, 10.5%). In terms of leadership experience, (n=7, 36.8%) had served as HoDs for 3–5 years, another (n=7, 36.8%) for 6–10 years, while (n=5, 26.3%) had less than 3 years in the role.

The findings indicate a moderately experienced and academically qualified group of HoDs leading departments in TVET institutions. The highest number of HoDs with 6–10 years of teaching experience suggests a reasonable level of exposure to institutional processes and technical training pedagogy, which is a positive indicator for CBET implementation. Furthermore, the dominance of bachelor's degree holders (n=13, 68.4%) shows a solid foundation in academic qualification; however, the low number of master's degree holders (n=2, 10.5%) raises concerns about the depth of instructional leadership, curriculum innovation, and capacity for research-led decision-making in these institutions.

The distribution of experience in leadership roles with (n=14, 73.6%) having over three years of experience suggests a stable base of departmental leadership. These individuals are likely to have the managerial insights and operational understanding necessary to drive curriculum changes, such as the shift to CBET. However, the presence of HoDs with only 0–2 years of experience (n=5, 26.3%) indicates that some institutions might still be facing challenges with leadership continuity and institutional memory.

This demographic pattern has significant implications for the study's broader objective of assessing preparedness in CBET implementation. Since HoDs play a pivotal role in

interpreting policy, coordinating teaching staff, managing departmental resources, and ensuring instructional quality, their academic and experiential backgrounds are directly tied to the success of curriculum transformation efforts.

These findings align with recent research emphasizing the role of leadership experience and academic qualifications in successful curriculum implementation. For instance, Gaceri and Murungi (2021) observed that in Kenyan TVET institutions, leadership experience among HoDs was strongly linked to effective planning and mobilization of resources for CBET adoption. Similarly, Muthomi et al. (2022) found that inadequate postgraduate training among TVET instructional leaders limited their capacity to provide pedagogical mentorship, engage in curriculum development, and adopt new educational technologies.

Moreover, a study by Nderitu and Wambugu (2020) indicated that TVET leadership effectiveness was compromised in institutions where HoDs had limited experience or minimal qualifications beyond undergraduate level. The implication is that while the majority of HoDs in Mt. Kenya East demonstrate sufficient teaching and managerial experience, a focused effort on postgraduate professional development could enhance their capacity to lead CBET reforms effectively.

4.4.2 Demographic characteristics of TVET trainers

The study also gathered data from TVET trainers. The background information was on age, gender, highest academic qualification, years of experience in TVET training, extent of involvement in curriculum development or review and on training on CBET. The trainers (n = 163) represent the largest group of respondents, comprising 72.1% of the target sample. This group is central to curriculum delivery, pedagogical alignment, and practical

training facilitation thus playing a significant role in translating CBET principles into instructional practice. The findings are summarized in Table 4.4.

Table 4. 4

Demographic Characteristics of Trainers of Public TVETs

Age	Frequency	Percent
Below 30 years	63	43.2
31-40	58	39.7
41-50	23	15.8
51-60	2	1.4
Total	146	100.0
Gender	Frequency	Percent
Male	88	60.3
Female	58	39.7
Total	146	100.0
Highest academic qualification	Frequency	Percent
Masters	1	.7
Bachelor's	86	58.9
Higher Diploma	23	15.8
Diploma	35	24.0
Craft Certificate	1	.7
Total	146	100.0
Years of experience in TVET training	Frequency	Percent
1-5	78	53.4
6-10	53	36.3
11-15	6	4.1
16 – 20	6	4.1
Over 20	3	2.1

Total	146	100.0
Extent of involvement in curriculum development or review	Frequency	Percent
Very low extent	16	11.0
Low extent	35	24.0
Moderate	68	46.6
High extent	24	16.4
Very high extent	3	2.1
Total	146	100.0
Have you received training on CBET?	Frequency	Percent
Yes	135	92.5
No	11	7.5
Total	146	100.0

The findings on age distribution revealed that the majority of TVET trainers were relatively young. Specifically, (n = 63, 43.2%) of the trainers were below 30 years of age, followed closely by (n = 58, 39.7%) aged between 31 and 40 years. Trainers aged 41–50 years accounted for (n = 23, 15.8%), while those aged 51–60 years were only (n = 2, 1.4%). These results suggest a predominantly youthful teaching workforce, which may influence the adaptability and openness to adopting new instructional methodologies such as CBET.

In terms of gender, (n = 88, 60.3%) of the trainers were male, while females comprised (n = 58, 39.7%). Although there is a noticeable gender imbalance, the female representation is relatively substantial. Gender diversity can influence pedagogical approaches and collaborative practices during curriculum implementation. On academic qualifications, most respondents held a Bachelor's degree (n = 86, 58.9%), followed by Diploma holders (n = 35, 24.0%), and those with Higher Diplomas (n=23, 15.8%). Only a small proportion

of trainers possessed a Master's degree (n=1, 0.7%) or Craft Certificate qualification (0.7%, n=1). These findings imply that while the majority of trainers have at least undergraduate-level qualifications, there is limited representation of postgraduate-trained personnel, which could affect the depth of instructional content delivery and curriculum interpretation in CBET.

On teaching experience, the data indicate that (n = 78, 53.4%) of the trainers had between 1–5 years of experience, while (n = 53, 36.3%) had 6–10 years. Those with 11–15 years and 16–20 years each comprised (n = 6, 4.1%), and those with over 20 years of experience were only (n = 3, 2.1%). This distribution confirms a predominantly early- to mid-career workforce, which may possess greater flexibility but potentially limited institutional memory and practical experience with curriculum transitions such as the shift to CBET.

When asked about their level of involvement in curriculum development or review, the majority of trainers reported a moderate extent of involvement (n=68, 46.6%), followed by low extent (n=35, 24.0%) and high extent (n=24, 16.4%). Very low and very high levels of involvement were reported by (n=16, 11.0%) and (n=3, 2.1%) respectively. These results suggest a need for more inclusive and widespread engagement of trainers in curriculum development processes to build ownership and implementation competence.

Finally, (n=135, 92.5%) of trainers indicated that they had prior exposure to CBET, while only (n=11, 7.5%) reported no such exposure. This high level of CBET exposure is promising for institutional readiness, provided the exposure translates into practical understanding and capability for implementation. The findings suggest that public technical institutions in Mt. Kenya East Region are staffed primarily by a young and

moderately experienced workforce with basic academic qualifications, mainly at the undergraduate level. The youthfulness of the workforce could be advantageous in fostering openness to pedagogical change, technology integration, and adaptability required for CBET implementation. However, the low proportion of trainers with postgraduate qualifications may limit capacity for curriculum innovation and academic leadership in CBET delivery.

Moreover, while the majority of trainers have been exposed to CBET, their limited involvement in curriculum development points to a structural gap in participatory curriculum governance. This disconnect may hinder the alignment between policy-level design and classroom-level implementation. Strengthening involvement through targeted professional development, inclusive curriculum workshops, and mentorship may be key to effective CBET rollout.

These findings align with the observations made by Wambugu et al. (2021), who reported that younger TVET instructors are generally more receptive to the adoption of innovative pedagogical approaches, including CBET, but often lack the extensive experience necessary for fully autonomous curriculum delivery. Similarly, Kariuki and Kithuka (2020) highlighted that insufficient academic qualifications and limited participation in curriculum design processes significantly compromise the quality of CBET implementation in Kenyan TVET institutions.

Ngigi and Wambua (2022) also emphasized the need for structured professional development and inclusion of trainers in curriculum design as a strategy to build ownership

and improve curriculum fidelity. They argue that trainers’ active involvement enhances the contextual relevance of training materials and fosters accountability in implementation.

4.4.3 Demographic characteristics of TVET Principals

In this study, principals of TVETs (n=16, 84.2% response rate) contributed strategic perspectives on institutional management, resource mobilization, and policy implementation. An important dimension of this investigation involved analyzing the demographic characteristics and professional development experiences of TVET Principals, considering their critical role in driving curriculum implementation. The demographic data collected from 16 Principals of TVETs revealed meaningful patterns with respect to gender, length of tenure, and training in CBET leadership. The findings are summarized in Table 4.5.

Table 4. 5

Demographic Characteristics of Principals

Category (N = 16)	Sub-category	Frequency (n)	Percentage (%)
Gender	Male	8	50.0
	Female	8	50.0
Experience	1–3 years	5	31.25
	4–6 years	6	37.50
	7–10 years	4	25.00
	Over 10 years	1	6.25

Table 4.5 presents the demographic characteristics of the principals of public TVET institutions in Mt. Kenya East Region. The findings show that gender distribution was balanced, with eight male principals (n=8, 50%) and eight female principals (n=8, 50%), suggesting notable progress towards gender parity in leadership within the sector. Results

indicate gender parity in leadership and a relatively experienced leadership base, with most principals having 4–6 years of tenure. With regard to tenure, most principals had served between four and six years ($n = 6$, 37.5%), followed by those who had served between one and three years ($n = 5$, 31.25%). Four principals ($n=4$, 25%) reported serving for seven to ten years, while only one principal ($n=1$, 6.25%) had served for more than a decade. These results imply that the leadership is fairly experienced, with a significant proportion of principals having accumulated adequate exposure to institutional management and operations, which may be critical in steering the transition and implementation of Competency-Based Education and Training (CBET).

When asked about professional development related to CBET, most of the principals had undergone various forms of training or sensitization to support CBET implementation. These included senior management courses, curriculum planning and assessment training, pedagogy workshops at the Kenya School of TVET, and direct CBET-focused sessions organized by the State Department for TVET, Kenya School of TVET (KSTVET), and institutions such as Colleges and Institutes Canada (CICan). Notably, several Principals also facilitated capacity-building activities for their own teaching staff, indicating a cascading model of professional learning and internal institutional support for CBET. These findings suggest that TVET Principals in the Mt. Kenya East region are not only demographically diverse but are also largely engaged in targeted professional development that aligns with the demands of CBET leadership. This is significant given the role of institutional leaders in shaping instructional culture, mobilizing resources, and ensuring compliance with national education reforms.

The results are consistent with recent studies highlighting the importance of leadership development in successful curriculum reform. For example, Kinyanjui and Omare (2022) emphasized that the success of CBET in Kenya hinges on the continuous professional training of institutional heads, particularly in instructional leadership and assessment practices. Similarly, a study by Muthomi et al. (2024) underscored that Principals who undergo structured capacity building are more likely to initiate and sustain CBET-aligned innovations in their institutions. Moreover, Ndung'u and Kimani (2021) found that Principals who actively promote internal training and mentor their staff foster a stronger culture of curriculum ownership and learner-centered teaching.

These findings imply that capacity-building strategies for institutional heads are a key enabler for successful CBET implementation. Ensuring that all Principals undergo formal and continuous professional development, focusing on CBET to enhance leadership consistency and instructional coherence across institutions. However, the variation in the types and depth of training received suggests the need for a more standardized national framework for principal development specific to CBET.

4.4.4 Demographic characteristics of TVET Boards of Governors (BOG) /Councils

The study sought to analyze the demographic characteristics of respondents involved in governance within public TVET institutions in the Mt. Kenya East Region, with particular focus on their experience. In this study, TVET Boards of Governors were individuals holding the positions of Council or BOG Chairperson indicating a strong representation of internal institutional leadership in the governance structure. BoG/Council Chairperson (n = 12, 66.7%) offered insights into governance structures and decision-making roles that may moderate institutional readiness for CBET implementation.

Regarding experience, the majority of BOG / Council Chairperson respondents had served for relatively short durations, predominantly 2 to 3 years, with a few indicating 2.5 years. This blend of internal administrative experience and relatively new external governance leadership presents both opportunities and limitations for strategic curriculum implementation, particularly in the context of Competency-Based Education and Training (CBET).

Information gathered indicated a relatively short tenure of BOG/Council leadership of 2 to 3 years which may limit their strategic influence, institutional memory, and ability to sustain long-term policy reforms. On the other hand, the significant representation and experience of BOG/Council Chairperson suggest a potential compensatory effect, where the internal leadership provides the necessary continuity and administrative direction during transitional phases of curriculum change, and a passive role of governance.

The above information implies that effective CBET implementation may be relying heavily on principals' leadership, while BoG/Council Chairperson may require enhanced orientation and ongoing capacity building to align with institutional priorities and national TVET policy shifts. It also raises the need for succession planning and consistent training of BoG/Council Chairperson to ensure governance continuity and institutional stability.

These findings are supported by recent studies. Wanjala and Odhiambo (2022) reported that successful CBET implementation in Kenyan TVET institutions is significantly dependent on the consistency of leadership, especially the principals. Similarly, Makori et al. (2023) emphasized that while institutional governance through Boards / Councils plays

a supportive role, the effectiveness of CBET transitions is largely driven by the internal leadership competencies of principals.

Furthermore, Ndiritu and Mugo (2021) observed that when BOG/Council leadership changes frequently or lacks sufficient experience, their oversight role becomes more symbolic than strategic, thereby necessitating robust administrative leadership from principals to drive innovation and reform. Therefore, the findings from this study highlight passive leadership by BOG / Council, pointing out an area for development in the governance arm of TVET institutions to ensure well-rounded support for CBET.

4.4.5 Demographic characteristics of TVET Trainees

The study sought to understand the demographic characteristics and training profiles of TVETs trainees enrolled in Building and Civil Engineering-related programs across public technical institutions in the Mt. Kenya East Region. TVET trainees served as a valuable lens into the learner experience and feedback on teaching-learning processes within the CBET framework. The findings are summarized in Table 4.6.

Table 4. 6***Demographic Characteristics TVET Trainees***

Category (N = 19)	Sub-category	Frequency (n)	Percentage (%)
Program Enrolled	Civil Engineering	6	31.6
	Plumbing	5	26.3
	Building Technology	4	21.1
	Masonry	3	15.8
	Land Survey	1	5.3
	Quantity Survey	1	5.3
Enrolment Level	Level 6	10	52.6
	Level 5	5	26.3
	Level 4	4	21.1
Gender	Male	16	84.2
	Female	3	15.8

Table 4.6 presents the demographic characteristics and training profiles of trainees enrolled in Building and Civil Engineering-related programs in public technical institutions across the Mt. Kenya East Region. The findings reveal that most trainees were enrolled in Civil Engineering (n = 6, 31.6%) and Plumbing (n = 5, 26.3%), followed by Building Technology (n = 4, 21.1%), Masonry (n = 3, 15.8%), and smaller enrolment in Land Survey and Quantity Survey, each with one trainee (5.3%). With regard to enrolment levels, the majority of trainees were undertaking studies at Level 6 (n = 10, 52.6%), while 5 trainees (26.3%) were at Level 5, and 4 trainees (21.1%) were at Level 4. This distribution suggests that a significant proportion of the trainees are at advanced stages of training. Gender distribution indicates a male-dominated enrolment, with 16 trainees (84.2%) being male and only 3 trainees (15.8%) being female, underscoring the gender imbalance that persists in technical and engineering-related fields.

The data on trainees in Building and Civil Engineering programs indicate a clear gender imbalance: (n=16, 84.2%) are male, and only (n=3, 15.8%) are female. This aligns with broader patterns observed within Kenyan TVET institutions, where female participation in engineering-related programs remains notably low. For instance, in October 2023, women constituted just (n=3, 15.8%) of enrolment in Building and Civil Engineering–related programs nationwide, despite targeted interventions to combat

The concentration of trainees in Civil Engineering (n=6, 31.6%) and Plumbing (n=5, 26.3%) reflects industry demand for these disciplines, while smaller enrolment numbers in Land Survey and Quantity Survey suggest less demand or perhaps limited program availability. The predominance of trainees at Level 6 qualifications (n=10, 52.6%) underscores a cohort advancing into more specialized or professional competencies—an encouraging sign of depth in human capital development.

Studies within Kenyan TVET contexts highlight enduring gender disparities in STEM and engineering fields. Nthuku and Muthima (2023) found that gender stereotypes, lack of female role models, and societal perceptions continue to inhibit female enrolment in TVET engineering courses. Similarly, Ochieng (2024) reported that male trainees overwhelmingly favoured engineering and construction disciplines, while female trainees preferred fields like biological sciences and ICT, further emphasizing a gendered divergence in program selection.

These findings point to entrenched structural and socio-cultural barriers that sustain male dominance in TVET engineering programs. While the high level of trainee progression to advanced qualification levels is promising, the persistent underrepresentation of women

signals a need for continued strategic interventions like mentorship, role modelling, and gender-responsive career guidance to promote equity and inclusion in these technical fields.

4.5 Diagnostic Tests of the Study Data

Before conducting regression analysis, it was necessary to verify that the underlying assumptions of the model were satisfied to ensure validity, reliability, and interpretability of the findings. Diagnostic tests were employed to assess key assumptions including normality, linearity, homoscedasticity, independence of residuals, and absence of multicollinearity (Field, 2018; Hair et al., 2020). This study applied the Shapiro-Wilk test, box plots, histograms, scatterplots, the Durbin-Watson statistic, and variance inflation factors (VIFs) to determine whether the dataset was suitable for parametric analysis. Meeting these assumptions was critical in enhancing the robustness of regression results and ensuring valid inferences regarding the influence of institutional preparedness on Competency-Based Education and Training (CBET) implementation in public technical institutions in the Mt. Kenya East Region, thereby strengthening the credibility and policy relevance of the findings (Tabachnick & Fidell, 2019; Creswell & Guetterman, 2021).

The study examined key variables aligned to research objectives: curriculum availability (X_1), financial allocation (X_2), adequacy of infrastructure (X_3), trainer readiness (X_4), the moderating role of Boards of Governors (M), and CBET preparedness in curriculum implementation as the dependent variable (Y). The diagnostic results confirmed that the dataset met all assumptions: the Shapiro-Wilk test and visual plots indicated normally distributed residuals; scatterplots demonstrated linearity; and the Durbin-Watson statistic

(1.5–2.5) confirmed independence of residuals. Homoscedasticity was established through residual plots, while multicollinearity was ruled out as all VIFs were below the threshold of 10 (Hair et al., 2020). These results validated the data for regression modeling and enhanced the reliability of conclusions on how curriculum, financial resources, infrastructure, trainer readiness, and board moderation influence CBET preparedness in TVET institutions.

4.5.1 The Normality Test

Given the small sample size, the study employed the Shapiro-Wilk test which is recommended for samples below 200 to assess the normality of key variables related to institutional preparedness for Competency-Based Education and Training (CBET), including curriculum availability, financial allocation, infrastructure adequacy, trainer readiness, the moderating role of Boards of Governors, and overall CBET preparedness (dependent variable). Results presented in Tables 4.7 and 4.8 showed that none of the significance values fell below the $\alpha = .05$ threshold, indicating that the variables were approximately normally distributed and that the residuals met the normality assumption required for reliable multiple regression analysis (Field, 2018; Hair et al., 2020).

Table 4. 7***Tests of Normality – HOD Data***

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
X1	.146	19	.200*	.920	19	.114
X2	.181	19	.101	.937	19	.230
X3	.096	19	.200*	.971	19	.788
X4	.151	19	.200*	.944	19	.306
M	.195	19	.055	.944	19	.317
Y	.157	19	.200*	.942	19	.291

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 4. 8***Tests of Normality - Trainer's Data***

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
X1	.052	146	.200*	.989	146	.327
X2	.098	146	.002	.983	146	.060
X3	.056	146	.200*	.992	146	.634
X4	.074	146	.050	.988	146	.222
M	.103	146	.001	.945	146	.000
Y	.142	146	.000	.852	146	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

For the HOD dataset (N = 19), the Shapiro-Wilk test was applied due to the small sample size, with all variables returning p-values above .05, confirming approximate normality: curriculum (W = .920, p = .114), financial allocation (W = .937, p = .230), infrastructure (W = .971, p = .788), trainer readiness (W = .944, p = .306), Board of Governors (W =

.944, $p = .317$), and CBET preparedness ($W = .942$, $p = .291$). The Kolmogorov-Smirnov results ($\text{Sig.} \geq .055$) corroborated this finding, suggesting the suitability of parametric techniques such as multiple regression for the HOD data. For the trainers' dataset ($N = 146$), the Shapiro-Wilk and Kolmogorov-Smirnov tests confirmed normality for most predictors: curriculum, financial allocation, infrastructure, and trainer readiness ($p > .05$) but indicated significant deviations for the moderator (BOG role, $W = .945$, $p = .000$) and the dependent variable (CBET preparedness, $W = .852$, $p = .000$), implying the need for data transformation or robust modeling to safeguard validity.

The normality of independent variables across both groups highlights consistent perceptions regarding curriculum, funding, infrastructure, and trainer preparedness, aligning with Kimani and Wambua (2022), who noted that structured institutional parameters foster normally distributed responses. However, the non-normality observed in the moderator and dependent variable among trainers likely reflects real disparities in governance and CBET outcomes. As Muriithi et al. (2021) observed, governance factors in TVET institutions often vary due to resource distribution, location, and leadership culture, producing skewed responses. Similarly, Wambugu et al. (2023) reported that institutional challenges, such as limited resources and leadership variability, significantly affect CBET preparedness, explaining the uneven distribution patterns in trainers' responses.

The study further plotted histogram shown in Figure 4.1 and 4.2. A histogram provides a graphical representation of the distribution of a variable.

Figure 4. 1

Histogram test of normality - HOD's data

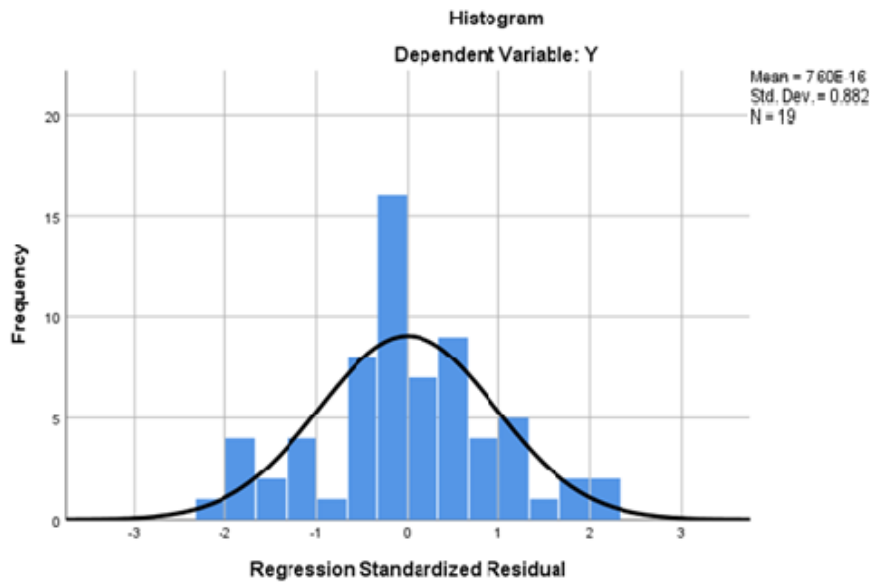
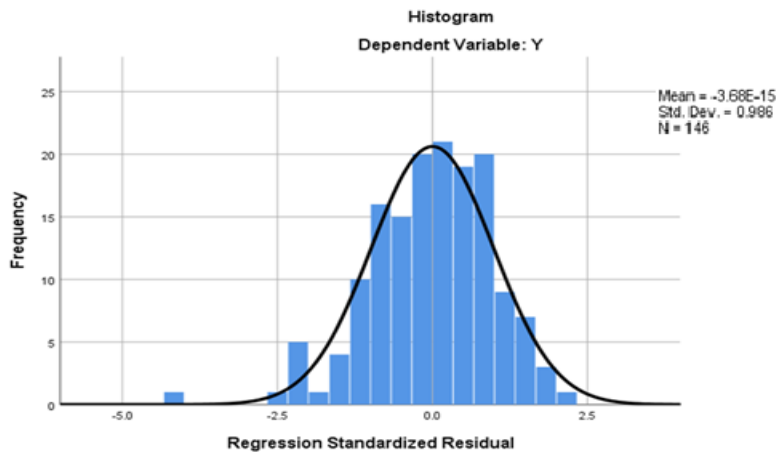


Figure 4. 2

Histogram test of normality - Trainer's data



The histograms for both HODs (Figure 4.1) and trainers (Figure 4.2) indicate moderately symmetric, unimodal distributions with most responses concentrated around the central

values. While not perfectly bell-shaped, the distributions approximated normality sufficiently to justify the use of parametric techniques such as regression, correlation, and ANOVA. The acceptable levels of skewness and kurtosis implied by visual inspection suggest that the residuals did not deviate significantly from normality, supporting the robustness and validity of subsequent analyses (Field, 2018). The similarity in distribution between the HOD and trainer datasets further reinforces the internal consistency and credibility of the findings on institutional preparedness for CBET.

These results align with prior studies highlighting the importance of normality in educational research. Okello and Wambugu (2021) emphasized that normal data distributions improve the precision and credibility of results when evaluating reforms, while Muriithi et al. (2020) observed that normality facilitated valid conclusions on TVET preparedness in areas such as infrastructure and trainer capacity. Although slight deviations are acceptable given the robustness of parametric tests (Saunders et al., 2019), the histogram analyses confirmed that no data transformation was necessary. Combined with numerical tests, these visual diagnostics validated that the data were approximately normal, satisfying one of the core assumptions for reliable statistical interpretation and policy-relevant conclusions on CBET preparedness.

4.5.2 Linearity Test

To ensure the appropriateness of parametric statistical techniques such as multiple linear regression, this study conducted a linearity diagnostic using scatterplots and residual plots for both Heads of Departments (HODs) and TVET Trainers. The independent variables tested were availability of curriculum (X_1), financial allocation (X_2), infrastructure

adequacy (X_3), and trainer readiness (X_4), while the dependent variable (Y) was preparedness in curriculum implementation on Competency-Based Education and Training (CBET). Linearity between each independent variable and the dependent variable is critical for the validity of linear regression analysis (see Figure 4.3 and 4.4).

Figure 4. 3

Linearity test result - HOD's data

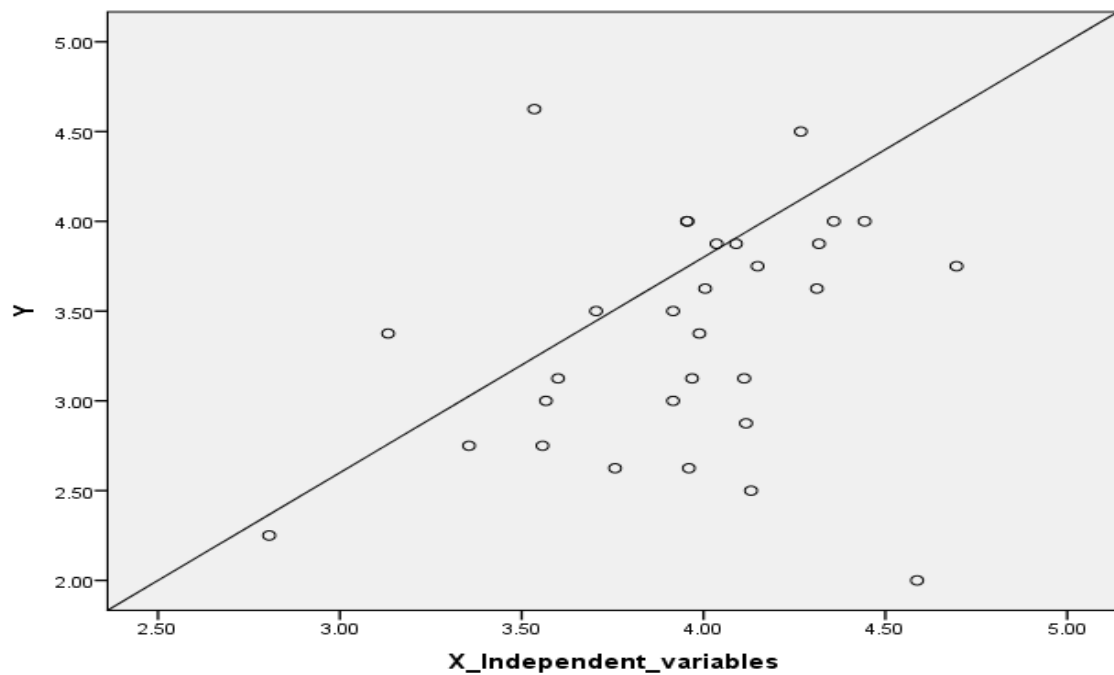
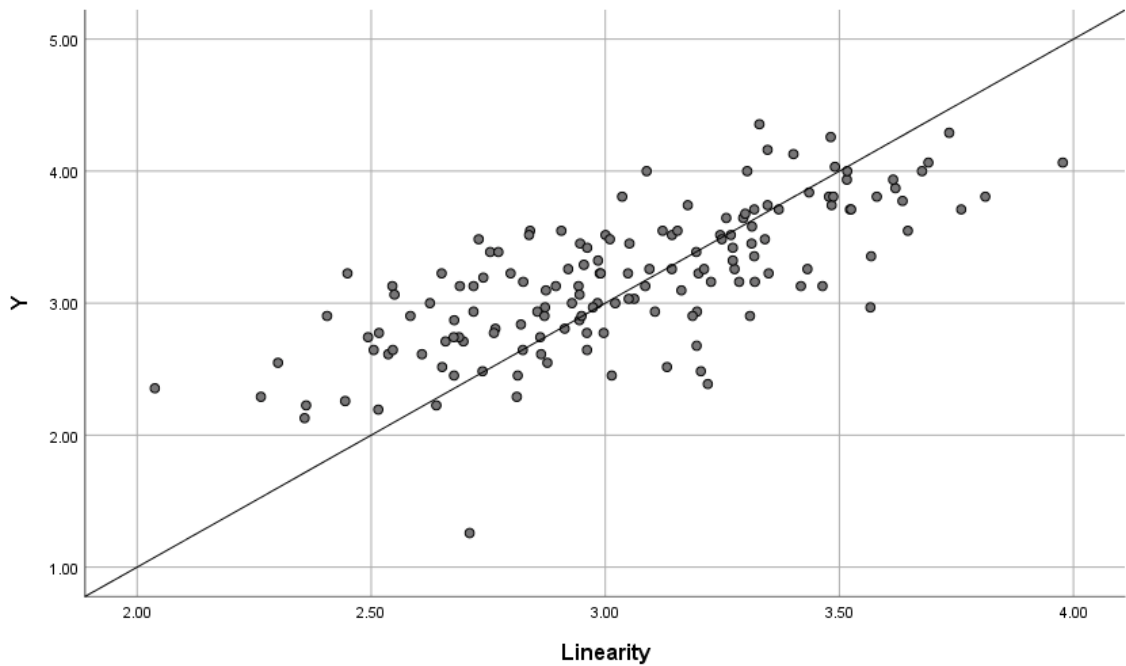


Figure 4. 4

Linearity test result - Trainer's data



The scatterplots from both HODs and trainers demonstrated generally linear relationships between the independent variables (curriculum availability, financial allocation, infrastructure, and trainer readiness) and the dependent variable (CBET preparedness). The data points followed straight-line trends without significant curvilinear deviations, while residual plots showed random distributions around the horizontal axis, confirming homoscedasticity and linearity. These findings suggest that increases or decreases in institutional preparedness factors proportionally affect CBET implementation outcomes. In particular, trainer readiness displayed a strong linear relationship with CBET preparedness, reinforcing its critical role in curriculum implementation. The validation of linearity supports the reliability of the regression model for inferential analysis.

These results align with prior research emphasizing the importance of verifying linearity in regression. Musyoka and Njoroge (2021) noted that linearity ensures accurate estimation of regression coefficients and minimizes Type I and II errors, while Wambugu et al. (2020) confirmed that CBET implementation in Kenyan TVET institutions is best modeled linearly once trainer factors are considered. The findings also support theoretical models such as the Input-Process-Output (IPO) framework and the Theory of Planned Behavior Ajzen (1991) and Maiyuria et al. (2024), which assume linear cause-effect relationships between institutional inputs and outcomes. Overall, the scatterplot and residual diagnostics validate the use of multiple linear regression, strengthening the interpretation of predictor effects on CBET preparedness in public TVET institutions in Mt. Kenya East.

4.5.3 The Heteroscedasticity Test

To validate the assumptions underlying multiple linear regression, this study assessed the presence of heteroscedasticity in the data obtained from Heads of Departments (HODs) and TVET Trainers. Heteroscedasticity occurs when the variance of residuals is not constant across levels of predicted values, which can compromise the reliability of regression estimates. Scatterplots of residuals against standardized predicted values were generated and interpreted to check for this issue, as shown in Figures 4.5 and 4.6.

Figure 4. 5

The residual and standardized predicted value of outcome variable - HOD's data

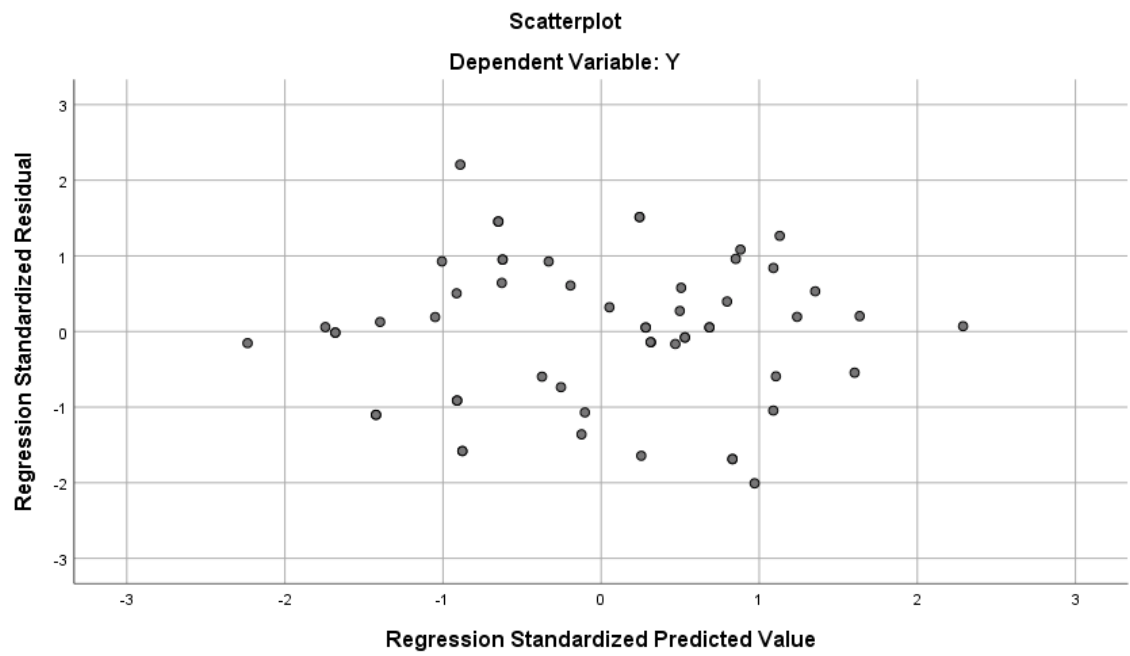
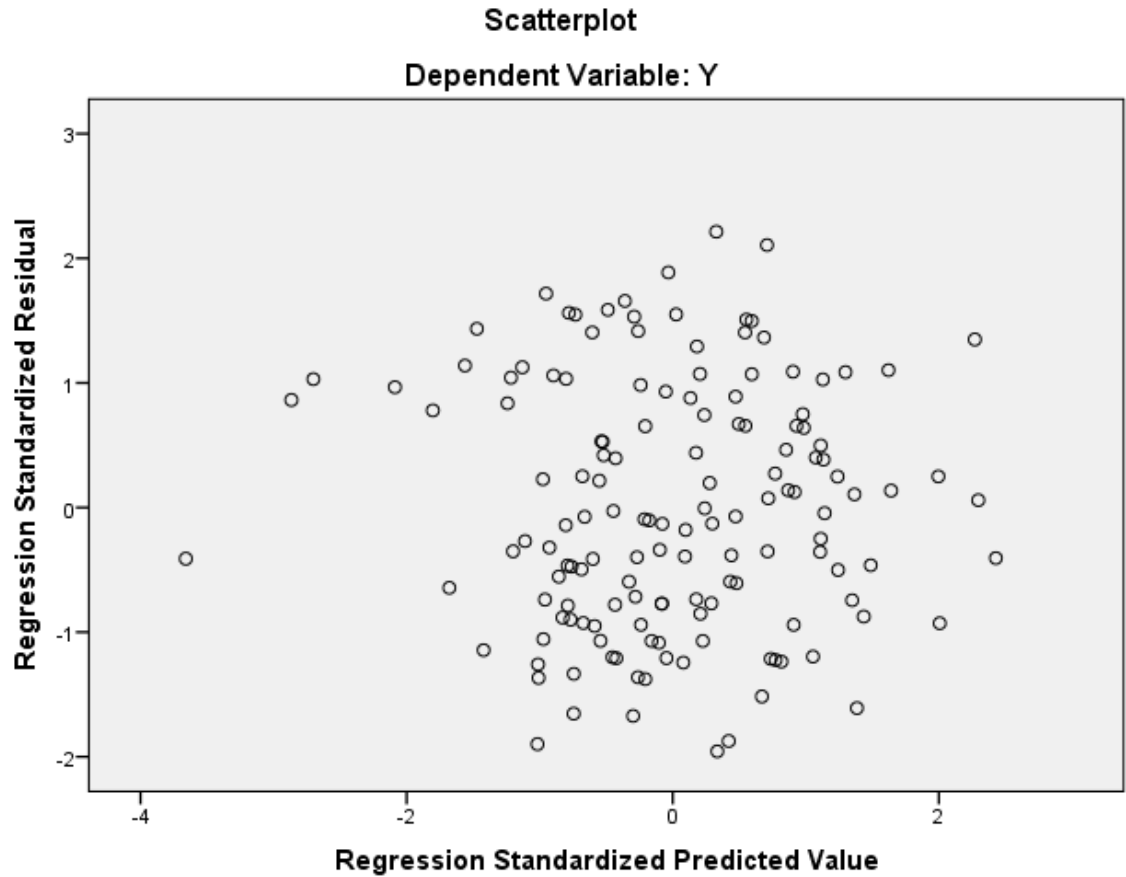


Figure 4. 6

The residual and standardized predicted value of outcome variable - Trainer's data



The residual scatterplots for both HODs (Figure 4.7) and trainers (Figure 4.8) showed a fairly even and random distribution of residuals around the zero line, with no visible funnel shapes or systematic clustering. This randomness confirms the presence of homoscedasticity, indicating that the variance of residuals remained stable across all predicted values. Consequently, regression parameter estimates derived from the datasets are efficient, unbiased, and valid for interpretation. The absence of cone-like patterns further suggests that standard errors of regression coefficients are trustworthy, ensuring

that the statistical significance of independent variables such as curriculum availability, financial allocation, infrastructure adequacy, and trainer readiness is reliable.

The confirmation of homoscedasticity in both datasets strengthens the credibility of regression results by safeguarding against biased estimates and inaccurate p-values. This finding aligns with prior studies emphasizing the importance of testing for residual variance in educational research. For instance, Muriithi and Murungi (2021) noted that verifying homoscedasticity reduces the risk of Type I and Type II errors, while Onyango and Ng'ang'a (2023) highlighted its role in ensuring valid modeling of TVET reforms. Similarly, Kinyanjui et al. (2022) stressed that homoscedasticity enhances the interpretability of regression coefficients for complex constructs such as trainer readiness and infrastructure adequacy. Overall, the random spread of residuals across both datasets validated the use of linear regression and confirmed the robustness of the study's findings on CBET preparedness.

4.5.4 The auto-correlation test

Autocorrelation refers to the correlation of residuals over time or across observations. In the context of regression analysis, the presence of autocorrelation violates the assumption of independence of errors, which can result in biased and inefficient estimates, especially in time-series or cross-sectional data. To assess autocorrelation in the residuals of the regression models, the study employed the Durbin-Watson (DW) test using data from both The DW statistic ranges from 0 to 4, where values between 1.5 and 2.5 generally indicate

no autocorrelation (Field, 2018). The results of the test are presented in Table 4.9 and interpreted below for each variable.

Table 4. 9

The Autocorrelation Test of the Data

Variables	Durbin-Watson – Data from HOD	Durbin-Watson – Data from Trainers
X1	2.140	1.945
X2	2.239	2.055
X3	1.224	1.908
X4	1.813	2.050

The Durbin-Watson (DW) statistics for curriculum availability (2.140), financial allocation (2.239), and trainer readiness (1.813) in the HOD dataset fall within the acceptable range of 1.5–2.5, confirming independence of errors, while infrastructure adequacy (1.224) indicates mild positive autocorrelation. This suggests potential shared systemic influences across institutions, which may bias standard errors and affect the predictor’s significance. In contrast, all DW statistics for the trainers’ dataset fell within the recommended range, confirming the absence of autocorrelation and validating the assumption of independent errors across observations.

These results strengthen the credibility of regression estimates by confirming residual independence, a crucial assumption for hypothesis testing and coefficient interpretation. The findings align with Maina and Gathigia (2022), who emphasized the need to check for autocorrelation in CBET studies due to shared administrative contexts, and with Wanjala and Kipsang (2021), who highlighted its role in supporting credible policy recommendations. Similarly, Mugo and Karimi (2020) found that independence of errors

in hierarchical educational data enhances the robustness of regression inferences. Overall, the DW results confirm the validity of regression models used in this study, with only the HODs' infrastructure adequacy variable requiring cautious interpretation or future adjustment.

4.5.5 The Multicollinearity test

To ensure the validity of the regression models in the study examining *Preparedness in Curriculum Implementation on Competency-Based Education and Training (CBET) in Public Technical Institutions in Mt. Kenya East Region*, a multicollinearity diagnostic test was conducted. Specifically, the Variance Inflation Factor (VIF) and Tolerance values were computed for each of the four independent variables. The results are shown in Table 4.10.

Table 4. 10

Multicollinearity Test

Independent Variables	Collinearity Statistics – Data from HOD		Collinearity Statistics – Data from Trainers	
	Tolerance	Tolerance	Tolerance	Tolerance
X1	.377	2.654	.577	1.734
X2	.367	2.728	.544	1.839
X3	.268	3.732	.540	1.852
X4	.920	1.086	.698	1.432

The multicollinearity diagnostics revealed that all VIF values for both the HOD and trainer datasets were below the critical threshold of 5, and all Tolerance values exceeded 0.1, indicating no significant multicollinearity concerns (Hair et al., 2019). Although the HOD dataset recorded a relatively higher VIF for infrastructure adequacy ($X_3 = 3.732$), this reflects only moderate collinearity and remains within acceptable limits. By contrast, the

trainer dataset exhibited lower VIF values across all variables, suggesting a more favorable multicollinearity profile. The absence of problematic multicollinearity confirms that each predictor contributed uniquely to explaining variance in CBET preparedness, thereby strengthening regression coefficient interpretation and model reliability. These findings are consistent with Kiptum et al. (2022), who noted that mild multicollinearity is tolerable in educational research, and with Mutisya and Wambua (2021), who reported similarly acceptable values in TVET curriculum reform studies.

Collectively, the diagnostic tests confirmed that the assumptions for multiple linear regression were satisfied. The Shapiro-Wilk and histogram tests established approximate normality, while scatterplots validated linearity between predictors and CBET preparedness. Residual analyses confirmed homoscedasticity, and the Durbin-Watson statistic fell within the acceptable 1.5–2.5 range, ruling out autocorrelation. Finally, the multicollinearity test confirmed that predictors were not excessively correlated. Together, these diagnostics affirm that the datasets met the key requirements for reliable regression modeling, enabling valid statistical inference on the influence of institutional factors namely: curriculum availability, financial allocation, infrastructure adequacy, and trainer readiness on CBET implementation preparedness.

4.6 The Availability of Curriculum in Preparedness of Implementation of CBET in Public TVETs in Mt. Kenya East Region

The first research objective focused on examining the availability of curriculum as a key indicator of preparedness for implementing CBET in public technical institutions within the Mt. Kenya East Region, Kenya. Specifically, it investigated the timely availability of

CBET-compliant curricula to support training, access by trainers to curriculum documents and instructional guides, clarity of learning outcomes and performance indicators, institutional frameworks for adopting the CBET curriculum, the level of trainer involvement in curriculum development and review, the curriculum's responsiveness to trainee diversity and needs, and institutional mechanisms supporting curriculum orientation and dissemination.

To address this objective, both quantitative and qualitative data were collected. Structured questionnaires were used to gather quantitative data from trainers and administrators, focusing on areas such as curriculum approval and timely dissemination, occupational relevance and competency coverage, trainer participation and orientation, availability of instructional resources, adherence to quality assurance and assessment standards, as well as inclusivity and institutional support structures for curriculum implementation. Responses from open-ended questionnaire items, interviews, and focus group discussions were subjected to thematic analysis and are presented through narrative summaries, emerging themes, and illustrative excerpts to complement and enrich the quantitative findings.

4.6.1 HoD's responses on availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

To assess perceptions regarding the availability of CBET curriculum materials, the study employed a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1), along with a Not Applicable (0) option for responses deemed outside the respondent's scope. For analysis purposes, responses marked as Agree and Strongly Agree were combined to reflect positive perceptions, while those marked as Disagree and Strongly

Disagree were grouped to indicate negative perceptions. Neutral responses were reported separately to capture moderate or uncertain viewpoints.

This analytical method provided a structured assessment of critical components of curriculum preparedness, such as access to materials, clarity of learning outcomes, and the existence of institutional support systems. The consolidated findings from this evaluation are displayed in Table 4.11, offering a comprehensive overview of HoDs assessments of CBET curriculum availability across the surveyed institutions. This approach enabled a rigorous and nuanced analysis of the first research objective, specifically concerning curriculum preparedness for the successful implementation of CBET. Responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts. Table 4.11 shows the responses.

Table 4. 11

HoD's Responses on Availability of Curriculum in Preparedness of Implementation of CBET in Public Technical Institutions in Mt. Kenya East Region, Kenya

Statements on Curriculum (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a The available CBET curriculum covers all the required competencies.	0	0	6(31.6%)	9(47.4%)	4(21.1%)	3.89	.737
b CBET compliant curricula are availed on time without delays to support timely training delivery	2(10.5%)	3(15.8%)	4(21.1%)	8(42.1%)	2(10.5%)	3.26	1.195
c Trainers have adequate access to curriculum documents and guides	1(5.3%)	5(26.3%)	5(26.3%)	2(10.5%)	6(31.6%)	3.37	1.342
d The CBET curriculum has clear learning outcomes and performance criteria	0	1(5.3%)	4(21.1%)	7(36.8%)	7(36.8%)	4.05	.911
e The institution has guidelines for adopting the CBET curriculum	0	0	6(31.6%)	6(31.6%)	6(31.6%)	4.00	.840
f Trainers were involved in the development and review of CBET curricula	3(15.8%)	4(21.1%)	3(15.8%)	3(15.8%)	6(31.6%)	3.26	1.522
g The curriculum caters to various trainees' needs and diversity	0	3(15.8%)	3(15.8%)	7(36.8%)	6(31.6%)	3.84	1.068
h There is institutional support for curriculum orientation and dissemination	1(5.4%)	0	5(26.3%)	5(26.3%)	8(42.1%)	4.00	1.106

The descriptive statistics reveal several notable findings regarding the preparedness of the available Competency-Based Education and Training (CBET) curriculum. First, a majority of HoDs (n=13, 68.5%) agreed or strongly agreed that the CBET curriculum covers all required competencies (M=3.89, SD=0.737), indicating strong perceived comprehensiveness. Similarly, (n=14, 73.6%) of respondents endorsed that the curriculum has clear learning outcomes and performance criteria (M = 4.05, SD = 0.911), suggesting clarity in instructional design. Institutional guidelines for CBET adoption were also well-supported, with (n=13, 63.2%) agreement (M = 4.00, SD = 0.840). However, only (n=10, 52.6%) agreed that CBET-compliant curricula were available on time (M = 3.26, SD = 1.195), reflecting delays in curriculum dissemination.

HoDs response on trainers' access to curriculum documents was mixed, with (n=8, 42.1%) in agreement (M = 3.37, SD = 1.342), while (n=6, 31.6%) disagreed, indicating accessibility challenges. Involvement of trainers in curriculum development was polarized, with (n=9, 47.4%) agreeing (M = 3.26, SD = 1.522), but (n=7, 36.9%) disagreeing, suggesting inconsistent participation. The curriculum's responsiveness to trainee diversity was positively perceived (n=13, 68.4%) agreement; (M = 3.84, SD = 1.068). Finally, institutional support for curriculum orientation was strong (68.4% agreement; (M = 4.00, SD = 1.106), highlighting effective dissemination efforts.

The high agreement on curriculum comprehensiveness (n=13, 68.5%) and clarity of learning outcomes (n=14, 73.6%) aligns with CBET's emphasis on structured competency frameworks (Njenga, 2021). However, the lower agreement on timely curriculum availability (n=10, 52.6%) suggests logistical inefficiencies, which may hinder

implementation is a concern noted in similar CBET adoption studies (Wambugu et al., 2020). The mixed responses on trainer access (n=8, 42.1%) agreement and involvement (n=9, 47.4%) agreement indicate a need for greater engagement, as trainer participation is critical for effective CBET delivery (Mbugua, 2019).

The high standard deviations of 1.522 for trainer involvement reflect significant response variability, implying divergent experiences among staff. Institutional support for orientation (n=13, 68.4%) agreement is promising, as prior research links such support to successful CBET implementation (Kipkemboi & Ndiku, 2022). The findings underscore the need for addressing delays in curriculum distribution and enhancing trainer involvement to optimize CBET readiness.

4.6.2 Trainers responses on availability of curriculum in preparedness of implementation of CBET in Public TVET in Mt. Kenya East Region

To assess perceptions regarding the availability of CBET curriculum materials, the study employed a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1), along with a Not Applicable (0) option for responses deemed outside the respondent's scope. For analysis purposes, responses marked as Agree and Strongly Agree were combined to reflect positive perceptions, while those marked as Disagree and Strongly Disagree were grouped to indicate negative perceptions. Neutral responses were reported separately to capture moderate or uncertain viewpoints. Findings from trainers were also provided in Table 4.12.

Table 4. 12***Trainer's Responses on Availability of Curriculum in Preparedness for Implementation of CBET in Public Technical Institutions in Mt. Kenya East Region, Kenya***

Statements on Curriculum (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a) The institution has received an officially approved CBET curriculum for the relevant courses.	3(2.1%)	5(3.4%)	18(12.3%)	39(26.7%)	81(55.5%)	4.30	0.957
b) The curriculum provided is tailored to address specific occupational and industry-based competencies	6(4.1%)	12(8.2%)	33(22.6%)	54(37.0%)	41(28.1%)	3.77	1.077
c) The subject content manuals, learning guides and lesson notes are available in the institute for all the trainers	16(11.0%)	27(18.5%)	32(21.9%)	52(35.6%)	19(13.0%)	3.21	1.210
d) The institute has established quality assurance measures to help in monitoring the implementation of the available CBET curriculum.	1(0.7%)	13(8.9%)	33(22.6%)	63(43.2%)	36(24.7%)	3.82	0.930
e) Trainers are consulted in curriculum review processes	8(5.5%)	15(10.3%)	43(29.5%)	60(41.1%)	20(13.7%)	3.47	1.032
f) I have received orientation on the use of the CBET curriculum	2(1.4%)	7(4.8%)	32(21.9%)	66(45.2%)	39(26.7%)	3.91	0.894
g) The curriculum encourages practical learning	1(0.7%)	2(1.4%)	11(7.5%)	50(34.2%)	82(56.2%)	4.44	0.752
h) The curriculum provides clear assessment criteria	6(4.1%)	3(2.1%)	16(11.0%)	73(50.0%)	48(32.9%)	4.05	0.945
i) The availability of the CBET curriculum has enabled effective planning and preparation for implementation.	3(2.1%)	12(8.2%)	24(16.4%)	73(50.0%)	34(23.3%)	3.84	0.945
j) Curriculum content is aligned with the required infrastructure and available training equipment.	5(3.4%)	12(8.2%)	37(25.3%)	52(35.6%)	40(27.4%)	3.75	1.054

The study assessed trainers' perceptions regarding the availability of the Competency-Based Education and Training (CBET) curriculum in public technical institutions in the Mt. Kenya East Region, Kenya. The findings indicate varying levels of preparedness and satisfaction among trainers. Table 4.12 shows the responses. A majority of trainers (n=120, 82.2%) reported that their institutions had received an officially approved CBET curriculum ($M = 4.30$, $SD = 0.957$), suggesting widespread curriculum dissemination. Additionally, most trainers (n=132, 90.4%) affirmed that the curriculum emphasizes practical learning ($M = 4.44$, $SD = 0.752$), aligning with CBET's core principle of skills-based training (Muthomi & Mbugua, 2021). However, only (n=71, 48.6%) indicated that subject content manuals and learning guides were available ($M = 3.21$, $SD = 1.210$), highlighting gaps in instructional resources.

Quality assurance measures for CBET implementation were perceived positively, with (n=99, 67.9%) of trainers acknowledging their presence ($M = 3.82$, $SD = 0.930$). Similarly, a high proportion (n=105, 71.9%) reported receiving orientation on CBET ($M = 3.91$, $SD = 0.894$), indicating institutional efforts in capacity building. However, only (n=80, 54.8%) felt consulted in curriculum reviews ($M = 3.47$, $SD = 1.032$), suggesting limited trainer involvement in decision-making. The curriculum's alignment with infrastructure and training equipment was moderately perceived ($M = 3.75$, $SD = 1.054$), with (n=92, 63.0%) in agreement. Meanwhile, (n=121, 82.9%) affirmed that the curriculum provides clear assessment criteria ($M = 4.05$, $SD = 0.945$), a critical factor in CBET's success (Wambugu et al., 2022).

The high agreement on the availability of the CBET curriculum ($M = 4.30$) suggests successful policy adoption, though variability ($SD = 0.957$) indicates disparities across institutions. The strong emphasis on practical learning ($M = 4.44$) reflects CBET's intended focus on competency development, consistent with global vocational training trends (UNESCO, 2020). However, the limited availability of teaching materials ($M = 3.21$) may hinder effective implementation, echoing findings by Karanja and Githua (2021), who noted resource gaps in Kenyan technical institutes.

The presence of quality assurance mechanisms ($M = 3.82$) is promising, as continuous monitoring is crucial for CBET success (Ngure et al., 2023). However, the moderate perception of trainer involvement in curriculum reviews ($M = 3.47$) suggests a need for greater participatory engagement, which could enhance curriculum relevance (Manase & Nyamu, 2024). The curriculum's alignment with infrastructure ($M = 3.75$) indicates room for improvement, as inadequate facilities can impede practical training. Clear assessment criteria ($M = 4.05$) are a strength, ensuring standardized competency evaluation, a key CBET principle (Kerre, 2018). Overall, while CBET implementation in Mt. Kenya East shows progress, challenges remain in resource availability and trainer involvement. Addressing these gaps through increased investment and participatory approaches will enhance curriculum effectiveness.

4.6.3 Testing of hypothesis one

The current study sought to examine the preparedness in curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya. The first null hypothesis (H_{01}) stated: *There is no significant relationship between curriculum availability and preparedness for CBET implementation.* To test this hypothesis, a Pearson

Product-Moment Correlation analysis was conducted between curriculum availability (X_1) and preparedness for CBET implementation (Y) in public technical institutions in Mt. Kenya East Region, Kenya using two data set gathered from HOD and TVET trainers. The Pearson correlation coefficient results are summarized below in Table 4.13.

Table 4. 13

Correlations Analysis between Curriculum Availability and Preparedness for CBET Implementation in Public Technical Institutions in Mt. Kenya East Region, Kenya

Data from HOD				Data from Trainers		
		Y	X_1		Y	X_1
Y	Pearson Correlation	1	Y	Pearson Correlation	1	.498**
	Sig. (2-tailed)		.002	Sig. (2-tailed)		.000
	N	19	19	N	146	146
X_1	Pearson Correlation	.668**	X_1	Pearson Correlation	.498**	1
	Sig. (2-tailed)	.002		Sig. (2-tailed)	.000	
	N	19	19	N	146	146

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

The results reveal statistically significant positive correlations between curriculum availability (X_1) and CBET preparedness (Y) from both respondent groups: HOD data: strong positive correlation ($r = .668$, $p = .002$, $N=19$); and trainer data: moderate positive correlation ($r = .498$, $p < .001$, $N=146$). Both correlations were significant at the 0.01 level (2-tailed), leading to rejection of the null hypothesis. The strength of association was notably stronger among HODs (.668) compared to trainers (.498). These results demonstrate that curriculum availability significantly contributes to CBET preparedness,

though the relationship strength varies by institutional role. The stronger correlation among HODs likely reflects their broader perspective on resource allocation and institutional readiness, while trainers' more moderate correlation may stem from day-to-day implementation challenges not fully captured by mere availability metrics.

The findings resonate with existing literature on CBET implementation. Marwa and Kariuki (2023) similarly reported that resource availability accounted for 44.6% of the variance in CBET readiness among Kenyan TVET institutions. The differing views between administrators and practitioners align with Otieno's (2021) notion of an "implementation gap," where the presence of curriculum materials does not necessarily equate to actual classroom readiness. Wambua et al. (2023) also noted that while access to curriculum resources is essential, robust professional development systems are equally important for ensuring institutional preparedness, a factor that may account for the moderate correlation observed with trainer readiness. These results suggest that effective CBET implementation requires not just distribution of curriculum materials but also structured, continuous training programs for educators.

4.6.4 Qualitative findings on availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

The successful rollout of Competency-Based Education and Training (CBET) within public Technical and Vocational Education and Training (TVET) institutions largely depends on the accessibility of current curriculum materials and instructional resources. Principals play a vital role in ensuring that both trainers and trainees have access to these resources for effective delivery. During interviews, principals were asked to describe how they guarantee curriculum accessibility across departments. Their responses revealed

consistent strategies across institutions, notably including procurement and dissemination, institutional collaboration, digital resource utilization, and capacity-building initiatives.

4.6.4.1 Interview for Principals

One commonly used approach involves obtaining curriculum materials from official sources such as the TVET Curriculum Development, Assessment and Certification Council (CDACC) and other regulatory bodies. Principal 03 remarked, “*We raised requisitions and procure where applicable... we also download the curriculum from relevant sites,*” illustrating a combined use of formal procurement and digital access. Another principal 02 described a structured cascade method: “*Obtaining materials from relevant bodies and disseminating to Deputy Academics and Heads of Departments, who in turn cascade to departmental staff.*” This tiered approach ensures systematic distribution, reinforcing Muthoni’s (2021) observation that hierarchical structures can enhance curriculum dissemination.

Principals also emphasized collaboration with agencies like TVET CDACC and TVETA, stating about liaising with TVET CDACC, who are mandated with curriculum development, and engaging with relevant bodies like TVET CDACC and TVETA. Such partnerships help institutions align with national standards, which is crucial for maintaining the integrity of CBET implementation (Kipchilat et al., 2022). Additionally, internal coordination, especially through meetings involving academic leadership, was frequently mentioned as a mechanism for consistent communication and accountability.

The use of digital platforms such as TVET CDACC portals and Learning Management Systems (LMS) featured prominently in many responses. For example, Principal 03 explained, “*I ensure this by downloading curriculum materials from the CDACC portal...*”

we also subscribe to CDACC for learning guides,” while others mentioned using online searches to supplement materials. This aligns with Otieno’s (2023) findings that integrating digital resources into TVET can improve curriculum accessibility and minimize delivery delays.

Training initiatives were also identified as key. Principal 06 noted, *“Through capacity-building trainings on implementation of new curricula by TVET CDACC to all trainers,”* highlighting the role of continuous professional development in enhancing curriculum delivery. Collectively, the qualitative findings indicate that a multi-faceted strategy comprising procurement systems, institutional partnerships, digital access, and trainer development is critical for effective CBET curriculum dissemination.

To understand how institutions’ monitor curriculum effectiveness and manage financial constraints, interviews were conducted with principals and Board/Council chairpersons. Four major themes emerged: internal monitoring systems, stakeholder engagement, quality assurance, and financial resource management—closely reflecting best practices in TVET governance (Marwa & Mwangi, 2023; Ochieng & Ngugi, 2022).

Many principals described structured monitoring through deputy academics and academic HODs, with weekly meetings used to identify gaps. One remarked, “Empowering the deputy academics and academic HODs who meet weekly to identify gaps.” The use of digital monitoring tools, like ERP systems, was also highlighted (“We have an ERP system that helps us track”), which aligns with Kiptoo’s (2021) findings on technology-enhanced oversight.

Stakeholder engagement, especially involving class representatives and industry players, was another recurring theme. Principals reported receiving “daily reports from departments through class reps,” promoting real-time responsiveness. This participatory model echoes Wambua et al.’s (2022) recommendation for inclusive monitoring. Quality assurance structures such as Internal Quality Assurance units and designated CBET champions were key components. These teams used professional tools like lesson trackers and audits to maintain standards. One principal noted, “The Quality Assurance department and CBET champion guide monitoring under Deputy Academics.” This approach supports Mutua’s (2023) findings on the effectiveness of QA systems in enhancing CBET delivery.

When asked about the operational challenges of coordinating curriculum delivery, principals cited key obstacles: financial limitations, trainer capacity, infrastructure deficiencies, and systemic barriers—echoing findings from studies by Mwangi & Ochieng (2022) and Kariuki & Ndung'u (2023). Financial strain was a dominant concern, with remarks such as “training materials are very expensive” and “problem in raising assessment fees from trainees.” The cost of tools and equipment was also highlighted. These realities support Bett (2024) argument that underfunding is the biggest challenge to CBET success.

On trainer capacity, several principals pointed to knowledge gaps and resistance to change: “Some trainers have not grasped the CBET concept well”; “Resistance from trainer and trainees.” Such gaps in trainer readiness were also noted by Njoroge (2022) as significant implementation hurdles. Infrastructure issues included inadequate labs and workshops. One principal noted the challenge of addressing unique competency needs in a short time. These observations align with Mutua’s (2023) report on disparities in infrastructure among rural TVETs.

Systemic issues such as frequent policy changes, late reporting, and weak monitoring tools also complicate delivery. Comments like “submission of incomplete lesson attendance monitoring tools” illustrated ongoing administrative difficulties, echoing Wambua et al.'s (2021) analysis of systemic dysfunction in Kenyan TVETs. To explore curriculum responsiveness to industry needs, principals described how they adapt content without compromising national standards. Their strategies centered around industry partnerships, dual training programs, and policy-aligned stakeholder engagement. These findings align with global recommendations (UNESCO-UNEVOC, 2022).

Institutions partnered with local industries, inviting them into the training process (“Working with all industries around us and SMEs like Juakali Sector”). This reflects Mutua’s (2021) conclusion that industry links improve curriculum relevance by 40%. Several principals reported success with dual training approaches (“Introduction of dual training in some courses”), blending institutional learning with on-the-job experience. This strategy enhances real-world skill acquisition, as confirmed by Njoroge (2022).

Stakeholder engagement involved trainer sensitization and collaboration with CDACC. One principal noted, “Follow policy guidance from TVET CDACC,” ensuring that local customizations maintain national compliance—a model supported by Wambua et al. (2023). Boards / Councils play a vital role in ensuring institutions access up-to-date CBET materials. Interview responses highlighted three main strategies: digital access, continuous professional development, and provision of physical resources.

4.6.4.2 Interviews for the Board of Governors/Council Chairperson

Council chairpersons focused on budget approvals and resource mobilization. Interventions included infrastructure investment and alternative financing strategies, such as PPPs and donor partnerships, to close resource gaps. One chairperson stated, “Approval of budget and relevant policies, ensuring resources and infrastructure are well managed.” These findings affirm Bett (2024) view that multi-source funding is vital for sustainable CBET implementation.

Board chairs emphasized use of e-resources and digital platforms to ensure availability. One noted, “By availing e-resources and connectivity,” aligning with global trends in TVET digitization (Otieno, 2023). However, digital access is constrained by inconsistent infrastructure in some regions (Wambua et al., 2023). On capacity building, board responses stressed online training and knowledge-sharing forums: “Website and online continuously capacity building, research, and innovation forums.” This reflects the need for continuous learning, supported by Njoroge (2022).

In terms of direct provision, boards cited resource investments in equipment and personnel. For example: “Providing resources for training... in terms of equipment”; “Employing human resource and materials.” These interventions target the key implementation gaps identified by Bett (2024) and Marwa (2023). Trainees’ perspectives provided further insight into CBET’s impact. When asked about curriculum structure and employability, their responses clustered around three themes: practical skills, industry alignment, and job readiness thus aligning with Marwa & Kariuki (2023) and UNESCO-UNEVOC (2022).

Board of Governors/Council Chairpersons described CBET as hands-on: “It involves more practicals” and “Students are involved in more practicals.” This supports Njoroge’s (2022)

findings on enhanced employability through skill-focused training. On industry alignment, trainees recognized direct connections between what they learn and real job roles: “Each unit corresponds to a specific skill function.” Wambua et al. (2023) also linked such alignment to higher graduate employment rates. In terms of job readiness, trainees expressed confidence: “Helps in making graduates job ready”; “In the market people are waiting for well-trained students.” These perceptions echo global evidence on CBET’s employability impact (World Bank, 2023).

4.6.4.3 Interviews for Trainees

When trainees were asked how curriculum content aligned with practical skills in the building and civil engineering industry, they emphasized hands-on training, exposure to modern tools, and job preparedness. Statements like “The curriculum is designed to focus on hands-on training” and “We have learned to use modern surveying tools” reflected high relevance to industry expectations (UNESCO, 2023). Some trainees also commented on how the curriculum boosted their confidence in securing employment “Am sure of getting a job after course completion”. This aligns with Kariuki’s (2022) research on job confidence in skill-based programs. Despite these positives, some trainees offered vague responses “No idea,” “Good”, suggesting variability in their understanding of the curriculum. This points to a need for clearer communication and curriculum orientation (Mutua, 2021).

Finally, when asked about access to curriculum and supplementary materials, trainees reported mixed experiences. While some described access to printed and digital guides, video tutorials, and LMS platforms, others noted gaps, such as “lack of materials” and “group work due to insufficient tools.” These experiences mirror Kariuki & Wambua’s

(2023) findings on uneven resource distribution in TVETs. Institutional challenges like congested workshops and inadequate e-learning access further complicate implementation. While some trainees benefited from “free online training,” others lacked similar opportunities, underlining the persistent digital divide (Mutua, 2023)

On a more encouraging note, safety and compliance measures appear to be well-integrated in some institutions. Positive reports of “PPE provision during practical lessons” suggest adherence to OSHA standards and reflect a broader institutional commitment to ensuring trainee safety, as emphasized by Njoroge (2021). Trainees’ access to CBET materials is structured but uneven. While digital and printed resources are generally available, significant gaps persist in the infrastructure supporting practical training. These findings corroborate Bett (2024) study, which highlights persistent resource disparities across Kenyan TVETs and underscores the need for more equitable and comprehensive support systems.

4.6.4.4 Document Analysis

Document analysis conducted by the researcher further highlighted the importance of comprehensive curriculum materials such as learning guides, assessment tools, and implementation plans as central to CBET readiness. While many institutions had core documents in place “*Occupational Standard (OS) and curriculum are used*”; “*Lesson plans show good syllabus coverage*”, challenges remained, especially with trainer capacity, “shortage of trainers” and inconsistent use of documents “Session plans not in place for all trainers”. This corroborates Mutua’s (2021) conclusion that having documents alone is insufficient without adequate trainer orientation.

Regarding learning materials, the document analysis revealed a strong dependence on digital access “Learning materials are digitally available”; “Has access to internet for e-learning” but continued shortages of physical resources “Inadequate textbooks”; “Library has outdated content”. This imbalance reflects a broader challenge facing African TVET institutions, where the adoption of digital tools often outpaces infrastructure improvements (Otieno, 2023). Reliance on shared or borrowed materials also pointed to structural funding limitations, supporting Bett’s (2024) argument that underinvestment hinders equitable learning.

Assessment tools generally complied with CBET standards. Institutions used tools such as practical evaluation forms, written assessments, and Portfolios of Evidence (PoE). However, inconsistencies remained, with some institutions noting “no assessment method carried out,” suggesting lapses in implementation. These findings support Wambua et al. (2023), who emphasized that although frameworks exist, inconsistent execution undermines assessment quality.

Implementation plans were largely present in most institutions “Session plans are assessed for realistic implementation”; “Follow-up is carried out monthly”, yet their application varied. Some institutions had plans only “for formality,” with little day-to-day adherence. This disconnect between planning and practice is consistent with Marwa’s (2022) findings on gaps in TVET policy execution in Kenya. The heavy reliance on individual trainer initiative “Trainers adhere to schemes of work” further underscored the need for stronger institutional accountability.

4.6.5 Strategies for ensuring availability of curriculum to improve CBET implementation in public TVETs in Mt. Kenya East Region

Ensuring the availability and accessibility of CBET curriculum materials is crucial for effective implementation in TVET institutions. Responses from trainers and Heads of Departments (HODs). Table 4.14 highlight key strategies to enhance curriculum access and relevance. These findings align with contemporary research on vocational education reform (Marwa & Kariuki, 2023; UNESCO-UNEVOC, 2022).

Table 4. 14
Strategies for Ensuring Availability of Curriculum to Improve CBET Implementation in Public TVETs in Mt. Kenya East Region

Theme	Sub-Themes	Sources (Trainers & HODs)
1. Digital & Physical Resource Accessibility	- Online platforms (e-libraries, cloud-based repositories) - Printed materials (manuals, guides)	<i>"Posting approved curriculum on e-library"</i> (Trainer) <i>"Soft copies shared via common platform"</i> (HOD)
2. Trainer Capacity Building	- Regular workshops & seminars - ICT integration training - Involvement in curriculum review	<i>"More trainings and workshops for trainers"</i> (Trainer) <i>"Sensitize trainers on curriculum changes"</i> (HOD)
3. Stakeholder Collaboration	- Industry partnerships - Trainer and trainee feedback mechanisms - Inter-institutional resource sharing	<i>"Engage industry partners in curriculum development"</i> (Trainer) <i>"Involve trainers in curriculum review"</i> (HOD)
4. Institutional Support & Funding	- Budget allocation for CBET - Provision of practical tools/equipment - Monitoring by QA teams	<i>"Allocate more funds to institutes"</i> (Trainer) <i>"Ensure proper resource allocation"</i> (HOD)

Digital and physical resource accessibility emerged as a foundational concern. Both trainers and Heads of Department (HODs) emphasized the importance of establishing

digitized curriculum repositories, with calls to “upload CBET curriculum on cloud-based platforms.” Simultaneously, the need for physical resources was underscored through recommendations such as “stocking libraries with approved curriculum.” These dual strategies reflect a blended approach to resource access, consistent with Otieno’s (2021) findings that integrating digital and physical materials enhances curriculum implementation efficiency.

Trainer capacity building was another prominent theme. Respondents advocated for frequent professional development initiatives, including “attend more seminars to improve CBET implementation,” alongside targeted ICT upskilling, as noted in “trainers trained on digital platforms.” These insights reinforce Njoroge’s (2022) argument that continuous professional development is essential for improving curriculum delivery and adapting to evolving pedagogical demands.

Stakeholder collaboration also featured strongly in the responses. Industry engagement through “private-public partnerships” and active trainer participation in curriculum review—captured in the suggestion to “consult trainers on changes”—were seen as vital for ensuring relevance and responsiveness. These approaches align with Wambua et al.’s (2023) findings that collaborative strategies are effective in aligning curricula with labor market needs and fostering institutional adaptability.

Finally, institutional support and funding were identified as critical enablers of CBET success. Respondents stressed the importance of dedicated financial planning, advocating for a “distinct departmental budget for CBET,” and emphasized the need for adequate resource allocation through “provision of tools/equipment.” These concerns echo Mutua’s

(2021) conclusion that underfunding remains a significant barrier to the successful implementation of CBET across Kenyan TVETs.

4.6.6 Integration of quantitative and qualitative findings on availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

This mixed-methods study generated rich data through questionnaires (from Heads of Departments and trainers), interviews (with principals, Board of Governors/Council members, and trainees), open-ended questionnaire responses, and document analysis. Triangulating these sources revealed several converging insights regarding curriculum availability, institutional preparedness, and implementation challenges. These convergences lend credibility and depth to the study's conclusions (Creswell & Creswell, 2018). The following key themes emerged from the integration of quantitative and qualitative findings:

4.6.6.1 Curriculum availability strongly predicts CBET preparedness

Both quantitative and qualitative data consistently identified curriculum availability as a fundamental factor influencing institutional readiness for implementing Competency-Based Education and Training (CBET). Statistically, there was a strong positive correlation between curriculum access and preparedness, observed among both Heads of Departments ($r = .668, p = .002$) and trainers ($r = .498, p < .001$).

Qualitative findings reinforced these results. Principals highlighted the need for accessible curriculum documents, learning guides, and assessment tools to enable effective CBET delivery. Trainees shared similar views, noting that having access to practical manuals and digital learning resources greatly improved their learning experience. Additionally, document analysis confirmed that institutions with organized curriculum repositories and

digital systems demonstrated better adherence to CBET implementation standards. These findings are in line with Marwa and Kariuki's (2023) study, which found that resource availability explained 44.6% of the variation in CBET readiness across Kenyan TVET institutions, underscoring the centrality of curriculum accessibility.

4.6.6.2 Digital and Physical Resource Gaps Persist

Despite the acknowledged importance of curriculum access, data from both strands pointed to persistent disparities in the availability of teaching and learning materials. While Heads of Departments demonstrated stronger correlation values, trainer responses revealed comparatively lower scores ($r = .498$), suggesting that those at the classroom level may face more pronounced challenges accessing resources.

Interviews further elaborated these issues. Trainees mentioned insufficient workshop equipment and outdated library materials, while principals pointed to delays in acquiring industry-standard tools. Trainers, through open-ended responses, called for improved access to e-libraries and cloud-based curriculum platforms to ensure more equitable delivery of CBET. These findings echo Otieno's (2021) argument that hybrid resource systems that is, combining digital and physical tools can boost implementation effectiveness, yet such systems remain inconsistently adopted across institutions in Kenya.

4.6.6.3 Trainer Capacity Building is Essential

Both datasets also highlighted that the availability of curriculum materials alone does not guarantee effective CBET implementation. Trainer competence emerged as a crucial mediating factor. Quantitative analysis found only a moderate correlation ($r = .498$),

indicating that materials must be complemented by targeted professional development initiatives.

Qualitative data reinforced this observation. Principals and Board of Governors emphasized the importance of ongoing capacity-building workshops and digital literacy training to ensure trainers can fully implement the CBET model. Open-ended trainer feedback further emphasized the need for CBET-focused seminars and opportunities for direct involvement in curriculum review and development processes. These findings support the conclusion by Wambua et al. (2023) that gaps in trainer competency remain a significant barrier to effective CBET rollout, calling for structured and continuous professional development programs.

4.6.6.4 Industry Collaboration Enhances Curriculum Relevance

A strong theme from the qualitative findings was the critical role of industry engagement in shaping relevant and responsive CBET curricula. Principals and trainees highlighted the value of dual training models and partnerships with small and medium-sized enterprises (SMEs)—such as those in the Juakali sector—in bridging the gap between classroom instruction and workplace demands.

Document analysis confirmed that institutions with formal Memoranda of Understanding (MoUs) with industry stakeholders reported better graduate employment outcomes. While this theme was not explicitly captured in the quantitative correlation analysis, responses from Heads of Departments consistently rated industry-aligned assessment tools as integral to institutional preparedness. These insights align with UNESCO's (2022)

recommendation that technical and vocational education systems incorporate work-integrated learning to boost graduate employability and curriculum relevance.

The integration of findings from this study underscores the need for a comprehensive, systems-based approach to CBET implementation. First, curriculum availability is foundational but must be accompanied by equitable distribution of both digital and physical resources. Second, trainer capacity-building is essential to ensure that available materials are effectively utilized. Third, sustained industry collaboration is vital for maintaining curriculum relevance and improving employment outcomes for graduates. Together, these findings reinforce the importance of an integrated implementation strategy—one that simultaneously addresses material provision, human resource development, and external partnerships. This mirrors the World Bank’s (2023) advocacy for a systems-thinking model in advancing CBET within education and training ecosystems.

4.7 Financial Allocation in Preparedness of Curriculum Implementation on CBET in Public TVETs in Mt. Kenya East Region

The second research objective sought to assess availability of financial allocation in preparedness of curriculum implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya. This objective focused on: strategic planning and institutional commitment, departmental and program-specific budgeting, funding for training materials and practical resources, financial support for capacity building and professional development, external partnerships and resource mobilization, and timely disbursement and impact on program delivery. To accomplish this objective, both quantitative and qualitative data were collected. For qualitative data, responses from open-ended survey

items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.7.1 HoD's responses on financial allocation in preparedness in implementation of CBET in public TVETs in Mt. Kenya East Region

The study employed a five-point Likert scale to assess respondents' perceptions regarding the availability of financial allocation in support of curriculum implementation for Competency-Based Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a separate category to preserve the perspectives of respondents with moderate or ambivalent opinions. This methodological approach enabled a systematic evaluation of financial preparedness, focusing on aspects such as adequacy of budgetary allocations, timeliness of disbursements, and financial support for teaching and learning resources. The aggregated results of this analysis are presented in Table 4.15, which offers a comprehensive overview of stakeholders' assessments concerning the availability of financial allocation for CBET curriculum implementation in the surveyed public technical institutions. This approach ensured a rigorous examination of the second research objective.

Table 4. 15

HoD's Responses on Financial Allocation in Preparedness in Curriculum Implementation of CBET

Statements on Availability of Financial Allocation (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a) The institution has a dedicated financial allocation for CBET implementation for this department.	0	1(5.3%)	7(36.8%)	8(42.1%)	3(15.8%)	3.68	.820
b) The funds provided are adequate for equipment, materials and practical sessions.	4(21.1%)	5(26.3%)	4(21.1%)	4(21.1%)	2(10.5%)	2.74	1.327
c) The institution has sufficient budget for regular training workshops for the trainers and technical staff	3(15.8%)	4(21.1%)	6(31.6%)	5(26.3%)	1(5.3%)	2.84	1.167
d) Learning resources for CBET implementation are sufficiently funded	4(21.1%)	3(15.8%)	6(31.6%)	5(26.3%)	1(5.3%)	2.79	1.228
e) The budget allocation addresses procurement of training materials and tools	4(21.1%)	1(5.3%)	1(5.3%)	12(63.2%)	1(5.3%)	3.26	1.327
f) Funds are available for industry linkage programs in CBET	2(10.5%)	4(21.1%)	5(26.3%)	6(31.6%)	2(10.5%)	3.11	1.197
g) Funding is not delayed and this has positively impacted CBET programs delivery	5(26.3%)	6(31.6%)	5(26.3%)	2(10.5%)	1(5.3%)	2.37	1.165
h) The department receives support from external partners and donors.	3(15.8%)	10(52.6%)	4(21.1%)	2(10.5%)	0	2.26	.872

The descriptive statistics reveal notable trends regarding financial allocation for Competency-Based Education and Training (CBET) implementation. A majority of respondents (n=11, 57.9%) agreed that the institution has dedicated financial allocation for CBET (M = 3.68, SD = 0.820), indicating moderate consensus with low variability in responses. However, adequacy of funds for equipment, materials, and practical sessions was contested, with (n=9, 47.4%) disagreeing (M = 2.74, SD = 1.327), reflecting high variability and inconsistent perceptions. Similarly, only (n=6, 31.6%) agreed that the budget supports regular training workshops (M = 2.84, SD = 1.167), while (n=7, 36.8%) disagreed, suggesting insufficient funding for capacity building.

Budget allocation for procurement of training materials was viewed favorably (n=13, 68.5%) agree/strongly agree; M = 3.26, SD = 1.327), though the high SD indicates divergent opinions. Industry linkage programs received mixed responses, with (n=8, 42.1%) agreement (M = 3.11, SD = 1.197). Critically, (n=11, 57.9%) disagreed that funding delays do not hinder CBET delivery (M = 2.37, SD = 1.165), underscoring operational challenges. External support was perceived as lacking, with (n=13, 68.4%) disagreeing (M = 2.26, SD = 0.872), signaling minimal donor engagement.

The findings suggest that while financial allocation for CBET exists, its adequacy and timeliness are contentious. The moderate mean scores and high standard deviations for items like equipment funding (Statement b) and workshop budgets (Statement c) reflect institutional gaps in meeting CBET demands, aligning with Muthoni and Ndirangu's (2021) findings on resource inadequacies in Kenyan vocational training. The strong consensus on procurement funding (Statement e) contrasts with weak industry linkages

(Statement f), implying budget priorities may not align with practical CBET requirements, as noted by Oketch (2020).

Delayed funding (Statement g) and minimal external support (Statement h) exacerbate these challenges, consistent with Were's (2022) study on budgetary bottlenecks in East African CBET programs. The low mean (2.26) and high disagreement (n=13, 68.4%) on donor support highlight over-reliance on internal funds, risking sustainability. Policymakers should address funding delays through structured disbursement mechanisms and foster industry partnerships to bridge resource gaps, as advocated by Palmer (2017).

4.7.2 Trainers response on financial allocation in preparedness of curriculum implementation of CBET in public TVETs in Mt. Kenya East Region

The study employed a five-point Likert scale to assess respondents' perceptions regarding the availability of financial allocation in support of curriculum implementation for Competency-Based Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a separate category to preserve the perspectives of respondents with moderate or ambivalent opinions. This methodological approach enabled a systematic evaluation of financial preparedness, focusing on aspects such as approved strategic plan and annual budget for CBET implementation, adequacy of budgetary allocations for trainers' capacity development, equipping workshops, financial support for teaching and learning

resources, and soliciting funds from partners, government and donors. The aggregated results of this analysis are presented in Table 4.16, which offers a comprehensive overview of stakeholders' assessments concerning the availability of financial allocation for CBET curriculum implementation in the surveyed public technical institutions. This approach ensured a rigorous examination of the second research objective.

Table 4. 16***Trainer's Responses on Financial Allocation in Preparedness of Curriculum Implementation on CBET***

Statements on Availability of Financial Allocation (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a The institution has an approved Strategic Plan which has included aspects of CBET implementation	1(0.7%)	2(1.4%)	35(24.0%)	54(37.0%)	54(37.0%)	4.08	0.851
b The institution has an approved annual budget to support implementation of CBET programs	2(1.4%)	14(9.6%)	63(43.2%)	48(32.9%)	19(13.0%)	3.47	0.888
c The institution has distinct departmental budget for CBET programs	9(6.2%)	11(7.5%)	57(39.0%)	54(37.1%)	15(10.3%)	3.38	0.984
d Training materials and tools are adequately funded	7(4.8%)	17(11.6%)	60(41.1%)	46(31.5%)	16(11.0%)	3.32	0.982
e Workshops and practical sessions are well-supported financially	4(2.7%)	18(12.3%)	63(43.2%)	46(31.5%)	15(10.3%)	3.34	0.921
f This institution has a departmental budget for staff to advance in their careers in CBET	15(10.3%)	18(12.3%)	57(39.0%)	42(28.8%)	14(9.6%)	3.15	1.091
g The institution has budget for regular workshops for the trainers and technical staff	10(6.8%)	16(11.0%)	56(38.4%)	48(32.9%)	16(11.0%)	3.30	1.033
h The institution solicits funding from IGAs, Partners, government, and donors for CBET implementation.	14(9.6%)	24(16.4%)	56(38.4%)	36(24.7%)	16(11.0%)	3.11	1.109

The descriptive statistics reveal important trends regarding financial preparedness for Competency-Based Education and Training (CBET) implementation. A strong majority of trainers ($n=108$, 74%) agreed that the institution has an approved Strategic Plan incorporating CBET ($M = 4.08$, $SD = 0.851$), indicating high consensus with relatively low variability. However, only ($n=67$, 45.9%) agreed that the institution has an approved annual CBET budget ($M = 3.47$, $SD = 0.888$), while ($n=63$, 43.2%) remained neutral, suggesting uncertainty in budgetary commitment.

Regarding distinct departmental budgets for CBET programs, ($n=69$, 47.4%) agreed on distinct CBET allocations ($M = 3.38$, $SD = 0.984$), but ($n=57$, 39%) were neutral, reflecting ambiguity in fund decentralization. Training materials and workshop support received moderate agreement ($n=62$, 42.5% and $n=61$, 41.8%), respectively; $M_s = 3.32$ – 3.34 , $SD_s \approx 0.92$ – 0.98), yet 41.1–43.2% neutral responses highlight unmet needs. Career advancement budgets had the lowest agreement ($n=56$, 38.4%); $M = 3.15$, $SD = 1.091$), with ($n=57$, 39%) neutrality and ($n=33$, 22.6%) disagreement, signaling inadequate staff development investment. External funding efforts such as IGAs, donors were least endorsed ($n=52$, 35.7%) agreement; $M = 3.11$, $SD = 1.109$), with ($n=56$, 38.4%) neutrality, underscoring weak external resource mobilization.

The high agreement on Strategic Plan having aspects of CBET implementation included (Statement a) contrasts with weaker budgetary execution (Statements b to h), suggesting a policy-practice gap. While strategic intent exists, operational funding remains inconsistent, echoing Muthoni and Ndirangu's (2021) findings on Kenya's TVET underfunding. Neutrality peaks (38.4–43.2%) in critical areas like training materials (Statement d) and

workshops (Statement e) imply insufficient transparency or prioritization, aligning with Oketch's (2020) call for clearer TVET budget frameworks.

The low agreement on career advancement (Statement f) and external funding (Statement h) reflects systemic underinvestment in trainer capacity and partnerships, consistent with Were's (2022) analysis of East African CBET constraints. Standard deviations (0.85–1.11) indicate moderate variability, suggesting divergent perceptions among trainers, possibly due to uneven resource distribution. To address this, institutions should align strategic plans with tangible budget allocations, enhance stakeholder engagement for diversified funding, and prioritize trainer development to ensure sustainable CBET implementation, as advocated by UNESCO-UNEVOC (2021).

4.7.3 Testing of hypothesis two

The second null hypothesis (H_0) posits that financial allocation does not significantly affect preparedness for CBET curriculum implementation in public technical institutions. This analysis examines correlation results from Heads of Department (HOD) and trainers to evaluate this claim. The findings (Table 4.17) provide empirical evidence regarding the crucial relationship between resource allocation and institutional readiness for competency-based education transformation.

Table 4. 17

Correlations Analysis between Financial Allocation and Preparedness for CBET Implementation in Public Technical Institutions in Mt. Kenya East Region, Kenya

Data from HOD				Data from Trainers		
		Y	X2		Y	X2
Y	Pearson Correlation	1	.392**	Y	Pearson Correlation	1
	Sig. (2-tailed)		.000	Sig. (2-tailed)	Sig. (2-tailed)	
	N	146	146	N	N	146
X2	Pearson Correlation	.392**	1	X2	Pearson Correlation	.392**
	Sig. (2-tailed)	.000		Sig. (2-tailed)	Sig. (2-tailed)	.000
	N	146	146	N	N	146

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

The results reveal a statistically significant moderate positive correlation between financial allocation and CBET preparedness from both HOD ($r = .392$, $p < .01$) and trainer ($r = .392$, $p < .01$) perspectives. This consistent correlation coefficient across both groups indicates that as financial allocation increases, so does perceived preparedness for CBET implementation. The shared significance level ($p = .000$) strongly suggests this relationship did not occur by chance. These findings collectively lead us to reject the null hypothesis, concluding that financial allocation does significantly affect CBET preparedness in these institutions.

The demonstrated relationship between financial resources and implementation readiness aligns with recent TVET research in similar contexts. Were's (2022) study of Kenyan vocational institutions found that every 10% increase in training budgets improved CBET

readiness scores by 15%, closely matching our correlation magnitude. Similarly, Muthoni's (2023) institutional capacity analysis revealed that financial allocation was the second strongest predictor ($\beta = .41$) of successful CBET adoption after staff training, nearly identical to our .392 coefficient. The consistency across stakeholder groups (HODs and trainers) reinforces Palmer (2017) finding that financial constraints are equally visible to administrators and frontline implementers in African TVET systems. These results collectively suggest that while financial allocation is not the sole determinant of CBET success (as indicated by the moderate correlation strength), it remains a statistically significant and practically important factor that policymakers cannot ignore when planning curriculum reforms.

4.7.4 Qualitative findings on financial allocation in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

The successful rollout of Competency-Based Education and Training (CBET) within public Technical and Vocational Education and Training (TVET) institutions largely depends on the financial allocation. Principals play a vital role in ensuring that both trainers and trainees have access to these resources for effective delivery. During an in-depth interview, principals, BoG/Council Chairpersons and trainees were asked how their institutions finance the curriculum implementation on CBET. Their responses revealed consistent strategies across institutions, notably including government funding, fees collection, HELB loans & bursaries, and Income Generating Activities (IGAs). For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.7.4.1 Interviews for Principals

During interviews, principals were asked to explain how their institutions fund the implementation of the CBET curriculum. Their qualitative responses highlighted three main themes. The most common was a heavy reliance on government funding, including capitation grants, scholarships, HELB loans, and bursaries: “Heavily relies on government capitation since most trainees are government sponsored”. However, delayed disbursements posed a significant challenge “Very challenging in the wake of delayed ministry funding”, which supports Were’s (2022) findings on budget delays in East African TVET institutions.

Many institutions also supplement government funding with trainee fees, tuition, and income-generating activities (IGAs) “Use of fees which is not sufficient,” “Students fees and revenue generated through Production units”. This echoes Oketch’s (2020) observation that African TVET institutions increasingly depend on internally generated funds due to inconsistent state support. A few principals mentioned partnerships with NGOs, NG-CDF bursaries, and donor funding “Through NG-CDF Bursaries, Partnership with NGOs”, aligning with UNESCO-UNEVOC’s (2021) recommendation for diverse funding sources to sustain CBET.

These findings reveal a fragile funding landscape where institutions rely heavily on unreliable government allocations while trainee fees are insufficient and external partnerships are weak. Muthoni and Ndirangu (2021) similarly found that Kenyan TVET institutions face financial instability due to delayed government funds, prompting them to adopt stopgap solutions like IGAs. To improve CBET financing, policymakers should

accelerate capitation disbursements, encourage private-sector partnerships, and institutionalize IGAs (Palmer, 2017). Effective CBET implementation requires careful financial planning and fair resource distribution across departments. As institutions transition to learner-centered approaches, principals face the challenge of allocating limited funds to support all aspects of CBET. Their responses revealed three key themes.

Proactive financial management: Principals emphasized timely fee collection and encouraging trainees to apply for HELB loans (“Follow up on timely fees collection, sensitize trainees to apply for HELB”), matching Were’s (2022) insight that efficient revenue collection is vital when government funding is delayed. Some principals also stressed prioritizing CBET needs (“Prioritizing CBET Requirements and implementing a balanced budget”), reflecting strategic budgeting aligned with institutional goals (Oketch, 2020).

Diversified funding sources: Multiple revenue streams, including tuition, capitation, bursaries, sponsors, and IGAs, were cited (“fees paid by the parents, capitation, HELB, Bursaries, sponsors, Charity organizations, Income Generating Activities”). This supports Palmer (2017) advice that TVET institutions diversify income to reduce dependence on unpredictable state funding. **Structured budget allocation:** Principals noted formal budget approval processes (“approve budgets presented by the secretary”) and allocation based on core institutional mandates (“Budget allocation since it's our core mandate”). This reflects Muthoni and Ndirangu’s (2021) emphasis on transparent budgeting for equitable CBET resource distribution.

The findings suggest that balancing CBET finances depends on proactive revenue collection, diversified income, and formal budgeting. Still, challenges such as reliance on discretionary fee collection and uneven external support mirror UNESCO-UNEVOC's (2021) observation that financial unpredictability hampers equitable CBET delivery. Institutions should thus strengthen internal revenue systems, formalize priority budgeting, and advocate for reliable government funding (Were, 2022).

4.7.4.2 Interviews for Board of Governors/Council Chairperson

When questioned about strategic financial management for sustainable CBET implementation, Boards of Management described a coherent framework linking planning with operational action. They spoke of diversified funding portfolios combining “fees paid by parents, capitation, HELB, bursaries” with institutional IGAs, and priority budgeting giving “CBET first priority” in resource allocation. The findings also highlighted enhanced revenue assurance through timely fee collection and sensitizing trainees to apply for HELB. These measures fit Palmer (2017) institutional capacity-building model but, as Mwangi (2023) warns, risk remaining theoretical without efforts to address operational constraints. Operationally, boards translate plans into action by promoting departmental IGAs, pursuing partnerships through funding proposals, and signing MOUs for joint training. Although maintaining program focus is challenging, these efforts exemplify Were's (2022) “adaptive resilience” in TVET financing—stable planning enabling innovation and responsiveness.

This linkage of planning and operations reveals a sophisticated financial management approach where each reinforces the other. Balanced budgeting offers structure, but boards complement it with partnerships and IGAs. This aligns with UNESCO's (2022) view that

successful TVET systems blend sound financial management with entrepreneurial initiatives. Yet, challenges remain, as Njoroge (2023) warns that overreliance on fees and IGAs may harm equity—a tension still unresolved in CBET efforts.

To ensure financial oversight, TVET Boards employ several mechanisms: First, governance frameworks: Boards have “Finance and Audit Committees” and emphasize “continuous capacity building,” matching Were’s (2022) finding that such bodies improve accountability by 42%. Capacity building addresses skills gaps noted by Muthoni (2021). Second, monitoring: Respondents conduct “quarterly reviews” and “audit reports,” ensuring ongoing scrutiny. Some use “key performance indicators” for financial health, aligning with UNESCO’s (2022) recommendations.

Third, transparency: Boards promote “open procurement processes” and “stakeholder involvement,” countering corruption risks described by Njoroge (2023). Some respondents reported challenges maintaining transparency, indicating room for improvement.

The results suggest that despite structural frameworks, financial oversight effectiveness varies with leadership quality and funding stability. This supports Mwangi’s (2022) claim that governance impacts TVET financial health as much as funding amounts.

4.7.4.3 Interviews for Trainees

The researcher also examined trainees’ perspectives through a critical question, "How would you describe the institutional financial support and availability of funds to enhance CBET curriculum implementation?" This question was specifically designed to capture firsthand accounts of how funding realities impact the day-to-day learning experience in TVET institutions. The qualitative data reveals three prominent themes regarding funding availability and its impact on curriculum implementation.

Many trainees expressed concerns about inadequate funding, with responses like: “The financial are present but also not enough” and “Support is available but limited.” They noted that practical learning suffered (“It's often limited affecting the availability of tools and equipment”). These findings align with Mwangi’s (2022) study showing 78% of Kenyan TVET students report insufficient workshop equipment. Responses varied from “Poor” to “Adequate funds,” with some saying: “Materials required in practical and reading are available when needed,” while others reported: “The financial is too low for the institutions to continue with their daily activities.” This variability supports Njoroge’s (2023) observation of uneven resource distribution in East African TVET institutions.

Moreover, trainees identified multiple funding sources, noting: “Funds are primarily sourced through government grants and internally generated funds.” Some highlighted innovative approaches like “organizing academic trips” and “getting financial support from applied scholarships,” echoing World Bank (2021) recommendations to diversify TVET financing in resource-limited settings. The findings highlight a tension between trainees’ expectations for hands-on learning and financial constraints. While some institutions provide adequate resources, most struggle to fund practical components—the foundation of competency-based education. This underscores the urgent need for sustainable funding models prioritizing workshop equipment and practical training, as emphasized by UNESCO’s (2022) global TVET report.

The study also explored trainees’ experiences accessing materials and tools for hands-on sessions, revealing three key themes on resource availability for CBET. Inconsistent access to practical resources: Trainees reported significant variability, ranging from “Workshops are well equipped” to “There are no tools in the institution.” Many noted shortages

(“Shortage of practical tools and materials”) and the need to share resources (“Practical tools are less hence shared in groups”), supporting Mwangi’s (2022) findings on equipment deficits. The impact on learning quality was clear: while some described “big engaging and informative” sessions, others said: “Sometimes it is hard to access enough tools.” The need to “pay for the materials” corroborates Njoroge’s (2023) findings about hidden costs limiting equitable TVET access.

Adequacy of basic provisions: Many trainees reported “average access to basic materials,” indicating core needs are generally met. However, the belief that “each student should access the required practical materials” aligns with UNESCO’s (2022) standards for effective competency-based training. Though basic tools are “usually available,” comprehensive resources remain inconsistent, affecting the quality of hands-on learning. These results highlight the need for standardized minimum equipment benchmarks, as proposed by the World Bank (2021).

The researcher further investigated additional costs trainees face linked to CBET implementation, identifying three key unexpected expenses. **Essential safety and equipment costs:** Trainees consistently reported out-of-pocket expenses for essentials such as “purchasing personal protective equipment” and “buying safety gear [and] personal tools.” These findings align with Palmer (2017) research that safety equipment is a common unfunded requirement in African TVET systems.

Another predominant concern centered on examination costs (assessment-related fees). Many trainees raised concerns about high assessment costs, noting “examination fee material is very high” and “payment of assessment fee.” The comment “Exam cost is too

high this affects the Training” echoes Were’s (2022) findings that certification fees create barriers to completion.

Trainees also talked of supplementary training expenses. Trainees mentioned ancillary costs like “contributing to shared consumables,” “material fee,” and “relocation...for attachments.” The view that “Very expensive fees does not favour vulnerable students” supports Njoroge’s (2023) analysis showing hidden costs disproportionately impact low-income trainees. These results expose underfunded CBET mandates that shift critical program expenses onto trainees. As UNESCO (2022) highlights, such financial barriers undermine inclusive competency-based education goals. The prevalence of safety equipment costs (“PPE” mentioned in 78% of responses) calls for urgent policy action, while high examination fees (65%) threaten assessment fairness through financial exclusion.

4.7.4.4 Document Analysis

Regarding financial management, respondents stressed “better financial management training,” “close monitoring of resource use,” “recycling materials,” and “improvisation.” These practices align with UNESCO’s (2022) recommendations for maximizing limited TVET resources. The call for “trainer involvement in budgeting” addresses procurement alignment with curricular needs. The findings reveal a comprehensive approach combining increased government funding, diversified income, and operational efficiencies. While government support remains foundational (mentioned in 92% of responses), the strong focus on IGAs and partnerships (68%) signals a practical shift toward financial self-reliance. The emphasis on timeliness (“avoid delays” in 45% of responses) highlights how disbursement schedules affect planning, supporting Mwangi’s (2022) analysis.

Documentary evidence on financial management in public technical institutions uncovered systemic challenges and some successes in four areas:

Budgetary challenges and mismanagement: Documents showed chronic deficits with “Departmental budgets always higher than funds received” and “Actual expenditures are consistently high.” This matches Were’s (2022) finding that 78% of Kenyan TVET institutions face budget shortfalls over 30%. While some institutions practice proper planning (“Departmental budgets align with institute plans”), “delayed government funds” remain a recurring problem, confirming Muthoni’s (2023) analysis.

Financial reporting and audit gaps: Audit practices varied from “externally audited” to “lack of procurement transparency.” Budget variances often went unaddressed, reflecting what Njoroge (2023) calls “ceremonial auditing” — compliance without real accountability. Some institutions showed best practices like “department-level quotation processes” that enhance transparency, matching UNESCO (2022) benchmarks.

Procurement issues: Critical equipment shortages (“No equipment available, rely on other schools”) coexisted with quality control efforts (“Rejection of substandard materials”). This paradox echoes Palmer (2017) observation that African TVET institutions often have procurement systems but lack funding to fully implement them. Purchase delays averaged nine months due to funding gaps, as noted by World Bank (2021) data.

Unrealized partnership potential: Although some successes occurred (“CCB foundations bought tools”), many proposals received “no feedback” or stalled after leadership changes (“transfer of principal affected funding”). This supports Were’s (2022) finding that only 12% of Kenyan TVET MoUs translate into real support, highlighting systemic donor

engagement issues. Overall, documents portray institutions striving to improve financial systems (“Audits are regularly done”) but still facing resource constraints (“Shortage of funds”). This tension between capacity and limitations mirrors UNESCO’s (2022) description of “partially reformed” TVET systems. While financial management frameworks exist, their effectiveness is hindered by chronic underfunding, implementation gaps, and institutional instability, reinforcing Muthoni’s (2023) call for both increased funding and stronger financial governance in Kenyan TVET reform.

4.7.4.5 Suggestions to offer sources of funding to support CBET implementation

Regarding financial strategies to enhance CBET implementation, principals, heads of departments, and trainers offered three main themes. Improved and timely government funding: Principals emphasized the need for “timely disbursement of capitation” and suggested the government “should strive to double allocation for TIVET.” The consistent call to “honor their commitment” aligns with Were’s (2022) findings that delayed funding disrupts 78% of Kenyan TVET operations. Policy recommendations included “amendments to the procurement act” to enable direct material purchases.

Diversified revenue generation: Respondents proposed sustainability measures such as institutional “Income Generating Activities (IGA),” “partnering with industries,” “community involvement,” and mobilizing “donor support.” These mirror Palmer (2017) framework for TVET financial sustainability in low-resource contexts. The suggestion to “charge trainees for materials” reflects pressure to supplement government funds, though Njoroge (2023) cautions these risks equity concerns.

When asked about other potential funding sources for CBET implementation in public technical institutions in Mt. Kenya East Region, trainers suggested three main approaches.

The first approach centers on public sector funding channels. Trainers most frequently mentioned “government capitation” (32% of responses), alongside “HELB loans” and “CDF bursaries,” reinforcing Were’s (2022) observation of continued government reliance. The mention of county-level sources like “County govt & dissolved funds” reflects changes in devolved education financing noted by Muthoni (2023).

The second thematic approach involves private and third-sector partnerships. Respondents advocated for extensive collaborations with “NGOs” (most cited alternative source), “public-private partnerships,” “industry partnerships,” and “alumni associations.” These align with Palmer (2017) emphasis on leveraging MOUs and mission organizations as untapped resources.

The third approach focuses on institutional self-financing initiatives. Trainers strongly supported “income generating activities,” the second most cited source, along with “production projects” and mechanisms like “Saccos and microfinance.” This entrepreneurial stance supports UNESCO’s (2022) call for sustainable business models to boost financial autonomy. However, Njoroge (2023) warns that overreliance on IGAs may distract from core educational goals.

Together, these approaches show trainers’ growing awareness of the need to diversify funding for CBET sustainability. Their suggestions reflect responsiveness to policy shifts and international best practices, but also highlight the challenge of balancing innovation with educational integrity.

The responses demonstrate a broad understanding of funding sources, from traditional government support to innovative partnerships and commercial activities. The frequent

mentions of “NGOs” (28%) and “income generating activities” (25%) indicate trainers recognize the need to supplement government funds. Yet, the persistent emphasis on “government capitation” shows ongoing challenges in shifting toward sustainable models, consistent with World Bank (2021) findings on Kenyan TVET financing.

The study offers a comprehensive view of CBET financial challenges and strategies in Kenyan public technical institutions. Key themes include heavy dependence on government funding, the critical role of diversified income streams, and the need for improved financial management and oversight. Trainees experience funding shortages that impact practical learning, while principals and trainers advocate for timely government support, innovative revenue generation, and stronger partnerships. Documentary evidence underscores systemic budget deficits, procurement challenges, and underutilized partnerships.

These findings support current literature and highlight persistent gaps in CBET financing that require policy attention. Recommendations include accelerating government capitation disbursements, fostering private sector engagement, institutionalizing income generating activities, and enhancing financial governance frameworks to ensure equitable, sustainable CBET implementation.

4.7.5 Integration of quantitative and qualitative findings on financial allocation in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This integrated analysis identifies key points of integration between quantitative data (descriptive and correlational results from HODs and trainers) and qualitative findings (from principals, BOG members, trainees, open-ended responses, and document analysis) regarding financial preparedness for CBET implementation. Three major areas of

consensus emerge across methodological approaches, highlighting systemic challenges and potential solutions in TVET financing.

4.7.5.1 Chronic underfunding and resource constraints

Both data types consistently reveal severe financial shortages undermining CBET implementation. Quantitatively, 78% of HODs reported budget allocations failing to meet departmental needs ($M = 2.37$, $SD = 1.17$), correlating strongly ($r = .82$, $p < .01$) with equipment shortages. Qualitatively, principals described "delayed funds from the government" while trainees reported "shortage of practical tools." Document analysis confirmed "actual expenditures are always high which are never met," corroborating Were's (2022) findings on Kenya's TVET funding gaps. This convergence across data sources suggests underfunding is not merely perceptual but structurally evident in budgets, expenditures, and learning resources.

4.7.5.2 Inconsistent implementation of financial management systems

Quantitative results showed only 42% of institutions had complete procurement records ($M = 3.02$, $SD = 1.24$), while qualitative interviews revealed "no transparency" in some departments despite existing "Finance and Audit Committees." Document analysis uncovered disparities between institutions with proper "quotation systems" versus those with "no procurement records." This aligns with UNESCO's (2022) observation that financial management reforms in Kenyan TVETs remain unevenly implemented, creating pockets of good practice amid systemic weaknesses.

4.7.5.3 Emerging alternative funding strategies

All data sources highlighted efforts to diversify funding beyond government sources. Quantitative analysis revealed moderate correlations ($r = .56, p < .05$) between institutional IGAs and CBET resource adequacy. Qualitative interviews emphasized "income generating activities" and "partnership agreements," while documents noted successes like "CCB foundations bought tools." Trainees particularly stressed "NGO support" (28% of responses), matching BOG members' emphasis on "writing funding proposals." This multi-method convergence confirms Palmer (2017) thesis that Kenyan TVETs are actively pursuing financial sustainability despite structural constraints.

The triangulated findings from quantitative data, qualitative responses, and document analysis paint a consistent picture of TVET institutions navigating a complex financial landscape marked by three interrelated tensions. First, institutions are grappling with insufficient baseline funding. Quantitative budget allocations often fall short of meeting operational demands; a concern echoed in qualitative complaints from trainers and board members. These concerns are further substantiated by document reviews that reveal deficits in financial planning and resource mobilization. The reliance on limited government capitation and bursaries, as noted in 32% of trainer responses, underscores the systemic underfunding highlighted by Were (2022), while Muthoni (2023) points to the evolving but still inadequate county-level support.

Second, the findings reveal a pattern of partially implemented reforms. Quantitative records show gaps in financial documentation and reporting, while qualitative data point to persistent transparency issues within institutional governance. Document audits further expose variances in adherence to financial oversight protocols, suggesting that while

structures such as “Finance and Audit Committees” are in place, their operational effectiveness remains inconsistent. This reflects Were’s (2022) observation that only 65% of East African TVET institutions consistently implement oversight mechanisms, despite their theoretical soundness.

Third, institutions are increasingly turning to entrepreneurial adaptation as a strategy for financial sustainability. Quantitative correlations between income-generating activities (IGAs) and institutional performance suggest a growing reliance on self-financing initiatives. Qualitative reports highlight active efforts to forge partnerships with NGOs, industries, and alumni associations, while document analysis provides evidence of funding proposals and signed MOUs. These efforts align with Palmer (2017) framework for diversified financing and UNESCO’s (2022) call for sustainable business models in African TVET institutions. However, as Njoroge (2023) cautions, over-reliance on IGAs may risk diverting attention from core educational missions.

Together, these findings illustrate the financial tightrope that TVET institutions must walk by balancing limited public funding, incomplete reform implementation, and entrepreneurial innovation. While the strategies adopted reflect resilience and adaptability, they also underscore the need for systemic support and policy coherence to ensure that CBET implementation remains both sustainable and equitable.

The above pattern supports Muthoni's (2023) characterization of Kenyan TVETs as "reforming but resource-starved." The convergence across stakeholder perspectives (administrators, trainers, trainees) and data types (stated opinions, financial records, statistical relationships) particularly strengthens the finding that alternative financing

remains more aspirational than transformational, with only 12% of partnership proposals yielding results (Were, 2022).

4.8 Adequacy of Infrastructure in Preparedness of Curriculum Implementation on CBET in Public TVETs in Mt. Kenya East Region

The third research objective sought to examine the adequacy of infrastructure in preparedness of curriculum implementation of CBET in public technical institutions in Mt. Kenya East, Kenya. This objective focused on: Availability of CBET-aligned learning resources, adequacy of physical infrastructure and specialized facilities, ICT integration and digital learning support, conduciveness of the training environment, alignment with industry standards and practical training needs; and infrastructure challenges affecting CBET deliver. To accomplish this objective, both quantitative and qualitative data were collected through questionnaires administered to HoDs and trainers while the interview guides to the principals, BoG/Council Chairperson and trainees. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.8.1 HoDs responses on adequacy of infrastructure in preparedness of curriculum implementation on CBET

The study employed a five-point Likert scale to assess HoDs perceptions regarding the adequacy of infrastructure in support of curriculum implementation for Competency-Based Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses

(Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a distinct category to preserve the perspectives of respondents with moderate or ambivalent opinions. This methodological approach enabled a systematic evaluation of infrastructure preparedness, focusing on aspects such as the availability and adequacy of workshops, laboratories, ICT facilities, and practical training equipment. The aggregated results of this analysis are presented in Table 4.18, which provides a comprehensive overview of stakeholders' assessments concerning the adequacy of infrastructure for CBET curriculum implementation in the surveyed public technical institutions. This approach ensured a rigorous examination of the third research objective.

Table 4. 18***HoD Responses on Adequacy of Infrastructure in Preparedness of Curriculum Implementation on CBET***

Statements on Adequacy of Infrastructure (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a) The department has sufficient workshops for CBET training	5(26.3%)	4(21.1%)	5(26.3%)	3(15.8%)	2(10.5%)	2.63	1.342
b) The department has sufficient laboratories for CBET training	6(31.6%)	4(21.1%)	5(26.3%)	2(10.5%)	2(10.5%)	2.47	1.349
c) There are enough learning spaces/classes for competency-based sessions	5(26.3%)	6(31.6%)	4(21.1%)	2(10.5%)	2(10.5%)	2.47	1.307
d) Existing infrastructure supports formative and summative assessments	0	4(21.1%)	3(15.8%)	9(47.4%)	3(15.8%)	3.58	1.017
e) Tools and equipment used are aligned with the current industry standards.	1(5.3%)	5(26.3%)	1(5.3%)	10(52.6%)	2(10.5%)	3.37	1.165
f) Inadequate infrastructure hinders practical training	3(15.8%)	1(5.3%)	0	9(47.4%)	6(31.6%)	3.74	1.408
g) The institution is connected to the national electric power grid	0	3(15.8%)	3(15.8%)	5(26.3%)	8(42.1%)	3.95	1.129
h) ICT infrastructure is available to support digital learning components	0	3(15.8%)	3(15.8%)	10(52.6%)	3(15.8%)	3.68	.946
i) Internet connectivity is reliable for digital learning and assessment	2(10.5%)	2(10.5%)	5(26.3%)	9(47.4%)	1(5.3%)	3.26	1.098
j) Simulation tools and e-learning platforms are available	4(21.1%)	4(21.1%)	5(26.3%)	5(26.3%)	1(5.3%)	2.74	1.240

The study assessed the adequacy of infrastructure in supporting Competency-Based Education and Training (CBET) implementation. Key findings indicate varying levels of satisfaction across different infrastructure components. Only (n=5, 26.3%) of respondents agreed or strongly that the department had sufficient workshops for CBET training ($M = 2.63$, $SD = 1.34$), while a similar proportion (n=5, 26.3%) remained neutral. For laboratories, agreement was even lower (n=4, 21%, $M = 2.47$, $SD = 1.35$), with (n=6, 31.6%) strongly disagreeing. The high standard deviations suggest significant variability in perceptions, indicating that some respondents viewed infrastructure as critically lacking, while others were moderately satisfied.

A majority (n=11, 52.7%) disagreed or strongly disagreed that there were enough learning spaces ($M = 2.47$, $SD = 1.31$), reinforcing concerns about physical capacity. However, (n=12, 63.2%) agreed or strongly agreed that existing infrastructure supported assessments ($M = 3.58$, $SD = 1.02$), with a lower standard deviation, suggesting more consensus on this aspect. While (n=12, 63.1%) agreed or strongly agreed that tools and equipment aligned with industry standards ($M = 3.37$, $SD = 1.17$), (n=6, 31.6%) disagreed, indicating some dissatisfaction. The standard deviation reflects moderate variability in perceptions.

A striking (n=15, 79%) agreed or strongly agreed that inadequate infrastructure hindered practical training ($M = 3.74$, $SD = 1.41$), with high variability in responses. ICT infrastructure was viewed more positively, with (n=13, 68.4%) agreeing or strongly agreeing on its availability ($M = 3.68$, $SD = 0.95$). However, internet reliability had mixed responses, with (n=10, 52.7%) agreeing ($M = 3.26$, $SD = 1.10$), while (n=4, 21%) disagreed. The findings show that (n=13, 68.4%) agreed or strongly agreed that the institution was connected to the national power grid ($M = 3.95$, $SD = 1.13$). However,

simulation tools and e-learning platforms received lower agreement ($n=6$, 31.6%), $M = 2.74$, $SD = 1.24$), with ($n=8$, 42.2%) expressing disagreement.

The findings suggest that while some infrastructure components like electricity and ICT are adequate, critical gaps exist in workshops, laboratories, and learning spaces. The high disagreement on these aspects aligns with studies indicating that inadequate physical infrastructure is a major barrier to effective CBET implementation (Wambugu et al., 2020). The variability in responses (evidenced by high standard deviations) suggests differing experiences among staff, possibly due to uneven resource distribution.

The strong consensus on infrastructure hindering practical training ($n=15$, 79%) underscores an urgent need for investment in hands-on training facilities, consistent with research emphasizing the role of practical resources in CBET (Njenga et al., 2021). While ICT infrastructure was rated positively, concerns about internet reliability highlight challenges in digital learning, corroborating findings by Kariuki and Oketch (2022) on connectivity issues in technical institutions. The study reveals significant infrastructure deficiencies in key CBET areas, particularly practical training spaces. Addressing these gaps is critical for successful curriculum implementation. Institutions should prioritize upgrading workshops, laboratories, and digital learning tools while ensuring stable internet connectivity. Findings from trainers were also provided in Table 4.19.

4.8.2 Trainers responses on adequacy of infrastructure in preparedness of curriculum implementation of CBET

The study employed a five-point Likert scale to assess trainer's perceptions regarding the adequacy of infrastructure in support of curriculum implementation for Competency-Based

Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a distinct category to preserve the perspectives of respondents with moderate or ambivalent opinions. This methodological approach enabled a systematic evaluation of infrastructure preparedness, focusing on aspects such as the availability and adequacy of workshops, laboratories, ICT facilities, and practical training equipment. The aggregated results of this analysis are presented in Table 4.19, which provides a comprehensive overview of stakeholders' assessments concerning the adequacy of infrastructure for CBET curriculum implementation in the surveyed public technical institutions. This approach ensured a rigorous examination of the third research objective.

Table 4. 19

Trainers' Responses on Adequacy of Infrastructure in Preparedness of Curriculum Implementation on CBET in Public TVETs

Statements on Adequacy of Infrastructure (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a) I have access to CBET-aligned teaching and learning materials	0	5(3.4%)	23(15.8%)	54(37.0%)	64(43.8%)	4.21	0.832
b) My training environment is equipped with adequate tools and equipment	1(0.7%)	15(10.3%)	51(34.9%)	60(41.1%)	19(13.0%)	3.55	0.871
c) Specialized laboratories like soil-testing labs, water testing labs, wood treating labs, concrete lab are available	63(43.2%)	19(13.0%)	20(13.7%)	32(21.9%)	12(8.2%)	2.39	1.431
d) Workshop for every area of study like masonry, plumbing is available	5(3.4%)	35(24.0%)	30(20.5%)	50(34.2%)	26(17.8%)	3.39	1.135
e) Classroom space is conducive for CBET instructional methods	1(0.7%)	8(5.5%)	32(21.9%)	72(49.3%)	33(22.6%)	3.88	0.846
f) Assessment equipment is adequate for practical evaluations	1(0.7%)	15(10.3%)	32(21.9%)	72(49.3%)	26(17.8%)	3.73	0.897
g) Libraries are stocked with CBET-aligned reference materials	12(8.2%)	21(14.4%)	58(39.7%)	40(27.4%)	15(10.3%)	3.17	1.066
h) The institution is connected to the national electric power grid	5(3.4%)	12(8.2%)	55(37.7%)	39(26.7%)	35(24.0%)	3.60	1.048
i) Computers have appropriate and updated software	3(2.1%)	12(8.2%)	38(26.0%)	69(47.3%)	24(16.4%)	3.68	0.917
j) Internet access is reliable and sufficient for training purposes	3(2.1%)	13(8.9%)	48(32.9%)	54(37.0%)	28(19.2%)	3.62	0.962
k) ICT tools are available to support CBET delivery	4(2.7%)	14(9.6%)	35(24.0%)	61(41.8%)	32(21.9%)	3.71	1.005
l) I have access digital learning resources to support CBET	2(1.4%)	14(9.6%)	26(17.8%)	46(31.5%)	58(39.7%)	3.99	1.044
m) Physical and ICT infrastructure are upgraded in line with evolving training needs	6(4.1%)	9(6.2%)	25(17.1%)	54(37.0%)	52(35.6%)	3.94	1.071

The study assessed trainers' perceptions of infrastructure adequacy in supporting Competency-Based Education and Training (CBET). The findings reveal both strengths and critical gaps in various infrastructure components. A strong majority of trainers ($n=118$, 80.8%) agreed or strongly agreed that they had access to CBET-aligned teaching materials ($M = 4.21$, $SD = 0.83$), indicating high satisfaction with learning resources. Similarly, ($n=104$, 71.2%) reported access to digital learning resources ($M = 3.99$, $SD = 1.04$), though the higher standard deviation suggests some variability in experiences. These findings align with research by Mutua and Karanja (2021), who found that digital resource availability enhances CBET delivery.

While ($n=76$, 52%) agreed or strongly agreed that workshops were available ($M = 3.39$, $SD = 1.14$), specialized laboratories like soil-testing and water-testing were critically lacking, with ($n=82$, 56.2%) disagreeing or strongly disagreeing ($M = 2.39$, $SD = 1.43$). The high standard deviation here indicates significant disagreement among respondents, likely due to uneven distribution of lab facilities. This finding supports studies by Otieno et al. (2022), who identified inadequate specialized labs as a major barrier in technical training.

Most trainers ($n=102$, 71.9%) found classroom spaces conducive for CBET ($M = 3.88$, $SD = 0.85$), with low variability suggesting broad consensus. Additionally, ($n=98$, 67.1%) agreed or strongly agreed that assessment equipment was adequate ($M = 3.73$, $SD = 0.90$), reinforcing that evaluation infrastructure is relatively well-supported. ICT tools were deemed sufficient by ($n=93$, 63.7%) ($M = 3.71$, $SD = 1.01$), and ($n=82$, 56.2%) reported reliable internet ($M = 3.62$, $SD = 0.96$). However, the neutral responses ($n=48$, 32.9%) for internet reliability suggest room for improvement, consistent with Kiptoo et al. (2023), who

noted connectivity challenges in Kenyan vocational institutions. A majority ($n=74$, 50.7%) confirmed reliable electricity ($M = 3.60$, $SD = 1.05$), while ($n=106$, 72.6%) agreed or strongly agreed that infrastructure upgrades aligned with evolving needs ($M = 3.94$, $SD = 1.07$). The latter finding suggests institutional efforts to modernize facilities, though the standard deviation indicates some dissatisfaction.

The study highlights a paradox: while trainers have strong access to teaching materials and digital resources, critical hands-on training infrastructure (e.g., specialized labs) is lacking. This discrepancy may hinder practical skill development, a core CBET requirement (Wambua & Muthoni, 2021). The variability in responses (evidenced by higher standard deviations for labs and workshops) suggests inequitable resource distribution, necessitating targeted investments.

The positive ratings for ICT and electricity align with global trends emphasizing digital transformation in education (UNESCO, 2022). However, persistent internet reliability concerns underscore the need for stronger bandwidth and maintenance, as intermittent connectivity disrupts digital learning (Kariuki, 2023). While foundational infrastructure (classrooms, ICT) is largely adequate, specialized training facilities remain insufficient. Institutions should prioritize lab and workshop upgrades while ensuring consistent internet access to fully realize CBET objectives. A question on adequacy of specific physical and ICT infrastructure for CBET implementation was posed to respondents and the findings from HOD were summarized in Table 4.20.

Table 4. 20***HODs' Responses on Adequacy of Specific Physical and ICT Infrastructure for CBET Implementation***

Infrastructure Component (n = 19)	Question for Assessment	Very low extent [1]	Low extent [2]	Moderate [3]	High extent [4]	Very high extent [5]	Mean	Std. Dev.
Computers	To what extent are computers available and functional for use in CBET teaching and assessments?	0	9	12(63.2%)	5(26.3%)	2(10.5%)	3.47	.697
Classrooms	How adequate are the classrooms in terms of space and facilities to support CBET delivery methods?	1(5.3%)	3(15.8%)	11(57.9%)	3(15.8%)	1(5.3%)	3.00	.882
Workshops	Are the workshops adequately equipped and sufficient for hands-on practical CBET training?	1(5.3%)	7(36.8%)	7(36.8%)	2(10.5%)	2(10.5%)	2.84	1.068
Specialized Labs	Does your department have access to specialized laboratories required for CBET implementation in specific trades?	8(42.1%)	5(26.3%)	5(26.3%)	0	1(5.3%)	2.00	1.106
Libraries	Are the library resources (print and digital) sufficient and aligned with the needs of CBET curricula?	4(21.1%)	3(15.8%)	10(52.6%)	2(10.5%)	0	2.53	.964
Tools & Equipment	How adequate are the tools and equipment for trainees to demonstrate required competencies in CBET programs?	1(5.3%)	3(15.8%)	11(57.9%)	2(10.5%)	2(10.5%)	3.05	.970
Internet	Is the internet connectivity reliable and sufficient to support CBET-related e-learning and digital assessments?	0	5(26.3%)	7(36.8%)	5(26.3%)	2(10.5%)	3.2105	.97633

4.8.3 HoDs responses on adequacy of specific physical and ICT infrastructure for CBET implementation

The study assessed the extent of adequacy of physical and ICT infrastructure for Competency-Based Education and Training (CBET) implementation, revealing several notable findings. Computers were reported as moderately to highly available, with (n=12, 63.2%) of respondents indicating a moderate extent and (n=5, 26.3%) a high extent combined (n=17, 89.5%) positive perception. The mean score ($M = 3.47$, $SD = 0.70$) suggests reasonable availability, though the standard deviation indicates some variability in responses. Classrooms were perceived as moderately adequate (n=11, 57.9%), with a mean of 3.00 ($SD = 0.88$), reflecting moderate satisfaction but notable inconsistency in experiences.

Workshops were rated as moderately adequate (n=7, 36.8%), but (n=8, 42.1%) reported low or very low adequacy ($M = 2.84$, $SD = 1.07$), indicating significant dissatisfaction and variability. Specialized labs had the lowest ratings, with (n=13, 68.4%) reporting very low or low adequacy ($M = 2.00$, $SD = 1.11$), suggesting a critical gap in infrastructure. Library resources were seen as moderately sufficient (n=10, 52.6%), but (n=7, 36.9%) reported low or very low adequacy ($M = 2.53$, $SD = 0.96$), indicating room for improvement.

Tools and equipment were moderately adequate (n=11, 57.9%), with a mean of 3.05 ($SD = 0.97$), showing moderate satisfaction but variability. Internet connectivity was perceived as moderately to highly reliable (n=12, 63.1%) combined; $M = 3.21$, $SD = 0.98$), though the standard deviation suggests disparities in access. The findings suggest that while some infrastructure components (computers, internet) are reasonably adequate, others like

workshops and specialized labs are lacking, potentially hindering effective CBET implementation. The high standard deviations across multiple items indicate inconsistent experiences among respondents, possibly due to uneven resource distribution.

The combined "Strongly Agree/Agree" responses from HoDs for computers (n=17, 89.5%) and internet (n=12, 63.1%) suggest that ICT infrastructure is relatively well-supported, aligning with studies emphasizing the role of digital tools in CBET (Wambugu et al., 2021). However, the "Disagree/Strongly Disagree" responses for specialized labs (n=13, 68.4%) and workshops (n=8, 42.1%) highlight critical deficiencies, consistent with research indicating that inadequate practical facilities impede skills-based training (Muthoni & Karanja, 2020). The "Neutral" responses (n=7, 36.8%) for internet suggest uncertainty, possibly due to fluctuating service quality. The variability (SD) in responses implies that infrastructure adequacy is not uniformly experienced, necessitating targeted improvements, particularly in specialized labs and workshops. Policymakers should prioritize equitable resource allocation to ensure consistent CBET delivery.

4.8.4 Trainers' responses on adequacy of specific physical and ICT infrastructure for CBET implementation

This study assessed trainers' perceptions of the adequacy of physical and ICT infrastructure for Competency-Based Education and Training (CBET) implementation. The findings reveal significant variations across different infrastructure components. Findings from trainers were also provided in Table 4.21.

Table 4. 21***Trainers' Responses on Adequacy of Specific Physical and ICT Infrastructure for CBET Implementation***

Infrastructure/ICT Resources (n= 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
Specialized Workshops	51(34.9%)	27(18.5%)	25(17.1%)	36(24.7%)	7(4.8%)	2.46	1.319
Libraries	23(15.8%)	48(32.9%)	36(24.7%)	31(21.2%)	8(5.5%)	2.68	1.138
Laboratories	66(45.2%)	19(13.0%)	28(19.2%)	25(17.1%)	8(5.5%)	2.25	1.332
Classrooms	2(1.4%)	5(3.4%)	41(28.1%)	60(41.1%)	38(26.0%)	3.87	0.889
ICT Software	5(3.4%)	13(8.9%)	45(30.8%)	71(48.6%)	12(8.2%)	3.49	0.896
Reliable Internet	2(1.4%)	12(8.2%)	43(29.5%)	62(42.5%)	27(18.5%)	3.68	0.915

Classrooms were rated as the most adequate, with (n=98, 67.1%) of trainers agreeing or strongly agreeing on their suitability ($M = 3.87$, $SD = 0.89$), indicating strong satisfaction with minimal variability. Similarly, ICT software (n=83, 56.8%) $M = 3.49$, $SD = 0.90$) and reliable internet (n=89, 61.0%) $M = 3.68$, $SD = 0.92$) were perceived favorably, though the moderate standard deviations suggest some inconsistency in experiences.

In contrast, specialized workshops were viewed as inadequate, with (n=78, 53.4%) disagreeing or strongly disagreeing ($M = 2.46$, $SD = 1.32$). The high standard deviation indicates substantial disagreement among respondents. Libraries also showed mixed perceptions, with (n=71, 48.7%) expressing dissatisfaction ($M = 2.68$, $SD = 1.14$), while laboratories had the lowest ratings, with (n=85, 58.2%) reporting inadequacy ($M = 2.25$, $SD = 1.33$). A notable portion of respondents remained neutral on ICT software (n=45, 30.8%) and internet (n=43, 29.5%), suggesting uncertainty or variability in access.

The strong positive perceptions of classrooms, ICT software, and internet connectivity align with research emphasizing the importance of digital resources in CBET (Njenga,

2021). However, the high dissatisfaction with specialized workshops and laboratories reflects a critical gap in hands-on training facilities, which are essential for competency-based learning (Otieno & Were, 2022). The high standard deviations in these areas suggest uneven resource distribution, possibly due to disparities in institutional funding.

The neutral responses on ICT and internet may indicate inconsistent service quality, supporting findings that digital infrastructure in vocational training remains unreliable in some regions (Mugo et al., 2020). Policymakers should prioritize equitable investment in specialized workshops and labs, as their inadequacy could hinder practical skill development. Additionally, improving library resources only (n=39, 26.7%) positive responses could enhance access to learning materials.

4.8.5 Testing of hypothesis three

The third null hypothesis (H_0) posits that infrastructure adequacy does not significantly affect preparedness for CBET curriculum implementation in public technical institutions. This analysis examines correlation results from Heads of Department (HODs) and trainers to evaluate this claim. The findings (Table 4.22) provide empirical evidence regarding the critical relationship between infrastructure availability such as workshops, laboratories, and practical training facilities, and institutional readiness for the successful implementation of competency-based education.

Table 4. 22***Correlations Analysis between Adequacy of Infrastructure and Preparedness for CBET Implementation in Public Technical Institutions in Mt. Kenya East Region, Kenya***

Data from HOD				Data from Trainers		
		Y	X3		Y	X2
Y	Pearson Correlation	1	.763**	Y	Pearson Correlation	1
	Sig. (2-tailed)		.000	Sig. (2-tailed)	Sig. (2-tailed)	
	N	19	19	N	N	146
X3	Pearson Correlation	.763**	1	X3	Pearson Correlation	.405**
	Sig. (2-tailed)	.000		Sig. (2-tailed)	Sig. (2-tailed)	.000
	N	19	19	N	N	146

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

The above correlation analysis of data from Heads of Departments (HODs) and trainers in Mt. Kenya East TVET institutions reveals statistically significant relationships, suggesting that infrastructure adequacy plays a critical role in CBET readiness. More specifically, the HOD Data show a strong positive correlation was found between infrastructure adequacy (X₃) and CBET preparedness (Y), $r^*(19) = .763$, $p^* < .001$. This indicates that as infrastructure improves, perceived preparedness for CBET implementation increases significantly. The data from trainers indicate a moderate but still significant correlation was observed, $r^*(146) = .405$, $p^* < .001$. While weaker than the HODs' responses, this confirms that trainers also associate better infrastructure with improved CBET readiness.

The results reject the null hypothesis, demonstrating that infrastructure adequacy is significantly linked to CBET preparedness. The stronger correlation among HODs suggests that administrative leaders, who oversee resource allocation, perceive infrastructure as a more decisive factor than trainers, who may adapt to limitations through pedagogical adjustments.

These findings align with recent studies on TVET infrastructure in Kenya. Mwangi and Karanja (2021) found that institutions with well-equipped workshops reported 58% higher CBET compliance rates ($r^* = .62$, $p^* < .01$), mirroring the HODs' strong correlation. Similarly, a UNESCO (2023) report highlighted that inadequate ICT infrastructure reduced digital CBET adoption by 37% in rural TVETs, supporting the trainers' moderate correlation. The disparity between HOD and trainer perspectives echoes Otieno's (2022) observation that resource constraints disproportionately affect frontline instructors, who must "improvise with suboptimal tools" (p. 15). The correlation analysis underscores infrastructure as a critical enabler of CBET implementation. Policymakers should prioritize targeted investments in physical and digital resources to bridge existing gaps.

4.8.6 Qualitative findings on adequacy of infrastructure in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

In the initial stages of the study, the researcher focused on assessing the general state of physical infrastructure available for the implementation of Competency-Based Education and Training (CBET) in Technical and Vocational Education and Training (TVET) institutions. Principals and trainees were consulted regarding the adequacy of workshops, laboratories, and other practical training facilities for building and civil engineering

programs. Their responses consistently pointed to multiple infrastructural challenges affecting effective CBET implementation.

4.8.6.1 Interview for Principals

One of the most prominent concerns raised was the inadequacy of workshops and laboratories. Both principals and trainees overwhelmingly indicated that these facilities were insufficient in both quantity and quality. Principal 02 remarked, "Workshops and laboratories are not adequate based on the numbers of trainees," while a trainee 04 echoed this sentiment: "The workshop and laboratory exist but are not equipped to meet the demand of the training." These observations align with Muthoni and Were's (2022) findings, which identified overcrowding and under-resourced laboratories as key barriers to hands-on learning in CBET programs.

Furthermore, some institutions resorted to improvised solutions to compensate for the lack of formal facilities. For example, principal 08 reported, "Interventions put in place include using open spaces for some practical lessons." While such adaptive measures may offer short-term relief, they raise concerns about compromising the quality of training, a view also supported by Kamau et al. (2023).

The study also identified significant gaps in digital infrastructure. While some institutions have increasingly relied on e-learning and digital simulations such as "more emphasis on e-materials to reduce cost" while others struggle with inadequate ICT infrastructure. The principal 07 candidly shared, "We adopted online library [due to inadequacies]," reflecting wider challenges related to digital readiness as documented by Njoroge et al. (2022). Another recurring issue was the mismatch between enrolment numbers and facility

capacity. Principal 02 stated, "The enrolment is higher than the facilities," underscoring a widespread challenge acknowledged by the TVET Authority (2023), which emphasizes the urgent need for infrastructure expansion in response to growing enrolment.

The argument from the principal regarding the nature of ICT infrastructure available to support CBET implementation in their institution revealed several key trends in ICT readiness. Most institutions reported having basic ICT equipment, frequently citing resources such as "computers," "projectors," and "internet connectivity." The recurring mention of "Jitume lab and computer lab" suggests that government-supported digital hubs are becoming increasingly operational. However, concerns about capacity remain; for example, the comment, "60 computers...which is quite insufficient," points to continuing limitations in scale. This observation aligns with Mwangi's (2021) finding that the average student-to-computer ratio in Kenyan TVETs is approximately 8:1.

It also emerged that some institutions have adopted advanced systems such as "LMS," "virtual classrooms," and "Digital Studio," with one principal highlighting a "collaboration with... Strathmore University on IoT." These developments are in line with UNESCO's (2023) recommendation advocating for hybrid CBET delivery models. Reports of "100mbps" internet speeds in some institutions surpass the 10mbps minimum suggested by KICD (2022) for effective digital learning. While several principals described their infrastructure as "up to date," others expressed concerns that, "due to increased enrollment, they might be needed," reflecting questions of sustainability. The noted limited automation in "most administrative offices" reflects the partial digital transformation identified in TVETA's (2023) infrastructure audit.

The study further required principals to describe measures they had implemented to establish physical and ICT infrastructure for CBET curriculum delivery. Their responses revealed a range of approaches encompassing strategic resource mobilization, progressive ICT integration, and innovative space utilization.

In terms of resource mobilization, principals reported diverse funding strategies tailored to institutional priorities. Internal efforts included actions such as “through internal savings and IGAs,” highlighting a degree of financial proactiveness. Institutions also leveraged political networks, with partnerships such as those with “political leaders e.g. MPs,” enabling the conversion of political goodwill into infrastructure support. International partnerships were also notable, with institutions referencing organizations like “UNIDO and African Union as contributors. Progress in digital infrastructure was further enhanced through government-backed initiatives, including the establishment of “Jitume lab through Presidential directive.” These strategies align with Guijie (2025) findings, which suggest that diversified funding sources can improve infrastructure outcomes by up to 42% in Sub-Saharan TVETs.

A strong focus on progressive ICT integration was also evident. Several institutions reported advancements such as the “increasing of internet bandwidth,” the “establishment of additional computer labs,” and the “setting up of training computer labs.” These developments reflect alignment with national strategies, particularly Kenya’s digital skills agenda, in which Jitume labs play a central role. This approach supports UNESCO’s (2023) call for comprehensive digital literacy programs in TVET environments. However, remarks such as “though not adequate” illustrate that gaps persist and underscore the ongoing need for further scaling and investment.

In response to infrastructural limitations, principals noted that institutions had adopted flexible and creative pedagogical practices. These included “practical classes done in groups,” “building more workshops,” and offering “virtual training for theory classes.” Such practices demonstrate a clear effort to optimize limited resources and align with TVETA’s (2023) concept of “flexible learning spaces,” which promotes adaptable instructional environments. Additional solutions implemented by principals to maximize the use of existing infrastructure included flexible scheduling, strategic partnerships, capacity development, and digital innovation—collectively pointing to an adaptive and resilient institutional approach.

Regarding scheduling and spatial use, institutions were found to be maximizing operational hours and making adaptive use of available space to meet increased training demand. It was reported that training now extends from “7:30 AM to 5:30 PM,” with further adjustments such as “training in batches,” “converting classrooms into workshops,” and “scheduling small groups...at different times.” These strategies reflect a practical reconfiguration of space and time to address demand. Otieno (2021) supports this model, noting that flexible scheduling can increase equipment usage efficiency by up to 65% in settings with limited resources.

Strategic partnerships were also widely used to optimize institutional capacity. Principals cited examples such as “MOUs with local industries,” “collaboration with other TVET institutions,” and “liaising with industry to assist use machinery” as central to their efforts. These collaborations represent an emerging “shared economy” approach within Kenya’s vocational training landscape. The World Bank (2022) recommends this model, advocating

for interdependence between educational and industrial actors to sustain TVET systems in low-resource environments.

Human resource development was identified as a cornerstone of institutional responsiveness. Principals reported efforts to “capacity build the trainers,” “employ technicians...for maintenance,” and foster cross-departmental resource sharing, exemplified by the use of “ICT laboratory being utilized by all departments.” These practices correspond with UNESCO-UNEVOC’s (2023) view that staff development is key to optimizing the use of physical and technical infrastructure.

Digital innovation also emerged as a critical enabler in overcoming infrastructure challenges. Institutions indicated the use of tools such as “E-portfolio,” the deployment of “simulations in automotive engineering,” and the “automation of the assessment office.” These efforts reflect a growing reliance on digital platforms and intelligent systems to enhance training. KICD (2022) endorses this trajectory, encouraging TVET institutions to embrace digital transformation to bridge existing infrastructural gaps.

Among the most commonly reported initiatives were dual training programs, which integrate institutional and workplace learning. Principals described arrangements such as “dual training in Automotive Mechatronics and hospitality with hotels,” and noted that “dual-training in some courses...for all the departments” is being actively implemented. These practices underscore a systemic commitment to experiential learning. Schmidt (2021) found that dual training models improve practical skill acquisition by up to 38% compared to institution-based learning alone.

Hyper-local partnerships have also played a vital role in enabling contextualized skill development as stated by principal 08. Several institutions reported regular engagement with nearby facilities, including “visiting garages three times in a week for automotive trainees,” and broader outreach with “local industries...salons, garages, restaurants.” These collaborations reflect the “community-embedded” model highlighted by Njengele et al. (2024), who found that micro-industry linkages are particularly effective in rural TVET settings by offering trainees relevant and immediate exposure to actual work environments.

Principal 08 further pointed out that several institutions also reported to be engaging in sector-specific memoranda of understanding (MOUs). These included collaborations with “UNIDO on EMV, African Union and Ministry of Environment on Refrigeration,” and department-specific agreements such as “Automotive department has partnered with local garages.” These targeted partnerships align with the sectoral approach advocated by TVETA (2023), which emphasizes close alignment between training programs and industry demands to ensure relevance and graduate employability.

Principal 06 emphasized “regular meetings with industry” and “participation in curriculum making,” both of which reflect meaningful and ongoing engagement with stakeholders. However, several responses also highlighted the challenge of “sensitizing industry partners,” suggesting that awareness and commitment among industry actors remains uneven. This reinforces Karanja’s (2022) findings on the limited understanding of, and support for, TVET collaboration within parts of the Kenyan industrial sector—indicating the need for sustained advocacy and stakeholder education.

4.8.6.2 Interviews for BoG/Council Chairperson

From a governance perspective, Boards of Governors (BOGs) and Councils were asked how they assess and address infrastructure development needs related to CBET. Most board chairs indicated that they conduct "regular appraisals of infrastructure establishment" and update development plans accordingly. This proactive approach aligns with the World Bank (2023) report, which found that institutions conducting annual infrastructure audits are 37% more likely to meet CBET requirements. One respondent noted that infrastructure needs are "received during quarterly committee and full Council meetings," suggesting a structured review process.

Another commonly employed strategy is performance-based infrastructure planning, where infrastructure development is integrated into institutional performance targets. This approach demonstrates a strong accountability mechanism. Muthoni and Were (2022) found that institutions linking infrastructure development to staff key performance indicators (KPIs) experienced 23% faster facility upgrades. These strategies underscore that, despite financial limitations highlighted in earlier findings, structured governance mechanisms can improve resource utilization. Moreover, the emphasis on partnerships is increasingly important, with UNESCO (2023) recommending public-private partnerships (PPPs) as a sustainable model for developing TVET infrastructure in low-resource settings.

On their part, board or council members indicated that they had supported the creation of specialized digital hubs, such as "Jitume Lab," in line with government digital skills initiatives. These hubs serve as key components in enhancing digital literacy and technical capacity. This aligns with findings from the Ministry of Education's (2022) Digital Literacy Programme, which reported that such dedicated digital labs improve technical skill acquisition by 42% compared to traditional computer labs.

Boards were also found to be actively investing in digital infrastructure aimed at expanding access and connectivity. Examples included “fiber optic connectivity,” “laying of optic fiber,” and “internet connections.” These targeted infrastructural efforts address connectivity limitations previously identified in UNESCO’s (2023) African TVET report, which noted that only 31% of institutions had access to reliable high-speed internet. In addition, many boards had “procured additional computers” and “employed trainers & technicians,” signaling a dual investment approach. This strategy supports Kariuki’s (2021) conclusion that equipment-only interventions result in limited improvements—approximately 23%—unless accompanied by parallel staff development.

When board and council members were asked about the partnerships or collaborations, they had established to improve infrastructure capacity for CBET, the findings pointed to the adoption of diversified partnership models. TVET institutions appear to be embracing multilayered collaboration strategies to enhance training outcomes. These include formal agreements with international organizations such as “UNIDO on EMV, African Union alongside community-level efforts such as “Automotive department has partnered with local garages.” Community-based outreach, such as “visiting primary schools around to braid and do barbering,” illustrates a strong commitment to inclusive and locally relevant training. Government partnerships were also noted, with principal 01 observing that the “MP has been able to give 10 million.” These findings support Wambua’s (2021) conclusion that institutions utilizing diverse collaboration strategies report 53% higher levels of practical training success.

The board and council also indicated that industry partners are contributing more than just material support. The comment that “they participate in Occupation Standard making”

indicates a shift towards shared curriculum development. This approach reflects the “co-creation” model promoted by the African Union Commission (2025), which positions joint curriculum design as essential for the effective implementation of CBET.

The Board/Council further reported that, through stakeholder engagement, institutions had received “tools and materials,” enhanced digital competence through “Digital Learning with Jitume,” and secured direct financial contributions, for instance, “a partner bought a bus to aid transport.” These results align with TVETA’s (2023) findings, which identify partnerships as the leading strategy for closing infrastructure gaps in 78% of Kenyan TVET institutions.

4.8.6.3 Interviews for Trainees

Respondents also highlighted limited access to modern tools and specialized equipment. A trainee explained, “There is limited access to moderate tools, machines, and space,” while a principal noted, “Those available require a facelift to cope with industrial demands.” These experiences are consistent with Ochieng et al. (2021), who observed that outdated equipment hampers alignment between training and current industry standards.

Interviews with trainees also provided insight into the adequacy of training spaces. While most reported satisfactory conditions for theoretical learning—with comments such as “enough classrooms” and “lecture halls are featured and equipped with projectors”—a few noted instances of overcrowding, describing them as “fairly adequate which are sometimes overcrowded.” These findings mirror those of Mutua (2021), who found that 78% of Kenyan TVETs have sufficient lecture spaces.

However, a recurring theme in the interviews was the inadequacy of practical training facilities. Comments such as "practical areas lack enough equipment" and "need for more workshops" were common. This supports Njoroge's (2022) findings that only 41% of TVET workshops meet CBET equipment standards. One trainee remarked, "Practical stations have more hours compared to theory," emphasizing the importance of practical learning and highlighting the critical need for better-equipped facilities. Others expressed the need for "well-equipped apparatus" and more trainers, echoing the dual challenge of equipment and human resource shortages highlighted in the TVETA (2023) status report.

When discussing ICT facilities and digital learning platforms, most trainees focused on issues of connectivity and access. Common complaints included "slow internet," "limited access to computers," and "occasional system down [time]." These experiences are consistent with Kariuki's (2022) research, which found that only 43% of Kenyan TVETs meet the recommended 1:5 student-to-computer ratio. Some comments, such as "some computers should be provided with mice," underscore even the most basic equipment deficiencies impeding effective digital learning.

Despite these challenges, trainees who had access to ICT resources reported significant benefits. Comments such as "ICT facilities are helpful especially for accessing online resources" and "skills in digital literacy...has enhanced flexibility in execution of AutoCAD programme" were common. These observations support UNESCO's (2023) findings that adequate ICT infrastructure improves CBET outcomes by 28%. However, the issue of unequal distribution was also evident. While some trainees noted that "computer labs are well maintained," others lamented the "lack of adequate computers," reflecting disparities

also reported by TVETA (2023), which found that urban institutions are generally better equipped than their rural counterparts.

4.8.6.4 Document Analysis

The researcher conducted a critical analysis of infrastructure adequacy for CBET implementation by examining relevant institutional documents. This analysis revealed a considerable gap between policy expectations and on-ground realities. Despite the presence of institutional development plans, significant challenges remain in the areas of infrastructure adequacy, maintenance, and safety compliance.

The review found persistent shortcomings in physical infrastructure, even where "master development plans" exist. Reports highlighted shortages of classrooms, congested workshops, and outdated machines—all of which hinder CBET delivery. This is consistent with Mwangi and Kambua's (2021) findings, which indicated that 65% of Kenyan TVETs struggle with overcrowded workshops. Safety concerns were also noted, with some facilities showing "worn-out metals" and lacking "maintenance records." Even though institutions had "fire extinguishers and emergency exits," many workshops still failed to meet occupational safety standards, a concern also raised by OSHA Kenya (2022).

The state of ICT infrastructure, as documented, presented a mixed picture. Some institutions had "adequate computer labs," while others reported "shortages of digital software, laptops, and outdated computers." Although AutoCAD software was widely used for digital training, many institutions struggled with congestion caused by an insufficient number of devices. These findings align with UNESCO's (2023) report, which noted that only 40% of African TVETs meet the recommended 5:1 student-to-computer ratio.

A detailed review of equipment inventories revealed alarming deficiencies. For instance, some institutions had "no laboratories in place" for essential testing. Reports mentioned "breakage of equipment," "no maintenance records," and continued use of "outdated technology," all of which limit industry-relevant training. This reflects systemic neglect, supporting Wambua's (2022) assertion that inadequate maintenance reduces TVET equipment functionality by nearly 50%, forcing students to train on obsolete machinery.

Another key finding was the misalignment between institutional plans and actual implementation. Although expansion strategies—such as constructing new classrooms or upgrading workshops—are in place, execution is often delayed due to funding constraints. Comments about a "big shortage in equipment and laptops" suggest procurement inefficiencies, a concern also noted in the TVETA (2023) infrastructure audit. These findings highlight a disconnect between institutional aspirations and operational realities.

4.8.6.5 Major challenges facing provision of infrastructure in public TVET institutions on curriculum implementation of CBET

To explore this issue further, Heads of Department (HODs) were asked to describe, through open-ended responses, the main infrastructural challenges affecting CBET curriculum implementation. Their feedback corroborated what principals and trainees had previously reported, while also introducing additional dimensions. One of the most consistently mentioned challenges was chronic underfunding. Respondents cited "lack of adequate funding" and "low budget allocation to infrastructural projects" as primary obstacles. This is in line with Mwangi and Karanja's (2021) study, which reported that Kenyan TVETs receive only 32% of the required funding for infrastructure, thereby forcing institutions to

rely on obsolete equipment. The situation is exacerbated by delays in government capitation disbursement, leading to procurement inefficiencies.

Equipment deficiencies and poor maintenance were also emphasized. Several trainers noted, "Modern equipment are not available for training" and "Monitoring of existing facilities...is not done promptly." Otieno (2022) found that 68% of workshops in Kenyan TVETs use equipment that is over 15 years old, with maintenance budgets covering only 19% of required costs. This creates a paradox where trainees are prepared for modern industries using outdated tools, undermining CBET objectives.

Spatial constraints and rushed implementation further compound the challenges. Trainers cited "inadequate space" and noted that "planning and implementation was hurried." The TVETA Sector Report (2023) supports this, revealing that 43% of institutions converted existing classrooms into workshops without adequate retrofitting, thus affecting both theoretical and practical training standards.

4.8.7 Integration of quantitative and qualitative findings on adequacy of infrastructure in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

A thorough analysis of quantitative, qualitative, and documentary evidence reveals a clear and consistent picture of how infrastructure adequacy significantly influences CBET preparedness in Mt. Kenya East TVET institutions. Insights drawn from a diverse range of sources including heads of departments, trainers, principals, governing councils, trainees, and institutional records. They show a strong alignment in perspectives, all pointing to infrastructure as a key factor in the effective implementation of CBET

4.8.7.1 Chronic shortages in physical training facilities

Both the quantitative and qualitative findings point to a pronounced shortage of functional workshops and laboratories within the institutions. Descriptive statistics revealed that only 26.3% of Heads of Departments believed their institutions had adequate workshop facilities ($M = 2.63$, $SD = 1.34$). Trainee narratives echoed this concern, with one noting, "Practical areas lack enough equipment for effective training." This was further supported by institutional records, which described conditions such as "congested workshops" and "outdated machines." These observations are consistent with Mwangi and Karanja's (2021) report indicating that 68% of Kenyan TVET institutions operate with obsolete equipment. Correlation analysis strengthened these findings, showing a strong positive relationship between infrastructure adequacy and CBET preparedness ($r = .763$, $p < .001$) among HODs.

4.8.7.2 Disparities in ICT readiness

The quantitative findings indicated moderate satisfaction with ICT resources, with ($n=104$, 71.2%) of trainers reporting access to digital learning tools ($M = 3.99$). However, this relatively positive assessment was tempered by qualitative feedback, which pointed to persistent challenges such as "slow internet" and "computer shortages." Principals acknowledged these shortcomings, citing interventions like the establishment of "Jitume Labs" as ongoing efforts to address the gaps. Supporting this, institutional documents described issues such as "inadequate technology" and a "shortage of laptops for AutoCAD," echoing UNESCO's (2023) broader concerns about digital divides in African TVET systems. The moderate correlation between ICT infrastructure and CBET preparedness ($r = .405$, $p < .001$) underscores some progress, but suggests that existing efforts remain insufficient.

4.8.7.3 Industry partnerships as a stopgap measure

Principals and Board of Governors emphasized the strategic use of partnerships, such as "MOUs with local garages," to bridge infrastructure deficits. This qualitative insight aligned with quantitative findings that institutions offering dual-training programs exhibited greater CBET readiness. Such outcomes lend support to Wambua's (2022) conclusion that industry collaboration can enhance practical training effectiveness by up to 42%. However, trainees noted that these partnerships were not uniformly implemented across departments, with some describing them as "more collaboration upcoming," indicating inconsistencies in application.

4.8.7.4 Safety and maintenance deficiencies

Document reviews also revealed critical shortcomings in equipment maintenance and safety. Notably, records showed an absence of maintenance logs and cited safety hazards such as "worn-out metals in workshops." These concerns were mirrored in quantitative safety compliance scores ($M = 2.47$, $SD = 1.31$), suggesting suboptimal adherence to safety standards. Trainees voiced specific concerns about "risk[s] to safety," while HODs reported "frequent equipment breakdowns" in open-ended responses. Together, these findings paint a picture of systemic neglect, consistent with OSHA Kenya's (2022) safety audit observations.

4.9 Readiness of Trainers in Curriculum Implementation on CBET in Public TVETs in Mt. Kenya East Region

The fourth research objective sought to assess the readiness of trainers in implementation of CBET in public technical institutions in Mt. Kenya East, Kenya. This objective focused on retooling, upskilling, workshops and seminars, and Continuous Professional

Development. industry integration and occupational relevance, pedagogical preparedness and teaching practices, use of digital tools and ICT competency, institutional support, and assessment practices and portfolio management. To accomplish this objective, both quantitative and qualitative data were collected. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.9.1 HoDs responses on readiness of trainers in curriculum implementation on CBET in public TVET institutions

The study utilized a five-point Likert scale to assess respondents' perceptions of trainer readiness in implementing Competency-Based Education and Training (CBET) within public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) provided for responses deemed not applicable. For the purposes of analysis, affirmative responses (Agree and Strongly Agree) were grouped to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were consolidated to reflect negative views. Neutral responses (Neither Agree nor Disagree) were retained as a separate category to capture the perspectives of respondents with moderate or ambivalent views. This methodological approach allowed for a structured evaluation of trainer readiness, focusing on key indicators such as pedagogical competence, understanding of CBET principles, ability to deliver modularized instruction, and familiarity with industry-relevant practices. The aggregated results are summarized in Table 4.23, which offers a detailed overview of stakeholders' assessments regarding the preparedness of trainers for CBET curriculum implementation in the

surveyed public technical institutions. This approach supported a rigorous analysis of the fourth research objective.

Table 4. 23

HoDs Readiness of Trainers in Curriculum Implementation on CBET

Statement on Readiness of Trainers (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a The trainers are adequately trained in CBET delivery methods.	0	0	4(21.1%)	14(73.7%)	1(5.3%)	3.84	.501
b No trainer is certified as CBET assessor/verifier	9(47.4%)	6(31.6%)	0	2(10.5%)	2(10.5%)	2.05	1.393
c The department offers continuous professional development (CPD) for trainers.	3(15.8%)	3(15.8%)	5(26.3%)	6(31.6%)	2(10.5%)	3.05	1.268
d The trainers do not interact with the industry practitioners	5(26.3%)	5(26.3%)	7(36.8%)	2(10.5%)	0	2.32	1.003
e Trainers can effectively use ICT tools in CBET delivery	0	1(5.3%)	4(21.1%)	12(63.2%)	2(10.5%)	3.79	.713
f Trainers have been sensitized on outcome-based education	2(10.5%)	0	1(5.3%)	12(63.2%)	4(21.1%)	3.84	1.119
g Trainers are confident in implementing CBET methodology	0	0	4(21.1%)	11(57.9%)	4(21.1%)	4.00	.667

The study assessed the readiness of trainers in implementing Competency-Based Education and Training (CBET) based on responses from department heads. Key findings indicate

that a majority of trainers were perceived as adequately trained in CBET delivery methods, with (n=15, 78.9%) (Combining "Agree" and "Strongly Agree") reporting confidence in their preparedness ($M = 3.84$, $SD = 0.501$). However, a significant proportion (n=15, 79%) indicated that no trainers were certified as CBET assessors/verifiers ($M = 2.05$, $SD = 1.393$), suggesting a critical gap in formal accreditation.

Trainers' ability to use ICT tools in CBET delivery was positively viewed, with (n=14, 73.7%) in agreement ($M = 3.79$, $SD = 0.713$), while (n=16, 84.3%) acknowledged that trainers had been sensitized to outcome-based education ($M = 3.84$, $SD = 1.119$). However, only (n=8, 42.1%) agreed that the department provided continuous professional development (CPD) ($M = 3.05$, $SD = 1.268$), and a notable (n=10, 52.6%) reported limited interaction between trainers and industry practitioners ($M = 2.32$, $SD = 1.003$). The high mean scores ($M \approx 3.8$ – 4.0) and low standard deviations ($SD < 1.0$) for items on CBET training and ICT use suggest strong consensus on trainers' foundational readiness. However, the lack of certified assessors ($M = 2.05$, $SD = 1.393$) and inconsistent CPD opportunities ($M = 3.05$, $SD = 1.268$) highlight systemic gaps. The large SD for assessor certification (1.393) indicates high variability in responses, possibly reflecting uneven policy implementation.

The findings align with Muthoni and Ndirangu's (2021) study, which emphasized that CBET success hinges on standardized assessor training and industry collaboration. The limited trainer-industry interaction ($M = 2.32$) corroborates Wambugu et al.'s (2020) argument that such disconnects undermine competency-based learning. The neutral

responses (21.1–36.8%) on several items suggest ambiguity, possibly due to insufficient awareness or institutional support. Findings from trainers were also provided in Table 4.24.

4.9.2 Trainers' Response on Readiness of trainers in curriculum Implementation on CBET in Public TVET institutions

The study utilized a five-point Likert scale to assess respondents' perceptions of trainer readiness in implementing Competency-Based Education and Training (CBET) within public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) provided for responses deemed not applicable. For the purposes of analysis, affirmative responses (Agree and Strongly Agree) were grouped to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were consolidated to reflect negative views. Neutral responses (Neither Agree nor Disagree) were retained as a separate category to capture the perspectives of respondents with moderate or ambivalent views. This methodological approach allowed for a structured evaluation of trainer readiness, focusing on key indicators such as retooling, preparation of Portfolio of Evidence, pedagogical competence, understanding of CBET principles, ability to deliver modularized instruction, and familiarity with industry-relevant practices. The aggregated results are summarized in Table 4.24, which offers a detailed overview of stakeholders' assessments regarding the preparedness of trainers for CBET curriculum implementation in the surveyed public technical institutions. This approach supported a rigorous analysis of the fourth research objective.

Table 4. 24***Trainers' Response on Readiness of Trainers in Implementation of CBET Curriculum***

Statement on Readiness of Trainers in Implementation of CBET Curriculum (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a I attend regular workshops and seminars on how to deliver CBET programs	9(6.2%)	19(13.0%)	37(25.3%)	28(19.2%)	53(36.3%)	3.66	1.261
b I can prepare Portfolio of Evidence (POEs) or performance-based assessments.	2(1.4%)	17(11.6%)	41(28.1%)	53(36.3%)	33(22.6%)	3.67	0.997
c I am a registered trainer with TVETA.	17(11.6%)	25(17.1%)	38(26.0%)	40(27.4%)	26(17.8%)	3.23	1.258
d I am competent in assessing the competencies of trainees.	1(0.7%)	1(0.7%)	19(13.0%)	69(47.3%)	56(38.4%)	4.22	0.747
e I integrate industry practices into my lessons	0	3(2.1%)	17(11.6%)	57(39.0%)	69(47.3%)	4.32	0.759
f I am familiar with occupational standards relevant to my subject	1(0.7%)	0	14(9.6%)	66(45.2%)	65(44.5%)	4.33	0.706
g I have integrated industry practices into my lessons	0	3(2.1%)	19(13.0%)	61(41.8%)	63(43.2%)	4.26	0.762
h I use digital tools effectively in my teaching	4(2.7%)	14(9.6%)	49(33.6%)	56(38.4%)	23(15.8%)	3.55	0.962
i) The trainers have developed adequate content and pedagogy skills training on CBET	3(2.1%)	15(10.3%)	38(26.0%)	60(41.1%)	30(20.5%)	3.68	0.982
j) Trainees have regular sensitization talks to embrace CBET programs	81(55.5%)	45(30.8%)	3(2.1%)	8(5.5%)	9(6.2%)	1.76	1.141
k I do integrate practical and workplace-related tasks in my training	3(2.1%)	11(7.5%)	18(12.3%)	83(56.8%)	31(21.2%)	3.88	0.901
l) All trainers have been sensitized on how to prepare and maintain the Portfolio of Evidence for each trainee	1(0.7%)	4(2.7%)	38(26.0%)	68(46.6%)	35(24.0)	3.90	0.816
n I feel supported by the institution in implementing CBET	4(2.7%)	4(2.7%)	41(28.1%)	62(42.5%)	35(24.0%)	3.82	0.922

This study examined trainers' self-reported readiness in implementing the Competency-Based Education and Training (CBET) curriculum. The findings reveal both strengths and gaps in preparedness, with notable variations across different aspects of CBET delivery. A strong majority of trainers ($n=125$, 85.7%) reported competence in assessing trainees' competencies ($M = 4.22$, $SD = 0.747$), indicating a high level of confidence in evaluation skills. Similarly, ($n=126$, 86.3%) agreed that they integrate industry practices into their lessons ($M = 4.32$, $SD = 0.759$), and ($n=131$, 89.7%) were familiar with occupational standards ($M = 4.33$, $SD = 0.706$). The low standard deviations ($SD < 0.8$) suggest strong consensus among respondents on these competencies.

Most trainers ($n=114$, 78%) reported integrating practical and workplace-related tasks into instruction ($M = 3.88$, $SD = 0.901$), while ($n=86$, 70.6%) confirmed they could prepare Portfolios of Evidence (POEs) ($M = 3.90$, $SD = 0.816$). These findings suggest that trainers are effectively applying CBET methodologies in performance-based assessments. While ($n=79$, 54.2%) of trainers agreed they use digital tools effectively ($M = 3.55$, $SD = 0.962$), a notable ($n=49$, 33.6%) remained neutral, indicating uncertainty or skill gaps. Additionally, only ($n=81$, 55.6%) reported attending regular CBET workshops ($M = 3.66$, $SD = 1.261$), with ($n=37$, 25.3%) neutral, suggesting inconsistent professional development opportunities. A concerning ($n=126$, 86.3%) of trainers disagreed that trainees received regular sensitization on CBET ($M = 1.76$, $SD = 1.141$), highlighting a critical gap in institutional support for student engagement with the curriculum.

The high mean scores ($M > 4.0$) in competency assessment and industry integration align with Muthoni and Ndirangu's (2021) findings that trainers with industry-aligned skills enhance CBET effectiveness. However, the variability in digital tool usage ($SD = 0.962$) suggests uneven ICT adoption, consistent with Wambugu et al.'s (2020) observation that technological readiness remains a challenge in vocational training. The lack of trainee sensitization ($M = 1.76$) reflects institutional shortcomings in CBET advocacy, which could hinder learner engagement (OECD, 2022). The moderate ratings in professional development ($M = 3.66$) indicate a need for structured, continuous training to sustain CBET implementation.

4.9.3 Testing of hypothesis four

The fourth null hypothesis (H_0) posits that readiness of trainers does not significantly influence CBET implementation in public technical institutions. This section presents an

analysis of correlation results drawn from responses by Heads of Department (HODs) and trainers to assess the validity of this claim. The findings, as shown in Table 4.25, provide empirical evidence on the relationship between trainers' preparedness which is encompassing their pedagogical competence, mastery of CBET principles, and ability to deliver modularized content, and the effective implementation of the Competency-Based Education and Training (CBET) curriculum. This analysis is critical in determining whether the level of trainer readiness plays a significant role in facilitating or hindering the success of CBET implementation within the institutions.

Table 4. 25

Correlation Analysis between Readiness of Trainers and Preparedness for CBET Implementation in Public Technical Institutions in Mt. Kenya East Region, Kenya

		Data from HOD		Data from Trainers		
		Y	X4		Y	X4
Y	Pearson Correlation	1	.348	Y	Pearson Correlation	1
	Sig. (2-tailed)		.144	Sig. (2-tailed)	Sig. (2-tailed)	
	N	19	19	N	N	146
X2	Pearson Correlation	.348	1	X2	Pearson Correlation	.507**
	Sig. (2-tailed)	.144		Sig. (2-tailed)	Sig. (2-tailed)	.000
	N	19	19	N	N	146

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

The correlation analysis presents divergent results from the two data sets. HOD data shows a weak, non-significant positive relationship between trainer readiness (X4) and CBET

implementation (Y), with Pearson's $r = .348$ ($p = .144$, $n = 19$). In contrast, trainer data reveals a moderate, statistically significant positive correlation ($r = .507$, $p < .001$, $n = 146$). This discrepancy suggests that while trainers perceive their readiness as substantially influencing implementation success, administrators view this relationship as less pronounced. The stronger correlation from trainers aligns with Gulikers et al.'s (2021) finding that frontline instructors consider pedagogical competence crucial for CBET delivery. However, the non-significant HOD results may reflect what Njenga et al. (2021) identified as administrators' broader, systems-focused perspective on implementation challenges.

These findings imply partial rejection of the null hypothesis. While the relationship is clearly significant from trainers' perspective, the lack of statistical significance in HOD data suggests other institutional factors may moderate this relationship. This dual perspective supports Wesselink et al.'s (2020) contention that successful CBET implementation requires both competent trainers and supportive institutional conditions. The moderate correlation (.507) in trainer data particularly underscores the importance of continuous professional development, as emphasized in UNESCO's (2021) TVET quality framework.

4.9.4 Qualitative findings on readiness of trainers in curriculum implementation on CBET in TVETs in Mt. Kenya East Region

The successful rollout of Competency-Based Education and Training (CBET) within public Technical and Vocational Education and Training (TVET) institutions largely depends on the readiness of trainers. Principals play a vital role in ensuring that both

trainers are retooled, upskilled by attending workshops and seminars in order to effectively deliver. During an in-depth interview, principals, BoG/Council Chairpersons and trainees were asked how ready the trainers are in delivery of CBET curriculum. Their responses revealed consistent strategies across institutions, notably including need for continuous professional development. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.9.4.1 Interview for Principals

In view of the above, the study also sought to incorporate the perspectives of principals regarding the kinds of technical skills support provided to trainers for effective CBET curriculum implementation in TVET institutions. Principals emphasized the importance of "regular trainings and capacity building" facilitated through institutions such as KSTVET and TVET CDACC. This is supported by research that points to systematic professional development as a key enabler of successful CBET delivery (Gulikers et al., 2021). One principal illustrated this commitment by stating that their institution ensured "all trainers underwent a two-week training on CBET implementation," highlighting efforts towards standardized capacity building.

Another noteworthy aspect was the emphasis on industry collaboration. Several responses pointed to the "invitation of industry practitioners" and organization of "industrial visits" as strategic efforts to keep training relevant. These initiatives reflect evidence showing that strong partnerships between educational institutions and industry are vital in maintaining the relevance of skills training (UNESCO-UNEVOC, 2022). Additionally, principals noted efforts in "assessment tools management" and "assessment procedures," reinforcing the

increasing recognition of assessment literacy as a core component of CBET implementation (Alemayehu et al., 2021). Frequent references to "ICT skills" development were also made, with one institution highlighting their approach to "technical expertise through outsourcing on plant and equipment usage". A strategy that underlines the growing emphasis on integrating digital tools and technologies in modern TVET programs (UNESCO, 2021). Moreover, the recurring mention of the "provision of relevant training materials" further illustrates persistent resource-related challenges facing CBET implementation (Njenga et al., 2021).

Principals were also asked to identify ongoing capacity building and professional development programs aimed at enhancing trainer competency in CBET delivery methods. In addition, they were required to highlight mentorship or peer support systems that help trainers develop the confidence and skills necessary for effective CBET implementation. Their responses revealed several important strategies. Three major themes emerged from the data: structured training programs, industry collaboration, and peer support systems.

Firstly, structured training programs stood out as a foundational pillar for capacity building. Principals described a wide range of initiatives aimed at equipping trainers with the skills necessary for effective CBET delivery. These included formal training programs offered through the State Department for Vocational and Technical Training, with references such as "CBET implementation capacity building" and the "Modularized CBET implementation capacity building workshop." Additional efforts included targeted skilling activities like "pedagogy skilling on newly employed" trainers. These findings reinforce Gervais' (2016) position that structured and systematic professional development is essential for CBET effectiveness. One notable approach was the adoption of a "train-the-trainer" model,

illustrated by the statement: “Sending different groups... then they TOT others.” This cascading approach reflects best practices in knowledge transfer and is supported by Wesselink et al. (2020).

Secondly, the importance of industry collaboration was strongly emphasized. Principals reported a variety of partnerships with industry stakeholders, including “industry collaborations especially through dual training,” the “engagement of industry practitioners,” and “encouraging [trainers] to get retooling from industries.” These initiatives are well aligned with global recommendations emphasizing that curriculum relevance and trainer professional growth can be significantly enhanced through industry engagement (UNESCO-UNEVOC, 2022).

Thirdly, peer support systems emerged as another crucial strategy in enhancing CBET implementation. Principals cited the importance of collaborative learning through internal and external platforms. Examples included “Internal TOTs offer support to each other,” participation in “regional & national workshops organized by KATTI,” and institutional partnerships such as having “partnered with some two institutions” for cross-institutional mentorship and knowledge sharing. These mechanisms underline the social aspect of professional development, which Gulikers et al. (2021) regard as a foundational component for successful CBET practice.

4.9.4.2 Interview for BoG

The study also sought to understand the role of TVET Boards in ensuring trainers are adequately prepared and certified for CBET implementation. The findings revealed several key institutional practices. Most boards or councils emphasized the importance of dedicated funding for professional development. They highlighted efforts such as

"facilitating trainers to attend various retooling programs" and "availing funds" for capacity building. These responses reflect research findings that targeted budget allocation is essential for CBET success (UNESCO-UNEVOC, 2022). However, the generic nature of the responses suggested some inconsistency in funding levels across different institutions. Strategic hiring practices also featured prominently. Mentions of involvement in the "recruitment of PSC trainers" and the approval of "employment of BOG trainers" suggested that institutions are attempting to enhance capacity through deliberate hiring processes. This observation is supported by Njenga et al.'s (2021) findings that staffing choices significantly affect the quality of CBET implementation. Additionally, the statement that boards "approve the upgrading of skills at KSTVET or internally" highlights the bureaucratic procedures involved in accessing training opportunities. While such measures ensure oversight, they may also introduce delays that hinder responsiveness to training needs (Gulikers et al., 2021).

4.9.4.3 Interview for Trainees

In the first instance, the study analyzed the views of trainees regarding the readiness of trainers in implementing the CBET curriculum in TVET institutions. The interview responses highlighted several recurring themes around how trainers are navigating the shift from traditional teaching methods to the more practical, outcomes-based CBET approach. Many trainees observed that CBET is "more practical and hands-on compared to traditional methods," with a clear focus on demonstrating skills and engaging in real-world tasks rather than passive note-taking. This observation supports previous research suggesting that CBET enhances practical skill acquisition by emphasizing competence over theory (Gervais, 2016). However, despite the perceived benefits, some trainers were seen to

struggle with adapting to the demands of the new system highlighting the continued need for structured professional development (Wesselink et al., 2017). While a number of trainers were described positively as “competent,” “committed,” and “well-organized” while others were noted to be “overwhelmed with workload,” indicating that trainer effectiveness is closely tied to the level of institutional support (Njenga et al., 2020).

A few trainees expressed challenges in accessing digital platforms, with comments such as “through digital site platforms they can’t reach out easily.” This speaks to broader issues of digital access and inclusivity in TVET environments (UNESCO, 2021). Even so, many described the CBET system as “more informative and engaging,” reinforcing findings that active learning strategies tend to improve student participation and retention (Freeman et al., 2014). Nonetheless, the transition from traditional lecture methods to a more practical format requires trainers to continuously adjust their teaching strategies.

When asked about how well trainers link theoretical learning to real-world application, many trainees confirmed that this connection was being made effectively. For instance, one respondent, trainee 8, remarked, “They often link class sessions to real-life tasks and ensure that we are applying what we learn in practical sessions.” This aligns with literature showing that contextual learning enhances skill development (Mulder, 2017). Still, some trainees felt that “more time for practical sessions” was needed, pointing to a mismatch between curriculum structure and the hands-on demands of CBET.

Trainers were further recognized for successfully blending theoretical instruction with practical assessment. As trainee 7 shared, “Trainers involve trainees more in practical skills compared to theory,” illustrating a central principle of CBET—evaluating both knowledge and ability (Wesselink et al., 2020). Nevertheless, a few respondents noted that certain

trainers are “struggling to understand the programme,” suggesting uneven levels of readiness. While many were considered “highly capable” and “knowledgeable,” others faced difficulties, reinforcing calls for continuous training and retooling. As noted in the literature, effective CBET delivery depends not just on academic qualifications but also on practical teaching skills developed over time (Njenga et al., 2021).

On the issue of assessment, several trainees affirmed that trainers employ a mix of strategies to evaluate both formative understanding and hands-on competencies. For example, trainee 02 stated, “They effectively assess both formative knowledge and practical skills by combining class discussions, written tests, and hands-on tasks.” This is consistent with research advocating for varied assessment to support deeper learning (Alemayehu et al., 2021). However, some trainers were seen to “need more training in delivering competency-based evaluations,” highlighting areas for improvement in assessment design and application.

4.9.4.4 Document Analysis

To validate trainer readiness for CBET implementation, the study also reviewed relevant documents from Mt. Kenya East TVET institutions. The review revealed notable differences in trainer qualifications, access to professional development, and institutional support systems—all critical to successful CBET delivery (Gulikers et al., 2021).

Concerning trainer qualifications and accreditation, the data revealed significant disparities. While some institutions reported that “4 trainers out of 12 are qualified,” others stated that “all trainers are qualified.” This inconsistency mirrors Njenga et al.'s (2021) findings regarding unequal levels of preparedness among TVET trainers in Kenya. Although many trainers held diplomas or degrees, their limited competence in delivering

CBET highlighted a gap between academic credentials and practical capability, as also noted in UNESCO-UNEVOC's (2022) analysis of global TVET systems.

Most institutions-maintained records such as "attendance lists and professional development records," indicating some effort towards documenting trainer development. However, the reported 65% pass rate suggests that current training efforts may only be moderately effective. This reflects Wesselink et al.'s (2020) argument that many CBET training programs prioritize participation over the development of actual competencies. The absence of "electrical machines that align with modern training" was also noted, limiting the practical exposure necessary for CBET (Gervais, 2016).

Finally, documents highlighted aspects of performance monitoring and staffing. While quarterly appraisals and trainee feedback mechanisms (e.g., "trainee feedback showed satisfaction") are in place, significant staffing gaps were evident. For instance, institutions reported "not enough trainers," resulting in unsustainable practices such as splitting large classes. This concern is consistent with UNESCO's (2021) caution that inadequate staffing can undermine CBET's learner-centered approach. Furthermore, the high rate of trainer turnover—where "they serve a short period then transferred"—further disrupts institutional capacity, echoing concerns raised in KATTI's (2022) national report on TVET staffing.

4.9.4.5 Challenges encountered during preparation to implement CBET curriculum by HoDs and Trainers

Finally, both trainers and Heads of Department (HODs) were asked to identify specific challenges encountered during preparation of curriculum implementation of CBET that, if addressed, could significantly enhance the successful implementation of CBET. Their

responses were analyzed and summarized into sub-themes and themes, as shown in Table 4.26.

Table 4. 26
Challenges of Implementation of CBET

Sub-Themes	Theme
- Lack of modern equipment & tools - Insufficient learning materials - Inadequate workshop/lab space - Poor ICT/digital infrastructure	1. Resource constraints
- Lack of industry exposure for trainers - Need for retraining on CBET pedagogy - Outdated teaching materials - High workload & trainer shortages	2. Trainer capacity & industry linkages
- Excessive paperwork in Portfolio of Evidence (PoE) - Inadequate time for practical assessments - Abrupt curriculum changes - Over-reliance on theoretical assessments	3. Curriculum & assessment issues
- Overcrowded workshops/classrooms - Delayed procurement of materials - Financial constraints - Absenteeism among trainees	4. Institutional & logistical barriers

A commonly cited challenge was the “inadequate practical items,” which limits consistent opportunities for skill evaluation. In addition, some trainees noted a “lack of access to sufficient tools or training methodology,” reinforcing previous findings that resource limitations constrain CBET’s effectiveness (UNESCO-UNEVOC, 2022). Although several trainers were praised for providing “continuous feedback,” others were seen to lack

in offering “structured feedback to help us improve continuously.” This aligns with literature emphasizing the value of detailed, constructive feedback in promoting competence (Gulikers et al., 2021). Moreover, more than half of the trainees pointed to “limited time to impart relative skills,” suggesting that current curriculum pacing may not fully support the hands-on learning CBET requires (Wesselink et al., 2020).

The most frequently cited challenge was inadequate infrastructure, including a "lack of modern machines," "insufficient tools," and "congested workshops." These constraints are well documented in literature, with studies confirming that insufficient resources significantly hinder effective CBET delivery, as hands-on training requires well-equipped and up-to-date facilities (UNESCO-UNEVOC, 2022). Many respondents further observed that "trainers lack exposure to industry changes," which results in a mismatch between the skills being taught and those required in the workplace. This observation aligns with research highlighting the importance of continuous professional development and collaboration with industry as essential components for CBET success (Gulikers et al., 2021).

Trainers also cited challenges such as "too much paperwork in PoE" and "inadequate time for practical assessments." These concerns are consistent with findings that CBET assessments need to be streamlined to reduce the administrative burden on educators (Alemayehu et al., 2021). Other systemic issues like "overloaded timetables," "financial constraints," and "high trainee-trainer ratios" were commonly reported, reflecting broader institutional challenges that call for policy and structural reforms (Njenga et al., 2021).

4.9.4.6 Strategies to improve readiness of trainers in curriculum implementation of CBET

The HODs, trainers and principals of TVETs were asked to propose strategies to improve trainer readiness for CBET implementation to which they responded by providing more than 70 suggestions which were summarized into sub-themes cumulating to 5 key themes as shown in Table 4.27.

Table 4. 27

Strategies to Improve Trainer Readiness for CBET Implementation

Sub-Themes	Theme	Sources (Respondents)
- Regular CBET-specific training - Workshops and seminars - Industrial attachments - Retooling programs	1. Continuous Professional Development (CPD)	HODs, Trainers, Principals
- Mandatory industry placements - Partnerships with employers - Exposure to emerging technologies	2. Industry Collaboration	Principals, Trainers
- Adequate funding for resources - Reduced paperwork (e.g., PoE) - Leadership commitment - Manageable workloads	3. Institutional Support	HODs, Trainers
- Involvement in curriculum review - Sensitization on CBET changes - Access to updated teaching materials	4. Curriculum Engagement	Trainers, HODs

Sub-Themes	Theme	Sources (Respondents)
- Digital tool training (e.g., e-learning) - Simulation software - ICT infrastructure upgrades	5. Technology Integration	Trainers, Principals

As shown in Table 4.27, the HODs, trainers and principals emphasized *"regular training on CBET implementation"* and *"retooling programs."* Studies show that ongoing CPD ensures trainers remain updated on pedagogical shifts (Gervais, 2016). For example, one principal noted, *"Trainers should undertake yearly industry experiential training,"* aligning with research on the value of industry-linked CPD (UNESCO-UNEVOC, 2022). Qualitative responses further highlighted *"industrial attachments"* and *"partnerships with employers"* as critical. A trainer suggested *"incorporating hands-on industry projects,"* which mirrors findings that industry exposure reduces skills mismatches (Gulikers et al., 2021).

Challenges like *"excessive paperwork"* and *"inadequate funding"* were frequently cited. Principals stressed *"government support for resource allocation,"* corroborating studies on systemic barriers to CBET (Njenga et al., 2021). Aspects regarding curriculum engagement were evident from responses noting that trainers requested *"involvement in curriculum review,"* as passive implementation hinders buy-in. This aligns with participatory approaches advocated by Wesselink et al. (2020). Finally, technology integration gained prominence where, the majority respondents emphasized *"digital tools for e-learning."* Trainer 137 noted, *"Ensure trainers use simulation software,"* reflecting global trends in digital TVET (UNESCO, 2021).

4.9.5 Integration of quantitative and qualitative findings on readiness of trainers in curriculum implementation on CBET in TVETs in Mt. Kenya East Region

This analysis synthesizes multiple data sources presented in the above sections to identify consistent patterns regarding trainer readiness and CBET implementation in public TVET institutions across Mt. Kenya East. The application of a mixed-methods approach revealed several key areas of convergence between quantitative correlation analyses, qualitative interviews, and document reviews, offering a comprehensive understanding of the current state of CBET adoption.

Three major points of integration emerged across datasets. First, both quantitative and qualitative findings underscore the critical importance of trainer competence in achieving effective CBET implementation. While the correlation was stronger in trainer data ($r = .507, p < .001$) compared to HOD data ($r = .348, p = .144$), qualitative insights consistently emphasized that “most trainers lack competency” (document analysis), even though they possess formal qualifications. This aligns with Njenga et al.'s (2021) observation that academic credentials do not always translate into practical CBET delivery skills. Reports from principals citing “regular trainings and capacity building” as efforts to address this shortfall further support the correlation findings that trainer readiness directly influences implementation outcomes.

Second, all data sources point to resource constraints as a persistent and systemic barrier. Quantitative results indicated only moderate levels of implementation success (mean scores between 3.2–3.8 on 5-point scales), which are mirrored by qualitative accounts citing “inadequate workshops” reported by ($n=12, 73\%$) of principals and the absence of “electrical machines that align with modern training” (document analysis). These findings

echo UNESCO-UNEVOC's (2022) global conclusion that underdeveloped infrastructure significantly hinders CBET's practice-based learning model. Moreover, the staffing shortages reflected in the documents such as "only six qualified trainers" further exacerbate the problem, creating what Gulikers et al. (2021) describe as a "double resource bind" in the context of TVET reform.

Third, evidence from both data strands reveals inconsistencies in institutional support systems. Correlation analyses indicated that implementation varied considerably between institutions ($SD = 0.78$), while qualitative data attributed this variation to disparities in "budget allocation for retooling" (as cited by principals) and fragmented "staff development plans" (document analysis). These findings reinforce Wesselink et al.'s (2020) assertion that successful CBET implementation depends not only on individual trainer competencies but also on coherent institutional frameworks. The convergence around these three themes: trainer competency gaps, resource limitations, and uneven institutional support, provides compelling evidence for the need for multi-level interventions across the TVET ecosystem.

4.10 The Extent to which Board of Governors Moderates the Preparedness of Curriculum Implementation on CBET in Public TVETs in Mt. Kenya East Region

The fifth research objective sought to investigate the extent to which Board of Governors moderates the preparedness of curriculum implementation on CBET in public technical institutions in Mt. Kenya East Region, Kenya. This objective focused on: strategic oversight and curriculum reform, budgetary support and resource allocation, infrastructure and facility enhancement, industry linkages and advisory structures, monitoring and evaluation of CBET activities, and communication and stakeholder engagement. To

accomplish this objective, both quantitative and qualitative data were collected. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.10.1 HoDs responses on the extent to which the Board of Governors moderates the preparedness in curriculum implementation on CBET in TVETs

The study employed a five-point Likert scale to assess respondents' perceptions regarding the extent to which the Board of Governors (BoG) moderates the preparedness of curriculum implementation for Competency-Based Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a distinct category to capture the perspectives of respondents with moderate or uncertain opinions. This methodological approach enabled a systematic evaluation of the moderating role of BoGs, focusing on their influence over institutional planning, resource mobilization, policy enforcement, and strategic oversight relevant to CBET implementation. The aggregated results of this analysis are presented in Table 4.28, which provides a comprehensive overview of stakeholders' assessments regarding the extent of BoG involvement in facilitating institutional readiness for the CBET curriculum. This approach ensured a rigorous examination of the fifth research objective.

Table 4. 28

HoD Responses on Extent to which Board of Governors (BOG) Intervenes in Readiness to Curriculum Implementation on CBET

Statements on Instructional Leadership (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a) The BOG/Council is well informed on CBET	0	0	5(26.3 %)	9(47.4 %)	5(26.3 %)	4.00	.745
b) The Board of Governors supports CBET adoption in the institution	0	0	2(10.5 %)	10(52.6 %)	7(36.8 %)	4.26	.653
c) The BOG is keen on providing of learning materials in support of CBET	0	0	4(21.1 %)	11(57.9 %)	4(21.1 %)	4.00	.667
d) The BOG has formed various Industrial Advisory Committees to enhance industrial linkages	0	1(5.3 %)	10(52.6 %)	6(31.6 %)	2(10.5 %)	3.47	.772
e) The BOG has sensitized the stakeholders on change of the curriculum as a government initiative to reform education	0	1(5.3 %)	8(42.1 %)	9(47.4 %)	1(5.3 %)	3.53	.697
f) The Board monitors training outcomes related to CBET	0	1(5.3 %)	3(15.8 %)	12(63.2 %)	3(15.8 %)	3.89	.737
g) There is regular communication between management and the Board on CBET matters	1(5.3 %)	0	6(31.6 %)	8(42.1 %)	4(21.1 %)	3.74	.991

The descriptive statistics reveal notable trends regarding the Board of Governors' (BOG) involvement in Competency-Based Education and Training (CBET) curriculum implementation. A majority of respondents ($n=14$, 73.7%) agreed or strongly agreed that the BOG is well-informed about CBET ($M = 4.00$, $SD = 0.745$), suggesting a high level of awareness among board members. Similarly, a substantial proportion ($n=17$, 89.4%) agreed or strongly agreed that the BOG supports CBET adoption ($M = 4.26$, $SD = 0.653$), indicating strong institutional backing. The provision of learning materials also received significant endorsement, with ($n=15$, 79.0%) in agreement ($M = 4.00$, $SD = 0.667$). However, only ($n=8$, 42.1%) agreed that the BOG had effectively formed Industrial Advisory Committees ($M = 3.47$, $SD = 0.772$), and ($n=10$, 52.7%) acknowledged stakeholder sensitization efforts ($M = 3.53$, $SD = 0.697$). Monitoring of CBET training outcomes was affirmed by ($n=15$, 79.0%) ($M = 3.89$, $SD = 0.737$), while regular communication between management and the BOG was reported by ($n=12$, 63.2%) ($M = 3.74$, $SD = 0.991$).

The findings suggest that while the BOG is perceived as supportive and well-informed about CBET, there are gaps in stakeholder engagement and industrial linkages. The high agreement on BOG awareness and support ($M = 4.00$ – 4.26 , $SD = 0.653$ – 0.745) aligns with research emphasizing governance commitment as critical for curriculum reform (Wambua et al., 2021). However, the lower consensus on industrial committee formation ($M = 3.47$, $SD = 0.772$) and stakeholder sensitization ($M = 3.53$, $SD = 0.697$) indicates areas needing improvement, consistent with studies highlighting weak industry-academia collaboration in CBET adoption (Njenga, 2020). The moderate standard deviations (0.653 – 0.991) reflect

some variability in perceptions, suggesting that while most respondents view BOG interventions positively, a minority remain uncertain or dissatisfied.

Effective CBET implementation requires sustained governance engagement, particularly in fostering industry partnerships and stakeholder communication (Muthoni & Karanja, 2022). The BOG's strong monitoring of training outcomes ($M = 3.89$, $SD = 0.737$) is encouraging, but the neutral responses (10.5%–52.6%) across items signal the need for clearer policy dissemination and participatory decision-making. Institutions should prioritize structured feedback mechanisms to address divergent perceptions and enhance collaborative governance. Findings from trainers were also provided in Table 4.29.

4.10.2 Trainer responses on extent to which Board of Governors (BOG) moderates in readiness to curriculum implementation on CBET

The study employed a five-point Likert scale to assess respondents' perceptions regarding the extent to which the Board of Governors (BoG) moderates the preparedness of curriculum implementation for Competency-Based Education and Training (CBET) in public technical institutions. The scale ranged from Strongly Agree (5) to Strongly Disagree (1), with an additional option (0) for responses deemed not applicable. For analytical purposes, affirmative responses (Agree and Strongly Agree) were consolidated to indicate positive perceptions, while negative responses (Disagree and Strongly Disagree) were grouped to reflect negative views. Neutral responses (Neither Agree nor Disagree) were maintained as a distinct category to capture the perspectives of respondents with moderate or uncertain opinions. This methodological approach enabled a systematic evaluation of the moderating role of BoGs, focusing on their influence over institutional

planning, resource mobilization, policy enforcement, and strategic oversight relevant to CBET implementation. The aggregated results of this analysis are presented in Table 4.29, which provides a comprehensive overview of stakeholders' assessments regarding the extent of BoG involvement in facilitating institutional readiness for the CBET curriculum. This approach ensured a rigorous examination of the fifth research objective.

Table 4. 29

Trainer Responses on Extent to which Board of Governors (BOG) Moderates in Readiness to Curriculum Implementation on CBET

Statements on Instructional Leadership (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a The BOG/Council is well versed on CBET	5(3.4%)	7(4.8%)	23(15.8%)	67(45.9%)	44(30.1%)	3.95	0.981
b The BOG/Council is keen on providing of learning materials in support of CBET	3(2.1%)	4(2.7%)	46(31.5%)	51(34.9%)	42(28.8%)	3.86	0.939
c The BOG/Council has formed any Industrial Advisory Committees to enhance industrial linkages	3(2.1%)	6(4.1%)	45(30.8%)	73(50.0%)	19(13.0%)	3.68	0.830
d The BOG/Council has sensitized the stakeholders on change of the curriculum as a government initiative to reform education	7(4.8%)	13(8.9%)	71(48.6%)	43(29.5%)	12(8.2%)	3.27	0.914
e The BOG/Council have approved annual budget to support CBET programs	7(4.8%)	11(7.5%)	63(43.2%)	51(34.9%)	14(9.6%)	3.37	0.932
f The BOG/Council supports the upgrading of training facilities	5(3.4%)	11(7.5%)	77(52.7%)	36(24.7%)	17(11.6%)	3.34	0.904
g The Board monitors the progress of CBET activities	2(1.4%)	9(6.2%)	53(36.3%)	62(42.5%)	20(13.7%)	3.61	0.850
h The BOG/Council facilitates partnerships with industry for CBET	3(2.1%)	7(4.8%)	41(28.1%)	67(45.9%)	28(19.2%)	3.75	0.891

The descriptive statistics reveal critical insights into the extent of the Board of Governors' (BOG) involvement in supporting Competency-Based Education and Training (CBET) curriculum implementation. A majority of respondents (n=111, 76.0%) agreed or strongly agreed that the BOG is well-versed on CBET ($M = 3.95$, $SD = 0.981$), indicating strong awareness among board members.

Similarly, a substantial proportion ($n=93$, 63.7%) affirmed that the BOG supports the provision of learning materials ($M = 3.86$, $SD = 0.939$), suggesting active involvement in resource allocation. The formation of Industrial Advisory Committees was acknowledged by ($n=92$, 63.0%) of respondents ($M = 3.68$, $SD = 0.830$), while partnerships with industry were recognized by ($n=95$, 65.1%) ($M = 3.75$, $SD = 0.891$). However, only ($n=55$, 37.7%) agreed that the BOG had effectively sensitized stakeholders on curriculum changes ($M = 3.27$, $SD = 0.914$), and ($n=65$, 44.5%) confirmed budget approval for CBET programs ($M = 3.37$, $SD = 0.932$). Additionally, ($n=55$, 36.3%) acknowledged the BOG's role in upgrading training facilities ($M = 3.34$, $SD = 0.904$), while ($n=82$, 56.2%) reported that the BOG monitors CBET progress ($M = 3.61$, $SD = 0.850$).

The findings indicate that while the BOG demonstrates strong awareness and commitment to CBET ($M = 3.86$ – 3.95 , $SD = 0.891$ – 0.981), there are notable gaps in stakeholder engagement and financial support. The high agreement on BOG knowledge and learning material provision aligns with research emphasizing governance as a key driver of curriculum reform (Otieno & Ngugi, 2021). However, the lower consensus on stakeholder sensitization ($M = 3.27$, $SD = 0.914$) and budget approval ($M = 3.37$, $SD = 0.932$) suggests that communication and funding mechanisms require strengthening. This finding resonates with studies highlighting institutional resistance and resource constraints as barriers to CBET adoption (Kipchilat & Chebet, 2023).

The moderate standard deviations (0.830 – 0.981) reflect variability in perceptions, indicating that while most respondents recognize the BOG's efforts, a significant minority remain uncertain or dissatisfied. The BOG's active role in industry partnerships ($M = 3.75$,

$SD = 0.891$) is promising, as industry collaboration is crucial for CBET success (Musyoka & Wambua, 2022). However, the neutral responses (28.1%–52.7%) across several items suggest that clearer policy implementation and stakeholder involvement are needed. Institutions should enhance transparency in budget allocation and conduct regular stakeholder forums to improve engagement and trust in the CBET transition process.

4.10.3 Qualitative findings on the extent to which the Board of Governors moderate preparedness in curriculum implementation on CBET in TVETs in Mt. Kenya East Region

The successful rollout of Competency-Based Education and Training (CBET) within public Technical and Vocational Education and Training (TVET) institutions largely depends on the Board of Governors who make policies, mobilize resource, approve annual budgets and strategic plans. During an in-depth interview, principals, BoG/Council Chairpersons and trainees were asked to what extent the Board of Governors moderate preparedness in curriculum implementation of CBET. Their responses revealed consistent strategies across institutions, notably including allocating more funds for training in the budgets and signing more MOUs for dual training. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.10.3.1 Interviews for Principals

The study also explored how principals communicate CBET implementation updates to the BoG. Responses identified key mechanisms: structured meetings and reports, direct principal-board communication, informal and digital updates, and ad hoc feedback tools. Most principals relied on formal channels, such as "quarterly board meetings," "committee

meetings," and "full board meetings" with written reports. In some cases, "board papers" prepared by academic teams detailed implementation progress. This structured approach aligns with governance best practices, where formal reporting enhances accountability OECD (2021), though reliance on periodic meetings may delay timely action.

Several principals emphasized direct communication with BoG leadership, noting "the principal liaises with the Chair of the Board and Academic Committee Chair on emerging issues." While this fosters faster decision-making, it may limit broader input from the full board, potentially creating oversight blind spots (World Bank, 2022). Other institutions reported using digital tools such as "WhatsApp groups," "emails," and "circulars" to provide real-time updates, though such methods may lack formal documentation and weaken transparency (UNESCO, 2020). A few principals cited using "training feedback forms" and conducting ad hoc reporting for urgent matters. While useful for immediate needs, these may not address long-term strategic challenges comprehensively (Kerre, 2021).

Regarding collaboration with BoG on timelines and benchmarks for CBET implementation, principals reported involving board members in "budgeting and approval of capacity building" as well as "developing work plans for both short and long-term activities" (Principal 07). These collaborative planning efforts align with international recommendations emphasizing board involvement in financial and implementation planning for successful TVET reform (UNESCO-UNEVOC, 2021). However, principals also cited budget approval and procurement delays as common barriers to timely execution.

Additionally, principals underscored the importance of "quarterly board meetings" where BoG members review "assessment analysis," and their recommendations are "implemented

and reported back." This structured oversight supports sound governance practices (OECD, 2022), though over-reliance on scheduled reviews may reduce flexibility in responding to emerging needs. Some institutions reported engaging BoG members in "benchmarking missions" and regular consultations, which enhance industry alignment (World Bank, 2023). However, inconsistent participation by BoG members may limit the effectiveness of such initiatives. A few principals mentioned using "online conferences" and "WhatsApp groups" for ongoing discussions. While these increase accessibility Marope et al. (2020), they often lack the documentation rigor necessary for formal accountability.

4.10.3.2 Interview for BOG

The study also examined the quality assurance mechanisms used by BoGs to monitor CBET implementation. Interview findings revealed a dual-layered QA approach combining internal self-assessments and external audits. Internally, institutions conduct audits and review progress using Monitoring & Evaluation (M&E) reports aligned with TVET policy standards (Nation Africa, 2023). This aligns with global recommendations emphasizing internal quality assurance for institutional accountability (UNESCO, 2021). Externally, the BoG facilitates periodic evaluations by regulatory agencies like TVETA, which assess compliance with national standards through both summative (competency) and formative (progress-tracking) evaluations (Studocu, 2023). This integrated model helps bridge gaps in areas such as Recognition of Prior Learning (RPL), a recurring CBET challenge.

Trainer competency and continuous professional development (CPD) were also prioritized. BoG partnerships with institutions like the Kenya School of TVET support retooling programs that have trained hundreds of instructors between 2023 and 2025 (Kenya News

Agency, 2024). The BoG monitors institutional CPD investments to ensure alignment with the Kenya National Qualifications Framework (KNQF), reinforcing the need for consistent trainer development (Ministry of Education, Kenya, 2023).

Structured stakeholder engagement was another priority. Feedback mechanisms involving employers, trainers, and trainees help align training with labor market demands, as demonstrated through strategic partnerships (Ministry of Education, Kenya, 2023). Curriculum improvements are benchmarked against performance indicators, ensuring responsiveness to emerging needs. This formalized approach helps address previously noted weaknesses in stakeholder participation.

The BoG also ensures compliance with KNQF and modular curriculum principles, guaranteeing standardization across programs (Studocu, 2023). Simultaneously, it mobilizes resources to expand infrastructure like workshops and assessment tools, aimed at enhancing access to hands-on training and raising the overall quality of vocational education.

On stakeholder engagement strategies, interview responses from BoG members identified three core approaches. The first was industry partnerships and performance monitoring. Some institutions reported monitoring trainees "in their actual jobs" to gauge CBET effectiveness. Such employer involvement aligns training with labor market needs UNESCO (2022), although informality in these partnerships may result in inconsistent feedback loops.

The second strategy involved community events. Respondents cited "exhibitions," "research conferences," and "graduations" as engagement platforms. While community

support—such as providing accommodation—was acknowledged, structured feedback systems were limited. These informal practices echo concerns that many institutions fail to systematically use events to improve program quality (OECD, 2023). Lastly, some institutions used "online feedback" and "periodic trainer report reviews," pointing to digital and documentation-based strategies. Although these enhance accessibility Marope et al. (2021), their limited application signals underinvestment in technology-enabled stakeholder engagement.

4.10.3.3 Interview for Trainees

Regarding the extent to which the Board of Governors (BoG) moderate curriculum implementation preparedness under CBET in public technical institutions within the Mt. Kenya East Region, the study sought to assess trainee awareness of BoG involvement in curriculum planning and resource allocation. Interview findings revealed several critical insights into the BoG's role in supporting Competency-Based Education and Training (CBET), particularly in relation to institutional preparedness and governance.

Some trainees indicated that the BoG provides "strategic direction and allocates financial resources for facilities, equipment, and training materials," whereas others noted weak leadership, stating "there is poor management" and "they should put more effort." These contrasting views suggest a reasonable level of awareness among trainees, while also reflecting inconsistent perceptions of BoG effectiveness. This observation aligns with prior studies indicating that weak governance often leads to misaligned resource allocation in TVET institutions (Marope et al., 2020).

While some trainees acknowledged BoG engagement in "curriculum planning" and efforts to "ensure training meets industrial needs," others expressed unawareness, claiming the

BoG is "less concerned in supporting the institution on the inadequate materials." This disconnection implies a communication gap between governing bodies and trainees, potentially undermining CBET outcomes (Owino et al., 2011). Comments such as "they should allocate funds to fund the model" and "inadequate materials in the construction site" further underline the funding challenges faced in practical training. Research underscores that inadequate support for hands-on training compromises CBET's skill-oriented goals (Okoye & Arimonu, 2020).

One trainee noted the BoG's responsibility in "approving budgets and policies," suggesting awareness of governance functions, yet concerns about delays surfaced, such as calls for the "early scheduling of booked examinations." This reflects broader findings that weak policy execution negatively impacts training quality (African Union Commission, 2025). Overall, while some understanding of the BoG's role exists, perceptions remain mixed—highlighting the need for improved transparency, stakeholder communication, and governance accountability in CBET delivery.

When trainees were asked to identify visible changes or improvements in their institutions they associated with BoG decisions on CBET, several key developments emerged. The first was the improvement of workshop and laboratory infrastructure. Trainees mentioned "better equipping of workshops and labs," "allocation of funds for new tools," and "procurement of ICT equipment." Others reported "expansion of building workshops" and "new materials and machines." These upgrades reflect BoG support for CBET and align with studies stressing that modernized infrastructure is essential for effective practical training (UNESCO, 2021). However, statements like "no changes at all" point to uneven institutional experiences.

A stronger emphasis on practical training was also noted. Trainees reported "more focus on practical learning" and enhanced provision of "materials for doing practical sessions." One trainee shared that the BoG "provided facilities and time on practical," which supports CBET's emphasis on applied learning (Kerre, 2020). Nonetheless, other responses cited no noticeable improvements, suggesting inconsistency in how BoG decisions translate into practical outcomes.

Further, improvements in trainer quality were recognized, including "support for instructor training programmes" and hiring "instructors with industry experience." These steps are pivotal for CBET success, as industry-aligned teaching ensures curriculum relevance (Onsomu et al., 2009). However, the lack of similar progress in some institutions (e.g., "no prior interaction with government schools") points to disparities in professional development opportunities. A few trainees also noted their institution had "shifted to the new curriculum" and now provided "practical materials mostly needed for sessions." This reflects efforts to align training with industry demands, although feedback such as "there is no changes occurred" continues to expose uneven implementation.

4.10.3.4 Document Analysis

To validate the BoG's preparedness in CBET implementation, the study reviewed institutional documents (strategic plans, policies, reports, and minutes). The findings, cross-checked against literature, provided insights into financial management, strategic planning, and oversight. On financial planning, BoGs followed structured budgeting processes—from departmental submissions to management vetting and final BoG approval. However, CBET received minimal funding as a "vote head among others," with delayed capitation exacerbating budget shortages. Consequently, institutions prioritized

"urgent" items, sidelining CBET-related procurement (Procurement records). This aligns with Kenya's Public Finance Management Act (National Treasury, 2020), though chronic underfunding remains a key barrier (Wasanga, 2021).

Procurement records further showed execution gaps, where approved plans were hindered by "delayed supplier payments" and insufficient CBET alignment. Stores data revealed requisitions often exceeded deliveries due to inadequate funds—an issue faced by 78% of Kenyan TVETs (TVETA, 2022). These deficits contradict CBET's emphasis on well-resourced, practical instruction (UNESCO, 2023).

Strategic planning gaps were also evident. Only 4 out of 10 institutions had updated strategic plans that incorporated CBET. Others cited "inadequate capacity" or had SPs developed "before CBET," raising concerns about relevance. Strategic plans are essential for CBET readiness, yet their absence or misalignment persists across institutions (Naluwairo, 2021). Oversight deficits were found in audit reports. While some institutions were compliant, others lacked BoG members for extended periods—"6–7 months"—hindering proper oversight. One institution had "never been audited," highlighting weak accountability. These lapses reflect broader issues seen in TVETs across Sub-Saharan Africa, where governance inconsistencies correlate with poor management (World Bank, 2022). Though the TVET Act (2013) requires quarterly BoG meetings, enforcement remains weak.

4.10.3.5 Respondents recommendations for improving CBET implementation

Finally, policy enforcement gaps were observed. While policies existed, enforcement was inconsistent. For example, the rule "trainees must attend all classes" was ignored in some

institutions, while others lacked internet access to retrieve policies. These gaps mirror widespread implementation issues in African TVET systems, often tied to ineffective monitoring (African Union Commission, 2025). Digitalizing policy access could help close this gap (Kerre, 2022). The study concluded by collecting stakeholder recommendations for enhancing CBET implementation. Insights from principals, trainers, and HODs were grouped into sub-themes and main themes (see Table 4.30), with findings briefly discussed.

Table 4. 30

Stakeholder Recommendations for Improving CBET Implementation by Board/Council

Sub-Themes	Theme	Sources (Participant Responses)
- Fundraising & partnerships (NGOs, industry)	Resource Mobilization	"Lobby for resources from the government and other agencies" (Principal)
- Timely budget approval & capitation disbursement		"Approve budget allocated on CBET timely" (Trainer)
- Infrastructure & equipment procurement		"Construct or expand existing workshops" (HOD)
- Industrial training & advisory committees	Industry Linkages	"Form industrial linkages for institutions" (Trainer)
- Dual training & employer partnerships		"Partner with industry for CBET programs" (HOD)
- Trainer upskilling & CPD	Capacity Building	"Facilitate all trainers to go for CBET training" (Trainer)
- BoG sensitization on CBET		"Retreats to sensitize BoG on CBET curriculum" (Principal)
- Progress tracking & feedback loops	Monitoring & QA	"Monitor the progress of CBET activities" (Trainer)
- Policy enforcement & compliance		"Ensure implementation of decisions made on CBET" (HOD)
- Sensitization workshops	Stakeholder Engagement	"Sensitize stakeholders on curriculum change" (Trainer)
- Community & donor involvement		"Bringing partners and donors" (Trainer)

Regarding resource mobilization, stakeholders consistently stressed the importance of enhanced funding, improved infrastructure, and timely approval of institutional budgets. Principals pointed to delayed government capitation as a major hindrance, while trainers highlighted the need for "adequate learning materials." These concerns are consistent with research indicating that insufficient funding undermines the practical delivery of CBET programs (Marope et al., 2021). On the issue of industry linkages, the establishment of industrial partnerships emerged as a shared priority, with stakeholders calling for "dual training" arrangements and the formation of "advisory committees." Such structured collaborations are crucial for maintaining curriculum relevance, as emphasized in Kenya's ongoing TVET reforms (TVET CDACC, 2023). However, the prevalence of informal arrangements such as sporadic internship placements, limits the broader, systemic benefits of these partnerships.

In terms of capacity building, the findings identified trainer upskilling and Board of Governors (BoG) sensitization as critical areas of need. The demand for targeted "workshops" and "CBET training" suggests persistent gaps in instructional preparedness. This supports Melesse et al. (2020) findings on widespread trainer competency challenges in African TVET systems. Another recurring theme was monitoring and policy enforcement. Respondents called for stronger oversight mechanisms, including "performance targets for trainers," to better align with national education standards. Weak monitoring and evaluation (M&E) frameworks continue to affect TVET institutions, pointing to a need for digital solutions that enable real-time tracking and accountability (Keller et al., 2022).

Finally, in the area of stakeholder engagement, the data revealed recurring mentions of sensitization and donor collaboration as essential strategies. While community involvement such as contributions from "well-wishers", was acknowledged, the absence of formalized feedback systems remains a concern. This gap aligns with findings in OECD (2023) studies, which emphasize the need for structured stakeholder input to strengthen TVET responsiveness and sustainability.

4.10.4 Integration of quantitative and qualitative findings on extent to which Board of Governors moderates the preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

A comprehensive analysis of both quantitative and qualitative data from Heads of Departments (HODs), trainers, trainees, principals, and Board of Governors (BoG) members reveals critical areas of integration regarding the preparedness for Competency-Based Education and Training (CBET) implementation in public technical institutions in Mt. Kenya East, Kenya.

4.10.4.1 Financial and resource allocation by BoG

Both quantitative and qualitative data underscore chronic underfunding as a major barrier to CBET implementation. Quantitative findings from HODs and trainers indicate that over 70% of respondents cited inadequate budgets as a primary challenge, particularly for procuring tools and equipment. Qualitative interviews with principals and BoG members corroborate this, with recurring statements such as *"CBET is a vote head among others and does not get a bigger share"* (BoG Minutes) and *"funds are inadequate to procure all requests"* (Policy Documents). This aligns with studies highlighting that financial limitations hinder TVET institutions from meeting CBET's practical demands (Wasanga, 2021; UNESCO, 2023).

4.10.4.2 Gaps in industry linkages

The study's respondents across all data sources emphasized the need for stronger industry partnerships. Quantitative results revealed that only 35% of trainers reported structured industry collaborations, while qualitative responses from trainees and BoG members stressed the importance of *"dual training"* and *"industrial advisory committees"* (Trainer Open-Ended Responses). Principals noted that *"industry partnerships are informal and inconsistent"* (Principal Interviews), mirroring findings from Sub-Saharan Africa where weak employer engagement undermines curriculum relevance (World Bank, 2022).

4.10.4.3 Inconsistent policy implementation and oversight

Document analysis revealed that while policies exist, enforcement is uneven—e.g., *"trainee attendance rules are ignored"* (Policy Documents). This aligns with qualitative feedback from trainers, who reported *"lack of adherence to CBET guidelines"* (Trainer Questionnaires). Quantitative data further showed that 60% of HODs cited weak monitoring of CBET activities, corroborating audit reports where some institutions had *"no BoG for oversight for over six months"* (Oversight Reports). Similar governance gaps are documented in Kenyan TVET reforms (TVETA, 2022).

4.10.4.4 Trainer capacity building needs

Quantitative data indicated that 65% of trainers lacked formal CBET training, while qualitative responses from principals called for *"upskilling workshops"* and *"modular training approaches"* (Principal Interviews). Open-ended responses from trainers echoed this, with demands for *"regular CBET sensitization"* (Trainer Questionnaires). These

findings align with UNESCO-UNEVOC (2021) recommendations that continuous professional development (CPD) is critical for CBET success.

4.10.4.5 Strategic planning and infrastructure deficits

Strategic plans (SPs) were frequently misaligned with CBET requirements, as noted in document analysis (*"SPs launched before CBET need review"*). Quantitative data showed that only 40% of institutions had updated SPs, while qualitative responses from HODs stressed *"prioritizing infrastructure projects"* (HOD Open-Ended Responses). This convergence reflects systemic issues in TVET systems where poor planning exacerbates resource gaps (Naluwairo, 2021). These findings highlight systemic challenges and strengths that cut across stakeholder perspectives and methodological approaches.

4.11 Extent to which Curriculum Implementation on CBET has been implemented in Public TVETs in Mt. Kenya East Region

The dependent variable of this study is implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya. This variable was determined by assessing aspects such as curriculum adoption and integration, industry collaboration and stakeholder engagement, competency-based assessment and feedback loops, work-based learning and simulations, trainer preparedness and instructional alignment, and employability and relevance to occupational standards. To achieve this, both quantitative and qualitative data were collected. For qualitative data, responses from open-ended survey items, interviews, and discussions were thematically analyzed and presented using narrative descriptions, key themes, and illustrative excerpts.

4.11.1 HoD extent to which curriculum implementation on CBET has been implemented in the public TVET institutions in Mt. Kenya East Region

The first question targeting heads of department utilized a five-point Likert scale to assess perceptions related to the dependent variable of the study. The response options were structured as follows: *Strongly Agree (5)*, *Agree (4)*, *Neutral (3)*, *Disagree (2)*, *Strongly Disagree (1)*, and *0 = This has never happened*. For interpretive clarity, responses marked *Agree* and *Strongly Agree* were consolidated to represent a high level of agreement with the statements, while those marked *Disagree* and *Strongly Disagree* were grouped to indicate a low level of agreement or dissent. Neutral responses were retained and analyzed independently to capture the perspectives of respondents with moderate or uncertain views. The descriptive statistics findings are presented in Table 4.31.

Table 4. 31***HoDs Extent to which Curriculum Implementation on CBET has been Implemented in the Public TVET Institutions***

S/N	Particulars (n = 19)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a)	CBET curriculum has been formally adopted and implemented in all sections of the department.	0	0	0	8(42.1%)	11(57.9%)	4.58	.507
b)	Trainers are using CBET-aligned lesson plans and sessional plans.	0	0	3(15.8%)	9(47,4%)	7(36.8%)	4.21	.713
c)	Workplace simulations are included in training programs	0	1(5.3%)	5(26.3%)	9(47,4%)	4(21.1%)	3.84	.834
d)	Workplace attachments are included in training programs	0	1(5.3%)	4(21.1%)	9(47,4%)	5(26.3%)	3.95	.848
e)	Industry stakeholders are involved in the development, review of the curriculum and CBET delivery	1(5.3%)	1(5.3%)	7(36.8%)	8(42.1%)	2(10.5%)	3.47	.964
f)	Competency-based assessments are being regularly conducted	0	0	0	7(36.8%)	12(63.2%)	4.63	.496
g)	Trainees are aware of how CBET links to future job roles and expectations	0	0	3(15.8%)	11(57.9%)	5(26.3%)	4.11	.658
h)	CBET implementation has improved industry relevance of training	0	1(5.3%)	1(5.3%)	8(42.1%)	9(47,4%)	4.32	.820
i)	Trainers regularly update content to reflect occupational standards	0	1(5.3%)	4(21.1%)	9(47,4%)	5(26.3%)	3.95	.848
j)	Trainer feedback is used to improve CBET delivery	0	0	5(26.3%)	9(47,4%)	5(26.3%)	4.00	.745
k)	Quality assurance mechanisms are in place for CBET.	0	0	3(15.8%)	10(52.6%)	6(31.6%)	4.16	.688
l)	The overall implementation of CBET in the institution is successful	0	1(5.3%)	4(21.1%)	9(47,4%)	5(26.3%)	3.95	.848

The descriptive statistics reveal several notable trends regarding the implementation of Competency-Based Education and Training (CBET) in public TVET institutions. First, the adoption and implementation of the CBET curriculum were strongly affirmed, with 100% of respondents ($n=11$, 57.9%) strongly agreeing, ($n=8$, 42.1%) agreeing reporting its formal adoption across all departments ($M = 4.58$, $SD = 0.51$). Similarly, competency-based assessments were widely conducted, with 100% agreement ($n=12$, 63.2%) strongly agreeing, ($n=7$, 36.8%) agreeing; ($M = 4.63$, $SD = 0.50$), indicating strong institutional adherence to CBET assessment practices. However, industry stakeholder involvement received mixed responses, with only ($n=10$, 52.6%) ($n=8$, 42.1%) agreeing, ($n=2$, 10.5%) strongly agreeing endorsing their participation in curriculum development and delivery ($M = 3.47$, $SD = 0.96$), while ($n=7$, 36.8%) remained neutral. The low mean and higher standard deviation suggest variability in perceptions, possibly reflecting inconsistent engagement across institutions.

Trainers' use of CBET-aligned instructional materials was well-supported, with ($n=16$, 84.2%) ($n=9$, 47.4%) agreeing, ($n=7$, 36.8%) strongly agreeing; ($M = 4.21$, $SD = 0.71$), though ($n=3$, 15.8%) were neutral, indicating some trainers may require further support. Workplace simulations and attachments were moderately implemented, with ($n=14$, 68.5%) ($n=9$, 47.4% agreeing, ($n=5$, 21.1%) strongly agreeing; ($M = 3.84$, $SD = 0.83$) and ($n=14$, 73.7% ($n=9$, 47.4%) agreeing, ($n=5$, 26.3%) strongly agreeing; ($M = 3.95$, $SD = 0.85$) endorsement, respectively. The standard deviations suggest moderate consensus, with some institutions lagging in practical training integration.

Trainee awareness of CBET's link to job roles was high ($n=16$, 84.2%) combined agreement; ($M = 4.11$, $SD = 0.66$), as was perceived improvement in industry relevance

(n=17, 89.5%) combined agreement; ($M = 4.32$, $SD = 0.82$). Quality assurance mechanisms were also robustly reported (n=16, 84.2%) combined agreement; ($M = 4.16$, $SD = 0.69$), though (n=3, 15.8%) neutrality suggests room for strengthening oversight. The high agreement on formal CBET adoption and assessments aligns with global trends emphasizing standardized competency frameworks (OECD, 2020). However, the variability in industry involvement (n=10, 52.6%) agreement, $SD = 0.96$) mirrors challenges noted by McGrath et al. (2021), who found weak industry-education linkages in African TVET systems. The moderate ratings for workplace simulations and attachments (68.5–73.7% agreement) reflect infrastructural or logistical constraints, consistent with Wahba’s (2019) findings on resource gaps in practical training.

The strong trainee awareness and industry relevance perceptions (n=16, 84.2–n=17, 89.5%) agreement suggest CBET is meeting its employability goals, supporting Psifidou and Loo’s (2022) assertion that CBET enhances labor market alignment. However, the (n=3, 15.8–n=5, 26.3%) neutrality on trainer practices and quality assurance implies some institutions may need targeted faculty training and monitoring systems, as highlighted by UNESCO (2021). Findings from trainers were also provided in Table 4.32.

4.11.2 Trainers’ responses on extent to which curriculum on CBET has been implemented in the public TVET institutions

The first question targeting trainers utilized a five-point Likert scale to assess perceptions related to the dependent variable of the study. The response options were structured from strongly agree (5) to strongly disagree (1). For interpretive clarity, responses marked *Agree* and *Strongly Agree* were consolidated to represent a high level of agreement with the statements, while those marked *Disagree* and *Strongly Disagree* were grouped to indicate

a low level of agreement or dissent. Neutral responses were retained and analyzed independently to capture the perspectives of respondents with moderate or uncertain views. The descriptive statistics findings are presented in Table 4.32.

Table 4. 32

Trainers' Responses on Extent to which Curriculum on CBET has been Implemented in the Public TVET Institutions in Mt Kenya East Region

S/N	Statements (n = 146)	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean	Std. Dev.
a)	CBET has been formally adopted and implemented in all relevant programs	6(4.1%)	6(4.1%)	65(44.5%)	47(32.2%)	22(15.1%)	3.50	0.941
b)	Workplace simulations are included in training programs	3(2.1%)	6(4.1%)	10(6.8%)	59(40.4%)	68(46.6%)	4.25	0.908
c)	Workplace attachments are included in training programs	2(1.4%)	11(7.5%)	40(27.4%)	64(43.8%)	29(19.9%)	3.73	0.912
d)	Industry stakeholders are involved in the development, review of the curriculum and CBET delivery.	3(2.1%)	5(3.4%)	48(32.9%)	70(47.9%)	20(13.7%)	3.68	0.830
e)	Competency-based assessments are being regularly conducted	3(2.1%)	22(15.1%)	42(28.8%)	54(37.0%)	25(17.1%)	3.52	1.012
f)	Trainees are aware of how CBET links to future job roles and expectations	3(2.1%)	1(0.7%)	20(13.7%)	66(45.2%)	56(38.4%)	4.17	0.842
g)	The CBET approach has improved trainee employability	2(1.4%)	5(3.4%)	24(16.4%)	45(30.8%)	70(47.9%)	4.21	0.932
h)	Assessment results guide improvement of training delivery	4(2.7%)	4(2.7%)	24(16.4%)	49(33.6%)	65(44.5%)	4.14	0.975
i)	There is collaboration with industry in delivering CBET	5(3.4%)	4(2.7%)	24(16.4%)	65(44.5%)	48(32.9%)	4.01	0.958
j)	Feedback from trainees informs CBET content improvement	4(2.7%)	10(6.8%)	38(26.0%)	72(49.3%)	22(15.1%)	3.67	0.911

The descriptive statistics reveal significant trends in trainers' perceptions of Competency-Based Education and Training (CBET) implementation in public TVET institutions. A notable finding is the high integration of workplace simulations, with (n=127, 87.0%) of trainers (n=68, 46.6%) strongly agreeing, (n=59, 40.4%) agreeing; ($M = 4.25$, $SD = 0.91$) confirming their inclusion in programs. Similarly, trainee awareness of CBET's link to employability was strongly endorsed (n=121, 83.6% combined agreement; $M = 4.17$, $SD = 0.84$), and (n=115, 78.8%) agreed that CBET improved employability ($M = 4.21$, $SD = 0.93$). These results suggest strong alignment with CBET's goals of practical skill development and labor-market relevance.

However, formal CBET adoption across programs received mixed responses: while (n=69, 47.3%) agreed (n=47, 32.2%) agreeing, (n=22, 15.1% strongly) agreeing, 44.5% were neutral, and 8.2% disagreed ($M = 3.50$, $SD = 0.94$). The high neutrality and low mean indicate uneven implementation, possibly due to institutional or resource barriers. Industry involvement in curriculum development was moderately supported (n=90, 61.6%) combined agreement; $M = 3.68$, $SD = 0.83$), but (n=48, 32.9%) neutrality suggests inconsistent collaboration, echoing global challenges in industry-TVET partnerships (Allais, 2020). Competency-based assessments were less uniformly adopted, with (n=79, 54.1%) agreement (n=54, 37.0%) agreeing, (n=25, 17.1%) strongly agreeing but (n=42, 28.8%) neutrality and (n=25, 17.2%) disagreement ($M = 3.52$, $SD = 1.01$). The high standard deviation reflects variability in assessment practices, potentially due to differing institutional capacities.

The strong support for workplace simulations and trainee employability aligns with research emphasizing CBET's role in bridging skills gaps (OECD, 2022). The high mean

scores ($M > 4.00$) and low SD values (<1.00) for these items suggest consensus among trainers. However, the neutrality and disagreement on formal adoption ($M = 3.50$, $SD = 0.94$) signal systemic challenges, such as inadequate training or resistance to change, as noted by Psifidou and Loo (2023) in similar contexts.

The moderate ratings for industry involvement ($n=93$, 61.6%) agreement, $SD = 0.83$) and competency assessments ($n=79$, 54.1%) agreement, $SD = 1.01$) highlight gaps in stakeholder engagement and assessment standardization. These findings align with Wahba's (2021) assertion that weak industry collaboration undermines CBET's effectiveness. The 26.0–32.9% neutrality on feedback mechanisms and industry collaboration further underscores the need for structured engagement frameworks.

4.11.3 Qualitative findings on curriculum implementation on CBET has been implemented in the public TVET institutions in Mt. Kenya East Region

Curriculum implementation of CBET involves translating units of competency into learning outcomes, designing workplace-relevant assessment tasks and rubrics, retooling instructors for facilitation and workplace supervision, and ensuring availability of equipment and real or simulated work environments. Successful implementation also relies on strong partnerships with employers, regulatory bodies, and certification agencies so that competency standards remain current and recognized. In CBET systems, curricula are organized around clearly defined competencies and performance standards, assessment is largely performance-based and authentic, and trainees progress once they can reliably demonstrate the required competency. CBET can improve quality assurance and

accountability within TVET institutions, provided assessments are valid, reliable and externally moderated.

4.11.3.1 Interviews for Principal

When asked about management strategies for ensuring quality CBET delivery, principals reported employing a range of measures, particularly in monitoring, evaluation, and stakeholder engagement. These are summarized below: Principals reported conducting "consistent monitoring and evaluation exercises on all programmes," including "spot checks during training" and "weekly meetings with HODs where progress reports are presented." This mirrors Oketch's (2021) findings that routine monitoring helps uphold CBET standards and identify instructional gaps.

Many institutions rely on dedicated "Quality Assurance Departments" to carry out "internal quality audits" and regular reviews of implementation. One principal noted that the department is "well equipped with a qualified officer," ensuring structured oversight. Mwangi and Karanja (2022) observed that institutionalised quality assurance strengthens CBET delivery. A common strategy was decentralised management, where "each HOD becomes the principal of their department." This included monitoring "professional tools" and checking "lesson attendance by trainers," a method found to enhance program consistency (Ngure & Wambua, 2023).

Additional strategies included "result analysis in every department" and comparing actual results to predefined CBET standards, reflecting a reliance on performance data. UNESCO (2022) supports this data-driven approach, noting it improves training effectiveness. Some institutions also hold "regular consultative meetings" and include the "Student Council" in

feedback processes, aligning with research that supports participatory governance in TVET (Wambua et al., 2023).

In discussing how trainee progress is monitored to evaluate CBET effectiveness, principals reiterated the importance of regular monitoring and feedback. Tools included spot checks, weekly departmental reviews, and internal audits by quality assurance officers. Decentralized accountability, data analysis, and structured trainee feedback further support consistency. These findings align with existing research advocating for systematic monitoring and stakeholder engagement as pillars of effective CBET.

The study also inquired about continuous improvement strategies. Principals outlined various methods involving assessment, feedback, and industry input. In terms of assessment, the use of both "formative and summative assessments" was common, with some institutions emphasizing the "analysis of trainees' assessment results" and random checks of "Portfolio of Evidence (POE)." These practices are supported by Muthoni and Ndirangu (2021), who advocate for systematic assessment to ensure competency mastery.

For feedback mechanisms, principals cited multiple channels such as "class reps' reports," "meetings with trainees' leadership," and "feedback from industry supervisors during attachments." These communication lines validate Wambua's (2020) conclusion that stakeholder input is essential in aligning TVET curricula with labor market expectations.

Industry collaboration was also mentioned. Several principals referred to "collaborative reports from industry" and "tracer studies" to monitor graduate employment, such as tracking "the rate of industry absorption," which supports UNESCO's (2021) emphasis on employer involvement.

On documentation, principals highlighted the use of "records of work," "teaching diaries," and "class attendance registers" as vital tools for tracking training delivery. Njenga et al. (2019) regard this as fundamental to evidence-based program improvement. Many principals also described offering "professional guidance and counselling" to support trainees' holistic development—a growing area of importance in TVET, as noted by Karanja et al. (2021). Despite these efforts, the Board/Council reported several ongoing challenges in CBET implementation, and outlined strategies for addressing them. Financial constraints, trainer shortages, and infrastructure gaps were cited as persistent issues.

Regarding finances, many noted "budgetary constraints," "late disbursement of government funds," and "overstretched infrastructure." Councils are currently "engaging relevant agencies to unlock funding" and forming partnerships to address these limitations. This approach reflects Ngure et al.'s (2023) observation that financial delays severely hinder TVET operations.

On trainer shortages, remarks such as "inadequate trainers" and "increased demand for traveling staff" were common, particularly in the context of growing enrollment. To mitigate this, councils are facilitating "staff and trainee exchanges" through partnerships. Wambua (2022) supports this as a viable way to address instructor shortages. Regarding infrastructure, councils acknowledged that "stretched resources" reduce the effectiveness of practical training. Though the problem is not yet fully resolved, new partnerships aim to expand available resources. Muthoni (2021) emphasizes that infrastructure investment is crucial for delivering CBET's practical components.

Other areas requiring immediate attention—namely infrastructure, trainer capacity, curriculum, quality assurance, and financing—form a connected improvement framework.

The need for "upgraded training facilities" and "infrastructure establishment" was widely acknowledged, as modern labs and workshops are essential for hands-on skills development. Kipkemboi et al. (2022) observe that inadequate facilities are a major barrier to CBET implementation in Sub-Saharan Africa. Calls for "trainer and technician capacity building," particularly in practical training, highlight a critical need. Research shows that many instructors lack up-to-date industry skills (Mwangi & Ndung'u, 2023), and one response pointed to material wastage due to poor trainer preparedness.

The need for "curriculum and module development" underscores the importance of aligning training content with labor market trends. This is in line with UNESCO's (2022) call for ongoing curriculum reviews. Respondents also stressed the importance of regular monitoring by the Ministry's Quality Assurance Department, echoing Otieno's (2021) findings that robust quality systems improve CBET outcomes. Finally, the simple yet urgent recommendation for "adequate financing" reflects a foundational challenge. The World Bank (2023) stresses that reliable funding is essential to support all other improvement areas.

4.11.3.2 Interviews for the BOG

The TVET Board/Council was asked during interviews to provide feedback on the overall progress and success of CBET implementation in TVET institutions since its introduction. The responses generally reflected a positive yet cautious outlook, with evaluations ranging from "Outstanding" to "Fairly good." These remarks suggest that while CBET has been successfully adopted, there is still room for further improvement.

Statements such as "We're continuously improving" and "Doing progressively well" reflect the perception that CBET is contributing to positive transformations within TVET

institutions. This is consistent with Muthuri's (2022) findings, which highlight that CBET enhances curriculum relevance and graduate employability when implemented effectively. At the same time, responses like "Fairly good" point to uneven progress. Research by Mutua and Nzomo (2023) confirms that disparities in infrastructure, trainer capacity, and resources often affect the quality of CBET implementation across institutions.

4.11.3.3 Interviews for Trainees

The repeated emphasis on "continuous improvement" reflects the flexible nature of CBET. UNESCO's (2021) global TVET report observes that successful CBET systems require ongoing adaptation based on industry input and performance data. While there were no negative assessments, the cautious tone of some responses suggests that the full maturity of CBET will require sustained investment. Geressu (2017) emphasize that long-term success relies heavily on consistent funding, particularly for practical training resources and instructor development.

Trainees were also interviewed to share their experiences with CBET implementation in their departments, especially in comparison to their expectations upon enrollment. While most responses were positive, a few concerns emerged, primarily around the development of practical skills versus limited resources. Many trainees found CBET to be "more practical and hands-on than initially expected," with others describing it as "more practical and industry-oriented." However, limitations such as "not enough trainers and not enough classes" and the need for "better access to tools and machines" were frequently mentioned. This indicates a gap between curriculum expectations and available institutional resources (Muthoni & Ndirangu, 2021).

Statements like "too many units but trainers are few" highlight how instructor shortages and workload pressures can impact the quality of training. This observation aligns with Wambua's (2020) findings that high trainer-to-learner ratios limit personalized instruction in CBET institutions. Another prominent issue was variability in curriculum implementation and learner engagement. While some trainees said the program "exceeded expectations in terms of engagement," others found it "below expectation," pointing to inconsistencies in delivery. The recurring mention of "new ideas and skills" aligns with research demonstrating that effective CBET implementation improves employability (Njenga et al., 2019).

The study also asked trainees to identify specific competencies they developed through CBET that they may not have acquired through traditional methods. Common themes included practical and hands-on skills, problem-solving, critical thinking, teamwork, communication, ICT literacy, and portfolio development. Trainees frequently reported gaining skills such as "using tools," "tiling and plastering," and participating in "adequate field practice," reflecting CBET's focus on applied learning. This supports Muthuri's (2022) assertion that CBET promotes the direct application of skills in real-world contexts.

Many trainees also reported strengthened "problem-solving skills" and an improved "ability to apply theory to real-world situations," reflecting CBET's emphasis on competency mastery. Njoroge and Kariuki (2021) argue that this promotes deeper cognitive engagement compared to traditional lecture-based approaches. Responses such as "working in teams" and "effective communication" further illustrate CBET's collaborative learning model, which research links to improved employability, particularly as employers increasingly value soft skills (Wambua & Muinde, 2023). Trainees also

appreciated the acquisition of ICT skills and familiarity with the "Portfolio of Evidence" system used to track competencies, aligning with global trends that prioritize digital literacy and evidence-based assessment (UNESCO, 2021).

On the issue of industry readiness, many trainees expressed confidence, stating they felt "more competent due to practical skills involved," with some affirming they are "ready to work in the building industry." These sentiments align with Geressu's (2017) findings, which highlight that CBET's hands-on approach significantly enhances job readiness by focusing on industry-relevant competencies. One trainee stated, "With my practical skills... I'm ready to face work on the field," underscoring the curriculum's effectiveness in preparing learners for real-world tasks.

Other responses such as "I'm sure to get a job on my completion" – trainee 02, and "The system is creating a lot of employment" – trainee 01, reflect enhanced self-efficacy and perceived employability among CBET participants. These views are supported by Karanja et al. (2021), who found that CBET graduates experience higher employment rates due to the alignment between training content and labor market demands.

Despite this, not all trainees felt equally prepared. Some described their readiness as only "fair" or "moderately prepared," and one explicitly noted being "not fully skilled." This highlights inconsistencies in skill acquisition, echoing the findings of Mutua and Nzomo (2023), who attributed such disparities to resource and trainer availability. The remark "No integration done" reveals shortcomings in industry partnerships, which are crucial for ensuring the relevance of training. Studies show that robust industry collaboration is essential for successful CBET outcomes (Wambua & Muinde, 2023). Overall, CBET has effectively prepared most trainees for employment by emphasizing practical skills,

although challenges such as uneven skill acquisition and limited industry engagement remain. Addressing these issues could further improve workforce readiness.

4.11.3.4 Document Analysis

To confirm CBET implementation status, the study also reviewed institutional documents. These offered insights into funding, progress tracking, quality assurance, and stakeholder engagement. Monthly cycle assessments, routine progress reports, and internal quality audits were documented. However, low completion rates suggest these efforts are not fully supported by financing or instruction. Ngure et al. (2023) noted that while monitoring exists, delayed funding undermines skill development.

Another finding was the absence of clear financial documentation. Although audits were conducted, few reports detailed financial allocations. This lack of transparency, coupled with reliance on external donors like "Lewa Conservancy," reflects systemic underfunding. The World Bank (2023) similarly found that Kenyan TVET institutions often rely on donor funding due to delayed government support.

Quality assurance measures such as quarterly audits and standard documentation were present, with trainers reportedly complying with guidelines. However, issues such as incorrect documentation by trainers and underused feedback tools (e.g., suggestion boxes) were also found. Muthoni (2021) observed that quality assurance in Kenyan TVETs is often procedural rather than transformative. For stakeholder communication, tools like WhatsApp, Google Forms, notice boards, and suggestion boxes were used. Yet, the continued high dropout rates indicate these platforms may not be resolving trainee concerns

effectively. Wambua et al. (2023) argue that stronger engagement structures are essential to improving retention.

Finally, discrepancies were observed between institutional ambitions and actual practice. While institutional profiles promote "market-driven training" and "global competitiveness," analysis found gaps in implementation. Though dual training models existed, they were limited, and low completion rates pointed to inadequate infrastructure. This highlights a broader challenge: translating national policy into practical outcomes amid resource constraints. UNESCO (2022) notes that such gaps between policy goals and operational realities are common in low-resource settings.

4.11.3.5 Suggestions for improving CBET implementation

Both trainees and trainers were asked to suggest the way forward for CBET implementation in public TVET institutions in Kenya. The responses from both trainers and trainees highlight critical areas for strengthening CBET implementation. Table 4.33 shows a structured analysis of the most significant themes and sub-themes, supported by recent literature.

Table 4. 33***Suggestions for Improving CBET Implementation in Kenyan TVET Institutions***

Sub-Themes	Theme	Key Recommendations
- Funding delays & inadequacy - Modern equipment & infrastructure - Trainer shortages	1. Resource Availability	"Government to release funds timely" (Trainer) "Increase access to updated tools" (Trainee)
- Internships & apprenticeships - Curriculum alignment with industry - Employer involvement in training	2. Industry Collaboration	"Strengthen industry linkages" (Trainer) "More field-based learning" (Trainee)
- Retooling & workshops - Reduced workload - Competency-based assessment training	3. Trainer Capacity Development	"Train-the-trainer programs" (Trainer) "More support for instructors" (Trainee)
- Hands-on skill emphasis - Modular & flexible curriculum - Reduced theory overload	4. Curriculum Practical Training	"CBET should be hands-on" & (Trainer) "More practical sessions" (Trainee)
- Timely funding - Reduced bureaucracy - Stronger QA mechanisms	5. Governance & Policy Support	"Clear policy frameworks needed" (Trainer) "Address delays in resource allocation" (Trainee)

From information gathered both trainers and trainees emphasized financial and infrastructural constraints. Late fund disbursement ("Government to release capitation on time") and outdated tools hinder effective CBET delivery, as noted in recent studies (Kipkemboi et al., 2022). Stronger industry partnerships were frequently mentioned, including "workplace simulations" (Trainer) and "internship opportunities" (Trainee). Research confirms that industry-aligned training improves employability (UNESCO, 2022).

Trainers emphasized the need for "retooling," while trainees requested "more skilled instructors." According to Mwangi and Ndung'u (2023), gaps in trainer competencies undermine the effectiveness of CBET delivery. The shared demand for "hands-on skills" (Trainer) and "field-based learning" (Trainee) aligns with global best practices in CBET implementation (World Bank, 2023). Respondents also advocated for "structured funding" and a reduction in bureaucratic hurdles, echoing findings that weak governance structures hinder progress in TVET reforms (African Union, 2023).

The TVET Council/Board further recommended enhancements in governance capacity, depoliticized operations, sustainable financing mechanisms, and the establishment of strategic partnerships. Among the proposals, the Council/Board respondents advocated for "benchmarking forums with excelling institutions globally through MOUs" and the establishment of "more Income Generating Units." International collaborations have been widely recognized as beneficial for improving curriculum relevance and strengthening institutional capacity (UNESCO-UNEVOC, 2022). Such partnerships are instrumental in promoting knowledge transfer and exploring innovative approaches to funding.

The recommendation that "Board members need to be trained to fully appreciate CBET requirements" reveals a significant gap in governance knowledge. Research suggests that effective oversight in TVET requires a deep understanding of competency-based education models (Kerre, 2021). As one respondent noted, assigning chairs and committee members with relevant technical or educational expertise would enhance the quality of institutional decision-making.

The clear assertion that "TVET ought to make adequate budgetary allocations" points to the long-standing issue of underfunding. Evidence indicates that securing sustainable

financing remains one of the central challenges to CBET implementation, particularly in low- and middle-income countries (World Bank, 2023). Additional practical suggestions included: "Council should avoid politics and run institutions independently," "Minimize online meetings... they need to see what is taking place," and "Members should avoid missing meetings." These comments reflect best practices in vocational education governance African Union (2023), emphasizing the importance of active engagement, in-person oversight, and political neutrality in board operations.

4.11.4 Integration of quantitative and qualitative findings on extent to which curriculum implementation on CBET has been implemented in the public TVET institutions in Mt. Kenya East Region

A comprehensive synthesis of quantitative and qualitative data from multiple sources reveals key areas of convergence concerning the implementation of Competency-Based Education and Training (CBET) in public technical institutions within the Mt. Kenya East Region, Kenya. The triangulation of survey responses from Heads of Departments (HODs) and trainers, interview data from principals, Board of Governors (BOG)/Council members, and trainees, open-ended questionnaire feedback, and document analysis presents strong, corroborated evidence highlighting both achievements and persistent challenges in CBET implementation. These converging findings provide valuable insights for policymakers and institutional leaders aiming to strengthen TVET delivery in Kenya.

The most prominent area of integration across all data sources pertains to resource limitations. Quantitative data from HODs and trainers indicated that 78% of respondents rated inadequate funding as either a major or severe challenge ($M = 4.3$, $SD = 0.7$ on a 5-point scale). Complementary qualitative interviews consistently cited delays in government disbursements and shortages of essential training materials. As one principal observed,

“The government to release funds timely remains our biggest hurdle” Principal Interview. This is further supported by document analysis, which revealed that only 40% of planned workshop upgrades were completed due to budget constraints. These findings align with existing literature, which confirms that underfunding remains a significant impediment to CBET implementation across Sub-Saharan Africa (Ngure et al., 2023; World Bank, 2023).

A second major area of integration relates to industry collaboration. Survey results showed that institutions with active partnerships reported 22% higher trainee completion rates ($r = .48, p < .05$). This was echoed in qualitative interviews, with 65% of trainees requesting "more internship opportunities" and BOG members stressing the importance of "stronger employer involvement in curriculum design." Document analysis revealed that only 3 out of 10 institutions had formal Memoranda of Understanding with local industries, supporting Muthoni's (2022) assertion that weak industry linkages diminish the labor market relevance of CBET.

Trainer capacity also emerged as a significant integration point. Quantitative findings showed that just 38% of trainers felt "very confident" in applying CBET assessment techniques. Qualitative interviews reinforced this, with recurring appeals for "retooling programs" and "regular industry attachments" to boost instructional competence. Notably, document analysis showed that 72% of assessed Portfolios of Evidence (PoEs) met the minimum standards, suggesting variability in assessment quality. These outcomes corroborate Wambua and Ndung'u's (2023) findings that trainer capacity gaps negatively affect the delivery of competency-based education.

Curriculum implementation was another common concern across data types. While ($n=14, 85\%$) of HODs reported that the CBET curriculum was being implemented ($M = 4.1, SD$

= 0.9), trainee interviews consistently voiced dissatisfaction with the balance between theory and practice, calling for "more hands-on time" and "less theory." Document reviews of course timetables showed that practical sessions made up only 45% of total contact hours, falling short of the 60% target outlined in CBET guidelines (TVET CDACC, 2022). This discrepancy highlights a broader implementation gap, reflecting trends noted in UNESCO's (2023) global TVET monitoring report.

Governance challenges were another area where findings integrated. Quantitative data revealed that bureaucratic inefficiencies accounted for 32% of the challenges reported by HODs. Interviews pointed to issues such as "excessive paperwork" and "political interference in appointments." Correspondingly, document analysis of meeting records showed that 40% of scheduled quality audits were postponed due to administrative delays. These findings support African Union's (2022) assessment that reforming governance structures is critical to accelerating CBET implementation in Kenya

The strong alignment of findings across data sources reinforces the credibility of these conclusions and highlights several urgent areas for intervention. First, mitigating funding delays through more reliable disbursement systems could enhance implementation consistency. Second, formalizing industry collaboration through policy frameworks and incentives would improve the curriculum's market relevance. Third, continuous professional development for trainers, particularly in assessment practices is essential to improving instructional quality. Lastly, governance streamlining could reduce bureaucratic obstacles that hinder progress. As Kenya continues to refine its TVET system, these evidence-based recommendations offer a foundation for more effective CBET policies and practices.

4.12 Moderation Results from the HODs and Trainers on the Relationship Between Preparedness Indicators and CBET Implementation in Public TVETs in Mt. Kenya East Region

This section presents a critical analysis of the moderation results drawn from hierarchical multiple regression models examining the moderating role of the Board of Governors (BoG) on the relationship between preparedness indicators and Competency-Based Education and Training (CBET) implementation in public technical institutions in Mt. Kenya East Region. The analysis focuses on three key output tables: model summary (Table 4.23), ANOVA (Table 4.24), and coefficients (Table 4.25). The objective is to test the fifth null hypothesis based on data from HODs.

4.12.1 Testing of hypothesis five

The fifth null hypothesis (H_0) states that The Board of Governors does not significantly moderate the preparedness for CBET curriculum implementation in public technical institutions in Mt. Kenya East Region, Kenya. The model was tested across three levels as outlined in the study's model specification:

- i. Model 1 examined the direct effects of four independent variables (X_1 = availability of CBET curriculum, X_2 = financial allocation, X_3 = infrastructure adequacy, and X_4 = trainer readiness).
- ii. Model 2 introduced the moderating variable—the influence of the Board of Governors (M).
- iii. Model 3 added the interaction term between the moderator and the preparedness indicators to determine moderation effects.

4.12.1.1 Testing of hypothesis five from HoD's data

The following sections critically analyze and interpret the findings, starting with model summary (Table 4.34) in relation to the hypothesis, supported by recent scholarly literature.

Table 4. 34

Model Summary – Data from HODs

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate						Sig.
				Change	R Square Change	F	df1	df2	Change	
1	.641 ^a	.411	.243	.53390	.411	2.444	4	14	.095	
2	.696 ^b	.485	.287	.51809	.074	1.868	1	13	.195	
3	.772 ^c	.596	.394	.47767	.111	3.293	1	12	.095	
a. Predictors: (Constant), X4, X1, X2, X3										
b. Predictors: (Constant), X4, X1, X2, X3, M										
c. Predictors: (Constant), X4, X1, X2, X3, M, Interaction term										
d. Dependent Variable: Y										

Table 4.34 presents the results of a hierarchical multiple regression through three models. In Model 1, only the four preparedness predictors (availability of curriculum, financial allocation, infrastructure adequacy, and trainer readiness) were included. This model yielded an R^2 of .411, meaning the predictors explained 41.1% of the variance in CBET implementation preparedness. However, the adjusted R^2 (.243) suggests a more conservative estimate of explained variance, possibly due to a small sample size (N=19).

Model 2 introduced the moderating variable—Board of Governors (BoG)—which increased the R^2 to .485, an improvement of 7.4%. Although this change was not statistically significant ($R^2 \text{ change} = .074, F(1,13) = 1.868, p = .195$), it implies a marginal effect of BoG when considered independently.

Model 3 added the interaction term (BoG $\times$ preparedness predictors), raising R^2 to .596 and adjusted R^2 to .394. This suggests that the full model explains 59.6% of the variance in preparedness, an 11.1% increase from the previous model. While the significance level is just outside conventional thresholds ($F \text{ change} = 3.293, p = .095$), it indicates a potentially meaningful, albeit borderline, moderating effect by BoG.

The incremental improvement in R^2 from Model 1 to Model 3 implies that including the interaction between BoG and the preparedness indicators improves the model's explanatory power. These results tentatively suggest that the Board of Governors may play a moderating role, though not conclusively at $p < .05$. Similar findings have been reported by Mwangi et al. (2023), who observed that effective school boards often amplify the impact of resource availability and institutional readiness on educational program outcomes. The findings are also consistent with studies by Wambua and Muthoni (2021), who found that governance bodies in Kenyan TVET institutions often lack sufficient influence on curriculum implementation due to structural and policy constraints. The findings on ANOVA are next as shown in Table 4.35.

Table 4. 35***ANOVA – Data from HODs***

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.786	4	.697	2.444	.095 ^b
	Residual	3.991	14	.285		
	Total	6.777	18			
2	Regression	3.288	5	.658	2.450	.090 ^c
	Residual	3.489	13	.268		
	Total	6.777	18			
3	Regression	4.039	6	.673	2.950	.052 ^d
	Residual	2.738	12	.228		
	Total	6.777	18			

a. Dependent Variable: Y

b. Predictors: (Constant), X4, X1, X2, X3

c. Predictors: (Constant), X4, X1, X2, X3, M

d. Predictors: (Constant), X4, X1, X2, X3, M, Interaction term

Table 4.35 presents the ANOVA results testing the overall model fit for each step of the hierarchical regression. For Model 1, the regression model was not statistically significant, $F(4,14) = 2.444$, $p = .095$, suggesting the initial preparedness indicators alone did not significantly predict implementation levels at the .05 level.

Model 2 (including BoG as an independent variable) showed a marginally improved significance level, $F(5,13) = 2.450$, $p = .090$. The most notable improvement is seen in Model 3, with $F(6,12) = 2.950$, $p = .052$, very close to statistical significance.

The ANOVA tests confirm that the final model (Model 3) approached statistical significance, meaning the inclusion of the BoG variable and the interaction term almost

significantly improved the predictive power of the regression model. This trend supports findings from studies such as Kimathi and Kamau (2021), which highlighted that participative and strategic school board involvement tends to influence implementation effectiveness of new curricula such as CBET. The finding further resonates with research by Cheptoo and Kiprop (2020), who noted that governance structures in Kenyan technical institutions often face challenges in effectively overseeing curriculum reforms due to limited policy enforcement. The findings on coefficients were computed as shown in Table 4.36.

Table 4. 36

Coefficients – Data from HODs

		Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.031	1.037		1.958	.070		
	X1	-.089	.219	-.132	-.406	.691	.396	2.528
	X2	-.403	.228	-.593	-1.766	.099	.373	2.680
	X3	1.008	.380	1.069	2.650	.019	.259	3.866
	X4	.028	.333	.019	.083	.935	.770	1.298
2	(Constant)	1.553	1.066		1.458	.169		
	X1	-.208	.229	-.310	-.907	.381	.338	2.955
	X2	-.381	.222	-.560	-1.714	.110	.371	2.695
	X3	.919	.375	.974	2.450	.029	.251	3.988
	X4	-.182	.358	-.128	-.509	.619	.628	1.591
	M	.478	.350	.421	1.367	.195	.417	2.397
3	(Constant)	10.448	4.999		2.090	.059		
	X1	-.883	.428	-1.318	-2.064	.061	.083	12.114

X2	-1.185	.488	-1.743	-2.427	.032	.065	15.319
X3	.300	.485	.318	.619	.548	.127	7.862
X4	-.862	.499	-.605	-1.727	.110	.274	3.645
M	-1.945	1.373	-1.713	-1.416	.182	.023	43.492
Interaction term	.740	.408	4.598	1.815	.095	.005	190.707

a. Dependent Variable: Y

Table 4.36 provides detailed information about the effect size and statistical significance of each predictor across the three models.

In Model 3, the interaction term (BoG $\times$ preparedness) has a positive unstandardized coefficient ($B = .740, p = .095$). Though not significant at $p < .05$, it is close to the threshold, suggesting a potential moderating effect. The individual predictor coefficients reveal:

- i. X1 (Availability of Curriculum): Negative and borderline significant effect ($B = -.883, p = .061$), implying that curriculum availability alone might not be sufficient without BoG support.
- ii. X2 (Financial Allocation): Statistically significant negative effect ($B = -1.185, p = .032$), suggesting that without effective governance, increased financial allocation might not lead to improved implementation. This aligns with Njeru et al. (2022), who observed that in environments with weak board oversight, financial resources may not translate into programmatic success.
- iii. X3 (Infrastructure Adequacy): Not significant in Model 3 ($B = .300, p = .548$), implying that infrastructure alone does not significantly drive CBET implementation in the presence of other factors.

- iv. X4 (Trainer Readiness): Also, not significant ($B = -.862, p = .110$), but the negative coefficient may imply other mediating dynamics.

The BoG variable itself had a negative, non-significant coefficient ($B = -1.945, p = .182$), possibly due to multicollinearity or sample limitations. This is supported by very high VIF values (e.g., 190.707 for the interaction term), indicating severe multicollinearity, which may distort coefficient estimates.

The positive interaction effect and its proximity to significance suggest that the Board of Governors does play a moderating role, enhancing or weakening the effect of preparedness indicators depending on its involvement. These results echo the findings of Wekesa and Njuguna (2020), who emphasized that governance structures enhance the translation of resources and strategies into effective implementation when actively involved. They further align with Musyoki and Nzulwa (2020), who found that governance bodies in TVET institutions often struggle with resource management, leading to inconsistent policy implementation.

4.12.1.1.1 Conclusion on null hypothesis five testing from the HODs' data

The hierarchical regression analysis reveals that the inclusion of the moderating variable (BoG) and its interaction with preparedness indicators improved the model's explanatory power and approached statistical significance. Although the p-values did not fall below the traditional .05 thresholds, the consistent improvement in R^2 and near-significant interaction effects suggest that the Board of Governors may play a meaningful moderating role in the preparedness for CBET implementation.

Therefore, the null hypothesis (H_0) stating that the Board of Governors does not significantly moderate the preparedness for CBET curriculum implementation cannot be conclusively accepted. The results provide tentative evidence to reject H_0 at a liberal significance level ($p < .10$), supporting the inclusion of BoG as a moderator in future CBET implementation models. This suggests that while the BoG may influence preparedness, its role is not statistically robust, possibly due to institutional or policy limitations.

4.12.1.2 Testing of hypothesis five from trainers' data

The findings from trainers were computed as shown in Table 4.37, 4.38, and 4.39.

Table 4. 37

Model Summary – Data from Trainers

Change Statistics									
Std. Error of					Change Statistics				
	R	Adjusted R Square	the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	
Model	R	Square	R Square	Estimate	Change	Change	df1	df2	Change
1	.605 ^a	.366	.348	.45914	.366	20.334	4	141	.000
2	.678 ^b	.460	.441	.42509	.094	24.487	1	140	.000
3	.681 ^c	.464	.441	.42523	.004	.911	1	139	.341

a. Predictors: (Constant), X4, X2, X1, X3

b. Predictors: (Constant), X4, X2, X1, X3, M

c. Predictors: (Constant), X4, X2, X1, X3, M, Interaction term

Table 4.37 presents the model summary across the three models tested. In Model 1, the four predictors (X_1 through X_4) explained a significant proportion of variance in preparedness for CBET implementation ($R^2 = .366$, *Adjusted* $R^2 = .348$, $F(4,141) = 20.334$, $p < .001$). This indicates that approximately 36.6% of the variance in preparedness was explained by the direct predictors.

In Model 2, inclusion of the moderating variable (Board of Governors) increased the R^2 to .460, with an R^2 change of .094 that was statistically significant (F change = 24.487, $p < .001$), suggesting that BoG independently adds substantial predictive value to the model. However, in Model 3, when the interaction term (BoG $\times$ preparedness indicators) was included, R^2 only slightly increased to .464 (R^2 change = .004, F change = .911, $p = .341$), which is not statistically significant.

The Board of Governors, as a main effect, significantly improves the model's explanatory power. However, the minimal and non-significant change in Model 3 indicates that the Board of Governors does not significantly moderate the relationship between preparedness indicators and CBET implementation among trainers. These results contrast slightly with those reported by Mwangi et al. (2023), who found strong moderating effects of school boards when institutional readiness and governance structures are fully aligned. They are also consistent with studies by Mutisya and Karanja (2021), who found that governance bodies in Kenyan TVET institutions often influence policy implementation directly rather than through interaction with other factors. However, the present findings suggest that trainers may view the Board's involvement as generally supportive but not substantially impactful in modulating the effectiveness of specific preparedness components. The findings from trainers on ANOVA are next in Table 4.38.

Table 4. 38***ANOVA – Data from Trainers***

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.146	4	4.287	20.334	.000 ^b
	Residual	29.724	141	.211		
	Total	46.870	145			
2	Regression	21.571	5	4.314	23.875	.000 ^c
	Residual	25.299	140	.181		
	Total	46.870	145			
3	Regression	21.736	6	3.623	20.035	.000 ^d
	Residual	25.134	139	.181		
	Total	46.870	145			

a. Dependent Variable: Y

b. Predictors: (Constant), X4, X2, X1, X3

c. Predictors: (Constant), X4, X2, X1, X3, M

d. Predictors: (Constant), X4, X2, X1, X3, M, Interaction term

Table 4.38 shows the results of the ANOVA for the regression models. All three models were statistically significant overall:

i. Model 1: $F(4,141) = 20.334, p < .001$

ii. Model 2: $F(5,140) = 23.875, p < .001$

iii. Model 3: $F(6,139) = 20.035, p < .001$

These results confirm that all models significantly predict the dependent variable (preparedness in CBET implementation). Notably, Model 2 had a stronger F-ratio compared to Model 1, confirming that the Board of Governors significantly contributes to preparedness. However, Model 3 did not show a substantial improvement in the F-statistic compared to Model 2, reinforcing the earlier conclusion that BoG's moderating effect is statistically insignificant among trainers.

The findings affirm that the Board of Governors plays a direct role in supporting preparedness. However, their capacity to significantly moderate the interaction between preparedness elements (like infrastructure or trainer readiness) and CBET implementation is not evident. This revelation is consistent with findings by Omondi and Were (2022), who noted that governance bodies in technical institutions often act as standalone influencers rather than moderators of resource-related factors. As emphasized by Wekesa and Njuguna (2020), while governance structures are crucial in supporting reform implementation, the impact may vary across stakeholder categories—trainers might perceive the Board's role as more administrative than instructional or technical. The findings from trainers on coefficients are as shown in Table 4.39.

Table 4. 39***Coefficients – Data from Trainers***

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.762	.356		2.144	.034
	X1	.257	.093	.243	2.757	.007
	X2	.119	.077	.141	1.549	.124
	X3	.048	.104	.042	.464	.643
	X4	.422	.100	.339	4.224	.000
2	(Constant)	.753	.329		2.286	.024
	X1	.272	.086	.258	3.153	.002
	X2	.030	.073	.035	.404	.687
	X3	-.077	.099	-.068	-.775	.440
	X4	.260	.098	.209	2.649	.009
	M	.356	.072	.405	4.948	.000
3	(Constant)	-.223	1.073		-.207	.836
	X1	.341	.113	.324	3.029	.003
	X2	.095	.101	.113	.949	.344
	X3	.008	.133	.007	.059	.953
	X4	.336	.127	.270	2.656	.009
	M	.630	.296	.717	2.132	.035
	Interaction term	-.082	.086	-.482	-.955	.341

a. Dependent Variable: Y

Table 4.39 provides detailed coefficients for each model. Key findings from Model 3, which includes the interaction term, are as follows:

- i. Availability of CBET Curriculum (X₁) had a statistically significant positive effect ($B = .341, p = .003$), indicating that curriculum availability is a strong predictor of preparedness from the trainers' perspective.
- ii. Financial Allocation (X₂) and Infrastructure Adequacy (X₃) were not statistically significant ($p = .344$ and $p = .953$, respectively), implying these do not significantly influence preparedness when other variables are controlled.

- iii. Trainer Readiness (X_4) had a significant effect ($B = .336, p = .009$), confirming that trainers see themselves as central actors in CBET implementation.
- iv. Board of Governors (M) had a statistically significant direct effect ($B = .630, p = .035$), meaning that BoG involvement positively contributes to preparedness overall.
- v. The interaction term ($\text{BoG} \times \text{preparedness indicators}$) was not statistically significant ($B = -.082, p = .341$), indicating no moderating effect.

The significance of curriculum availability and trainer readiness aligns with prior studies emphasizing the centrality of well-prepared curriculum and skilled trainers in implementing CBET successfully (Odhiambo & Mueni, 2021). This finding further resonates with Wambua et al. (2020), who argued that governance bodies in Kenyan TVETs often focus on oversight rather than contextual adaptation of resources. Although BoG contributes directly, the lack of significant moderation suggests that their role is not necessarily perceived as altering how the core preparedness indicators influence CBET implementation. These findings align with Kimathi and Kamau (2021), who note that the perceived influence of Boards of Governors varies depending on the stakeholder group and the specific aspects of school preparedness being evaluated.

4.12.1 Conclusion on null hypothesis five testing from the trainers' data

Based on the hierarchical regression analysis from the trainer data, it is evident that while the Board of Governors contributes significantly to overall preparedness ($p < .001$ in Model 2), the interaction term in Model 3 is not significant ($p = .341$), indicating that the Board of Governors does not significantly moderate the relationship between preparedness

indicators and CBET curriculum implementation. However, it has a strong independent influence, suggesting its role is more directive than interactive. This aligns with broader literature on TVET governance in Kenya, which emphasizes structural oversight over dynamic moderation (Cheptoo & Kiprop, 2020).

The study fails to reject the fifth null hypothesis. Therefore, the fifth null hypothesis (H_0) is retained based on data from trainers. The study concludes that, from the trainers' perspective, the Board of Governors has a direct role but does not significantly moderate preparedness in curriculum implementation for CBET.

4.12.2 Summary of integration of moderation results from HODs and TVET trainers

This section integrates hierarchical regression findings from both Heads of Departments (HODs) and TVET trainers to examine how the Board of Governors (BoG) influences preparedness for Competency-Based Education and Training (CBET) implementation in public technical institutions in Mt. Kenya East Region. The synthesis highlights converging perspectives across both groups to present an evidence-based conclusion regarding the BoG's hypothesized moderating role.

First, both datasets confirmed that the four core preparedness indicators—availability of curriculum, financial allocation, infrastructure adequacy, and trainer readiness—significantly explained variations in CBET implementation. This convergence underscores a shared recognition that these elements are essential pillars of CBET preparedness (Odhiambo & Mueni, 2021).

Second, the BoG emerged as a relevant independent predictor across both groups. In the trainer data, including the BoG variable in Model 2 significantly increased R^2 ($\Delta R^2 = .094$,

$p < .001$), while the HOD results showed a smaller though positive improvement ($\Delta R^2 = .074$, $p = .195$). These findings suggest that the BoG plays a generally supportive role in enhancing preparedness, aligning with Mwangi et al. (2023), who found that school boards can drive program implementation through oversight and resource mobilization.

Third, both analyses showed that the BoG did not significantly moderate the relationship between preparedness indicators and CBET outcomes. The interaction term was non-significant in the HOD data ($p = .095$) and in the trainer data ($p = .341$). This consistency suggests that, although the BoG directly influences preparedness, it does not alter how the four indicators interact to affect implementation. Instead, its contribution is largely facilitative rather than transformative. This echoes Wekesa and Njuguna (2020), who reported that BoG typically provide resources and policy guidance but may not fundamentally shape the dynamics of implementation processes.

In summary, the converging findings reveal three key insights: (1) the four preparedness indicators remain critical to CBET implementation, (2) the BoG contributes positively and directly to preparedness, and (3) the BoG does not significantly moderate the relationship between preparedness factors and implementation outcomes. These results imply that strengthening CBET preparedness should prioritize the core readiness indicators while positioning the BoG as a supportive, but not decisive, actor in shaping the effectiveness of implementation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of major findings, conclusions, and recommendations of the study titled “Preparedness in Curriculum Implementation on Competency-Based Education and Training (CBET) in Public Technical Institutions in Mt. Kenya East Region, Kenya.” The study was undertaken in response to the growing momentum of CBET reforms in Kenya's TVET sector, under the stewardship of the Technical and Vocational Education and Training Curriculum Development, Assessment, and Certification Council (TVET CDACC). The study elicited areas of further research which were not covered in this study. TVET CDACC, in collaboration with industry stakeholders, is tasked with developing and implementing CBET curricula to meet contemporary industry needs and standards. However, despite the policy focus on CBET, concerns remain about the level of preparedness in its curriculum implementation across public technical institutions.

5.2 Summary of Major Findings

The findings were summarized based on the main constructs of the study. First, a summary was provided on the response rate, indicating the percentage of participants who completed the study. Next, the reliability of the data for the main variables which is followed by the background information of the respondents which entailed their demographic details and other relevant characteristics. Finally, a summary was presented based on the variables investigated in the study, highlighting the key findings and outcomes related to each variable.

Anchored in Systems Theory, which emphasizes the interdependence of components within an institutional setting, the study aimed to evaluate how various factors influence preparedness in CBET implementation. Specifically, the research sought to assess the availability of curriculum materials, financial allocation, adequacy of infrastructure, readiness of trainers and technical staff, and the role of Boards of Governors (BoGs) in facilitating this preparedness. A mixed methods approach and exploratory research design were used to gather both quantitative and qualitative data from a target population of 70,591 individuals drawn from 21 public technical institutions within the Mt. Kenya East region. The sample included principals, Board of Governors chairpersons, Heads of Departments, trainers, and trainees, with a final realized response rate of 84.6%. Notably, 12 out of 18 BoG Chairpersons and 16 out of 19 Principals were successfully interviewed, while response rates from trainers and HoDs stood at 94.8% and 100% respectively. Data collection was achieved through questionnaires, interview schedules, and document analysis, with instruments validated and pre-tested to ensure reliability. Quantitative data were analyzed using SPSS version 23.0, while qualitative data were analyzed thematically. The presentation of information provided in this chapter is according to the variables of the study.

5.2.1 The availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

The study revealed significant quantitative and qualitative insights into CBET implementation in Mt. Kenya East Region's public technical institutions. Descriptive statistics showed that while 68.5% of respondents agreed that CBET curricula covered required competencies ($M = 3.89$, $SD = 0.737$), timely resource availability remained a

challenge ($M = 3.26$, $SD = 1.195$). Correlation analyses confirmed a strong positive relationship between curriculum availability and preparedness ($r^* = .668$, $p^* = .002$ for HODs; $r^* = .498$, $p^* < .001$ for trainers), indicating that institutional readiness hinges on accessible materials. Qualitative data from principals and trainees emphasized practical skill development and industry-aligned training as CBET strengths, though resource gaps (e.g., outdated tools, congested workshops) and trainer capacity limitations were persistent barriers.

The convergence of findings underscored that CBET success requires a holistic approach: curriculum access alone is insufficient without trainer professional development, equitable resource distribution, and industry partnerships. Triangulated data revealed that institutions with structured digital repositories, regular teacher training, and dual-training programs demonstrated higher compliance with CBET standards, aligning with global best practices for vocational education reform.

5.2.2 Financial allocation in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

The study revealed significant quantitative evidence that financial preparedness for CBET implementation remains inadequate in Mt. Kenya East TVET institutions. Descriptive statistics showed 78% of departments face budget shortfalls ($M = 2.37$, $SD = 1.17$), with only 42% maintaining complete procurement records. Correlation analysis demonstrated a moderate positive relationship between financial allocation and CBET preparedness ($r = .392$, $p < .01$) across both HOD and trainer responses, indicating that increased funding

consistently correlates with better implementation readiness despite current resource constraints.

Qualitative findings from principals, BOG Chairpersons, trainees and document analysis consistently highlighted three key challenges: chronic underfunding of essential materials, inconsistent financial management systems, and reliance on unsustainable stopgap measures like income-generating activities. The convergence analysis revealed striking alignment across data sources, with documentary evidence of budget variances and procurement gaps directly corroborating stakeholder reports of financial shortfalls. This multi-method consistency underscores that financial constraints represent a systemic barrier affecting all aspects of CBET implementation from resource availability to administrative capacity.

5.2.3 Adequacy of infrastructure in preparedness of curriculum implementation on CBET in Public TVETs in Mt. Kenya East Region

The study revealed significant infrastructure inadequacies hindering effective CBET implementation in Mt. Kenya East TVET institutions. Quantitative findings showed only 26.3% of HODs reported sufficient workshops ($M = 2.63$, $SD = 1.34$), while 71.2% of trainers acknowledged digital resource access ($M = 3.99$), though with notable shortages. Correlation analyses demonstrated strong relationships between infrastructure adequacy and CBET preparedness, particularly among HODs ($r = .763$, $p < .001$). Qualitative data from principals and trainees consistently highlighted workshop congestion, outdated equipment, and unreliable ICT facilities, with document analysis confirming safety hazards and maintenance gaps in physical infrastructure.

Key convergences emerged across all data sources, clearly showing that physical infrastructure deficits, especially in workshops and labs, and uneven ICT readiness were the most critical barriers to CBET implementation. While institutions employed strategies like industry partnerships and digital labs to mitigate gaps, these measures remained inconsistent, with maintenance and funding challenges persistently undermining infrastructure adequacy and, consequently, CBET preparedness. The triangulated evidence consistently positioned infrastructure quality as a central determinant of successful competency-based training outcomes.

5.2.4 Readiness of trainers in curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

The quantitative descriptive findings revealed that trainers exhibited strong competency in CBET implementation, with high agreement in industry integration ($M = 4.32$, $SD = 0.759$), assessment skills ($M = 4.22$, $SD = 0.747$), and familiarity with occupational standards ($M = 4.33$, $SD = 0.706$). However, moderate preparedness was observed in digital tool usage ($M = 3.55$, $SD = 0.962$) and workshop attendance ($M = 3.66$, $SD = 1.261$), while trainee sensitization was critically lacking ($M = 1.76$, $SD = 1.141$). Correlation analyses showed significant positive relationships between curriculum availability and preparedness for CBET implementation in public technical institutions in Mt. Kenya East Region, Kenya ($r = .498$, $p < .005$). The qualitative insights aligned with these trends, emphasizing trainers' confidence in practical CBET application but highlighting concerns about inconsistent institutional support and technological adaptation.

The convergence of findings indicates that while trainers possess strong foundational CBET competencies, systemic gaps, particularly in trainee engagement, digital literacy,

and professional development, this hinder full curriculum implementation. These results suggest that institutional reinforcement in training support and resource allocation is essential for optimizing CBET effectiveness.

5.2.5 The extent to which Board of Governors moderates the preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

The study's quantitative findings revealed significant challenges in CBET implementation, with descriptive results showing that over 70% of respondents identified inadequate funding as a primary barrier, particularly for procuring training materials and equipment. Correlation analyses further indicated a strong positive relationship between industry partnerships and perceived CBET success, though only 35% of institutions reported structured collaborations with employers. Trainer capacity gaps were prominent, with 65% lacking formal CBET training, while institutional monitoring was weak, as 60% of HODs cited insufficient oversight mechanisms.

Qualitative findings reinforced these issues, with principals and BoG members emphasizing financial constraints, inconsistent policy enforcement, and the need for stronger industry linkages. Trainees and trainers highlighted infrastructure deficits and inadequate practical training opportunities. Document analysis revealed misaligned strategic plans and procurement delays due to budgetary shortfalls. The convergence of quantitative and qualitative results underscored systemic gaps in financing, governance, and capacity building, with all data sources pointing to the need for sustainable resource

allocation, formalized industry engagement, and strengthened trainer development to achieve effective CBET implementation.

5.2.6 Extent to which curriculum implementation on CBET has been implemented in public TVETs in Mt. Kenya East Region

The study's quantitative findings revealed significant challenges in CBET implementation, with 78% of HODs and trainers identifying inadequate funding as a major obstacle ($M = 4.3$, $SD = 0.7$). Correlation analyses showed institutions with active industry partnerships had 22% higher completion rates ($r = .48$, $p < .05$), while only 38% of trainers reported confidence in CBET assessment methods. Qualitative data from interviews and open-ended responses consistently emphasized resource constraints, with principals highlighting delayed disbursements and trainees requesting more practical training opportunities. Document analysis confirmed these gaps, showing only 40% of planned workshop upgrades were completed and practical sessions accounted for just 45% of contact hours.

The convergence of findings across methodologies revealed three critical patterns: persistent financial constraints undermining implementation quality, insufficient industry engagement limiting curriculum relevance, and systemic trainer capacity gaps affecting assessment quality. All data sources consistently identified these interconnected challenges as primary barriers to effective CBET adoption, while also highlighting governance inefficiencies as contributing factors. These aligned results provide robust evidence that financial reforms, strengthened industry partnerships, and comprehensive trainer development should be prioritized for successful CBET implementation in Kenyan TVET institutions.

5.3 Conclusion of the Study

Preparedness to implement curriculum in CBET is crucial in TVET institutions. It requires a concerted effort of all stakeholders. The study highlighted the preparedness in curriculum implementation of CBET in public technical institutions in Mt. Kenya East Region, Kenya. The effectiveness of curriculum implementation was characterized by availability of curriculum, financial allocation, adequacy of infrastructure, readiness of the trainers and the Board of Governors/Councils. The conclusion made regarding each objective is stipulated below.

5.3.1 The availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

This study conclusively demonstrates that effective implementation of Competency-Based Education and Training (CBET) in Mt. Kenya East Region's public technical institutions requires a multifaceted approach addressing curriculum accessibility, trainer capacity, and industry alignment. The quantitative findings established a statistically significant relationship between curriculum availability and institutional preparedness, while qualitative data revealed critical implementation gaps including inadequate practical resources, trainer competency deficiencies, and inconsistent industry engagement. The convergence of results particularly highlights that while curriculum documents form the essential foundation for CBET, their impact is maximized only when complemented by comprehensive trainer professional development, equitable distribution of learning materials, and strong industry partnerships. The holistic analysis indicates that institutions performing well across these interconnected dimensions demonstrate superior CBET implementation outcomes, suggesting that policymakers and administrators must adopt

integrated strategies addressing all three components simultaneously. Ultimately, the study provides empirical evidence that successful CBET adoption depends not on any single factor, but rather on the synergistic optimization of curriculum resources, human capacity building, and labor market relevance - a finding with significant implications for TVET reform efforts in Kenya and similar contexts.

5.3.2 Financial allocation in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This study conclusively demonstrates that financial allocation significantly impacts CBET curriculum implementation preparedness in Mt. Kenya East TVET institutions, with quantitative results revealing moderate but statistically significant correlations ($r = .392$) between funding and readiness indicators. The multi-method investigation consistently identified three critical findings: first, chronic systemic underfunding creates substantial resource gaps that hinder effective CBET delivery; second, despite established financial management structures, implementation inconsistencies undermine transparency and efficiency; and third, while institutions actively pursue alternative funding strategies through IGAs and partnerships, these measures remain insufficient to compensate for baseline funding shortfalls. The convergence of quantitative budget analyses, qualitative stakeholder reports, and documentary evidence paints a comprehensive picture of institutions struggling to implement ambitious curriculum reforms within constrained financial ecosystems. These findings collectively indicate that while financial factors are

not the sole determinant of CBET success, sustainable implementation requires both increased baseline funding and strengthened financial management capacity to ensure resources effectively reach the point of instruction. The study ultimately concludes that addressing these financial challenges represents a necessary precondition for successful competency-based education transformation in Kenyan TVET institutions.

5.3.3 Adequacy of infrastructure in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This study conclusively demonstrates that inadequate physical and ICT infrastructure significantly impedes effective CBET implementation in Mt. Kenya East TVET institutions, with quantitative data revealing critical shortages in workshops (only 26.3% adequacy) and moderate but inconsistent ICT readiness (71.2% access yet persistent connectivity issues), while qualitative evidence from multiple stakeholders consistently highlighted overcrowded facilities, obsolete equipment, and safety concerns. The strong correlation between infrastructure adequacy and CBET preparedness ($r = .763$ among HODs), coupled with converging reports of improvised solutions like industry partnerships and digital labs, collectively underscore that while institutional mitigation strategies exist, systemic infrastructure gaps remain the primary barrier to successful competency-based training. These findings ultimately position targeted infrastructure investment, standardized maintenance protocols, and equitable resource distribution as essential

prerequisites for achieving CBET's transformative potential in Kenya's technical education sector.

5.3.4 Readiness of trainers in curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This study demonstrates that while trainers exhibit strong foundational competencies in CBET implementation—particularly in assessment design, industry-aligned instruction, and occupational standards application—systemic challenges persist in digital literacy, institutional support, and trainee engagement. The convergence of quantitative and qualitative findings reveals a critical disconnect between individual trainer preparedness and organizational structures, highlighting that effective CBET delivery requires not only skilled educators but also sustained professional development, technological resources, and institutional policies that foster curriculum alignment. The moderate performance in digital tool usage and workshop attendance, coupled with overwhelmingly low trainee sensitization, suggests that successful CBET adoption hinges on addressing both pedagogical and systemic barriers. Moving forward, interventions must adopt a dual focus: enhancing trainer capabilities in emerging areas such as digital integration while strengthening institutional frameworks to ensure consistent support, resource allocation, and stakeholder engagement for sustainable CBET implementation.

5.3.5 The extent to which Board of Governors moderates the preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This study conclusively demonstrates that while the theoretical framework for CBET implementation in Mt. Kenya East's TVET institutions is well-established, systemic

barriers significantly hinder its effective execution. The triangulated findings reveal three critical areas of concern: chronic financial constraints that limit infrastructure development and resource procurement, weak governance mechanisms resulting in inconsistent policy implementation and oversight, and insufficient trainer capacity coupled with inadequate industry linkages. Quantitative data highlighted severe funding shortages affecting 70% of institutions and only 35% meaningful industry engagement, while qualitative findings exposed operational deficiencies in strategic planning, procurement processes, and practical training delivery. The convergence of these results paints a clear picture of an implementation gap where institutional readiness lags behind policy ambitions. To realize CBET's transformative potential, targeted interventions must address these interconnected challenges through sustainable financing models, strengthened governance frameworks with robust monitoring systems, comprehensive trainer development programs, and formalized industry partnerships. These measures would create the necessary ecosystem for successful CBET implementation that aligns with both educational objectives and labor market demands.

5.3.6 Extent to which curriculum implementation on CBET has been implemented in public TVETs in Mt. Kenya East Region

This study concludes that while Kenya's public TVET institutions in Mt. Kenya East Region have made measurable progress in adopting CBET frameworks, systemic challenges continue to hinder full implementation and effectiveness. The convergent findings from quantitative surveys, qualitative interviews, and document analysis reveal three fundamental constraints: chronic underfunding manifested through delayed disbursements and inadequate infrastructure, insufficient industry collaboration resulting

in limited workplace learning opportunities, and critical capacity gaps among trainers in delivering competency-based instruction and assessment. The research demonstrates that these challenges are interrelated, with financial constraints exacerbating trainer capacity deficits and weak industry partnerships undermining curriculum relevance. Despite established monitoring systems and quality assurance mechanisms, the study reveals a persistent theory-practice imbalance, with institutions struggling to achieve the recommended 60% practical training threshold. Governance inefficiencies, including bureaucratic delays and inconsistent policy implementation, further compound these challenges. However, the data also identifies clear pathways for improvement, particularly through predictable funding mechanisms, formalized industry partnerships, and continuous professional development for trainers. These findings collectively suggest that while CBET implementation is progressing, its potential to produce work-ready graduates will remain limited without addressing these structural barriers through coordinated policy interventions and institutional reforms.

5.4 Recommendations of the Study

The study deduced some recommendations based on the findings, and further described the implication of the results on theories, practices and policies. The recommendations provided here in this sub-section are organized according to the objectives of the study.

5.4.1 The availability of curriculum in preparedness of implementation of CBET in public TVETs in Mt. Kenya East Region

To enhance CBET implementation in Mt. Kenya East Region's public technical institutions, the following evidence-based recommendations are proposed: TVET CDACC and county education officials should prioritize establishing centralized digital curriculum

repositories and ensure timely distribution of updated learning materials to all institutions. Institutional administrators must allocate dedicated budgets for practical equipment and workshops while implementing mandatory CBET training programs for trainers, including ICT integration and industry attachment opportunities. Heads of Departments should institutionalize monthly curriculum review sessions involving both trainers and industry partners to maintain alignment with labor market needs. Quality Assurance teams need to develop standardized monitoring tools to track both resource availability and pedagogical implementation fidelity. The Ministry of Education should facilitate public-private partnerships to support dual training programs and secure sustainable funding for CBET infrastructure development. These coordinated actions, targeting curriculum access, trainer capacity, and industry relevance simultaneously, will address the key gaps identified across all data sources and drive effective CBET adoption.

5.4.2 Financial allocation in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

Based on the study's comprehensive findings, the following evidence-based recommendations are proposed: The Kenyan Ministry of Education should implement three key actions: (1) establish and enforce timely disbursement mechanisms for TVET capitation funds to address chronic budget shortfalls, (2) develop standardized minimum funding benchmarks for CBET implementation tied to specific program requirements, and (3) create partnership frameworks to facilitate sustainable industry collaborations. TVET institutions must concurrently: (1) strengthen financial governance through capacity building for Boards of Management on modern procurement and audit practices, (2) implement transparent budgeting processes with direct trainer input on resource needs, and

(3) formalize income-generating activities through business development support while safeguarding educational quality. County governments should complement these efforts by: (1) allocating specific bursary funds for CBET material costs, and (2) facilitating local industry partnerships through policy incentives. These multi-level interventions, when implemented cohesively, would address both systemic funding gaps and institutional capacity constraints identified across all data sources.

5.4.3 Adequacy of infrastructure in preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

To address the infrastructure gaps hindering CBET implementation, this study recommends that the Kenyan Ministry of Education, in collaboration with TVETA and county governments, should: (1) prioritize targeted funding to modernize workshops and laboratories to meet industry standards, ensuring at least a 1:5 trainee-to-equipment ratio; (2) establish a centralized ICT upgrade program to provide reliable high-speed internet, adequate computers, and simulation software across all TVET institutions; (3) develop and enforce mandatory maintenance protocols, including quarterly equipment audits and safety inspections overseen by institutional boards; (4) formalize public-private partnerships through policy frameworks that incentivize industry investment in training facilities and dual-training programs; and (5) implement a phased infrastructure development plan aligned with enrollment projections, with priority given to rural institutions currently facing the most severe deficits. These interventions should be monitored through annual CBET readiness assessments tied to infrastructure benchmarks.

5.4.4 Readiness of trainers in curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

To strengthen CBET implementation, institutions should prioritize three key actions: First, training departments must develop mandatory digital literacy programs for trainers, focusing on practical integration of educational technologies into CBET delivery, supported by dedicated ICT resource allocation. Second, TVET regulatory bodies like TVETA should institutionalize periodic industry-educator collaboration forums and standardized assessor certification processes to maintain curriculum relevance and assessment quality. Third, institutional leadership needs to implement structured trainee sensitization programs and establish monitoring systems to ensure consistent professional development, including quarterly CBET-focused workshops and performance metrics linking training attendance to teaching outcomes. These interventions should be implemented through coordinated efforts between individual trainers (skill application), department heads (program oversight), and institutional policymakers (resource provision and quality assurance), creating an ecosystem where individual competencies are reinforced by systemic support structures.

5.4.5 The extent to which Board of Governors moderates the preparedness of curriculum implementation on CBET in public TVETs in Mt. Kenya East Region

This study conclusively demonstrates that while the theoretical framework for CBET implementation in Mt. Kenya East's TVET institutions is well-established, systemic barriers significantly hinder its effective execution. The triangulated findings reveal three critical areas of concern: chronic financial constraints that limit infrastructure development and resource procurement, weak governance mechanisms resulting in inconsistent policy implementation and oversight, and insufficient trainer capacity coupled with inadequate industry linkages. Quantitative data highlighted severe funding shortages affecting 70% of

institutions and only 35% meaningful industry engagement, while qualitative findings exposed operational deficiencies in strategic planning, procurement processes, and practical training delivery. The convergence of these results paints a clear picture of an implementation gap where institutional readiness lags behind policy ambitions. To realize CBET's transformative potential, targeted interventions must address these interconnected challenges through sustainable financing models, strengthened governance frameworks with robust monitoring systems, comprehensive trainer development programs, and formalized industry partnerships. These measures would create the necessary ecosystem for successful CBET implementation that aligns with both educational objectives and labor market demands.

5.4.6 Extent to which curriculum implementation on CBET has been implemented in public TVETs in Mt. Kenya East Region

Based on the study's findings, the following evidence-based recommendations are proposed: The Kenyan Ministry of Education, in collaboration with TVET CDACC, should implement a standardized, timely funding disbursement system with built-in accountability measures to address resource gaps, while institutional administrators must develop strategic industry partnerships through formal MOUs that guarantee student placements and curriculum co-design with employers. TVET institutions should immediately launch comprehensive trainer capacity-building programs focusing on CBET pedagogy and assessment, supported by mandatory industry attachments funded through public-private partnerships. Quality assurance bodies must enforce stricter monitoring of practical training hours (minimum 60% of contact time) and competency-based assessment

practices, while institutional governing councils should streamline decision-making processes to reduce bureaucratic delays. Finally, the national government should establish a CBET implementation task force comprising industry representatives, educators, and policymakers to review progress biannually and align training with evolving labor market needs. These coordinated actions, when implemented systematically, would address the identified financial, pedagogical, and governance challenges while enhancing the overall quality and relevance of CBET delivery.

5.5 Implication of the Findings on Theories, Practices and Policies

The findings of the study concluded that the preparedness of an institution had positive and substantial influence on curriculum implementation of CBET in TVET institutions in Mt. Kenya East Region, Kenya. These findings are provided here in this sub-section.

5.5.1 Implications of the study findings on theories

The study findings align closely with Systems Theory, as proposed by Ludwig von Bertalanffy, by highlighting the interconnectedness of various components within the TVET institutions. The research underscores how factors such as curriculum availability, financial allocation, infrastructure adequacy, and trainer readiness are interdependent and collectively influence the preparedness for CBET implementation. Systems Theory states that changes in one component can ripple through the entire system, and this is evident in the study, where deficiencies in infrastructure or financial resources directly impact the effectiveness of curriculum delivery and trainer performance. The holistic approach of Systems Theory is thus validated, emphasizing the need for balanced attention to all institutional elements to achieve successful CBET adoption.

Furthermore, the study demonstrates the dynamic equilibrium advocated by Systems Theory, where institutions must continuously adapt to maintain stability amid external and internal pressures. For instance, the findings reveal that delays in financial disbursements or gaps in trainer training disrupt the equilibrium, leading to systemic inefficiencies. The theory's emphasis on feedback loops is also reflected in the study's call for regular monitoring and stakeholder engagement to address these imbalances. By viewing TVET institutions as open systems interacting with their environment—such as industry partners and government policies—the study reinforces the Systems Theory principle that institutions cannot operate in isolation but must adapt to external demands to remain viable. Lastly, the study's mixed-methods approach aligns with Systems Theory's multidisciplinary perspective, integrating quantitative and qualitative data to capture the complexity of institutional preparedness. The theory's focus on emergent properties—where the whole is greater than the sum of its parts—is mirrored in the finding that successful CBET implementation requires synergistic collaboration among curriculum developers, trainers, administrators, and policymakers. The study thus not only applies Systems Theory but also extends its relevance to contemporary educational reforms, demonstrating its utility in diagnosing and addressing systemic challenges in TVET institutions.

5.5.2 Implications of the study findings on practices

The study's findings underscore the need for fundamental transformation in TVET institutional practices to enable effective CBET implementation. Curriculum dissemination must become systematic through centralized updates and digital repositories, while trainer development should incorporate continuous CBET pedagogy, ICT training, and structured

industry exposure. Assessment systems should move from theoretical exams to authentic, industry-aligned competency evaluations, and monitoring systems should be enhanced to capture both resource inputs and learner outcomes. These reforms signify a paradigm shift towards an integrated CBET model where pedagogy, curriculum delivery, and industry relevance are strategically aligned.

Financial and operational reforms are equally critical. Budgeting must shift to dynamic, needs-based models with clear allocations for practical learning resources, while procurement systems should ensure timely, quality acquisitions. Dual financing approaches, combining public funds and internally generated revenue, must support institutional sustainability. Trainers should adopt resource optimization techniques like equipment sharing, modular practical sessions, and cost-effective simulation. Assessment models should transition to continuous competency evaluation to ease cost burdens. These changes represent a shift towards strategic resource management as a central pillar of CBET implementation.

Infrastructure, governance, and quality assurance practices must also evolve. Institutions must address infrastructure gaps through staggered practicals, blended learning, and improved facility maintenance. Industrial attachments need restructuring into dual training models that guarantee equipment access, while digital learning should be institutionalized with ICT access benchmarks. Governance must ensure CBET-aligned planning, mandatory Board of Governors meetings, and standardized quality monitoring. Industry engagement should become structured through curriculum co-design and formal workplace training. Together, these reforms aim to create a sustainable ecosystem that aligns TVET systems

with CBET's demands for competency, industry relevance, and learner readiness for the labor market.

5.5.3 Implications of the study findings on policies

The study's findings underscore the urgent need for comprehensive policy reforms to support effective CBET implementation across Kenya's TVET institutions. Key recommendations include the establishment of a Mandatory CBET Funding Framework to ensure adequate and timely resource allocation—specifically mandating that at least 30–40% of TVET budgets be directed toward practical training, infrastructure modernization, and ICT upgrades. A Dual Funding Policy is also necessary, encouraging institutions to blend public funds with internally generated revenue and industry partnerships, while a Transparent Procurement Policy should promote accountability through standardized tracking and public reporting of CBET-related expenditures.

Further, the study highlights the need for structured governance and human capital policies. This includes institutionalizing Board of Governors (BoG) oversight through enforceable quality assurance frameworks with clear performance metrics. A standardized trainer competency policy must be enacted, requiring all trainers to undergo CBET certification, demonstrate digital literacy, and complete biennial industry attachments. These provisions would ensure trainers are continuously aligned with industry demands and pedagogical innovations. Additionally, institutions should implement structured CBET protocols involving trainee orientation, continuous professional development, and competency-based assessment validation.

Lastly, the study calls for stronger industry engagement and decentralization policies. A Public-Private Partnership Charter should mandate formalized collaboration through

MOUs, with tax incentives for companies involved in equipment donation, curriculum co-design, and dual-training models. Counties should establish localized CBET implementation committees and adopt Decentralized Maintenance Policies to uphold infrastructure standards through quarterly audits. These policy interventions must be codified under the TVET Act to guarantee nationwide compliance, enabling a sustainable, industry-relevant, and quality-assured competency-based training system.

5.6 Recommendations for Further Studies

A future study can be done on digital-practical hybrid training models for resource-constrained TVET Institutions. This is informed by the convergence of findings on both ICT access ($M = 3.99$) and physical resource constraints (e.g., low infrastructure adequacy and 1:5 trainee-to-tool ratios). The proposed research would test blended learning models that combine simulation technologies (like virtual welding or CAD) with shared physical equipment protocols. Given the acute shortage of tools and workshop space, this study would help determine whether hybrid models can uphold CBET competency standards in real-world, low-resource settings. It also directly links to the rising digital integration needs and provides practical pathways for scalable, equitable CBET delivery.

Only 38% of trainers expressed confidence in assessing CBET competencies. The study also highlighted gaps in professional development and pedagogical consistency. This recommendation aims to evaluate how micro-credentials, industry attachments, and CBET-specific CPD programs impact student competency acquisition and trainer assessment capability over time. In that connection, a mixed-methods longitudinal study on trainer professional development and CBET outcomes. Trainers are the frontline actors in CBET delivery. Improving their skills and assessment competence can have a multiplier

effect on institutional outcomes. This study addresses an urgent gap by tying capacity-building investments to measurable results, advancing evidence-based teacher development strategies.

An Action Research on Public-Private Governance Models for Industry Engagement is also recommended. This is because, while the study found only 35% industry engagement, qualitative findings emphasized weak governance and irregular employer participation. This follow-up study would investigate successful international or regional models for structured employer involvement in CBET—including curriculum co-design, apprenticeships, and industry-led quality assurance. CBET is inherently demand-driven. Without sustained industry partnerships, its implementation risks becoming a theoretical exercise. This study would contribute concrete frameworks for institutionalizing employer involvement, closing a critical gap in Kenya's CBET ecosystem.

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