ASSESSMENT OF TRAINERS' PREPAREDNESS FOR COMPETENCY-BASED EDUCATION TRAINING IMPLEMENTATION IN ELECTRICAL PROGRAMMES: A CASE OF TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING INSTITUTIONS IN NAIROBI COUNTY, KENYA

BY

WEFWAFWA FAITH NALIAKA

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DECLARATION

DECLARATION BY THE CANDIDATE

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……..... …….

Wefwafwa Faith Naliaka **DATE**

MTED/6074/22

DECLARATION BY SUPERVISORS

This thesis has been submitted with our approval as university supervisors.

……... ……..

Dr. Titus Murgor **DATE**

Department of Technology Education

School of Education

Moi University

……. ……..

Dr. Julius Keter **DATE**

Department of Technology Education

School of Education

Moi University

DEDICATION

This work is dedicated to my beloved husband, Evans Mos, my precious sons, Denys Uriel and Theo Lael, and my parents, Henry and Janet, whose love for education has inspired my academic achievements.

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I give all glory to God for my good health and the opportunity to pursue my master's program at Moi University in the Department of Technology Education.

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ABSTRACT

The growing focus on Competency-Based Education and Training (CBET) in Kenya necessitated a deeper understanding of its implementation in technical training institutions. The country's low ranking in the Global Talent Competitiveness Index underscored the urgent need for technical skills development. Following the rollout of CBET curriculum, empirical studies have highlighted a slow uptake among trainers while their level of preparedness remains relatively unexplored. The purpose of this study was therefore to assess trainers' preparedness towards the implementation of CBET approach in electrical programmes in TVET institutions in Nairobi County. The specific objectives of the study were: to assess existing training approaches adopted in electrical programmes; to explore trainers' perceptions of CBET, to evaluate trainees' views on the effectiveness of CBET and to investigate the challenges hindering CBET implementation in TVET institutions in Nairobi County. This study was anchored on Ajzen's Theory of Planned Behaviour. Grounded in the pragmatic paradigm, this study employed the mixed-methods approach where convergent design was utilized to integrate quantitative and qualitative data. Purposive sampling was used to select 3 TVET institutions and 6 trainers while stratified and random sampling were used to obtain 369 trainees, and convenient sampling was used to select 3 heads of departments. The sampling yielded a response rate of 88.9%. Data collection was conducted through semi-structured questionnaires and interview schedules. Descriptive analysis of frequencies and means was applied to quantitative data while qualitative data were subjected to inductive thematic analysis. Qualitative data from interviews indicated that despite efforts to align electrical programmes with CBET principles, traditional methods such as lectures, continued to dominate. The study further revealed that while the majority of trainers had a sufficient knowledge of the CBET concept, they struggled to prepare and deliver CBET-based sessions effectively. Although some trainers resisted the changes, most had a generally positive attitude opinion towards the CBET approach. However, 73% of the trainees perceived their trainers as unprepared to implement CBET due to a lack of understanding. Additionally, 76.7% of the trainees believed that the integration of CBET had not been fully realized in the electrical programmes. Despite these concerns, 93% of the trainees collectively favoured the CBET approach as an instructional method, recognizing its potential to enhance practical skills and employability. The results revealed that challenges such as lack of competent trainers due to insufficient training and industry experience, inadequate infrastructure and resources, and high costs of materials, hindered CBET implementation. The study concluded that trainers' preparedness was essential for successful CBET implementation in electrical programmes, but their lack of readiness hindered its effectiveness. This study recommended the need to align CBET programmes with industry demands, enhance the recognition of CBET certifications, provide sufficient training facilities, and establish continuous professional development opportunities for trainers. Whilst contributing to the broader field of CBET and its implementation in the Kenyan context, the study highlights areas for future research including undertaking longitudinal and experimental studies to explore the impact of continuous professional development on trainers' ability to deliver CBET.

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ABBREVIATIONS AND ACRONYMS

BCEF : Basic Curriculum Education Framework

CBA : Competency Based Assessment

CBE : Competency-Based Education

CBET : Competency Based Education and Training

CBT : Competency-Based Training

CDACC : Curriculum Development, Assessment and Certification Council

CETP : Competency-Based Education and Training Programme

EAC : East African Community

GTCI : Global Talent Competitiveness Index

ICT : Information and Communication Technology

KNEC : The Kenya National Examinations Council

KMA : Kenya Association of Manufacturers

MOE : Ministry of Education

MMR **:** Mixed Methods Research

NITA : National Industrial Training Authority

NVQ: : National Vocational Qualification

OAAT : Object-Oriented Collective Activity Theory

QAS : Quality Assurance System

RPL : Recognition of Prio Learning

TPD : Teacher Professional Development

TTI : Technical Training Institute

TVC : Technical and Vocational College

VTC : Vocational Training Centre

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter introduces the study's background, statement of the problem and the purpose, objectives and research questions. It also outlines the justification for the study, its significance, scope, limitations and assumptions. Furthermore, it presents the theory that underpins this study as well as the conceptual framework. It concludes with the definition of terms as operationalized in the study and a chapter summary.

1.2 Background of the Study

In many countries, technical and vocational education has been rendered a major tool of competency-based education and training (CBET). The core aim of this type of teaching is to give individuals practical skills which are required by employers. Such shift in educational paradigms is most important for developing countries where traditional models of education have often failed to address labour market needs. This study examined how Kenya's Technical and Vocational Education and Training (TVET) institutions have adopted CBET as part of a global movement towards outcome-based education, which places particular focus on the acquisition of specific competencies pertinent to job demands (Mulenga & Kabombwe, 2019).

The introduction of the CBET in TVET institutions was viewed as a response to an increasing need for workers who are not only academically qualified but also technically skilled. The conventional education system which stressed theoretical knowledge over practical abilities often left graduates ill-equipped for the labour market demands. In consequence, there was great lack of conformity between graduates' skills

and employers' requirements, resulting in high youth unemployment rates (Dambudzo, 2018). CBET attempts to close this gap by concentrating on the cultivation of particular attributable competences tied directly to job performance thus increasing graduate employability.

The significance of CBET in bridging the skills gap in the job market has been recognized by the government. Kenya Vision 2030, which sets out the country's development objectives, highlights that skilled and competitive labour force is necessary to drive economic growth. In line with this, the TVET sector reforming has been accorded priority by the government with particular emphasis on CBET implementation. This strategy aims at producing graduates who are not only academically proficient but also have hands-on expertise needed by various industries (Kipngetich et al., 2021).

Several policy and regulatory frameworks have guided the adoption of CBET in TVET institutions in Kenya. For instance, the Competency-Based Education and Training Policy Framework (2018) states that occupational standards approved by industry stakeholders would be established to transform TVET sector. These standards serve as a basis for developing flexible modular training programmes and qualifications that meet labour market requirements. Additionally, it focuses on appreciating earlier learning experiences and allowing multiple ways for acquiring competences which form core elements of competency-based education and training (Kenya Vision 2030 Progress Report, 2020).

However, several challenges have been encountered during its implementation in TVET institutions despite the potential advantages of CBET. One such issue is the absence of adequate infrastructure and resources to support practical and experiential

learning. Transitioning from traditional training to competency-based education requires massive investments on infrastructure, technology and instruction design. Nevertheless, most of TVET institutions in Kenya generally do not have the required resources for full implementation of CBET. As a result, training quality has been compromised hence impacting CBET's effectiveness (Hadullo, 2021).

Another challenge revolves around trainers' readiness to effectively implement CBET. The effectiveness of CBET largely depends on the ability of trainers to offer competence-based training that meets the standards set by industry stakeholders. However, many instructors in technical institutions were trained using traditional educational models and may lack necessary skills and knowledge for implementing CBET. This hence necessitates capacity building programmes aimed at equipping trainers with competencies needed for effective delivery of CBET (Kogo et al., 2022).

Besides these challenges, another problem is that TVET institutions and industry stakeholder do not work together. However, CBET only becomes successful by having educators work in close collaboration with the industry players so that they guarantee that labour market-oriented training is delivered. Nevertheless, this cooperation is weak or does not exist at all in most cases leading to a mismatch between skills taught in TVET institutions and those required by employers. This mismatch has worsened the problem of skill shortages in the labour market and it has made CBET lose its effectiveness (Ndile, 2018).

However, the implementation of CBET in TVET institutions offers a big chance for bridging the gap between skills required on job field. Focusing more on specific competencies which are directly related to job performance can make CBET boost graduates' employability and contribute significantly towards national economic

growth. Nonetheless, concerted efforts are needed if this potential is to be realized including provision of adequate resources; trainers' capacity building; as well as strengthening partnerships among TVETs and industry players (Ruth, 2020).

Various factors that influence the success of CBET in TVET institutions have been identified by empirical studies. For instance, in Kenya, (Onyango,2023) carried out a study in the Rift Valley region and found out that the successful implementation of CBET is highly dependent on adequate resources including modern training equipment and learning materials. It was established that most of the TVET institutions did not have the required infrastructure for supporting CBET thereby leading to a gap between what is taught in them and what is demanded by industry. Similar to this finding is the ILO (2018) which stipulates that there must be huge investment in TVET infrastructure so as to meet requirements under competency-based curricula.

The successful implementation of CBET also depends on industry linkages. A study by Waweru and Muturi (2020) showed that TVET institutions which had strong links with the industries were better placed to provide competency-based training. These associations made it possible to match curricula with industrial standards as well as enabling hands on activities among trainees through internships and attachments. The report also supported the need for continuous professional development for instructors, arguing that those who are in contact with the job market can deliver CBET effectively. This is consistent with Mulongo (2019) whose research asserts that continuous partnership with industry is necessary for keeping CBET relevant and keeping trainers acquainted with upcoming technological changes within sectors.

From the foregoing, it is apparent that addressing the current gaps facing CBET implementation in Kenya is crucial in ensuring the set objectives of producing a skilled

and competitive workforce are met. Electrical and electronic technology is one of the technical courses that are found in most of TVET institutions across Kenya as well as being the researcher's area of interest hence it was found worthy of investigation. In this regard, therefore, this study sought to examine how prepared trainers were to implement CBET within electrical programmes in TVET institutions within Nairobi County so as to provide an understanding of their current state of readiness while pointing out areas that need further development to enhance the effectiveness of CBET implementation.

1.3 Problem Statement

According to the Global Talent Competitiveness Index, Kenya was ranked 97th out of 133 economies in 2022 and 98th out of 134 in 2023 (Lanvin & Monteiro, 2022, 2023). Among the Sub-Saharan countries, the nation has been found to lag greatly behind with a mean of 29.80 in several key indicators, including vocational and technical skills (VTS). As per the GTCI (2022) model, TVET institutions are presented as a critical input with the potential to develop VTS among trainees, thereby enhancing employability. Notably, VTS was identified as one of the key output pillars of the GTCI model. Contextually, while looking at the VTS indicator, a large portion of the Kenyan youth population is deemed to be lacking the necessary technical skills that can guarantee employability. This can be argued to have a negative impact on the economic performance of the country. Furthermore, this situation is likely to render Sustainable Development Goal (SDG) No. 4 (targets 4.3 and 4.4) on quality education and SDG No. 8 (target 8.2) on decent work and economic growth elusive.

Even so, in an effort to address the problem of skills gaps and labour market mismatches, Kenya has joined other countries in adopting a CBET approach to enhance

the delivery of its technical programmes. This followed a recommendation by the Kenya Association of Manufacturers (KAM, 2017), whose earlier survey had shown that the TVET sub-sector had produced graduate students whose training-related skills fell short of industry standards. Furthermore, in order to improve their knowledge and abilities, KAM had advised TVET trainers to participate in industry attachment at least once every three years. In agreement, Ministry of Education (MOE-SD TVET, 2018) asserted that the CBET approach would help to raise the standard of instruction and training in TVET institutions.

While the first CBET curriculum was introduced for use in Kenya almost four years ago, a report by TVETA (2021) has shown that the uptake of CBET, especially in electrical programmes at TVET institutions has been very slow. Notably, the GTCI model indicates that professional competence (in terms of trainers' knowledge, skills, attitudes, etc.) is critical to enabling quality training in TVET programmes. Further, a study by Ndile (2018) covering Nairobi Technical Training Institutes (TTIs) showed that 93% and 7% of trainers were confident about using CBET approaches and traditional approaches in the delivery of technical programmes, respectively. As this does not reflect in the actual uptake of the CBET approaches, it is possible that such trainers possess more theoretical knowledge than practical knowledge.

It light of this, the present study sought to explore trainers' preparedness towards implementing the CBET approach in electrical programmes in selected TVET institutions in Nairobi, Kenya.

1.4 Purpose of the Study

The purpose of this study was to assess trainers' preparedness towards the implementation of CBET approach in electrical programmes in TVET institutions in

Nairobi County. This would help readers to develop an understanding of the trainers' conceptualization of CBET principles, and their ability to implement CBET approaches in electrical programmes.

1.5 Objectives of the Study

The specific objectives of the study were to:

i. Examine the existing training approaches adopted by the electrical programmes trainers
ii. Explore trainers' perceptions on the use of CBET approach to facilitate learning electrical programmes
iii. Evaluate the views of trainees on the effectiveness of CBET approach in electrical programmes
iv. Investigate the possible challenges that undermine the implementation of CBET approach in electrical programmes

1.6 Research Questions

i. What are the existing training approaches used by electrical programme trainers?
ii. What are the perceptions of trainers regarding the use of CBET approach to facilitate learning in electrical programmes?
iii. What are the views of trainees regarding the effectiveness of CBET approach in teaching electrical programmes?
iv. What are the challenges that undermine the implementation of CBET approach in electrical programmes?

1.7 Justification of the Study

Competency-Based Education and Training (CBET) is now a leading approach in Technical and Vocational Education and Training (TVET) worldwide, focusing on practical, job-relevant skills that meet industry needs. In electrical programmes, CBET enhances employability and supports economic growth. However, its success depends on changes in teaching, curriculum, and assessment, making trainer preparedness critical.

Effective adoption requires careful planning, investment in infrastructure, technology, instructional design, and alignment with industry demands. Trainers are central to this process, and partnerships between TVET institutions and industry can ease implementation through continuous professional development.

In Kenya, CBET is a core element of national policies such as Vision 2030 and the CBET Policy Framework (2018), aimed at producing a globally competitive workforce. Nairobi County, a key economic hub, plays a vital role in achieving these goals, particularly in technical fields like electrical engineering. Assessing trainers' readiness is essential to ensure the local workforce can meet future demands in the electrical industry.

This study examined trainers' preparedness to implement CBET in Nairobi's TVET institutions. The findings are intended to guide policymakers, educators, and industry stakeholders in developing strategies for effective CBET execution, contributing to Kenya's industrialization and economic development plans

1.8 Significance of the Study

This study will contribute to the existing knowledge by providing empirical evidence on the current state of preparedness of trainers for implementation of CBET in TVET

institutions in Nairobi. The study's results will therefore provide useful information for policymakers, educational establishments and industry players aimed at making focused interventions to improve CBET effectiveness in technical programmes.

In particular, targeted findings would enable TVET institutions to establish support systems to help trainers transition with little resistance from traditional teaching methods to the CBET approach. In order to improve program relevance, this research may also urge the industry to participate in the development of the electrical curriculum by supplying occupational criteria. The findings would equally guide Kenya School of TVET and industries to offer targeted continuous training and professional development opportunities for trainers to enhance their skills and familiarity with the CBET approach.

The findings would also assist policy and regulatory bodies e.g. State Department of TVET in the Ministry of Education and TVETA in the design of policies for improving CBET implementation including provision of training facilities and equipment for effective practical training and enactment of electrical training policies that align to CBET. Furthermore, the findings would help TVET-CDACC and Qualification Awarding Institutions to undertake continuous review and improvement of the curriculum to ensure that the training programmes remain relevant and effective over time. Lastly, this study will serve as a foundation for additional research in the field of CBET, including experimental and longitudinal studies to investigate the influence of ongoing professional development on trainers' capacity to implement CBET.

1.9 Scope and Limitations of the Study

1.9.1 Scope of the Study

This study was limited to the assessment of trainers' preparedness in Nairobi County TVET institutions. It was conducted in Nairobi County TVET institutions and specifically focused on electrical programmes. The institutions were selected on the basis that they offered electrical programmes and had implemented CBET in Kenya. This study targeted trainers and trainees in the electrical department of the target institutions, and also include heads of departments. The targeted trainees were those in Level 5 and Level 6 of their program.

1.9.2 Limitations of the Study

i) The study relied on self-reported data from the respondents. Even so, the data collection instruments were checked for validity and reliability to ensure the findings were verifiable and reflected the actual situation being studied.

ii) The study only provided a snapshot of the influence of trainers' preparedness on CBET implementation in selected TVET institutions in Nairobi County. Therefore, the study may not account for potential changes or developments in other variables over time.

iii) The study was limited to TVET institutions in Nairobi County offering electrical program. Therefore, gathering information from other TVET institutions and other technical programs in Kenya was impossible.

1.10 Assumptions of the Study

This study made an assumption that TVET institutions in Nairobi County are offering electrical programmes, and that trainers facilitating such programmes have been trained on CBET. Consequently, the trainers are actively implementing CBET in their electrical

programmes. Additionally, it was assumed that TVET institutions within Nairobi have adequate resources as required for effective implementation of CBET in the electrical programmes.

1.11 Theoretical Framework

This study was anchored on the Theory of Planned Behaviour (TPB) which is a psychological model developed by Icek Ajzen in the (1980). Ajzen posits that the intention of the individual to perform a specific behaviour is a key factor in the theory of planned behaviour. As a measure of how hard someone is willing to try and how much effort they plan to put in to carry out a behaviour, intentions are thought to capture the motivational factors that influence a behaviour (Ajzen, 1991). As a general rule, a behaviour should be performed more frequently if it is intended to be done. TPB describes the relationship between people's attitudes, subjective norms, perceived behavioural control, and their behaviour. The TPB theory is depicted in Figure 1.1 in the form of a structural diagram.

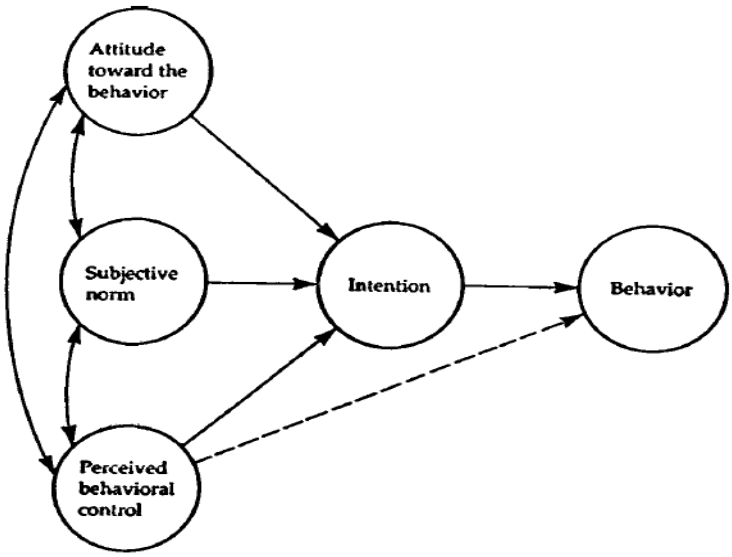

Figure 1.1: *Theory of planned behaviour (Ajzen, 1991, p. 182)*

The theory of planned behaviour is based on three distinct factors that determine intention. The first is the *attitude* toward the behaviour, which describes how much a person thinks favourably or unfavourably about the behaviour in question. They are an individual's positive or negative evaluations of a behaviour. The more positive a person's attitude towards a behaviour, the more likely they are to engage in that behaviour. Conversely, a negative attitude will discourage people from engaging in a particular behaviour.

The second predictor is a social factor termed *subjective norm*. It refers to the perceived social pressure to perform or not to perform the behaviour based on the beliefs of significant others in the individual's social environment. The more social pressure a person feels to engage in a behaviour, the more likely they are to engage in it. Conversely, if a person perceives that their social network would disapprove of the behaviour, they are less likely to engage in it.

The third antecedent of intention is the degree of *perceived behavioural control* which, as we saw earlier, refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles. This can include factors such as skills, resources, and obstacles that may affect a person's ability to perform the behaviour. If a person perceives that they have control over a behaviour, they are more likely to perform that behaviour. As a general rule, the more favourable the attitude and subjective norm with respect to a behaviour, and the greater the perceived behavioural control, the stronger should be an individual*s intention to perform the behaviour under consideration.

Regarding trainer preparedness, TPB proposes that a trainer’s intention to adopt a particular teaching method is determined by his/her attitude toward the method,

subjective norms and perceived behavioural control. A favourable attitude toward a teaching approach, perception of shared support in terms of their colleagues and community, together with self-efficacy beliefs as regards the efficacy of the implementation process are crucial for teachers' willingness to put into effect a teaching approach. Thus, an effective teaching approach including implementation of CBET, requires trainers' positive attitudes towards it. Furthermore, they should be supported through this process by their colleagues and educational community as well as have all necessary resources and trainings that would allow them feeling confident in their ability to implement it effectively.

From the aforementioned, this research opted for TPB because it helped the researcher to identify elements that affected trainer preparedness and come up with strategies to improve their CBET implementation.

1.12 Conceptual Framework

Creswell (2014) defined the conceptual framework as "a written or visual map summarizing key concepts and their proposed relationships within the context of research problem" (p.65). The conceptual framework for this study is illustrated in Figure 1.2

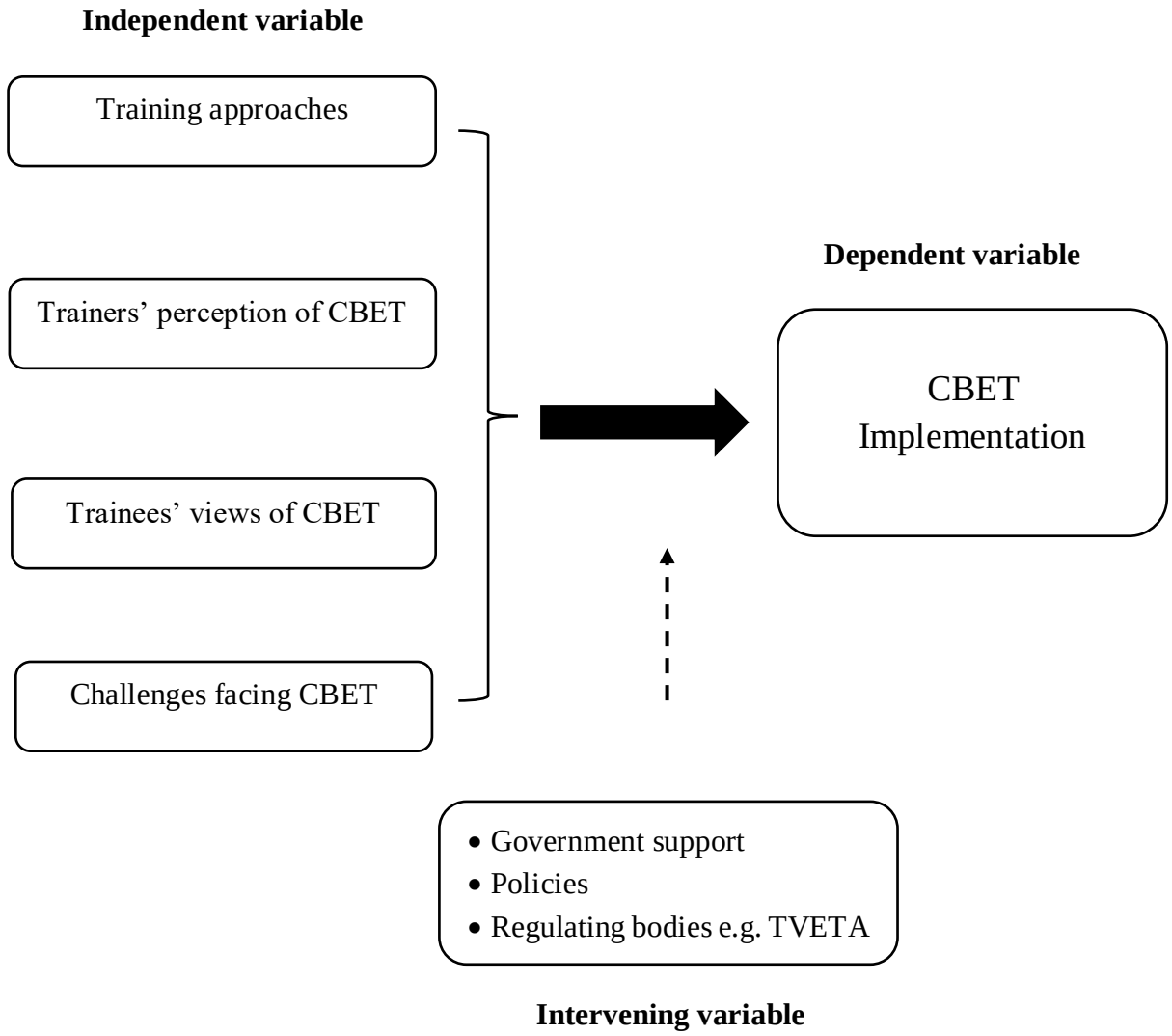

Figure 1.2: Conceptual Framework (Author, 2023)

1.13 Operational Definition of Key Terms

Competency-Based Education and Training (CBET) refers to training that emphasizes acquiring workplace skills, knowledge, and the right occupational attitudes (TVETA, 2019).

Trainer refers to a teacher or lecturer who professionally organizes teaching, learning, and work practice in a TVET institution.

Trainers' preparedness refers to the extent to which trainers are equipped with a set of requisite professional and pedagogical knowledge, skills and attitudes making them ready to effectively implement CBET

Training refers to an education and knowledge acquisition process within a Technical and Vocational Education and Training (TVET) establishment.

Electrical program: a field of study that covers the principles and applications of electrical energy, electronics, and electromagnetism, with applications in power generation, transmission, and distribution, electronics, communication, and control systems.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter begins by introducing the concept of Competency-Based Education (CBE) and Competency Based Education and Training (CBET), outlining their key features and benefits. It then explores the linkage between CBET and Technical and Vocational Education and Training (TVET), discussing the implementation of CBET in TVET institutions, its benefits, and the challenges faced. The chapter also reviews relevant policy documents that underpin the adoption of CBET approaches, both globally and in the Kenyan context. Finally, the review examines empirical studies on trainers' perceptions, trainees' views, and the challenges that undermine the implementation of the CBET approach, particularly in the context of electrical studies. The chapter concludes with a discussion of key issues from the literature and a chapter summary.

2.2 Competency-Based Education and Competency-Based Education & Training

Competency-Based Education (CBE) is a learner-centred model in which trainees make key decisions about how they build, apply, and demonstrate knowledge; assessment is integral and provides timely, actionable evidence of mastery rather than rewarding seat time (Levine & Patrick, 2019; Evans et al., 2020). CBE programmes use clear outcomes, aligned assessments, flexible pacing, and often recognise prior learning or work experience features linked to stronger labour-market relevance while scholars caution that an overly narrow focus on discrete competencies can sideline breadth and higher-order thinking, and that complex competencies raise consistency and rigour challenges (Kaufman, 2019). Successful implementation typically requires clear stakeholder communication, curriculum-assessment alignment to competencies, and

continuous evaluation; higher-education examples such as the University of Wisconsin show degree pathways awarded on demonstrated mastery (Curry, 2017; Stokes, 2017).

Competency-Based Education and Training (CBET) applies the same outcomes logic explicitly to occupational performance: competencies are specified against job standards, and learning and assessment are organised to meet those standards (Mulenga & Kabombwe, 2019). CBET has been adopted across vocational/technical education, workforce development, and professional programmes, with evidence of improved job performance and workplace readiness (Dambudzo, 2018; Schmidt, 2019). Designed to be adaptable, CBET supports self-paced progression that targets individual strengths and gaps particularly valuable for working adults balancing family and employment (Deißinger & Hellwig, 2005; Joseph & Tranos, 2020; Mwamwenda & Meleisea, 2016). Key adoption hurdles include ensuring assessment validity and reliability for complex competencies and financing the technology, infrastructure, and instructional design needed to run robust CBET systems (Açikgöz & Babadogan, 2021; Hadullo, 2021).

CBE and CBET share core principles clearly defined competencies, mastery-based progression, and personalised learning yet differ in emphasis: CBE is an educational approach, whereas CBET purposefully integrates education with vocational training for specific occupations and sectors (Camacho & Legare, 2016; Odewumi & Dekom, 2020). Both have been linked to improved progression, completion, and employability, often strengthened by industry-recognised credentials, apprenticeships, and on-the-job learning embedded alongside classroom work (Irvine & Kevan, 2017; Kipngetich et al., 2021; Lumina Foundation, 2015; Association for Career and Technical Education, 2015). Because CBET is tightly coupled to workplace performance, it typically requires additional resources (equipment, simulators, qualified assessors) and deep employer

partnerships to ensure relevance and authentic assessment (American Institutes for Research, 2022; Association for Career and Technical Education, 2015).

Given this review, blending CBE's mastery-based pedagogy with CBET's occupational specificity can produce programmes that are both educationally sound and industry-credible provided systems plan for rigorous assessment, invest in infrastructure and staff capability, and co-design with employers. These lessons from international experience offer a practical blueprint for TVET systems including Kenya's, to align learning with labour-market needs while safeguarding breadth, quality, and fairness in assessment (Stokes, 2017; Curry, 2017; Kaufman, 2019).

2.3 Implementation of CBET in TVET Institutions

CBET, as stated earlier stresses on the development of competencies through practice and experiential learning. Importantly, TVET institutions are very crucial in giving hands-on and industry specific skills to trainees that enable them transit into employment. CBET is an approach that integrates knowledge, attitudes, skills while emphasizing the application of learning in practical situations as noted by Kipngetich et al (2021). To implement CBET in TVETs, there has to be a change from traditional education and training delivery methods. Ruth (2020) argues that implementation of competency based CBET in TVETS must have curricula which are more practical oriented when it comes to issues concerning skills and knowledge. The syllabuses must therefore be developed through consultation with professionals working in those particular lines so as to address the relevant market needs.

Provision of practical and experiential learning opportunities is a must while implementing CBET in TVETs. Okumu and Bbaale (2019) posit that hands-on training is necessary for learners to obtain essential knowledge and skills for the workplace.

Many studies reveal that CBET has more advantages than TVETs. In fact, according to Ndile (2018), some CBET programmes are tailored towards meeting employers' needs as they equip trainees with current marketable practical skills. Additionally, these programmes also encourage critical thinking and problem-solving skills which are highly needed in the workplace environment. Moreover, by enrolling in TVET based CBET programmes, trainees often get an opportunity to acquire industry-specific competencies which cannot be gained from the usual academic settings. Thus Kankolongo & Mpundu-Kaambwa (2017) explain that in order to make them ready for challenges at workplace, such programmes develop real-life situation through practice exposure in TVETs. CBET provides hands on experience so that trainees can apply theory learnt to solve real life problems they may encounter at work when they graduate from colleges or other vocational institutions.

However, there are a number of drawbacks associated with the implementation of CBET in TVET institutions. Therefore, according to Ralushai (2021), for CBET to be implemented in TVETs it demands huge investment in infrastructure and equipment that will support practical learning activities. Consequently, implementing CBET in TVET requires competent trainers who can offer competency-based training (Kimani & Muola, 2019). Moreover, the lack of collaboration between TVETs and industry stakeholders, the lack of investment in infrastructure and equipment, as well as the shortage of skilled trainers hinder the implementation process as emphasized by Semali (2024). This lack of cooperation means that there is a mismatch between the competencies being taught at technical colleges and those required by labour market.

The implementation of CBETs in TVETS calls for a paradigm shift in how education and training is done. Nonetheless, non-investment on infrastructure and equipment; unavailability of competent trainer; and lack of corporation between TVETS with

industrial partners are all major challenges facing the implementation of competency-based training education in technical and vocational education and training in Kenya.

2.4 Policy and Regulatory Frameworks on CBET Implementation

In this section, we discuss the frameworks that anchor the adoption of CBET in Kenyan TVET institutions.

Competency Based Education and Training Policy Framework (2018): The Kenyan government is currently implementing a Competency Based Education and Training (CBET) approach in order to reform the TVET sector. This CBET framework aims at churning out globally competitive workers who are also responsive to industry demands. It entails having occupational standards that have been accepted by the industry from which flexible, modular training programmes and qualifications will be developed. This is backed up by the framework which stipulates that the CBET approach will help in recognition of prior learning, flexibility in skills acquisition as well as easy transition through the TVET system. The paper outlines different responsibilities of various government agencies and stakeholders who are involved in implementing the CBET system such as Directorates of Technical and Vocational Education, TVETA, TVET CDACC, industry among others. It also gives a stepwise process for developing occupational standards, learning programmes, and assessment of competence. Ultimately, it aims to establish a National Qualifications Framework that would see TVET qualifications aligned with international standards allowing mobility of labour force. The CBET methodology targets different groups like those already educated/trained but need to update their competences literate people from informal/formal sectors unemployed people out-of-school-youths illiterates.

African Union Agenda 2063: Africa's development is greatly highlighted in Africa Union Agenda 2063 that puts much emphasis on both technical education and competency-based education and training (TVET). Technological learning is important for the creation of essential human capital, which includes engineers and doctors needed for modern competitive societies and economies. In addition to increasing economic growth, it creates new knowledge, develops capacity to access global knowledge as well as adopt it locally. Conversely, practice-based schooling addresses this gap by developing skills for both formal and informal markets with an objective of closing up this gap between educational systems and job market requirements. A number of African nations have implemented TVET programmes aimed at providing employment opportunities for the ever-increasing youth population and enhancing their employability. These educational reforms are necessary for creating a knowledge-driven economy which is required for Africa to achieve its developmental goals.

To further improve technical and competency-based education, Agenda 2063 sets out the need to standardize educational qualifications across regions to promote mobility and degree recognition. It also promotes open and distance learning as a strategy for expanding tertiary education access with a view of tripling the current levels of enrolment. Moreover, it insists on using ICTs for teaching purposes, particularly in Africa, so as to bridge the skills gap. The paper also stresses on the importance of establishing postgraduate centres of excellence that would empower Africa better in global competition. This wholistic plan is meant to produce human capital relevant for an economy driven by knowledge and innovation, which is essential for African economic transformation towards sustainable development.

Kenya's Vision 2030 Goals on CBET: The progress report of the flagship project-vision 2030 outlines significant progress that Kenya is required to make on the

implementation of CBET in technical institutions. Major goals are; aligning TVET courses with labour market demand resulting to a 50% of CBET rollout, development of 406 curricula, training of 12,758 trainers/industry experts in CBET and CBA. In addition, there were created forty-six learning guides and digital content for six CBET courses, assessment tools were designed and developed while others consisted of sixty-seven TVET competence assessment centres which were created. However, the COVID-19 pandemic and budgetary constraints have hindered full implementation affecting enrolment growth and funding. Recommendations include restoring pandemic-rationalized budgets; ensuring capitation and HELB loans for trainees in all institutions; prioritizing funding for vocational training infrastructure by county governments.

The Kenya National Qualifications Framework: the Kenya National Qualifications Framework (KNQF) has been put in place to bring all the qualifications in the country onto a common platform by way of harmonization and standardization. It is meant to foster the integration of the Education and Training system, set national standards, facilitate mobility, recognition of qualifications as well as establish a national education and training data base. They have 10 levels with each having an assigned National Award. It applies a credit system such that one credit corresponds to ten notional hours of learning. The framework supports credit accumulation, transfer and recognition of prior learning for learner mobility and progression. Setting qualification standards, developing relevant curriculum; establishing an appropriate assessment and examination system are covered in this document. Accreditation and audit systems for education institutions should be developed as part of ensuring quality assurance in order to protect integrity and credibility of qualifications entered into the KNQF register.

Some key elements of Competence-Based Education and Training (CBET) are captured in the policy framework. In differentiating qualifications within the Kenyan National Qualifications Framework (KNQF), a distinction is drawn on the breath, depth and complexity of knowledge and skills contained in diverse qualifications. The KNQF has been developed to introduce flexibility into what would otherwise be rigid and crude structures that cannot accommodate all the range of programmes and qualifications offered across higher education and technical bands.

To enable learner mobility as well as efficiency of movement along the framework, e.g. from primary to secondary school or technical college to university, it is proposed that "horizontal and diagonal articulation" be implemented as these terms were defined by Gqili (2016). The use of this mechanism in learning horizontally and diagonally will serve as an equal opportunity foundation for learners whose prior learning experiences have not adequately prepared them for their current desired route.

Technical and Vocational Education and Training (TVET) Policy for the Republic of Kenya, **Ministry of Education (2014)**: The key highlights of the document include the policy's aims to guide the revitalization of the TVET sector in Kenya to adequately provide skilled and employable graduates needed to drive the aspirations of Kenya's Vision 2030. The policy advocates for expanding access and equity, improving quality, reforming the management and planning of TVET, entrenching competency-based TVET, strengthening governance and management, rebranding TVET, and developing sustainable financing mechanisms.

The policy objectives will serve as a framework for the development of TVET, resulting in two major paradigm shifts: (1) the transition from time-bound, standard curriculum-based training to flexible, competency-based education and training (CBET), and (2)

the transition from supply-led training to demand-driven enrolment. These objectives will be reached by reforming the pedagogical model and learning methods, as well as boosting industry input and participation in the design, delivery, and assessment of TVET skills and competences. Regarding the targeted objectives of the paradigm shifts, the introduction of competence-based training is intended to enable TVET graduates to acquire the essential skills, knowledge, and attitudes to perform jobs to the required standard.

The policy sets out six main objectives: providing relevant skills for industrial and economic development, improving access, equity and employability, assuring quality, organizing the TVET institutional framework, sustaining TVET financing, and rebranding TVET. The implementation framework involves institutional arrangements, coordination, TVET institutions, devolved responsibilities, and establishing a TVET Assessment and Certification Council.

The policy aims to transform TVET training into a system that effectively provides relevant and adequate skills for industrial and economic development identified in Kenya's Vision 2030. This will be achieved through realigning TVET programmes to national goals and market needs, expanding TVET opportunities, devolving TVET training to counties, employing affirmative action to increase equity, entrenching competency-based training, reforming governance and management, and assuring quality delivery of programmes.

2.5 Review of Related Empirical Studies

This section seeks to establish how current study is situated within works of earlier authors through discussing a review of literature for each objective. The studies are reviewed in order to identify the gaps that necessitated carrying out this present

research. CBET implementation's global perspective has been done separately for each objective followed by existing African cases. The Kenyan situation has also been presented by the researcher in relation to all objectives as well. This is partly combined by other global discussions and partly as standalone.

2.5.1 Training Approaches Adopted by Trainers in Electrical Programmes

Different techniques may have been used by trainers prior to the introduction of CBET such as: on-job training (OJT), apprenticeships and classroom-based instruction. OJT is a type of learning that occurs through observing and participating in work tasks, while apprenticeship usually combines classroom-based teaching with hands-on experience (Hadjer, 2019). In contrast, a typical lecture format characterizes classroom-based training that includes among others hands-on activities or simulation exercises, presentations, readings and other forms of passive learning but which are not necessarily targeted towards developing specific competencies (Eiris,2020).

Alternatively, there were also some trainers who used online learning or e-learning methods to impart knowledge to their trainees. According to Liu et al. (2017), using e-learning can be an effective way of delivering training materials flexibly and conveniently across vast distances. Nonetheless, e-learning might not always aim at building specific competencies or skills and it may fail to provide as much practical knowledge as other types of training provided. Trainers employed various ways of teaching before CBET was introduced; however, these methods did not focus on developing specific skills or competences which is the hallmark feature of CBET.

Essentially, Surface (2013) propose that for trainees to acquire relevant knowledge and skills through training, it is necessary to align training approaches with the goals and objectives of the training program. Traditional training methods are usually aimed at

transmitting information rather than developing specific competences or skills. As such, traditional modes of instruction may not be in line with the aims and objectives of an education programme based on competencies.

This implies that traditional instructional approaches may be ineffective in attaining desired learning outcomes as previous research has shown. Additionally, Hung & Amida (2020) have discovered that lecture-based instruction was less effective at promoting long-term recall of information than active learning techniques like problem-based learning or inquiry-based learning thus trainers ought to consider if their present training approaches are in line with these ambitions and purpose. To achieve this, one must assess whether their existing training approaches are consistent with their goals and objectives concerning the matter at stake including evaluating the effectiveness of traditional training approaches versus trying out other options such as CBET.

According to Anane (2013), CBET requires a distinct approach to learning, assessment, and certification. This is because, fundamentally, CBET differs from the traditional method. It is based on industry-specific competency requirements, is unit-based or modular, and can be applied in both official and informal education and training settings. For these reasons, flexible training or teaching methodologies are required. Education and training focus on the learner rather than the teacher. Though CBET employs both teacher- and learner-centred techniques, the emphasis is on the learner-centred approaches. Anane (2013) described the facilitation methods often used in CBET programs as follows:

i. **Direct Instruction Method**: It is effective when you need to introduce trainees to a new study area, describe new concepts, and demonstrate how they are related, or teach factual information. On the other side, because the method is

mostly based on one-way communication, there are few opportunities to obtain feedback on the trainee's comprehension of what is being taught, and psychomotor skills cannot be taught using this method.

ii. **Discussion Method**: Enables trainees to share information and ideas, motivating them to achieve more, especially when others value their contributions. It also allows the trainer to judge whether the trainee understands the content of the lesson. On the other hand, there is the possibility of deviating from the topic at hand, and dominant trainees may persuade the group to accept their viewpoint.

iii. **Small Group Method**: Pairing allows trainees to learn faster than the teacher could with a large class. There may be issues with the physical layout of the classroom, and individual assessment through group work is challenging.

iv. **Problem Solving Method**: is a very popular CBET teaching technique. Provides a challenge to trainees; gives them a sense of accomplishment and boosts their confidence when they overcome new difficulties and so learn new things. It also enables the student to hone critical thinking skills and adapt to new learning environments. It is, however, time-consuming, and while trainees sometimes work alone, they may not learn everything that is expected of them.

v. **Research Method:** It is used in workshops, laboratory assignments, field experiments, and case studies. It encourages trainees to conduct their own research and analysis, as well as evaluate information. However, it takes a lot of work and careful preparation of research projects for the learner.

2.5.1.1 Assessment in electrical programmes

Assessment is an equally important component in the CBET approach. To determine if a trainee has absorbed what he or she has learned, an evaluation is scheduled for all

trainees. The assessment is based on the learning outcomes provided in the learning unit specifications for each course (Muthuri 2023). As a result, in CBET, assessment is the process of gathering evidence of a trainee's performance, on which an assessor judges whether or not, or to what extent, a learner has met the performance requirements of the learning outcome laid out in a specific unit, and then making a decision based on these judgments as to whether or not a learner has achieved the learning outcome as a whole (Anane, 2013). In other words, it is the process of comparing trainees' skills, knowledge, and understanding to the standards (occupational standards) established for a certain unit. A trainee qualifies for a unit if they can demonstrate that they meet the standards by providing sufficient proof of their ability. Thus, CBET assessment determines whether or not a trainee is competent.

By implication, the evaluation procedure can only produce one of two outcomes: they are competent (i.e., they can accomplish what is described in the standard) or they are not yet competent. The evaluation is not intended to assess a learner who is 30%, 50%, 80%, etc. competent. If they do not achieve the standards, they are given the opportunity to improve their skills and knowledge before being examined again. To guarantee that performance is highly valued, the assessment process employs the following approaches: (a) Observation- seeing the trainees perform the activity. (b) Product- looking at anything a trainee has manufactured or done.

Moving on to specific studies, Siddique et al. (2020) examined and compared traditional training and competency-based training (CBT) within the TVET sector in Pakistan. They assessed the perceptions of TVET graduates, trainers, and employers regarding these two training approaches. Methodologically, the researchers used a phenomenological research design to understand the lived experiences of the

participants. They conducted semi-structured interviews with 10 TVET trainers, 10 TVET graduates of traditional training, 10 TVET graduates of CBT, and 10 employers.

The findings revealed that graduates of CBT programmes demonstrated superior competence in knowledge, skills, and attitude compared to their counterparts from traditional training. Furthermore, the teaching and learning (presentation) process was found to be more effective in CBT programmes and trainers who belonged to CBT used learning materials in better ways as compared to the teachers of traditional training programmes. These findings were congruent to the work of Ndile (2018) in that both studies showed that trainers working in CBET programmes were more skilled and gave their best performance to meet the requirements of market as compared to the traditional trainers. In contradiction, the work of Dadi (2014) showed that trainers faced problems in practicing basic principles and remained unable to define competencies in a proper manner in teaching-learning process.

Moreover, employers also expressed higher satisfaction with the performance of CBT graduates. The curriculum for CBT programmes was notably better aligned with industry demands and included regular, mandatory assessments for each module, which ensured that CBT graduates were well-prepared to meet workplace requirements. Although both training approaches impart relevant skills, CBT graduates were perceived as more adept at handling diverse workplace scenarios. However, some participants highlighted a discrepancy between training and industry standards due to outdated equipment in training institutes. Indeed, in as much as the CBT approach was presented as a superior model to traditional pedagogies, it is not clear which traditional methods were employed or investigated in the study. Consequently, it appears that the

study does not advocate the use of all forms of traditional approaches in technical programmes, including electrical programmes.

In another study, Gyadu-Asiedu et al. (2017) examined the implementation of CBT in Higher Technical Institutions (HTIs) in Ghana. Their study mainly sought to assess the mode of delivery and evaluation of CBT, identify the benefits of CBT adoption, and recognize the challenges encountered in implementing CBT. They used a mixed-methods research design, collecting data from 510 respondents (lecturers and trainees) across five polytechnics in Ghana through questionnaires and interviews. Random and purposive sampling techniques were used to select the participants. The findings revealed that the major form of CBT assessment and mode of delivery in the polytechnics was more of the traditional "pen-on-paper" test, which did not give an accurate indication of student competency. In as much as CBT was found to motivate learners, encourage flexible learning, and produce competent graduates with transferable skills, the study identified major challenges. Such included financial and logistical constraints, time implications and improper implementation of CBT assessment methods.

During their discussion, the researchers stated that traditional assessment measures used by CBT failed to measure trainees' practical skills and competences effectively. Furthermore, the study showed how CBT improved learner motivation, encouraged flexible learning as well as developed skills relevant to one's job. They posited that a lack of money and resources among other problems constrained CBT from realizing its full potential. The researchers suggested that in order to ensure CBT is viable for polytechnic education in Ghana, correct pedagogical methods should be employed, capacity building initiatives need to be financially supported, closer links with industry

are required, and all actors must have unwavering commitment. It seems therefore that traditional training approaches were still being practiced in Ghanaian institutions. What this study seems to focus on most however is the kind of assessment techniques used by technical institutions. Nonetheless, the authors seem to be suggesting CBT as an alternative training approach considering some challenges they have illustrated.

In Namibia, Gessler and Peters (2020) did their research on CBET implementation while comparing principles of original CBET used in United Kingdom with features of current one of Namibia. The investigation explored two main principles of original CBET: functionalism and behaviourism. Based on their analysis, the researchers conducted a qualitative study which involved a careful examination and comparison of the original CBET principles in the United Kingdom with the current CBET system used in Namibia.

The results showed that the present CBET system is mostly an imitation of National Vocational Qualification (NVQ)-CBET with no adjustments or transformation to its principles. The Namibian approach to CBET is behaviour oriented and focused towards low-level qualifications just like NVQ- UK. The functional classification of subfields and domains were features of the Namibian system, which originated from a functional analysis approach by NVQ. Work process knowledge and social competences were ignored in organizing this paper's discussion on how NVQ-CBET assumed only individual tasks without considering their interdependence or relation with other tasks. In fact, such curricular design for work activities did not adequately meet one central principle used in curriculum development namely involving connecting education to work life experience as well as preparing learners for future employment. This article suggested that this may be due to simplicity and marketing of "CBET" as panacea for

all ills, which made it possible for it to be transferred lock stock and barrel from UK to Namibia without any changes being affected on it.

Anane (2013) examined the CBT concept as a mode of delivery in skills development for TVET institutions in Ghana and highlighted some of the challenges in implementing CBT. Anane purposed to justify why CBT is the way to go for TVET institutions and provided an overview of the CBT approach, including its characteristics, structure, and objectives. Her work also discussed the program delivery, facilitation methods, and workplace experience learning in CBT. The study justified why CBT was the way to go for TVET institutions. It noted that the CBT program was an exciting new outcome-based qualification developed in partnership with leading employers, providing the kind of workers industry demanded and also preparing individuals for self-employment. The introduction of CBT in the TVET reform would engage many youths of the country in well-structured skills development and workplace experience to ensure employment opportunities and industry-led skills development.

The study discussed the key characteristics, structure and objectives of CBT, and how CBT program delivery was done through the development of Learning Unit Specifications and learner-centred learning materials. It also highlighted the facilitation methods used for CBT programmes, emphasizing the learner-centred approach, and the importance of the workplace experience learning component of CBT. The study found that the CBT workplace experience was better structured and trainees had a better attitude towards work and knew what to expect in real work situations. Industry feedback indicated that the competency levels of CBT trainees were higher than those from traditional education.

The study also noted some of the obstacles encountered when implementing CBT including the high cost of equipment and facilities, more facilitators who are trained in CBT are required and need to be increased, as well as the task of securing enough work experience placements for an expanding population of CBT learners. In addition to this difficulty, the study indicated various advantages of CBT such as graduates who are employable or can work on their own employment and how countries like Japan, UK and South Africa have been successful with it.

Boahin et al. (2014) have conducted research on the use of competency-based training systems in a number of countries, especially with respect to recognition of prior learning and collaboration with industry. The purpose of this was to establish a way forward for CBT implementation in Ghana and other economies in Africa. To describe the CBT's experience in these studied countries, the paper reviewed relevant articles from all over the world as well as policy documents regarding CBT implementation among UK, Australia and Ghana. The study mainly involved three types of analyses: contextual analysis that examines educational, economic and social contexts; content analysis that explores underlying philosophies, policies, practices and outcomes involving RPL & CBT; and comparative analysis aimed at determining how feature by feature towards employability achievement were trainees assisted by each process during implementation.

The findings revealed that RPL requires innovative approaches such as e-portfolios and online facilities to raise awareness and deliver high-quality material to help learners produce work-related evidence. RPL evaluation performance criteria must include situational contexts and contingency management skills in order to improve flexibility and adaptability in the labour force. The industry assisted in developing occupational

profiles, needed competences, and performance requirements, which served as the foundation for CBT curriculum, delivery, and assessment. However, the limited focus on task-specific skills in the absence of adequate fundamental understanding tended to inhibit the development of new knowledge and continuous learning.

The apprenticeship training in the UK and Australia aimed at meeting employers' short-term goals although it was limited to only routine, task-specific and functional skills at the workplace hence progression between qualification levels was narrow. In Ghana, RPL was not officially recognized and there was a weak linkage between training institutions and industry leading to inadequate industry-relevant training and employability of graduates.

Ayonmike et al. (2014) attempted to explore the meaning of CBET and how it could be integrated into Technical Vocational Education (TVE) in Nigeria. Their study highlighted among other things lack of employable skills by TVE sector in Nigeria hence their reference to CBET as an answer. Meanwhile, CBET is described as a student-oriented type of approach for building workers' competences that could be used on job sites. It integrates supportive theory with practice, detailed training materials, mastery learning, self-pacing and various forms of instruction such as large and small groups, and individual studies including also detailed training materials. CBET assessment was found to be a scale of measurement for competency or incompetency on the basis of given occupational standards using methods such as observing, examining products and questioning.

The advantages of CBET were also mentioned in the study as training individuals who become proficient and can work in any job situation and align education with employers' requirements. The research only drew from literature without incorporating

empirical data or case studies about the use of CBET within the TVET system in Nigeria. Consequently, other researchers may wish to examine how practical it is to integrate CBET into a curriculum provided by technical institutions.

From the foregoing, conducting competence-based education using traditional approaches might not be enough in preparing trainers for specialist tasks in technical areas. Also, not all trainees from general education programmes could be handled through similar methods because TVET sector needs customised training that ensures trainers have both technical knowledge and pedagogical skills (Zinn et al., 2019).

2.5.2 Trainers' Perceptions on the Use of CBET Approach

2.5.2.1 Importance of trainers' perceptions and continuous development

The way trainers perceive and approach Competency-Based Education and Training (CBET) is central to its successful implementation in technical courses. Trainers require not only adequate preparation but also opportunities for continuous professional development to overcome challenges such as the absence of structured teacher training programmes. As Njenga (2022) highlights, continuing education and professional development enable trainers to improve their capabilities and remain aligned with current industrial trends, thereby strengthening their ability to deliver CBET effectively.

Equally important, is the assessment of trainers' attitudes and beliefs before implementation. Mwashighadi et al. (2020) argue that trainers must demonstrate enthusiasm, develop an understanding of the CBET philosophy, and be willing to embrace new approaches, even when they involve unfamiliar territory. Positive perceptions of educational change have long been recognised as critical to curriculum

success, and trainers' outlook directly influences both their teaching practices and learners' experiences (Avci & Kalelioğlu, 2019).

Beyond attitudes, the instructional strategies used by trainers play a vital role in shaping learning. Pirzada et al. (2021) found that many TVET trainers still depend on traditional instructional methods and lack exposure to engaging pedagogical strategies. However, their study revealed that trainers value participant involvement and activity-based learning as key to effective engagement, aligning closely with the learner-centred orientation of CBET, which aims to equip trainees with employment-ready skills.

Furthermore, trainers themselves acknowledge the link between their competencies and learner performance. Studies such as Bernardino and Curado (2020) affirm that trainer competence has a direct effect on trainees' attitudes, outcomes, and evaluations. This underlines the view that successful CBET implementation depends on trainers being not only well-prepared but also skilled in applying appropriate instructional approaches. When trainers combine positive perceptions, professional growth, and competency in CBET methods, they create the conditions necessary for meaningful skill acquisition among learners.

2.5.2.2 Trainer competency standards and professional development

TVET institutions are vital for a skilled workforce especially in electrical programmes but trainer preparedness remains a major challenge for effective CBET implementation. Achieving this requires a multifaceted approach. Ismail et al. (2016) examined Malaysian TVET trainer competency standards, integrating vocational training into trainer programmes to meet national core standards, using mixed methods: quantitatively, 101 experienced TVET trainers; qualitatively, interviews with 3 TVET experts. Findings showed trainers must possess specialised skills and knowledge in

their fields to deliver TVET effectively. The study identified dissemination and implementation issues for core standards, unclear guidelines, limited time, and insufficient briefing/capacity building and reported varied implementation rates across personnel standards, with some standards more widely adopted than others. Emphasising that trainer competency underpins quality management and effective instruction in TVET institutions, the researchers highlighted key competency domains: subject knowledge, pedagogical knowledge, and professional characteristics.

While TVET institutions play a crucial role in developing a skilled workforce, particularly in the field of electrical programmes, a significant challenge lies in the preparedness of trainers to effectively implement competency-based education training in these institutions. The literature review reveals that achieving this objective requires a multifaceted approach. For instance, Ismail et al. (2016) investigated TVET teachers' competency standards in Malaysia. The study focused on the implementation of vocational training into the TVET teacher program to meet the national core standard. The study used both quantitative and qualitative methods. For the quantitative part, 101 experienced TVET teachers/trainers were selected. For the qualitative part, 3 experts in TVET training were interviewed.

The results showed that trainers need to be equipped with specialized skills and knowledge in their respective fields to effectively deliver the TVET program. The researchers discussed the issues and problems encountered during the dissemination and implementation of core standards for TVET teachers including unclear guidelines, limited time, and limited briefing/capacity building. The status of implementation of various TVET personnel standards, such as teacher standards, school/college/principal standards, trainer of trainers' standards, and industry trainer standards were examined

and the results showed that the implementation rates varied, with some standards being more widely implemented than others. The researchers emphasized the importance of teacher competency in ensuring quality management and effective instruction in TVET institutions, and highlighted the key aspects of teacher competency, including subject knowledge, pedagogical knowledge, and professional characteristics.

2.5.2.3 CBET trainer capacity and implementation

Across Africa, evidence highlights both systemic gaps and actionable priorities for strengthening CBET. Ayonmike (2014) examined strategies to improve TVET personnel and, using both primary and secondary data, identified widespread insufficient human and material resources, low enrolments, too few institutions, and weak psychomotor skills. Trainers struggled to update knowledge, skills, and attitudes due to limited financial support for courses, workshops, or conferences, compounded by low patronage of technical teacher training institutions, lack of curriculum and facilities, inadequate staffing, and absence of textbooks. Nevertheless, retraining was shown to yield substantial benefits: a more functional delivery system, qualified and competent personnel, greater institutional patronage, more innovative and technology-driven staff, improved human resource development, sustainable development, and wealth generation. The paper did not detail how to implement these strategies, indicating the need for further research on practical roll-out and effectiveness.

At country level, findings converge on the competencies that trainers deem essential and the implementation challenges they face. Lai et al. (2019), surveying 205 Nigerian TVET trainers with the MHRDP model, found all 25 competency elements across organisational, thinking, and application domains rated as important or very important especially communication, leadership, facilitation, vision, competency and standard

identification, negotiating, workplace and questioning skills, model building, feedback, training theory, institutional development, and analytical thinking. The uniformly high ratings contrary to some prior studies, were attributed to contextual challenges such as communication gaps, weak leadership, and difficult work environments, underscoring the need for targeted training to address these issues (with noted limits: focus on TVET trainers in tertiary institutions, limited curriculum detail). Kanyonga et al. (2019), using a qualitative case study in Arusha, Tanzania, found limited awareness and understanding of CBET among trainers; mixed but lecture-heavy pedagogy with little student-centred practice; assessment dominated by assignments, tests, and end-semester exams rather than CBET-aligned formative/summative techniques; short, partial in-service CBET training; and shortages of staff and teaching-learning materials. The study, limited to Science and Allied Technology in three colleges, recommended broader scope and inclusion of trainee and stakeholder perspectives to deepen understanding of CBET implementation.

2.5.2.4 Institutional readiness, infrastructure, and partnerships

Noor et al. (2023) conducted a case study using questionnaires with trainers from four vocational colleges in Johor, Malaysia. A total of 116 technical teachers across seven fields took part in the research to examine curriculum, infrastructure, and industrial training aspects of vocational skills programme implementation. It was found out that curriculum elements for example teaching methods and professional growth programmes were rated high, while infrastructure like laboratories, classrooms, equipment was moderate; industry-related matters (coaching, training schedules, supervision) varied by institution and programme. They concluded that although institutions had successfully trained and developed tutors, colleges lacked sufficient facilities (workshops, tools) needed for practical experience, recommending

government and college management address infrastructure gaps. They further suggested adding qualitative methods to deepen insight into instructors lived experiences; accordingly, the present study adopted a mixed-methods approach to provide supplementary data on trainer readiness. (Noor et al., 2023).

In Tanzania, Kanyonga et al. (2019) used a qualitative case study content analysis of in-depth interviews and open-ended questionnaires with 24 trainers from three technical colleges in Arusha to assess CBET implementation. They note that CBET, introduced nationally in 2000 to replace KBET (criticized for inadequate job-market skills), framed the context for examining trainers' practices and understanding (Kanyonga et al., 2019).

Findings showed limited CBET awareness as fewer than half could correctly explain its meaning and features. Teaching methods mixed participatory and non-participatory approaches, with a majority using lectures, Q&A, and group discussions; trainers also used demonstration and practical methods for skills modules but showed little capacity for more student-centred CBET strategies. Assessment relied on assignments, classroom tests, and end-of-semester exams, with limited use of recommended CBET formative and summative techniques. Most trainers had received in-service CBET training, but it was brief and partial. Colleges faced insufficient teaching staff and teaching-learning materials, impeding effective implementation. The study was limited to the Science and Allied Technology (SAT) area in three Arusha colleges; future work should broaden subject coverage and sample size across Tanzania and include trainee and stakeholder perspectives for a fuller picture (Kanyonga et al., 2019).

2.5.2.5 Trainer capacity, institutional readiness, and industry partnerships in Kenya

Chepkoech et al. (2021) used a correlation design across 15 public TVET institutions in Western Kenya with 400 trainers and 15 principals, collecting data via questionnaires, interviews, and document analysis to examine how qualifications, specialisation, and professional development influence trainee skill formation. They found institutions understaffed, heavily reliant on poorly remunerated Boards of Governors (BoG) trainers; although most trainers held at least a first degree, many specialised outside core TVET mandates and rarely upgraded their skills, relying on historical competencies. Ideally, study variables would account for 72.5% of skill formation, but in reality, only 22.5%. The authors emphasised the need for adequate and competent staffing and regular upskilling to align with industry demands, concluding that public TVETs were incapacitated to produce the skills required for national development.

Osawa et al. (2023) employed a descriptive design using open and close-ended questionnaires with administrators and trainers from 369 TVET colleges (~17% of registered institutions) to assess CBET readiness via infrastructure, trainer capacity, and industry partnerships. Readiness was uneven: infrastructure adequacy was 57.7% (National Polytechnics), 55.2% (Technical and Vocational Colleges), 35.8% (Vocational Training Centres); trainer capacity was 69.2% (NPs), ~60.9% public /54.5% private (TVCs), and lower in VTCs. Industry partnerships existed in 55.4% of public and 63.6% of private institutions, largely industrial attachments. Overall, NPs and TVCs were more prepared than VTCs. Recommendations included addressing infrastructure gaps, ensuring trainers are qualified and CBET-trained, and diversifying industry partnerships beyond attachments. (Osawa et al., 2023).

2.5.2.6 Trainer quantity, quality and skill formation

In Kenya, Chepkoech et al. (2021) examined the quality and capacity of technical trainers in public TVET institutions in Kenya. They investigated how the trainers' qualifications, areas of specialization, and professional development influence the skill development of trainees for Kenya's economic growth. They used a correlation research design involving 15 public TVET institutions in Western Kenya. The respondents included 400 trainers and 15 principals. Data were collected using questionnaires, interview schedules, and document analysis.

The results showed that TVET institutions were inadequately staffed and mainly relied on poorly remunerated trainers employed by Boards of Governors. Though most trainers had at least a first degree, most of them had specialties outside the core mandate of TVET. Trainers also rarely upgraded their skills, relying mainly on historical competencies. The study established that the ideal situation would see the study variables account for 72.5% of trainees' skill formation, but the actual situation revealed they only accounted for 22.5%. The researchers emphasized the importance of adequate and competent trainers in the learning process, as the lack of such resources compromised the relevance of skills developed in TVET institutions compared to industry demands.

The emerging quantity and quality issues included inadequate staffing, misalignment of trainers' specializations, and lack of continuous professional development compromised. They argued that such factors impact the quality of skill formation among trainees. The study concluded that TVET institutions were incapacitated to produce human resources with the right skills to meet the country's development aspirations. The researches called for adequate staffing of TVET institutions in key courses and regular upskilling of trainers to align with emerging technological

advancements. It is notable that their study was conducted in Western Kenya and involved only public institutions. Their recommendation to carry out similar studies in to other parts of Kenya provided one of the pathways for the current study to be conducted in Nairobi County.

2.5.2.7 Readiness across institutions and partnerships in Kenya

Osawa et al. (2023) also undertook a study to measure readiness of TVET institutions in Kenya towards the implementation of Competency Based Education and Training (CBET) programmes. They used three criteria for assessing the preparedness: availability of physical infrastructure, capacity of trainers, and existence of partnerships with industry. The research employed a descriptive design. The data was acquired through questionnaires consisting of both open ended and close ended questions distributed to administrators, trainers in 369 TVET colleges which were selected randomly representing 17% of all registered TVET colleges in Kenya. It was analysed and presented in frequency tables.

The study found that the preparedness of Kenyan TVET institutions to implement Competency Based Education and Training (CBET) programmes was not consistent. In relation to physical infrastructure, good facilities for supporting CBET implementation exist at 57.7% for National Polytechnics (NPs), 55.2% Technical and Vocational Colleges (TVCs), 35.8% Vocational Training Centres (VTCs). With regard to trainer capacity, most educators in NPs accounted for 69.2% percent while those from TVCs make up about 60.9% (public sector) and 54.5% (private sector); this ratio is however lower among their VTC counterparts.

Another finding in the same study indicated that 55.4% of public and 63.6% of private TVET institutions had partnered with industry, largely through industrial attachments.

Generally, it was reported that NPs and TVCs were more prepared to start CBET programmes as compared to VTCs which were found to be less prepared. The study thus recommended that TVET institutions should be assisted in acquiring the needed infrastructure, ensuring all trainers are sufficiently qualified and trained on CBET, and looking for other types of industrial partnerships apart from just industrial attachments.

2.5.3 Trainees' Views on CBET Effectiveness

2.5.3.1 Trainee perceptions, pedagogies, challenges, and demographics in CBET

Trainees generally view CBET positively for its hands-on learning and career relevance, reporting satisfaction where programmes align with professional goals (Msuya, 2016) and emphasise job-specific skills and competencies (Albekairy et al., 2021). This satisfaction is underpinned by pedagogical features shown to enhance effectiveness: project-based learning in Electrical/Electronic Engineering (Forcael et al., 2021), practical training with up-to-date technologies (Chepchumba, 2024), virtual labs that provide safe, flexible environments (Racey et al., 2024), and real-life projects/problem-based learning (Koc & Ugur, 2019).

However, trainees also encounter challenges with CBET's self-directed, performance-based demands, including time-management and autonomy difficulties in electrical apprenticeships (Keawtavon, 2023) and increased responsibility that can be difficult for learners accustomed to lecture-based instruction (Orellana-Rojas et al., 2018). Language and resource factors matter: non-native English speakers face barriers and need greater access to textbooks and online materials (Saint, 2021). Perceptions are further moderated by demographics such as age, prior education, and gender significantly influence satisfaction in Electrical Engineering curricula (Deng et al.,

2020), with female trainees reporting more positive views than males in Pakistan (Pirzada et al., 2021).

2.5.3.2 Empirical studies in Africa on CBET outcomes and system linkages

Across African contexts, empirical evidence points to uneven CBET effectiveness shaped by curriculum–labour market alignment, pedagogy, industry linkages, and policy coherence. In Ethiopia, mixed-methods findings showed TVET colleges underperformed in developing demand-based curricula and implementing competence-based training; weak stakeholder consultation, limited resources, insufficient qualified staff, and fragile industry linkages produced a skills–jobs mismatch, with nearly 50% of graduates unemployed over two years and notable perception gaps between graduates and department heads suggesting the approach was not as effective (Geressu, 2017).

In Ghana, a structural-equation model with trainees across 10 polytechnics indicated that modular structure influenced skill acquisition indirectly via teaching quality and feedback, while industry involvement and assessment practices showed no significant direct effects; limitations included omission of teacher perspectives, reliance on industrial attachment as the sole industry proxy, and exclusion of Electrical Engineering trainees, leaving important design and sampling gaps for future CBET studies (Boahin & Hofman, 2014).

Nigeria positioned CBET as well suited to TVET because of its practical, employability focus, with benefits for employees (formal certification) and employers (standardised, cost-effective outcomes); importantly, implementers piloted CBET before recommending scale-up, underscoring the value of phased adoption rather than immediate nationwide rollout (Odewumi & Dekom, 2020).

In Zimbabwe, qualitative document analysis argued that CBET builds long-term competencies for self-sufficiency and economic growth by integrating psychomotor, affective, and cognitive domains, enhancing TVET quality and relevance, boosting confidence, optimising training time with trainers as facilitators, and addressing unemployment through self-employment or industry absorption; features included continuous assessment emphasising mastery, external industry assessors, and higher weighting of practical components, with lifelong learning viewed as flexible and ongoing across the economy (Zuva & Zuva, 2020).

In Rwanda, a descriptive study of CBET candidates found positive attitudes, high competence, good market accessibility, and optimistic prospects; male candidates were more market-competitive and more optimistic, longer work experience correlated with higher competence, and no significant differences appeared by age (Mbarushimana & Kuboja, 2016). Turning to Uganda, a review of TVET–industry cooperation noted the absence of a systematic, coordinated policy framework, with ad hoc arrangements limiting improvements in output quality and efficiency; while trainees elsewhere had been motivated by performance, results in Uganda and other developing nations were not encouraging, indicating the need for clearer policies and stronger linkages (Moses, 2016).

2.5.4 Challenges Facing CBET Implementation in TVET Institutions

The implementation of the competency-based education and training (CBET) approach in technical programmes has been met with some challenges that have limited its effective application as captured in literature. Across Africa, strategic analyses present CBET as a credible route to improve quality, reduce costs, and align training with labour-market needs, while warning that adoption must be gradual and well supported. A synthesis of the Australian CBET model highlighted benefits for employers,

supervisors, and trainees productivity, cost efficiency, skills recognition, and relevance yet noted no electrical sector specifics and called for African case studies and pilots. Proposed enablers included workplace change integration, industry-TVET councils, technology use, competency standards, national qualifications frameworks, and staff development (Obwoge & Obwoge, 2016).

System-level constraints in Nigeria underscore the enabling conditions CBET requires: inadequate funding, outdated facilities, teacher shortages and brain drain, and low social valuation relative to universities. Recommended strategies were public–private partnerships, curriculum alignment with industry, resourcing and training for TVET teachers, and shifting societal perceptions, measures directly pertinent where CBET operates within TVET (Oviawe & Anetekhai, 2019).

Evidence from Ghana shows both promise and practical limits. A CBT pilot (Agricultural and Civil Engineering; 151 respondents, 96% response) found CBT more career-oriented yet constrained by shortages of lecturers, workshops, rooms, and laboratories; instructors needed CBT re-orientation and stronger industry exposure. Curriculum conversion required close industry collaboration to reduce skills gaps, while unemployed CBT graduates signalled the need for clearer CBT aims and industry-relevant skills; funding diversification beyond government was advised, though findings were limited to three northern polytechnics and excluded Electrical Engineering (Alhassan & Habib, 2016). In technical universities, insufficient funding, weak institutional support for systematic initial and follow-up training, and policy gaps in assessment and promotion led trainers to revert to traditional teaching, prompting a call to engage legislators, business leaders, and trainees (Acquah et al., 2017).

Implementation realities elsewhere reinforce recurring themes. In Malawi, TEVETA inductions lacked clarity; instructors reported lower trainee motivation and a non-discriminating grading system, though CBET was judged capable of building skills and professional habits when grounded in realistic outcome assumptions (Kufaine & Chitera, 2013). In Ethiopia, stakeholders showed knowledge deficits on CBE's nature, assessment, and curriculum; integration with occupational standards was only "scattering," policy direction was inconsistent, facilities and materials were limited, teacher motivation was low, and trainer involvement in strategy and curriculum was weak—hence the need for broad stakeholder inclusion, thorough teacher preparation, and stronger administrative and resource bases (Likisa, 2018; Solomon, 2016).

In Tanzania, an exploratory mixed-methods study reported limited CBET comprehension (60% self-rated adequate) and 78% unable to plan or deliver a CBET lesson; barriers included insufficient preparation, lack of instructional materials, oversized classes, entrenched traditional practices, trainee absenteeism for collaboration, and weak institutional encouragement, with remedies proposed around CBET teacher training, improved environments, smaller classes, early exposure, and institutional support (Tambwe, 2019). Complementary evidence from Morogoro found trainers academically qualified but short on practical industry experience and upskilling opportunities, recommending greater industry exposure, additional education, field trips, and joint workshops, while noting limited generalisability; this motivated a focus on electrical programmes in the present study (Shukurani & Josephat, 2022).

2.5.5 Competency Based Education and Training in Kenya

2.5.5.1 Policy trajectory and system challenges

Jwan (2022) reviewed Kenya's TVET reforms from 1963 to the present, outlining ministers, reports, and theoretical underpinnings for CBET, identifying the object-oriented collective activity theory (OAAT) of Leontev as the most appropriate lens. He examined the television, video, electronic, and telecommunication outlook and mapped stakeholder roles (government, business community, development partners), noting that political declarations rather than policy directives drove CBET practice, leading to uneven, non-integrated implementation. Reported barriers included limited industry involvement, access constraints, financial and infrastructure gaps, trainer capacity needs, and low policy awareness. He proposed tracer studies and design-based research to co-solve field challenges (Jwan, 2022).

2.5.5.2 CBET implementation capacity and employability outcomes in Kenyan TVETs

Evidence from Nairobi indicates strong employability gains where CBET aligns training with industry occupational standards: graduates from CBET programmes were more competent and outperformed peers from traditional pathways, though the study covered only two institutions and recommended broader national inquiry (Ndile, 2018).

Institutional and systems capacity shape how consistently such gains are realised. In the North Rift, most trainers had CBET training and willingness to orient learners, yet facilities, instruments, and resources were insufficient; trainer–industry supervisor collaboration was weak; performance assessment was infrequent; ICT infrastructure was inadequate; workloads were heavy; and classes overcrowded despite reported career progression mechanisms, industry-aligned expectations, and M&E systems.

Staff capacity development was positively and significantly associated with CBET assimilation, and the authors urged expansion to other regions and inclusion of policymaker/industry perspectives (Kipngetich et al., 2022). In the Coast region, a survey across three institutions found inadequate CBET resources and apparatus, persistent budget and facility gaps, and limited industry involvement in curriculum review, prompting a call for concerted multi-stakeholder resourcing (parents, industry, government, donors) (Mwashighadi & Kitainge, 2023).

Trainer competence remains a pivotal lever for implementation quality. In Meru County, a cross-sectional survey of 265 trainers reported a high grand mean for CBET implementation (4.387; SD 0.799), with the widest variability on "assessing trainees at the institution and the industry," indicating uneven assessment practice. Factor analysis identified three inter-related dimensions; competence attainment, pedagogy, and mastery of content, and recommended deeper examination of specific competency domains like pedagogical, technical and technological to strengthen CBET delivery (Muthomi et al., 2023).

2.5.5.3 Industry partnerships and curriculum alignment in TVET

Kenya's construction sector illustrates how sectoral standards can anchor CBET, a National Construction Authority–Housing Finance Foundation partnership developed seven occupational standards across trades including woodwork (carpentry and joinery), water and plumbing (design and fitting), electrical installation and fittings, concrete works and masonry, and mechanical ventilation and air, forwarded to the National Construction Authority for review and adoption and then to the Ministry for curriculum development. The rationale was to mainstream CBET, shift TVET from time-bound, supply-led training to flexible, demand-driven preparation aligned with

global and industry practices (Mutua & Muriithi, 2015).At university level, evidence from the University of Nairobi's Electrical and Information Engineering Department showed graduates had limited understanding of CBET concepts despite reporting strong employability attributes (learning, problem-solving, dependability, working under pressure, responsibility). Recommended pathways included adopting CBET policy and classroom strategies including project-based learning, workplace-based learning, curriculum modification, and lecturer training, while addressing barriers such as lecturer shortages, resource inadequacy, and low CBET awareness among trainees, educators, and the wider society. The authors called for expansion beyond a single department to other faculties and universities (Ondieki et al., 2018).

Trainee and trainer perceptions along the Coast were broadly positive about CBET's practicality and employability value (e.g., work ethics, high-quality skills, positive work attitudes, workplace realism, adaptability, unemployment and poverty reduction, and pathways to self-employment), though engagement was reported higher in theory than in practical sessions (Mwagunga et al., 2020). A related study found majorities agreed CBET is practical and enhances employment and strongly disagreed that it is "easy," only for low achievers, or a waste of time; some remained undecided on CBET's value relative to academic education (Mwashighadi et al., 2020). Importantly, trainee perceptions shape the teaching–learning environment and outcomes; negative perceptions can undermine implementation and competencies, reinforcing the need to align sectoral standards and institutional delivery with learner experience (Wesselink, 2010).

Given regional and sectoral gaps especially the lack of Nairobi-specific evidence and unclear programme details in prior perception studies the current study will assess trainee views on CBET effectiveness in electrical programmes within Nairobi County

TVET institutions and further validate trainers' perceived understanding through face-to-face interviews to elicit deeper accounts of CBET practice.

2.6 Gap Amplification

The literature reviewed has identified several gaps in relation to the research objectives focusing on the training approaches, perceptions, and challenges associated with the implementation of the CBET approach in electrical programmes within TVET institutions in general and Kenya in particular.

When it comes to current training approaches, CBET marks a substantial departure from conventional teaching strategies by placing an emphasis on learner-centred methodologies. In contrast to more teacher-centred traditional approaches, CBET promotes techniques like research, problem-solving, and small-group discussions to help trainees develop their critical thinking and practical abilities. The goal of this strategy is to give trainees the skills that the industry demands. The research, however, points to a lack of uniformity in how these learner-centred techniques are implemented in TVET institutions. There are hints that some trainers might still mostly rely on conventional techniques, which could prevent CBET from reaching its full potential.

Literature on trainers' perceptions of CBET has shown that, although some recognize the approach's advantages such as its applicability to current business demands and capacity to raise trainee engagement, there is a dearth of general knowledge and endorsement of CBET. This disparity is partially caused by trainers' lack of knowledge on how to apply CBET successfully and their reluctance to stray from conventional teaching techniques. The results point to the need for more thorough professional development courses to provide trainers the abilities and information they need to properly adopt and implement the CBET strategy.

Regarding the success of CBET, it was observed that trainees had a generally good perception of the program and valued its emphasis on practical learning and the development of career-relevant skills. This viewpoint is consistent with the objectives of CBET, which is to increase the practicality and direct application of education to the labour market. The literature does, however, also show that some trainees find CBET's self-directed nature difficult. It has been shown that the transition from a more regimented, traditional learning environment to one where they must manage their own time and learning is difficult. This disparity shows that in order to assist trainees in meeting the requirements of CBET, the institutions' internal support mechanisms must be improved.

Several obstacles to the successful application of CBET in electrical investigations have been noted in the literature. Among these are insufficient resources, which are essential for the experiential learning that CBET demands and include infrastructure, tools, and trained instructors. The implementation process is further complicated by the fact that there is frequently a mismatch between the competencies taught and the real needs of the sector. Another major obstacle is stakeholder resistance to change who are used to using established techniques. While a multifaceted strategy is recommended to improve CBET delivery, including making sure trainers are adequately equipped to deliver CBET, the was a paucity of information touching on specific trainers' training needs and general preparedness.

Likewise, the majority of the evaluated works concentrated on trainers or trainees, which leaves a gap in our understanding of other stakeholders' perspectives on the integration of CBET in TVET, including those of legislators and business representatives. The CBET approach and the conventional pedagogies used in technical schools, such as electrical programmes, were not clearly compared in the

studies. The studies concentrated on the difficulties in putting CBET into practice, but they did not offer a thorough assessment of how it affected technical and vocational college graduates' employment.

The researcher also identified methodological gaps in existing empirical studies. For instance, some studies were based on document analysis of the CBET situation, while some either employed surveys or qualitative approach to understand the problem under investigation. In the same breath, the studies appeared to acknowledge that trainers are integral in the implementation of CBET. However, the role of the trainer was only mainly embedded in other findings generally touching on challenges to CBET implementation. Hence, methodological gaps in terms of choice of population and specific research approaches adopted were identified.

Consequently, while CBET holds promise for enhancing the relevance and effectiveness of vocational training in electrical programmes, its successful implementation in TVET institutions requires addressing the identified gaps in training approaches, trainer perceptions, trainee support, and resource availability. In view of these discussions, the present study set out to establish trainers' preparedness for the implementation of CBET in electrical programmes.

2.7 Chapter Summary

This chapter began by defining CBE and subsequently presenting the link between CBE and CBET. A discussion about the implementation of CBET within TVET institutions backed by a review of various policy and regulatory frameworks that support the adoption of CBET in Kenya followed. The literature review has also examined empirical studies on the implementation of CBET, drawing on global, African, and Kenyan contexts. These previous studies explored various aspects of CBET, including

the training approaches adopted in various technical programmes, trainers' perceptions about CBET, challenges faced during implementation, and the impact of CBET on trainees' preparedness for the workforce. The aim of this chapter was really to illustrate how this study relates with the broader field of CBET and the narrower area of trainers' capacity to adopt CBET especially in electrical programmes in TVET institutions. In the next chapter, the methodology that guided this study is presented.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter outlines the research design and methodology that will be used in this study. It outlines the research paradigm, research approach and research design. It also discusses the location of the study, target population, sampling design, methods of data generation and the measures of validating the intended findings of the study. It further outlines the data generation procedures, data analysis techniques and ethical considerations to be observed by this study.

3.2 Research Approach

According to Creswell and Creswell (2017) research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation. This study adopted a mixed methods research approach that incorporates both qualitative and quantitative data. The data obtained in this study suggested that Mixed methods research (MMR) was especially appropriate due to the fact that qualitative information enabled getting in-depth understanding of trainers' experiences and opinions, whereas quantitative data supported the findings through statistical evidence and facilitated identification of patterns within the data.

Furthermore, although this study saw MMR as a way forward to its research questions. The researcher took note of some misconceptions about MMR like stated by Ayiro (2021) that 'mixed methods is not simply the collection of multiple form of qualitative data nor the collection of multiple types of quantitative data' (p.3). Consequently, in

order to achieve both objectives, the researcher had to collect, analyse and integrate both primary and secondary data.

3.3 Research Design

According to Creswell (2014), "A research design is a plan, structure, and strategy of investigation that provides direction for collecting and analysing data" (p. 4). In this study, a convergent design was used. Creswell and Plano Clark (2018) posit that this is one of the mixed methods research designs, which involves gathering and analysing quantitative and qualitative data at the same time thus enabling the converging of findings and giving more insight into the research question. This design utilizes a collection and analysis of both types of data separately that are later merged to give a complete interpretation of the research questions. The researcher used the convergent design to gather data from multiple sources including interviews with trainers and heads of departments, informal observations of training sessions and analyses of training materials in order to come up with common themes that relate to trainer preparedness within the context of CBET in electrical programmes.

3.4 Study Location

This study was conducted in Nairobi County which is the capital city of Kenya, located in the southern part of the country. It has an approximate area of 696 square kilometres and a population of over 4.8 million people (Kenya National Bureau of Statistics [KNBS], 2019). In terms of education, there are a number of TVET institutions as well as universities that offer courses in electrical engineering in Nairobi. This county has a total of 50 TVET institutions comprising a polytechnic and a number of vocational training centres and technical vocational colleges (TVETA, 2024). In as much as most

of these institutions deal with many other technical programmes besides electrical engineering, the researcher only focused on those offering electrical programmes.

An analysis of government data showed that the share of economic productivity for Nairobi is more than three times higher than that of other Kenyan counties, rendering the city a major contributor to the country's economy. Controlling Kenya's manufacturing, construction and services industries, Nairobi generated 27.5% to Kenya's gross domestic product for a period of 5 years leading to 2022. Nairobi's control of key industries gives trainees in electrical programs better access to industry professionals, companies, and events, increasing their chances of securing internship opportunities for acquiring industry experience. The study location was appropriate because Nairobi County was among the first six counties where CBET implementation in TVET institutions was piloted.

3.5 Target Population

This study targeted 3 TVET institutions in Nairobi. Within the selected TVET institutions, this study targeted 616 trainees enrolled in electrical programmes together with their respective trainers. The electrical program trainers included trainers who were responsible for delivering CBET in electrical programmes. It was the expectation of the researcher that these trainers had varying levels of experience, qualifications, and teaching methods. The trainees targeted were those in the Level 5 (craft certificate) and Level 6 (Diploma) categories in Nairobi TVET institutions who were currently enrolled in electrical program. These trainees were believed to be in a position to provide insights into the quality of training they receive, their level of satisfaction, and the impact of trainer preparedness on their learning outcomes. Technically, they had also

accumulated knowledge overtime and their curriculum offers more opportunities for scaffolding competencies.

This study targeted the Heads of Departments (HODs). These would be officials responsible for overseeing education and training programmes in Nairobi TVET institutions. Arguably, these officers would provide information on the policies, guidelines, and resources available to trainers to enhance their preparedness in delivering CBET. As such, the study specifically focused on TVET institutions in Nairobi that offer CBET in their electrical programmes.

3.6 Sampling Design

According to Creswell (2014), "sampling is the process of selecting a group of individuals or cases from a larger population for study or research" (p. 164). Similarly, Babbie (2016) defines sampling as "the process of selecting units (e.g., people, organizations) from a population of interest so that by studying the sample we may fairly generalize our results back to the population from which they were chosen" (p. 175).

Sampling techniques refer to a variety of methods used in statistical sampling to select a subset of data from a larger population for analysis. According to Omair (2014) sampling techniques are procedures for selecting a representative part of a population, usually by some random method, so that the findings from the sample can be generalized to the population as a whole. This study used both probability and non-probability sampling techniques. Probability sampling methods, such as simple random sampling and stratified sampling, are often used when researchers want to ensure that each member of the population has an equal chance of being selected. Non-probability sampling methods, such as convenience sampling and purposive sampling, are often

used when researchers want to obtain a sample quickly or when it is not feasible to select a random sample (Babbie, 2016).

For probability technique, the study employed simple random and stratified sampling while purposive and convenience sampling as non-probability methods were used to get samples for participants from the population of study. Purposive sampling was applied to select Technical Training Institutes (TTIs) on grounds that they offered electrical programmes. The technique involved choosing participants through specific criteria that are relevant to the objectives of this study. The same approach was used to choose trainers who either had experience in CBET in electrical programmes or not.

Stratified sampling was used to divide the trainees into strata based on their level of training. In this study, the researcher divided the trainees into two categories- Level 5 and Level 6. Random sampling was then used to select trainees from each stratum to ensure that the sample was representative of the population. Furthermore, convenience sampling which is a sampling technique that involves the selection of participants who are easily accessible and available to participate in a study was used to select the HODs. In this case, the researcher selected the HODs who were available and willing to participate in the study.

3.6.1 Sample Size

Purposive sampling was employed to obtain a sample of 6 trainers. Given that the researcher was not able to obtain the trainees' enrolment prior, it was only possible to calculate the sample size upon visiting individual institutions. Even so, the researcher was still able to apply Yamane's formula (Yamane, 1973) to scientifically obtain a representative sample of the trainees. The formula assumes a 95% confidence level and P = .5. This is shown in Equation 3.1.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the level of precision, normally (0.05). Given this equation the sample size obtained for the study is as shown in Table 3.1. It is worth noting that the formula was applied to each institution separately, hence the total population (N) in the table was not used to obtain the sample size.

Table 3.1: Sample Size of Trainees in Selected TVET Institutions

TVET Institution	Population (N)	Sample Size (n)
TTI 1	400	200
TTI 2	83	69
TTI 3	133	100
Total	**-**	**369**

3.7 Research Instruments

Data generation in research refers to the process of collecting, creating or generating data through various methods such as surveys, experiments, observations, interviews, and simulations, among others. Data generation can be qualitative or quantitative in nature. Qualitative data generation involves the collection of non-numerical data such as opinions, experiences, and attitudes, while quantitative data generation involves the collection of numerical data such as measurements, counts, and statistics.

This study used both methods to generate data. This is consistent with the Dawadi et al. (2021) who posit that a mixed methods approach involves both qualitative data generation through interviews and quantitative data generation through surveys. Specifically, in this study, data were generated through semi-structured questionnaires and interview schedules so as to generate data seeking to answer to the research

questions. These methods have been summarized for each objective in Table 3.2 and explained in more details in the subsequent sub-sections.

Table 3.2: Table Showing the Alignment between Objectives and Data Instruments

Objective	Participant	Data Instrument
To examine the existing training approaches adopted by trainers in electrical programmes	Trainers, heads of departments	Interview schedule
To explore trainer's perceptions on tools and equipment that are used to facilitate learning in electrical studies To explore trainers' perceptions on the use of CBET approach to facilitate learning in electrical programmes	Trainers, heads of departments	Interview schedule
To evaluate the views of trainees on the effectiveness of CBET approach in electrical programmes	Trainees	Semi-structured questionnaire
To investigate the possible challenges that undermine the implementation of CBET approach in electrical programmes	Trainers, trainees, heads of departments	Interview schedule

3.7.1 Semi-Structured Questionnaire

Conducting a semi-structured questionnaire survey is a research method whereby data is collected from respondents via the use of a written or electronic set of questions. According to Bryman and Bell (2019), a questionnaire refers to "a set of questions asked in writing which are answered by the people, normally without the presence of the researcher". Questionnaires are usually applied in survey research that entails collection of information from individuals who represent target sample using standardized measurements. Survey research is "the process of giving out

questionnaires which are standardized to some various individuals chosen from population defined so as to generalize on such populations" (Babbie, 2016).

In this study, a paper- based semi-structured questionnaires was used to generate data from trainees in the electrical studies program. Semi-structured questionnaires were appropriate because they enabled the collection of quantitative data in a structured way, while still allowing some flexibility for respondents to provide clarifications. The questionnaires were a mix of open and closed- ended questions that were used to generate quantitative data about the trainers' preparedness and competence. The questions were designed to measure the trainees' experiences and attitudes related to competency-based education and training in electrical studies. During administration, the researcher informed the trainees about the purpose of the survey and gave clear instructions on how to complete the questionnaire.

3.7.2 Interview Schedule

This study used semi-structured interviews to generate data. A semi-structured interview is a type of research interview that involves a set of pre-determined open-ended questions, as well as the opportunity for the interviewer to ask additional questions to further clarify or explore the participant's responses (Braun & Clarke, 2013). They are often used in qualitative research to gather in-depth information on a specific topic or phenomenon. These were used to generate data from the HODs concerning information on the policies, guidelines, and resources available to trainers to enhance their preparedness in delivering CBET. The data generated were useful in answering the research questions on all the objectives. Even so, the answers were likely to weigh more on one objective than the other.

3.8 Pilot Study

Piloting is the process of conducting a small-scale trial of the research methodology and data collection instruments to ensure that they are feasible, reliable, and valid before implementing the full study. In this study the piloting process involved sampling of one TTI that was not actively selected for the main study. The developed data generation instruments highlighted in the previous sub-sections were tested with the trainers, trainees and HOD in the pilot TTI. This was important in ensuring that the questions in the tools were clear, concise, and easy to understand. Thus, helping to identify any issues with the tools and making necessary adjustments. This testing was aimed at ensuring the tools were reliable and valid.

Upon evaluation of the results from the tested tools, the researcher together with the help of respective supervisors and peers determined the changes that needed to be made to the research methodology or data collection instruments. The results of the pilot study were used to refine the study design before implementing the full study.

3.9 Validity and Reliability

In mixed methods research, validity refers to the degree to which the results accurately reflect the phenomenon being studied. It is the extent to which the findings are trustworthy and credible. In this study, the validity of the tools, particularly the semi-structured questionnaires and interview schedules, was checked with the assistance of the research supervisors, while peer review was conducted by trainers in the electrical programme. Congruently, Park et al. (2019) proposed a framework for evaluating validity in qualitative research, emphasizing the importance of data richness and operational measurement. In addition, triangulation was employed by using multiple data sources and methods to confirm the findings; specifically, feedback from the semi-

structured questionnaires and interview schedules was compared to assess whether the information provided was consistent.

Reliability in mixed methods research refers to the consistency and stability of the results over time and across different settings or contexts. It is the extent to which the findings can be replicated or reproduced. Reliability can be assessed by examining the consistency of the findings across multiple data sources or methods, as well as the consistency of the findings over time. The reliability measure in this study was majorly checked on the survey questionnaires. As indicated by Taherdoost (2016), the accuracy and consistency of a survey questionnaire form a significant part of the research methodology. As such, reliability is said to be concerned with the extent to which a measurement of a phenomenon provides stable and consist result.

Testing reliability in research is important because it ensures that the results of a study are consistent and dependable. Testing for reliability is important as it refers to the consistency across the parts of a measuring instrument (Sullivan, 2011). This study mainly checked for the internal consistency of the survey questionnaires. This involved assessing the degree to which different items supposed to measure the same construct are correlated with each other. This was done using Cronbach's Alpha yielded a consistency coefficient of .756. It was found most suitable especially because the research instrument made use of Likert scales. No absolute rules exist for internal consistencies, however most authors (e.g. Taber, 2018) agree on a minimum internal consistency coefficient of 0.70. The validity and reliability of the research instruments were tested during the pilot study and the relevant changes were made before the main study.

3.10 Data Collection Procedure

It is critical to highlight the data generation procedures that have been observed during one's study. This majorly entails the research permits sought and granted by relevant authorities at different levels of the research work. Actually, Kombo and Tromp (2006) argue that before beginning a research project, a researcher must secure a research permit from the relevant government agencies. The researcher received a permit letter for this study from Moi University's School of Education. Subsequently, the researcher obtained a research permit from both the Ministry of Education (MOE) and the National Commission of Science, Technology and Innovation (NACOSTI) via the Nairobi Regional Education office.

The Office of the Regional Director of Education (RDE) also gave out a letter of approval that was taken to the Principals and Heads of Department (HOD) in the selected TTIs. The principals were mandated to give permission so as to allow the trainers and trainees take part in the study after being informed on what it is about. Information regarding this research and their expected data generation roles were adequately provided to these trainers and trainees who only participated after consenting.

To ensure quality during the data collection process, several measures were put in place. First, the tools were piloted in a similar setting to test their clarity, relevance, and reliability before actual administration. Second, the researcher used a combination of data sources including trainers, trainees, and HODs which allowed triangulation and enhanced trustworthiness of the findings. Third, detailed notes were taken alongside recorded responses (for interviews) to minimize the risk of data loss or misinterpretation. The researcher also gave clear instructions to all respondents, which reduced errors during questionnaire completion.

Once collected, the data were systematically organized and managed. Completed questionnaires were coded and entered into a spreadsheet for quantitative analysis, while interview recordings were transcribed verbatim and labelled with participant codes, dates, and locations. Hardcopy data (questionnaires and field notes) were safely stored in files, while digital data (transcripts and coded entries) were backed up on password-protected devices. All data were arranged according to research objectives, which made the process of thematic analysis more systematic and efficient.

3.11 Data Analysis Procedure

According to Bryman and Bell (2019), data analysis is "the process of systematically examining and interpreting data, using statistical and other methods, to identify patterns, relationships, and trends in the data and to draw conclusions based on those patterns." There are many different methods and techniques that can be used for data analysis in research, including statistical analysis, content analysis, and thematic analysis (Bazeley, 2019). The specific method or combination of methods used will depend on the research question and the type of data that has been collected.

This mixed-methods study incorporated qualitative as well as quantitative data analysis techniques. Generally, triangulation technique was used when comparing the results of the quantitative and qualitative data to determine the level of agreement or disagreement between the two data sets. This helped to identify areas of convergence or divergence in the data. More specifically, the researcher employed a sequential data analysis technique involving the analysis of quantitative and qualitative data separately, in sequence. It is argued that this technique allows researchers to examine the data in depth and identify unique insights that may not be apparent when analysing the data concurrently.

The quantitative data collected was analysed using the SPSS statistical software. Descriptive statistics, such as frequencies, means, and percentages were used to summarize the data. For example, the mean score on the survey was calculated to determine the average level of preparedness of trainers as responded to by the trainees. Data visualization was also employed where the researcher created visual representations of the data using graphs, charts, and tables, to help in enhancing understanding and communicating the findings during reporting.

Prior to the quantitative data analysis, the researcher was involved in data cleaning that aimed at preparing the data to ensure that it was free from errors, outliers, and missing values. The qualitative data from the interviews, were analysed thematically. The following are the main processes of thematic analysis which the researcher carried out in this study:

1. Data familiarization: This includes reading and re-reading the data to understand its contents, as well as to gather initial ideas or themes.
2. First coding stage/initial coding: This entails identifying and labelling appropriate sections of data with codes in a systematic manner. Codes are usually brief descriptive labels that capture the essence of the data.
3. Searching for themes: This involves grouping related codes together and identifying larger patterns or themes that emerge from the data
4. Refining themes: In this case, one is expected to thoroughly scrutinize and refine his/her subjects so as to establish whether they capture precisely what was expected of them
5. Naming and defining Themes: It necessitates detailed definitions and descriptions of these themes that incorporate quotations extracted from interviews or focus groups.

6. Producing the Report: Afterward, you need to write a clear and concise report containing summary of findings which should be tailored according to research question requirements and intended audience preference

The highlighted steps were applied on the transcribed qualitative data that were gotten from the audio recordings, open questionnaire items and observation notes made by the researcher.

In this study, integration of quantitative and qualitative data was achieved through triangulation within the data analysis phase. After analysing the quantitative data using descriptive statistics in SPSS and the qualitative data through thematic analysis, the results were compared to determine the extent of agreement or divergence between the two data sets.

3.12 Ethical Considerations

Ethics in research is comprised of the moral principles and guidelines that lead researchers to act ethically and responsibly when conducting their studies. Consequently, in line with the standard code of behaviour, the researchers sought ethical clearance from NACOSTI, MOE, and the Ethics committee of Moi University. This study also observed several key ethical considerations. First, the researcher obtained consent from participants before they were involved in the study. As such, the participants had all the information required about the study nature including risks and benefits and have agreed to take part voluntarily.

Secondly, the participants' personal information and data were kept confidential and private by the researcher. This was done through using pseudonyms in the research instruments, to hide the names as well as any other possible identifiers of the subjects. The researcher also behaved respectfully towards the participants and their individual

rights, including the right to withdraw from the study at any time and be treated with dignity. Thus, it was explained to them that their participation in the study was voluntary.

3.13 Chapter Summary

The chapter has provided a detailed overview of the methodology that was employed in the study to address the research questions. It covered the paradigm, research approach, design, study area, target population, sampling strategies, data collection methods, piloting phase, data gathering procedure, data analysis methodologies, and the ethical concerns that were considered. The following chapter presents the findings of the study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter gives the demographic data of the participants. It presents data generated from semi-structured questionnaires which were administered to trainees and face-to-face interviews conducted with trainers and heads of departments. It also presents an analysis of the data from these three sources. It proceeds to outline the findings from the data generated in form of themes. The findings have been presented thematically based on the research objectives and subsequently interpreted and discussed in line with the literature and the underpinning theory.

4.2 Response Rate

Response rates approximating 60% for most research should be the goal of researcher (Draugalis et al., 2008). This study used different categories of data generation instruments that were administered to HODs, trainers and trainees enrolled in the electrical program. The response rate is shown in Table 4.1.

Table 4.1: Target Respondents and Response Rate

Category	Target	Achieved	Response rate (%)
Head of Department	3	2	66.7
Trainers	6	6	100.0
Trainees	369	369	100.0
Total	**509**	**377**	**88.9**

With respect to the valid criteria recommended by Draugalis et al. (2008), it can be seen that a response rate above 60% is good enough for a research study. Comparatively, the

obtained overall response rate of 88.9% for this study can be considered to be relatively high.

4.2 Preliminary Information of Respondents

This study targeted trainees, trainers and Heads of Departments (HODs) in Technical and Vocational Education and Training (TVET) institutions in Nairobi County. All the respondents targeted were those situated within the electrical department and undertaking electrical programmes. The targeted respondents were obtained from 3 public TVET institutions. Considering the design of the questionnaire that was administered to the trainees, the researcher was able to obtain specific biographic details that were of interest to the study. Concisely, details about the gender, age, program level and year of study of the trainees were captured. The category of the institution where the trainees came from was also established.

The researcher achieved a total sample of 369 trainees. The analysis established a representation of both genders out of which 86.6% were male while 13.4% were female. As much as both genders were represented, it is clear that enrolment in the Electrical Programmes was predominated by male trainees. The age ranges of trainees were spread into four categories as shown in Figure 4.1.

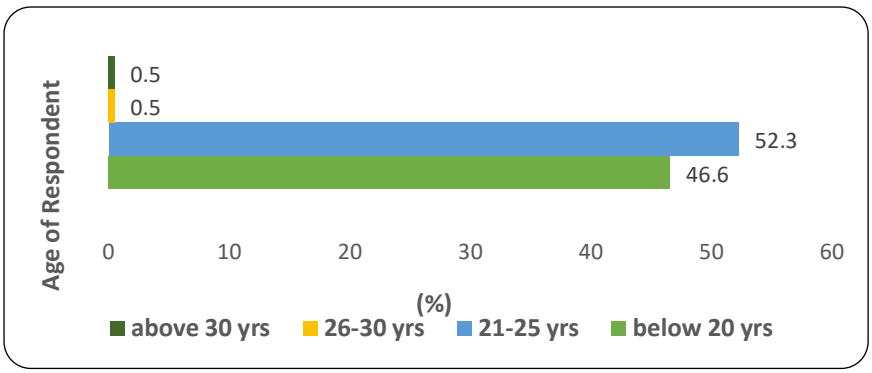

Figure 4.1: *Age distribution of trainees in electrical programmes*

Representation by age shows the age bracket of the trainees distributed as follows: 46.6% were below 20 years, 52.3% were between 21-25 years, 0.5% were between 26-30 years while 0.5% were above 30 years. It is clear that the most represented age group is between 21-25 years. Considering the electrical program under investigation is a vocational training program, it is likely it attracted younger individuals. Arguably, many younger trainees are entering the electrical field to pursue different programmes.

Subsequently, the results showed that all the sampled trainees were in their first year of study where 69.1% were in Level 6 while only 30.9% were in Level 5. Ultimately, an analysis of the category of institutions from which the trainees were obtained was carried out and the results presented in Figure 4.2.

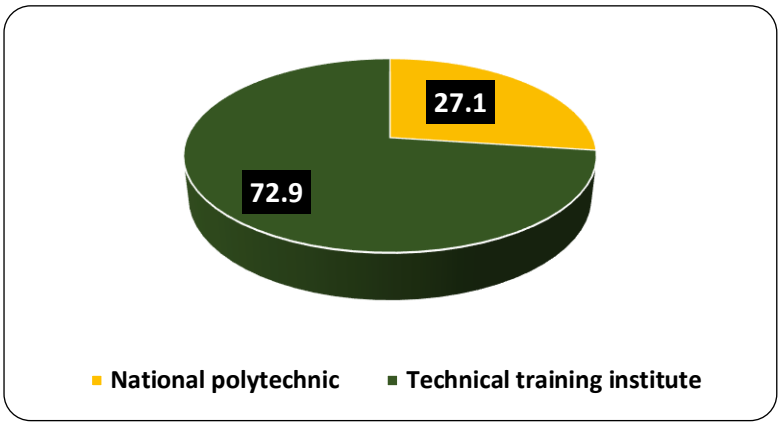

Figure 4.2: *Category of TVET institution*

The results showed that a majority (72.9%) of the trainees were from technical training institutes while 27.1% of them were from a national polytechnic. This can be attributed to the scarcity of national polytechnics within the county and the country in general. With respect to the clustering that was done by the researcher, there was only one national polytechnic that was available for sampling in the national cluster (TC1). On the other hand, two technical training institutes (TC2 and TC3) were sampled in the TTI cluster where both were public.

4.3 Presentation of Findings

This section presents the study's findings in line with four objectives. First, it investigates the training approaches currently used by trainers in electrical programmes within TVET institutions across Nairobi County. Second, it explores trainers' perceptions of employing the Competency-Based Education and Training (CBET) approach to facilitate learning in these programmes. Third, it evaluates the views of electrical-programme trainees on the effectiveness of CBET in Nairobi County's TVET institutions. Finally, it examines the challenges that undermine the implementation of CBET in electrical programmes within these institutions.

4.3.1 Approaches Used in Training Electrical Programmes

The first objective of this study sought to investigate the existing training approaches adopted by trainers in electrical programmes. In order to understand the issues around this phenomenon, three sub-themes were created based on feedback from trainers and trainees. Notably, there seemed to be a thin line between responses relating to former approaches and those relating to CBET.

4.3.1.1 Alignment of with industry needs

This sub-theme focused on whether the training approaches were aligned with the evolving demands of the electrical industry. This mainly involved examining industry trends and curriculum content to identify any gaps. Initially, when trainees were provided with a number of statements regarding their current program, they were required to indicate the extent to which they agreed with such statements. This was done using a scale of 1- 5 where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree. The results are shown in Table 4.2. showing weighted mean percentages.

Table 4.2: Trainees' Agreement Ratings on Aspects of Electrical Program

Statement	Weighted (%)
i) Program explicitly links covered material to specific industry standards and job roles	56.9
ii) Program outcomes focus on "what trainees will be able to do" rather than just content covered	60.9
iii) Program offers multiple learning pathways and prior learning recognition	60.7
iv) Trainees are allowed to demonstrate mastery and progress at their own pace, regardless of seat time	57.0
Average	**58.9**

Accordingly, the results showed a relatively higher score of 60.9% agreement that the electrical programmes focused on what trainees are able to do rather than content covered. This was followed by 60.7% agreement that the programmes offered multiple pathways and prior learning recognition. On the lower side, there was a 57% agreement that trainees were allowed to demonstrate mastery and progress at their own pace. The lowest score (56.6%) was assigned to the statement regarding the linkage between covered materials to specific industry standards and job roles. An overall mean of 58.9% was obtained relating to the characteristics of the current program. Arguably, as these statements were implicitly an embodiment of a CBET approach, the lower scores obtained could mean that the current programmes were not very effectively aligned to the needs of the industry. Notably, these statements were not exhaustive although they were carefully selected to reflect common practices in a vocational electrical program.

While highlighting the methods being used to implement CBET presently, some heads of departments cited the used of practical work. They further opined that the use of practicals was focused on what occurs in the industry hence s strong connection between the 'current approaches' to the industry needs.

> ***Head of Department:*** *Then of course the practicals we do, let's say some practical that is focused on something that the industry does…I can strongly advocate that the methods are connecting to the industry* ***(INT-HOD-TC3)****.*

4.3.1.2 Use of written notes and classroom presentations

In addition to the specific features of the CBET electrical programmes being offered, there was a deliberate attempt by respondents to directly point out the teaching approaches being used by trainers. For instance, the findings showed that trainers depended on PDF notes that were not self-created which they would circulate among the trainees. The trainees on the other hand expressed their displeasure when they reported that such notes were not well analysed and lacked elaborate discussions. They actually showed preference for written notes.

On the affirmative, the results showed that trainers would utilize class presentations which would be used frequently. Some of the trainees said that participating in such class presentations helped them to retain more knowledge about the electrical concepts in the curriculum. Some quotes are as follows:

> ***Trainee****: some trainers don't have written notes or analysed notes they depend on PDFs which they always forward to trainees with no vivid discussion on the notes (QN-TRN-TC3).*
>
> ***Trainee****: there is a lot of presentation in class and keeping records helping me to have the knowledge in mind (QN-TRN-TC1).*

The trainees on the other hand reported that the methods they employed in the CBET program were not any different from those they used in the knowledge-based approach. They emphasised that the only difference was in relation to the practical work which they felt was currently given prominence in the teaching-learning process. Concisely, they indicated that the lecture method was still relatively popular and indeed a common practice among trainers. In their justification, they said the applying practical work would not easily work without some phase of theoretical teaching (using lecture method) that enhanced trainees' understanding.

> ***Trainer:*** *We not only major on practical because the student can only understand it well once you have taught the theory aspect. So, we first of all do the lecturing a bit of oral discussion, in class so that you lay the foundation for the practical. We equally*

use the same methods we were using in the KNEC syllabus like open discussions, group work, questions and answers ***(INT-TR1-TC1)****.*

4.3.1.3 Use of collaborative training techniques

Given the study was conducted at a time that the sampled institutions were already implementing CBET, the feedback from trainers regarding training approached reflected those they use to promote CBET. Prominently, the results showed that group learning was commonly used among other forms of learner-centred techniques like project work. Notably, practical work was also used by trainers during which trainees would work in groups. The Heads of Departments (HODs) emphasizes a multifaceted approach to electrical training, integrating site visits, practical workshops, and lab sessions to enhance trainees' hands-on experience. By incorporating videos, industrial visits, and role play, they argued that trainees were enabled to understand theoretical concepts and relate them to real-world applications.

The use of practical was often facilitated by use of ICT. For instance, respondents indicated that they would use TV to display certain examples of practical work in YouTube.

> ***Trainer:*** *We have group discussions whereby we group trainees according to, let's say we have a class of 20 learners, so we group them in a group of 4 each whereby each group has its own task to accomplish at the end of the learning session* ***(INT-TR2-TC2)****.*
>
> ***Trainer:*** *based on the availability of resources, I can demonstrate by myself as they watch, then if the resources are available, I put them in groups and they do on their own* ***(INT-TR1-TC1)****.*
>
> ***Head of Department****: One of them is…putting trainees in groups and they share and also in a group when doing practical work* ***(INT-HOD-TC2)****.*
>
> ***Head of Department:*** *We have the one I have told you where you have site visits taking place. We have specific lessons that are meant for practicals in the workshops and the labs. Then we also have the, we show them videos and then we go one step further and take them for industrial visits they are able to relate…and then of course there is role play* ***(INT-HOD-TC3)****.*

In as much as the respondents highlighted the learner-centred methods preferred for CBET training, it is critical to mention that in certain instances, they affirmed that they relied on the lecture method to facilitate training in electrical programmes. Reportedly, the lecture method was preferred for handling introductory sessions to different electrical topics.

> ***Trainer:*** *As a trainer we also give lecture methods, mostly during the first during the introduction of the topic whereby learners try to understand what is expected of them* ***(INT-TR2-TC2).***

It is worth noting that while some trainers reported the use of preferred training methods in electrical programmes, some reported that there was no difference with the approaches they used traditionally. They however pointed out that the only difference they experienced was that in the CBET approach, practical work has been given prominence. They admitted that while employing the traditional methods, they were not so keen on the use of practical work. Furthermore, they indicated that there were some concepts or skills that were assumed in the initial program that were being implemented in the CBET training.

> ***Trainer:*** *Not much big difference from whatever we were using initially only that we are trying to do much on practical…So, out training is more of practical based* ***(INT-TR1-TC1)****.*

4.3.2 Trainers' Perceptions on Use of CBET Approach

The second objective of the study aimed to explore trainers' perceptions on the use of CBET approach to facilitate learning. Relevant responses were generated directly from trainers and indirectly from the HODs and trainees. The emerging themes have been discussed in this section.

4.3.2.1 Trainers' Competence (Knowledge and Skill level)

Trainers' competencies are an important factor to the implementation of CBET approach because trainers play a central role in the implementation process. To examine competencies required for trainers in implementing CBET approach, the researcher conducted semi-structured interviews were with trainers to identify the pre-requisite competencies possessed for CBET implementation.

An entry question about the meaning of CBET was asked to trainers during the interview. This was meant to gauge their entry behaviour and assess how much they knew about the approach so as to give perspective to their responses in subsequent questions. The results showed that the trainers and Hods had a fairly firm understanding of the CBET approach. In their explanations, most of the respondents indicated that CBET was an approach that imparted skills, attitudes and knowledge that prepared trainees for the job market hence rendering them easily employable. Some of the responses they gave regarding the meaning and objective CBET are exemplified as follows:

> ***Trainer:*** *I would say CBET is where the trainees are imparted with skills, attitudes and competencies that are required for the training or the for the workplace in the current society. Yeah, so the trainees given the skills rather than the knowledge and also, they are prepared to have the right kind of attitude and the competencies that the job market currently requires* ***(INT-TR1-TC1).***
>
> ***Trainer:*** *CBET for me is skill based…away from how we used to do the knowledge based just giving stories and theories now we have to give the trainees the skills also such that they can implement what they have learnt skill wise to the relevant industries* ***(INT-TR1-TC2)****.*
>
> ***Trainer:*** *CBET in electrical I can say it's a mode of integrating practicals and training unlike the former where we used to train by giving theoretical summary or training based on the theory part of it but for CBET based nowadays it has simplified the work because even the trainees are able to get it clearly just because we are more of practical* ***(INT-TR2-TC3)****.*
>
> ***Head of Department:*** *We are looking at the CBET curriculum we are implementing as a greater dimension of practicals where all the core units have a practical component which is supposed to constitute the 90% of the content* ***(INT-HOD-TC3)****.*

The trainees on the other hand were subjected to providing descriptive feedback regarding their perception of the CBET implementation. The variables of interest included electrical trainers' understanding and preparedness and the ratings are shown in Figure 4.3.

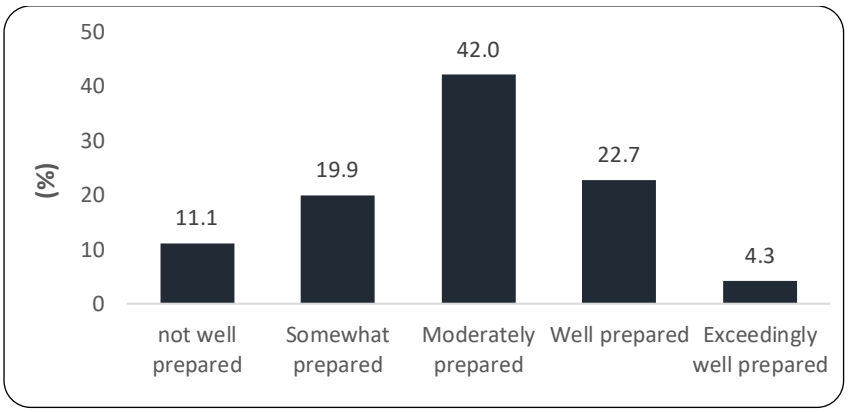

Figure 4.3: *Trainees' ratings on trainers' preparedness to implement CBET*

According to the results, 42% of the trainees perceived the trainers as moderately prepared to implement CBET. Progressively, another 19.9% of the trainees indicated that trainers were somewhat prepared and 11.1% of the trainees felt that trainers were not well prepared to implement CBET. Cumulatively, an overall 73% score was obtained showing trainers' lack of understanding and unpreparedness to implement CBET. On the other hand, 22.7% of the trainees indicated that trainers were well prepared and just 4.3% of the trainees perceived the trainers to be exceedingly well prepared. From the findings, it would be correct to point out that a majority of electrical trainers in the sampled institutions still lack an understanding hence not adequately prepared to implement the CBET approach.

Considering the multiplicity of feedback sources, some textual data appeared to be in congruence with the findings in Figure 4.3. For, instance, while a smaller percentage of the trainees perceived the trainers to be less prepared, a relatively fewer set of responses

from them indicated that the trainers we well prepared. Some of the responses tied trainers' preparedness to the intended learning outcomes of the curriculum and mode of instructions. In contrast, some linked trainers' preparedness to their abilities to utilize available resources such as the workshops to facilitate learning. This is exemplified in the following quotations:

> ***Trainee****: They are well prepared since they train trainees to be skilled as it is student-based guiding them relevantly on areas to tackle on various units* ***(QN-TRN-TC2)***.
>
> ***Trainee****: Trainers were well prepared in training theory parts but not on the practical areas i.e. electrical installation* ***(QN-TRN-TC1)***.
>
> ***Trainee****: …it requires a lot of practical and the trainers were well prepared as they usually take us to the workshop though not a lot of units have done so* ***(QN-TRN-TC1)***.

Conversely, most of the trainees were of the view that electrical trainers were not well prepared. While this is already evident in Table 4.2, more textual responses from trainees seemed to be justifying the same issue of unpreparedness. The responses moved from those who thought the trainers were moderately prepared to those who believed they were completely unprepared. Justifiably, for those with moderate perceptions, they indicated that the CBET programme was fairly new hence trainers were quite unfamiliar.

> ***Trainee****: The trainers are moderately prepared since CBET has currently being introduced resulting to the trainers are not that much familiar with the programme* ***(QN-TRN-TC2)***.
>
> ***Trainee****: Because it was newly introduced to them and there were not 100% ready as the days are gain and coping with the new curriculum that's why they are moderately prepared* ***(QN-TRN-TC2)***.
>
> ***Trainee****: Many of the trainers are confused between the KNEC and CBET curriculum. The results of this makes us much confused…****(QN-TRN-TC3)***.

Ultimately, respondents shared their views pointing to trainers' unpreparedness. The reasons they gave bordered around trainers being unfamiliar and unaware of what they were required to do within the CBET program. They added that such scenarios made them appear confused in the process of instruction delivery. Additionally, the findings

showed an implicit attempt by trainees to compare the CBET approach to the former KNEC curriculum. They reported that most trainers appeared to adopt the KNEC approach while delivering the CBET curriculum or rather had a mentality of the older system and only made a few changes to the curriculum. They said:

> ***Trainee:*** *Some of the trainers are also not familiar to what they are doing and some exploit the trainees with a lot of work* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *Some are somehow aware of the curriculum while others seem to have no even the slightest idea. Only one out of eight clearly understand the curriculum in good way* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *The trainer's approach towards the system seems a bit like the old system since what they are teaching is almost the same to KNEC with just the somethings removed therefore they still have the same perspective of the old system* ***(QN-TRN-TC3)****.*

Additionally, the researcher sought trainees' views on trainers' readiness to implement CBET. The trainees were required to indicate the extent to which they agreed with a set of statements about your trainers' readiness to implement CBET approach in an electrical program. The responses were placed on a scale of 1- 5 where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree, and the findings are presented in Table 4.3.

Table 4.3: Trainees' Ratings on Trainers' Readiness to Implement CBET

Statement	**%**
i) Trainers possess the necessary skills and knowledge to effectively integrate CBET into the electrical program	60.1
ii) Trainers assess and evaluate competencies accurately through CBET methods	62.2
iii) Trainers have incorporated real-world applications and industry-relevant competencies into the electrical program using CBET approach	52.4
iv) Trainers are well-equipped and ready to deliver effective CBET in the electrical program	55.8
v) Trainers have provided adequate support and resources to help trainees succeed within the electrical program using CBET approach	54.8
Average	**57.1**

From the findings, it can be seen that 62.2% were in agreement that trainers assess and evaluate competencies accurately through CBET methods. This was followed by the

perception that trainers possess the necessary skills and knowledge to effectively integrate CBET into the electrical program which got a rating of 60.1% agreement. Another 55.8% were in agreement that trainers are well-equipped and ready to deliver effective CBET in the electrical program.

On the lower side, 54.8% of the trainees were in agreement that trainers have provided adequate support and resources to help trainees succeed within the electrical program using CBET approach. The lowest rating was assigned to the perception that trainers have incorporated real-world applications and industry-relevant competencies into the electrical program using CBET approach. Considering these statements were a measure of trainers' readiness, the achieved average score of 57.1% is indicative of an existential gap relating to the competence of trainers to implement CBET.

4.3.2.2 Lack of practical engagement

Given the critical role that practical work plays within the CBET approach, the findings showed a case of doubt by the trainees. Consequently, they displayed a negative perception about the trainers' abilities to implement CBET and thought it caused them to be incompetent. Initially, trainers informed the trainees of the pedagogical reforms that promoted practical work. So apart from not actually organizing for practical, the trainers used the lecture methods for certain topics that required a practical approach. In some extreme cases, the trainees pointed out that trainers would not teach completely. Arguably, failure to teach impede the successful implementation of any curriculum approach including CBET. Moreover, the trainees complained about some promises about engaging. The quotations are highlighted as follows:

> ***Trainee:*** *This is because we haven't really done a practical with live electricity in electrical installation and also, I haven't really mastered the process of installation because the lecturer doesn't teach us. She just gives the question and a diagram to perform the practical* ***(QN-TRN-TC3)****.*

> ***Trainee:*** *… no much practical as they had told us earlier and still lack clear way of teaching CBET program* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *in subjects like electrical principals, the trainer just come teaches theory and tell us that we will do practical but fails continuous times* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *think they were unprepared when they organized a few hours a week for installation i.e. Four hours a week and that is on Thursdays. I think they should consider more of an engineer skill than entrepreneurial skills. I would prefer more installation lessons than entrepreneurship and communication lessons* ***(QN-TRN-TC3)****.*

Enabling the opportunity to carry out practical work was not the only feedback. Apparently, the respondents were equally concerned about the duration, frequency and resourcing of the practical. Concisely, they indicated a lack of adequate resources for successful completion, the duration of the work and the frequency of engagement. They reported:

> ***Trainee:*** *For instances there is a unit where we have a lot of practical, a practical is provided yeah but genuinely a trainer comes by gives the material but never returns to provide source of power therefore it becomes absolutely obsolete as you can't test whether the practical is working or not* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *are not prepared as a department as we are almost finishing the year, we can count on the numbers of practical done especially in electronics and mother unit installation now still lost on where we will work without the required knowledge* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *when we were told that after every two weeks, we will be able to visit the industries and learn more but they failed to take us* ***(QN-TRN-TC1)****.*

From the foregoing, it appears that a practical engagement is a preferred approach to delivery of CBET. Even so, it is evident that trainers' competence being measured by the ability to initiate, facilitate and initiate practical work was not satisfactory. This is because, they do not do as many provide such opportunities often, and when they do they facilitate the whole process. On the contrary, some dissenting voices reported that the trainers we were prepared as they would were always present for the work to offer the necessary support.

> ***Trainee:*** *the trainers are well prepared when first of all they always turn up for all lesson. He stays with us in the labs, directs us on what to do* ***(QN-TRN-TC3)****.*

4.3.3 Effectiveness of CBET in Electrical Programmes

The third objective of the study intended to evaluate the views of trainees on the effectiveness of CBET approach. The feedback generated was largely descriptive and partly textual. These two data sets have been integrated accordingly and discussed thematically in this section.

4.3.3.1 Trainees' understanding of CBET

From the foregoing, it was imperative to establish trainees' views of how effective they experienced the CBET approach in their learning process. In as much as this was an approach to be rendered by the trainers, obtaining feedback from trainees was critical to validating the implementation wholesomely. As such, the researcher initially sought to determine how much trainees knew about CBET. This was done by asking the trainees to rate their understanding of the CBET approach which was understood as CBET familiarity. The resultant ratings are shown in Figure 4.4.

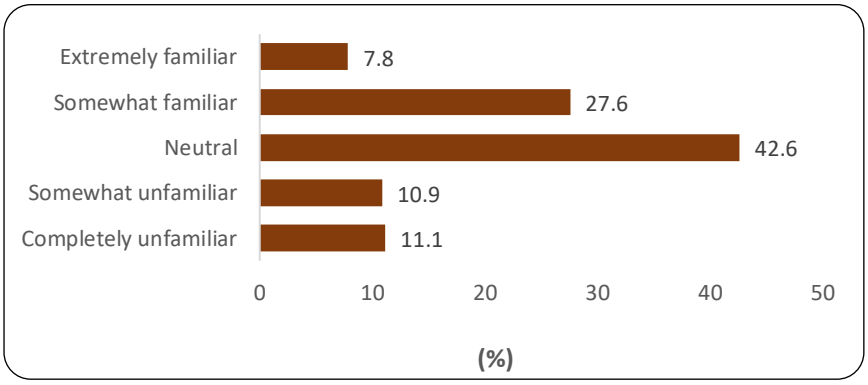

Figure 4.4: *Trainees' ratings on understanding of CBET*

A majority of the trainees (42.6%) indicated that their understanding of CBET is neutral. While this neutral understanding represented the largest group, it was indicative of a lack of strong opinions or existing knowledge about CBET. This was followed closely by 27.6% of trainees who reported that they were somewhat familiar with the

CBET approach. This suggests a basic understanding but potentially limited experience or in-depth knowledge. Another 7.8% of the trainees indicted that they were extremely familiar. This was a representation of the minority group(s) thus highlighting a need for further training for the majority. On the other hand, the low percentages (11.1% completely unfamiliar and 10.9% somewhat unfamiliar) suggest a relatively low prevalence of complete unfamiliarity with CBET.

Clearly, the trainees were not very conversant with the operational practices within the CBET approach. Some responses from the qualitative data that were generated highlighted the trainees' reasons for giving their positions indicating a general basic and/or lack of proper understanding of CBET. They emphasized that they were still catching up with the older curriculum and hence did not have enough time yet to internalized the CBET approach. In some cases, they pointed out that the institutions had not taken time to clarify CBET, its features and requirements hence their lack of proper understanding. They reported:

> ***Trainee:*** *I am still catching up with the old curriculum and since it is the first time in studying the competency-based curriculum it is taking time to catch up and enter into the system* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *The curriculum of CBET is somehow difficult to understand. The installation has not explained to us further to know what is it all about* ***(QN-TRN-TC3)****.*

4.3.3.2 CBET program design and impact on learning outcomes

An investigation into trainees' views on the overall structure and resourcing of the CBET program was critical for establishing how program design and resources affect the implementation of CBET approach. The researcher particularly focused on aspects like the relevance of program content to industry needs, the existence of adequate practical training opportunities and learning materials and equipment for effective CBET delivery. First, the researcher asked the trainees to report on the extent to which

the electrical programmes had incorporated CBET elements into the curriculum. The responses are shown in Figure 4.5.

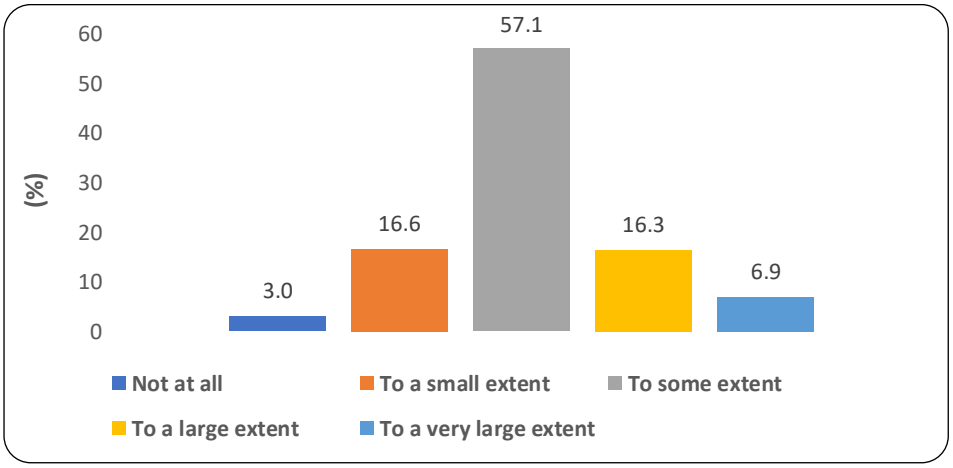

Figure 4.5: *Ratings on extent of CBET integration into electrical curriculum*

Looking at the results, it is clear that a majority (57.1%) of the trainees felt that CBET incorporation in the curriculum had only been done to some extent. This was followed by another 16.6% who perceived the integration to have been realized to a small extent. The lowest rating was evident among 3% of the trainees who felt that the CBET approach had not been integrated at all. Cumulatively, it appears that 76.7% of the trainees were of the view that CBET integration had not been realized fully in the electrical programmes. On the other hand, 16.3% of the trainees reported that the integration has taken place to a large extent while only 6.9% thought the integration had been done to a very large extent.

With respect to the targeted learning outcomes being achieved in the electrical programmes, the researcher focused on how trainees perceived the CBET approach in terms of their knowledge acquisition, skill development, and ability to apply what they learned in practical settings. Actually, it was critical to establish if trainees felt that the CBET approach helped them to achieve the learning objectives of the electrical

programmes. When asked to report on the extent to which the CBET approach had contributed to the development of practical skills relevant to electrical programmes, the trainees responded as shown in Figure 4.6.

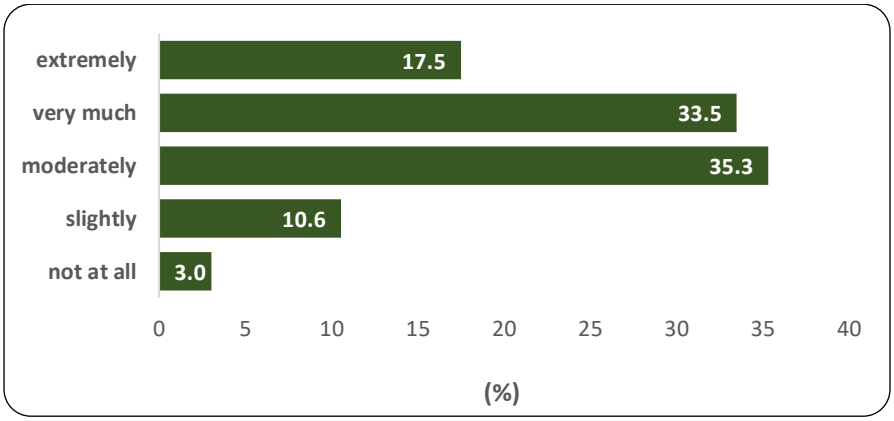

Figure 4.6: *Ratings on extent to which CBET contributes to practical skills development*

Regarding the responses, it can be seen that 35.3% of the trainees believed that CBET approach moderately contributed to development of practical skills. Another 33.5% of the trainees believed that this was very much the case. Among these trainees, a considerable number (17.5%) felt it contributed very strongly. A significant portion of trainees, 86.3% (35.3% + 33.5% + 17.5%), indicated that the CBET approach contributed to their practical skill development. In contrast, only a small minority (13.6%) expressed a less positive view, with 10.6% indicating a rather neutral position and 3% disagreeing entirely. The trainers were also in agreement that the CBET approach is bringing to the fore critical skills that trainees require to thrive in the current market. Undoubtedly, the findings offered promising initial evidence for the CBET approach's contribution to practical skills development.

> ***Trainer:*** *There are certain skills that are currently in the market so you find that aah, in the initial program learners were not aware of them but in this CBET program, they are being brought so that learners can be exposed to them* ***(INT-TR1-TC1)****.*

4.3.3.3 Theory-practical ratio in electrical programmes

In relation to the CBET program design, it was important to discuss the balance between theoretical knowledge and practical application within the electrical program. While the ideal scenario would require an equal timing ratio to theory and practice, the findings showed otherwise. Specifically, the trainees pointed out an imbalance between the timing for theory and practical respectively. While in some instances little time was allocated for practical work compared to theory, in other cases, no practical work was done at all. Moreover, the trainees acknowledged that in the CBET curriculum, they experienced an increment in practical work that currently stood at 60% compared to the KNEC assessment where practical was 40%. Their responses equally indicated a concern that doing less practical work would cause them to be less competent in the job market.

> ***Trainee:*** *we were told of frequent practical in CBET but theory is what is implemented so much than practical* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *because in some units like electrical installation we are not taught on practical but the trainer assumes we know and yet we don't know* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *we sit more in class than in the practical lesson of which we should be more competent in the field* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *In electrical installation, the practicals have helped me in knowing how to perform installation of lighting circuits though not widely taught in the workshop because of limited time in the day scheduled* ***(QN-TRN-TC1)****.*

From the foregoing, it is clear that the trainees have an improved theoretical grounding while they lack adequate practical experience in their programmes. Going by the principles of CBET, this kind of ration should be improved to ensure a more practical experience for trainees before entering the workforce as this boosts their confidence in applying their knowledge in real-world scenarios.

4.3.3.4 Application of practical skills through CBET

From the foregoing, it is evident that the trainees were engaged in more theory work than in practical. Even so, spotting the application of practical skills whilst giving specific examples in the electrical program was critical. In this study, the researcher was able to identify these kinds of applications and documented the benefits of such practical engagements in the learning process.

> ***Trainee:*** *Through doing electrical practical like installation has equipped me with skills on how to install different wiring systems* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *know how to wire and solder electrical component know how to distribute power from service cable etc*. ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Through practical in principles of electrical and a bit of Electrical installation I can now connect bulbs switches breakers* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *as an individual you can change the bulb in your house, switch and also repair electronic devices* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Electrical installation which includes domestic wiring or industrial electrification which is a job opportunity* ***(QN-TRN-TC1)****.*

Looking at the sample quotations and many other similar feedback, it is evident that the trainees have been able to apply practical skills in a range of tasks including: (1) wiring system (2) electrical installation (3) electrical soldering and (4) bulb connectivity. While these are critical areas of applying practical skills, it is not enough to do so in isolation. With respect to the view that such practical skills can enable graduated get a job, it was imperative to interrogate how the CBET approach prepares trainees for the industry. The details are provided in the next section.

4.3.3.5 Industry preparedness

While examining the effectiveness of CBET for skill development, the researcher was keen to explore how well the CBET approach equips trainees with the practical skills needed for electrical jobs. Particular attention was paid to whether trainees believed that CBET leads to (1) stronger practical application of knowledge (2) better

preparedness for industry needs (3) and increased trainee confidence in their abilities. Based on the need to expose trainee to a practical experience, the researcher initially sought to know how engaged they felt during the teaching and learning process due to the CBET approach. The feedback provided is captured in Figure 4.7.

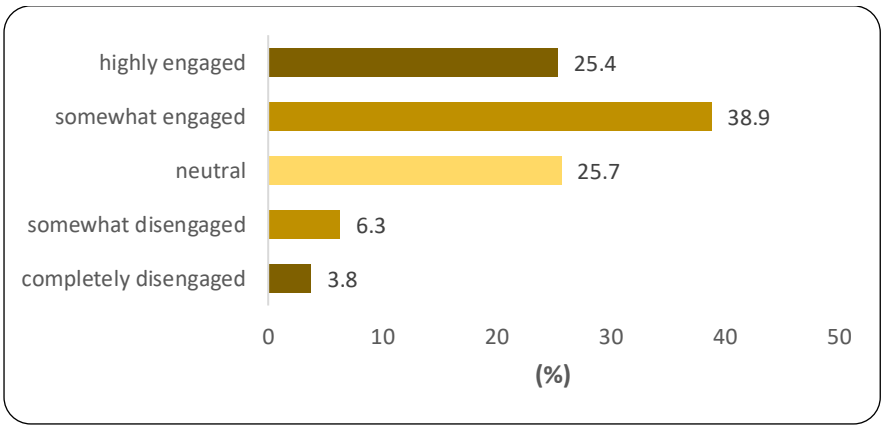

Figure 4.7: *Trainees' degree of engagement during CBET implementation*

Evidently, a high percentage of the trainees (38.9%) felt somewhat engaged while 25.4% felt highly engaged during learning. Another 25.7% indicated that they were neutral showing that they neither felt engaged or disengaged during the learning process. The minority group formed 10.1% of the respondents who felt disengaged during learning. This constituted 6.3% who felt that they were somewhat disengaged and 3.8% who felt completely disengaged.

Largely, the trainees were of the opinion that there is more engagement during learning within a CBET approach. The researcher made a follow-up on what aspects of CBET made them feel more engaged and motivated in the process of learning. This was meant to triangulate the numerical data presented in Figure 4.7. Thematically, most of the qualitative data generated spoke to such issues as emphasis on practical skills, individualization, authentic assessment, collaborative learning, and industry relevance.

First, the results revealed that the nature of the practical work enabled the trainees to explore concepts while using pictorial evidence, and do most of the work on their own with only little guidance from the trainers.

> ***Trainee:*** *the aspect of picture evidence during practical contribute to my engagement and the practice are effectively done leading to motivation* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *Trainees are able to ask questions and do set practicals by themselves with the help of trainers. Some needed items for practicals are provided by the institution* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *I want to explore more through practicals to understand and may to apply it at my home or start a small business* ***(QN-TRN-TC3)****.*

Subsequently, the results showed that trainees were motivated by the nature of assessment that were carried out during practical work. They indicated that testing was done to mainly assess acquisition of skills and competencies as opposed to knowledge along. Even so, some dissenting voices pointed out that keeping up with classwork and assessments of practical work was a bit challenging.

> ***Trainees:*** *Electrical practicals motivate my learning because you test of your competency in the programme* ***(QN-TRN-TC2)****.*
>
> ***Trainees:*** *practicals in class and CATS based on practicals done and is challenging keeping up with the two tasks at a time* ***(QN-TRN-TC3)****.*

The relevance of the learning activities within CBET approach were also found to be popular among trainees. The results showed that such factors as active learning engagement, integration of learning outcomes into the real world and participating in attachments positively impacted trainees' involvement in the learning process. However, it seems that the degree of interaction with industrial attachment was not satisfactory. Consequently, some trainees opined the need to have more industrial attachment to provide a platform for applying the practical knowledge acquired.

> ***Trainee:*** *attachment programmes will help me get engaged more rather than sitting in class studying theory* ***(QN-TRN-TC3)****.*

> ***Trainee:*** *the engagement in electrical appliances and transmission therefore preparing me to real world to electrical industry* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *going to workshops, leaning about things that can be implemented in today's world* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *It somehow happening but more of industrial attachment are supposed to be therefore use new in the system. We have more knowledge concerning our courses and units we are covering* ***(QN-TRN-TC1)****.*

The results further revealed that CBET promoted peer interaction: as the activities often incorporated group work and collaborative projects, allowing trainees to learn from each other and develop teamwork skills. Additionally, the shared learning opportunities created a supportive and engaging learning environment for the trainees. For instance, the respondents indicated that working in groups helped them to develop an open mindset and made it easier to understand electrical concepts.

> ***Trainee:*** *Group work has helped me develop open mindset in matters to do with practicals and theory work* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *Groupwork and assignments help me to familiarize with the equipment and the industry* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *Practical contribute in my engagement as they are done in group which makes understanding easier and fine* ***(QN-TRN-TC3)****.*

From the foregoing it would be correct to state that by emphasizing practical skills, individualization, clear goals, authentic assessment, collaboration, and industry relevance, CBET creates a highly engaging and effective learning experience for trainees in electrical programmes.

The question on degree of engagement was followed up by an inquiry into how well the CBET approach prepared the trainees for the real-world demands of the electrical industry. Irrespective of the year and level of their program, the trainees gave feedback regarding the extent to which they believed the CBET approach linked to the electrical industry. Their responses were spread into 5 distinct but closely related categories including: 1- not well prepared, 2- somewhat prepared, 3- moderately prepared, 4- well prepared, and 5- exceedingly well prepared. The results are laid out in Figure 4.8.

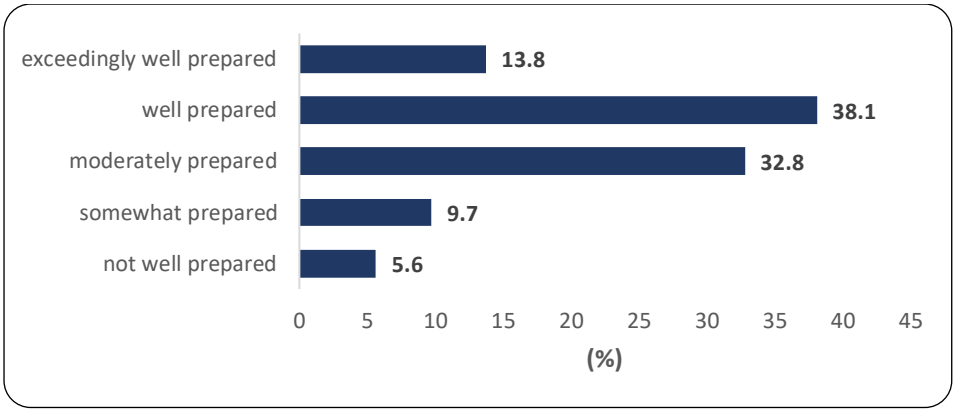

Figure 4.8: *Ratings on how well CBET prepares trainees for the electrical industry*

The findings showed that a majority of the trainees (38.1%) reported that through the CBET approach, they believed that they were well prepared for the demands of the electrical industry. This was followed by another 32.8% who felt moderately prepared for the industry. A significant 13.8% reported that they felt exceedingly well prepared for the industry. Arguably, those that indicated 'moderately prepared' were regarded to be positive about the linkage between CBET and the electrical industry. Follow-up responses sought by the researcher provided specific contrary scenarios highlighting why trainees felt less prepared for the electrical industry even while undergoing CBET training. The trainees felt that some units were irrelevant, that the electrical programmes were still theory-laden, and that industrial training provided was inadequate. These perspectives were extensively quoted from among trainees as:

> ***Trainee:*** *The units taught are somewhat unfamiliar. I feel like some are irrelevant in the electrical program e.g. environmental literacy* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *I don't see anywhere maths will help me in electrical job. The knowledge I gained in primary and secondary school is enough* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Mine is on practicals, we were not doing more practicals, theory is killing us in our classes yet we were told we will be visiting industries* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *No industrial training which supposed to be there because some machines we need to use them* ***(QN-TRN-TC1)****.*

Besides the unpleasant scenarios, some trainees feedback affirmed the place of CBET in preparing trainees for the industry. For instance, some said that learning about

electrical installation helped them to understand the real world and external industry well. In order to boost the industry experience, some institutions committed to forming partnerships with companies for trainees to train in their second semester.

Ultimately, while preparing to join the technical world of work, especially in the electrical field, confident in ones' ability to perform tasks, staying up-to-date and looking for opportunities to take on new challenges and expand one's skillset is critical. It is also likely that with boosted confidence, workers can readily apply their knowledge and skills in real situations in the field. An inquiry into how confident the trainees felt in applying the knowledge and skills gained through CBET in real-world electrical scenarios yielded the results shown in Figure 4.9.

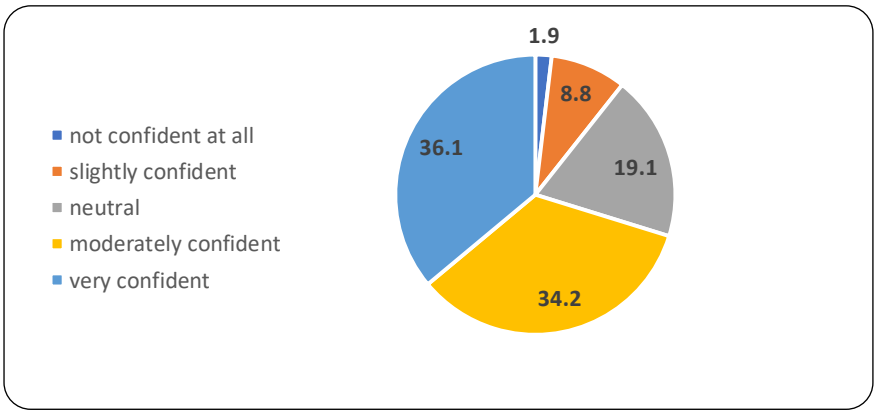

Figure 4.9: *Ratings on confidence level of applying skills to real-world scenarios*

Looking at the larger pies, it is evident that a majority of the trainees were positive about applying knowledge and skills to real scenarios as a result of learning under the CBET approach. Concisely, 36.1% felt very confident, while 34.2% felt moderately confident. Another 19.1% were neutral in their response hence not indicating whether they were confident or not. Even so, such a stand would arguably incline towards the positive direction as it is not outright negative. This sums to 89.4% of the trainees who felt confident about applying their skills due to CBET training.

In contrast, a minority forming 10.7% of the trainees were not confident. Among the minority group, 8.8% of the trainees reportedly felt slightly confident while 1.9% were not confident at all. Again, as much as some indicated they were slightly confident, it still points to some level of confidence due to CBET training. Out of the whole sample, it would be correct to highlight that only the 1.9% represented those trainees who were not confident with the CBET training.

From the foregoing, it is clear that much has been reported about the teaching and learning that takes place withing the electrical programmes. It is however important to test the extent to which the requisite skills are being developed so as to gauge trainees' technical competencies. In order to gauge such development of competencies, the programmes needed to have a criterion for measurement. The details of assessment procedures are thus presented in the next subsection.

4.3.3.6 Teaching and assessment within CBET approach

The Competency-Based Education and Training (CBET) offers a promising approach, where technical program including electrical programmes focus on achieving specific skill sets relevant to industry needs. Consequently, it was necessary to establish the existential assessment methods being employed to effectively evaluate trainees' mastery of the competencies required to thrive in the electrical field. The researcher presented the trainees with a set of assessment methods for them to choose only one that was mostly used by the trainers, and the results are captured in Figure 4.10.

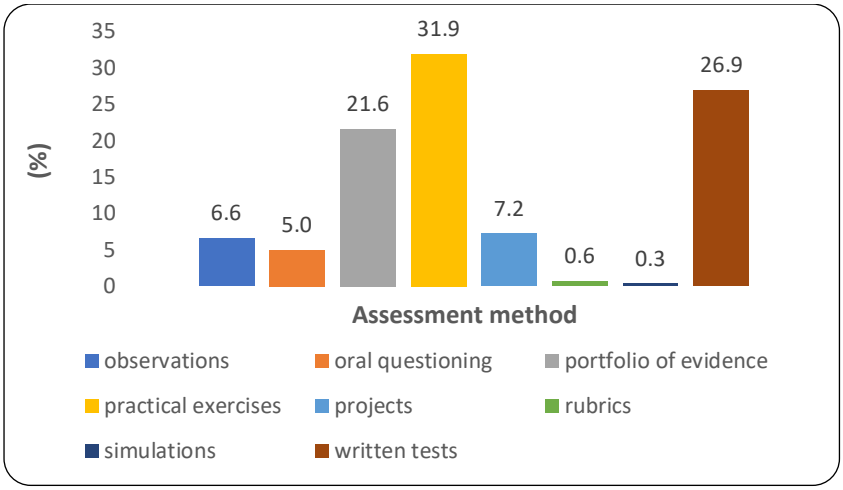

Figure 4.10: *Assessment methods mostly used by trainers in electrical programmes*

The result show that practical exercises were the most commonly used assessment method with a score of 31.9%. This was followed by the administration of written tests that attained 26.9%. Another 21.6% of the trainees indicated a common use of portfolio of evidence. The use of practical exercises seemed popular as they easily enabled trainees' application of skills, and a simulation of scenarios electricians might encounter on the job. While written tests are valuable assessment tools, they only assess knowledge. As such, they might not fully show trainees' practical abilities as expected within a CBET setup.

Undoubtedly, a combination of written tests with other assessments would render it more effective in ensuring trainees possess the complete skillset for electrical work. Some follow-up responses mainly reflected trainers' preparedness to undertake the various assessments. In some cases, it was about the frequency of administration while in others it was about the oral and material guidance offered by trainers regarding the assessment methods.

> ***Trainees:*** *The trainers are well prepared in that they give us CATS every week to ensure that we have filled our portfolio in time* ***(QN-TRN-TC2)****.*

> ***Trainees:*** *Practical and portfolios of evidence they are really prepared. Notes, course outline, how to allocate books to read if the notes are missing something* ***(QN-TRN-TC3)****.*
>
> ***Trainees:*** *Some trainers prepared us early to equip ourselves with the portfolio of evidence while others told us when it was too late* ***(QN-TRN-TC1)****.*

During the interviews, it was evident that some assessment methods are commonly used by the trainers compared to others. Such included issuance of assignments, administration pf continuous assessment tests, and having question-answer sessions. In some instances, the trainers would basically conduct observations and compare the measured indicators to trainees' project sheets. CBET assessment was also popular among trainers because of its twin feature that contained a practical part and a theoretical part. The quotations are as follows:

> ***Trainer:*** *The three major ones I have used are assignments, and there is the question-answer sessions maybe like ah oral questioning and then we have the continuous assessment test then we have the formative assessment we carry them out at the end of a given period* ***(INT-TR2-TC1).***
>
> ***Trainer:*** *I can use questions and answers, I can issue take away assignments to be done, I can issue class based continuous assessment…then I now give each trainee if they are too many a CAT to do in groups in workshops* ***(INT-TR1-TC1)****.*
>
> ***Head of Department:*** *We look at the record of work…I am looking at maybe electrical installation…their project sheet, does it match with their observation checklist* ***(INT-HOD-TC3)****.*

Following the affirmation that trainers were prepared to especially use practical exercises, portfolio of evidence and written tests, some trainees were of the contrary opinion. The results indicated displeasure with the manner in which some written tests were administered. While some trainees felt that trainers gave a lot of paperwork others pointed out that they were not adequately informed about the use portfolios prior exams. They attributed such practice to ambushing trainers with the CBET curriculum hence lack of adequate time for training.

> ***Trainee:*** *…some trainers send notes a night before the actual paper making it uncomfortable to read and prepare. We take a lot of paperwork rather than workshop and the timetables is deliberately squeezed* ***(QN-TRN-TC1)****.*

> ***Trainee:*** *...some didn't inform us for portfolios and yet when the exam are close they expect us to get each of them. Some were misplaced by the trainers and they expect us to redo the paper* ***(QN-TRN-TC2)****.*

Other assessment tools that were selected by a considerable number of trainees included project work (7.2%), observations (6.6%) and oral questioning (5%). Even so, the use of projects could be improved further as projects promote the application of learned knowledge in completion of specific electrical tasks. Further on, the results showed that the least used assessment methods were rubrics and simulation that were selected by 0.6% and 0.3% of the trainees respectively.

Progressively, the trainees were required to indicate whether they found the assessment methods being used engaging and effective. They were to respond on how accurately the assessment methods being used in the CBET program reflected their competency in electrical skills. The results are presented in Figure 4.11.

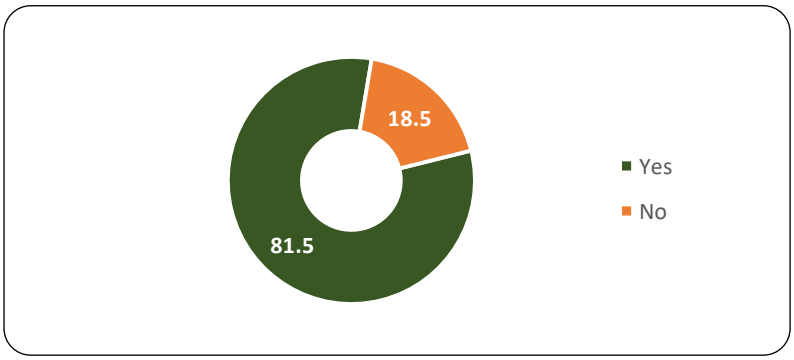

Figure 4.11: *Assessment methods as a reflection of industry knowledge and skills*

Looking at the results, it is evident that a majority (81.5%) of the trainees were in agreement that the assessment methods (practical exercises, portfolio of evidence, written tests) used in the electrical program accurately reflected the skills and knowledge needed for electrical jobs. On the other hand, a minority (18.5%) felt otherwise while indicating that the assessments were mostly based on theories which did not help them.

For practical-based assessments, the respondents reported that they were able to improve their skills as they acquired more knowledge and skills outside work. The also cited the use of real and authentic materials as an advantage to transitioning into the industry. It was evident that the trainees preferred practical work to written tests. They noted that as difficult as it may be to showcasing acquisition of skills on paper, it is easier to demonstrate during practical work.

> ***Trainee:*** *In some extent some assessments reflect the skills and knowledge needed in electrical jobs like practical in electrical installation helps one acquire the skills of wiring* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Doing much practical help us trainees occupy knowledge of outside work hence it is easy to get electrical job* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *My understanding of a task might be difficult to showcase on paper but in the actual sense the skill is confidently held in me* ***(QN-TRN-TC3)****.*
>
> ***Trainer:*** *For practicals, I have devised what we call marksheets which has a set of questions which we are able to give the trainees to see whether they are following all the steps of procedures* ***(INT-TR1-TC1)****.*

In as much as the written tests scored highly in terms of usage by trainers, trainees' responses showed little preference in regards to the CBET curriculum. On one hand, some trainees felt that written tests were inappropriate for technical courses such as engineering, while on the other hand they pointed out that written tests were biased and caused some trainees to have an advantage over others. They said:

> ***Trainee:*** *As an engineer I practically will be working physically all day for the country so I don't think there is need for written test but they should bring practicals and projects. This also helps in experience* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Not all since some might be biased e.g. written tests and projects that might advantage some trainees over the others. And also in term of group works, one reads and focuses on the area that they have been tasked to study and leave the rest for the other groups* ***(QN-TRN-TC3)****.*

The results in Figure 4.11 were coupled with a follow-up inquiry seeking to know how helpful the feedback trainees received through the CBET approach was in improving their knowledge and skills. The trainees responded as shown in Figure 4.12.

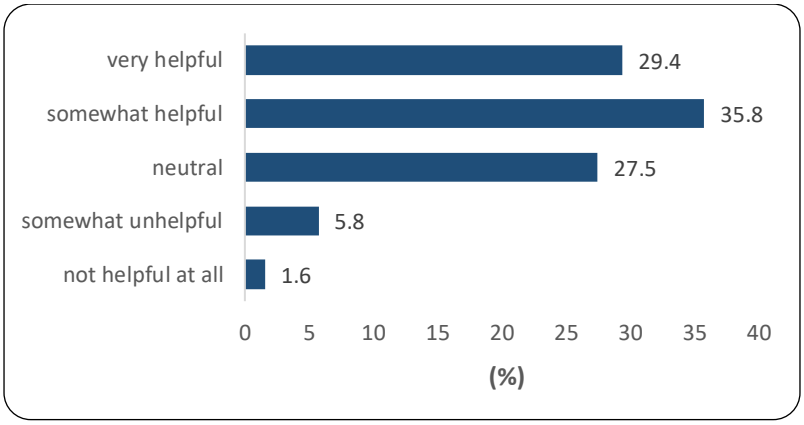

Figure 4.12: *Role of assessment feedback in improving trainees' knowledge and skills*

Clearly, the graph shows that the majority of people find the feedback they receive through the CBET approach helpful in improving their knowledge and skills. This majority group constitutes 35.8% of trainees who found the feedback somewhat helpful and another 29.4% who found it very helpful. Adding the "very helpful" and "somewhat helpful" categories together shows that 65.2% of people found the feedback helpful. This graph does suggest that the CBET approach can be a valuable tool for improving knowledge and skills.

While the majority of people found the feedback helpful, there is still a minority (7.4%) who found it to be somewhat unhelpful or not helpful at all. The minority group constituted trainees who felt the feedback was somewhat unhelpful (5.8%) and not helpful at all (1.6%). In view of these results, there could be a number of reasons why some the minority group found the CBET approach unhelpful. For example, the feedback may not be specific enough, or it may not be tailored to the individual's needs. Additionally, some people may simply prefer other methods of learning. Given that, it is critical to examine how the trainers provide such assessment feedback.

In support of the effectiveness of the assessment methods employed, trainers indicated that they found the CBET assessment techniques quite interesting as accountability was

key. In their explanation, it was clear that both trainer and trainee had a part to play to show that learning is taking place.

> ***Trainer:*** *trainer must provide evidence for coverage of the units, the trainee must also provide evidence that learning took place* ***(INT-TR1-TC1).***

On account of the preceding findings touching on CBET implementation with particular focus on the content relevance, program design, instructional delivery and assessment methods, it was paramount to get an overall opinion from trainees. Since they are the actual consumers of the CBET being implemented, the researcher inquired about their satisfaction with the CBET approach as a method of instruction in electrical programmes. The results are presented in Figure 4.13.

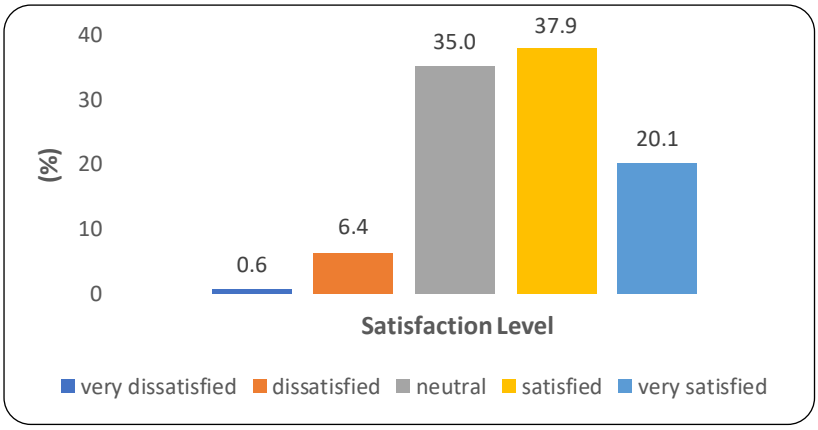

Figure 4.13: *CBET satisfaction among trainees in electrical programmes*

Based on the graph, it appears that a majority of respondents (58%) were satisfied or very satisfied with the CBET approach (20.1% very satisfied, 37.9% satisfied). With 58% responding positively, the graph suggests a generally favourable view of CBET as an instructional method. A significant portion (20.1%) is very satisfied, indicating a strong endorsement for CBET by a noteworthy group. Additionally, a sizeable group representing 35% of the trainees indicated that they were neutral which could indicate unfamiliarity with CBET or just mixed experiences.

Lastly, a small minority group represented 7% of the trainees where 0.6% were dissatisfied and 0.3% were very dissatisfied. Even though this group is very small, it is still valuable to understand their reasons as their feedback can help improve the implementation of CBET. In this regard, the next sub-section highlights the challenges facing implementation of CBET and presents some of the suggested solutions to improving its implementation from the respondents.

4.3.4 Challenges Facing CBET Implementation

The fourth objective of the study sought to examine the possible challenges that undermine the implementation of CBET approach in electrical programmes in Nairobi County TVET institutions. The research question for this objective was mainly answered with research items that yielded qualitative data. The findings showed that the challenges affecting CBET implementation coalesce around nine issues including:

i) Lack of competent trainers
ii) Insufficient training and learning resources
iii) High cost of materials
iv) Misalignment of CBET curriculum and assessment/ Program relevance
v) Low trainee and trainer cooperation attitudes
vi) Lack of institutional support
vii) Unstable industry partnerships/lack of industry opportunities
viii) Perceived imbalances in CBET program activities
ix) Lack of a piloting phase of CBET

These issues have been thematized and presented in the following sub-sections.

(i) Lack of competent trainers

Availability of qualified trainers with industry experience is key to the successful implementation of CBET approach although the findings showed otherwise. The trainers mentioned that time constraints and large class sizes had made it difficult to employ active learning techniques effectively. They also explained that covering the extensive portfolio of evidence required for the program was particularly challenging, as creating and managing the necessary documentation consumed a significant amount of the time that could have been used for instruction.

Additionally, they noted that the curriculum and Occupational Standards (OS) were often difficult to interpret, leading to uncertainty about how to deliver the training and a lack of consistency across the curriculum. The trainers also highlighted their lack of preparation in documentation tasks, such as developing learning and session plans. Furthermore, they indicated that creating assessment tools, particularly for practical components, was challenging, as many trainers had not participated in practical sessions themselves, making it difficult to assess effectively.

> ***Trainer:*** *It has been a challenge to employ the many active learning strategies because of the time constraints and the large class sizes that make it difficult to manage* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *A lot of difficulty in covering the portfolio of evidence, it takes a lot of time such that you take a lot of time where you have to create documentation such that it eats into your time for training* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *The way the curriculum and OS has been created is such that sometime it becomes a challenge to interpret. Such that the trainers do not know exactly what to do and how they are supposed to carry out their training…so there is a challenge in terms of how to harmonize the curriculum* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *There is also an issue of documentation. The trainers are not prepared in terms of creating documentation for those things. Things like creation of learning plan, session plan* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *Creation of the assessment tool especially the practical tool. It is very difficult for you to create the assessment areas and then you assess, because most of the trainers have not been able to participate in other practical sessions* ***(INT-TR2-TC1)****.*

Furthermore, the respondents, including Heads of Departments and trainers, pointed out gaps in understanding, interpreting, and applying CBET principles. They mentioned that many trainers were still using outdated teaching methods, having been trained under the Kenya National Examinations Council (KNEC) system, and lacked sufficient familiarity with CBET.

> ***Trainer:*** *My trainers are not really familiar with CBET as majority have gone through the KNEC process and after their training, initially they used to go to the institutions to train people* ***(INT-HOD-TC2).***
>
> ***Head of Department:*** *For the trainers, I would recommend they go industrial attachment because their competencies in terms of practicals are not very good…they are not in-serviced, they need exposure in industry…yes they are doing them, but the requirements for CBET are a bit high* ***(INT-HOD-TC3)***.
>
> ***Head of Department:*** *There's understanding and interpreting and implementing the CBET. Some people have not gone through that properly, they are still using the old approach to teach CBET* ***(INT-HOD-TC3)***.

It was reported that efforts such as in-house training and the involvement of CBET champions had been made, but they acknowledged that more structured programmes and industrial attachments were necessary to fully equip trainers with the required competencies. Additionally, there was a recognition that while steps had been taken to improve CBET implementation, the existing measures were not yet adequate to fully meet the expected standards.

> ***Head of Department:*** *We do not have any programmes to enhance trainers' readiness to implement CBET presently. But they are in the pipeline. For now, we cannot say we have any deliberate program in place to enhance the capacities* ***(INT-HOD-TC3)***.
>
> ***Head of Department:*** *We have a CBET champion, in fact two champions. And time and again we are now having to be in-serviced when we find we are lacking capacity in certain things. We then get to, some of our colleagues who have gone through the particularly the Kenya School of TVET, they assist us in understanding how to do certain things* ***(INT-HOD-TC3)***.
>
> ***Trainer:*** *We have had in-house training from those who are pioneers, but as an institution or as a department, most of the people are not well informed about CBET* ***(INT-HOD-TC2).***

Moreover, the respondents emphasized the need for exposure to industry-standard equipment, which was often more advanced than what was available in training

institutions. The head of department mentioned that efforts had been made to take trainees to industries to familiarize them with the latest equipment. Meanwhile, trainers expressed concerns about their own lack of exposure and training on these sophisticated tools. They suggested that refresher training in industry settings would be necessary to ensure they could effectively use and train using modern technologies.

> ***Head of Department:*** *We have been made to take them to industry to get used to those equipment* ***(INT-HOD-TC3)****.*
>
> ***Trainer:*** *The setup that we have you find that sometime the trainers have not been exposed to the industry. There are sophisticated equipment where the trainers are not prepared to use (INT-TR2-TC1).*
>
> ***Trainer:*** *Sometimes you find a new equipment which you have not been trained on. So the trainer to be given the opportunity maybe to go to the industries to take refresher training to interact with the industry equipment* ***(INT-TR1-TC1)****.*

(ii) Insufficient training and learning resources

With respect to the study's findings, the researcher, under this sub-theme explored issues such as access to appropriate equipment and technology for practical training, and the adequacy of funding for CBET programmes. The trainers reported that there were areas where the CBET approach faced challenges pertaining to resource allocation. First, it was evident that most institutions lacked adequate infrastructure and facilities including workshops and labs to carry out the practical work.

> ***Trainer:*** *The other challenge that we have is concerning availability of infrastructure in terms of classes and the spaces where practicals can be carried out* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *This system of CBET is more of practical based, so you will find that we lack some equipment. Each require some time, may be after sometime after the infrastructure has been put in place, that is when I can say it will be a hundred percent okay* ***(INT-TR1-TC1)****.*
>
> ***Trainee:*** *because it's a new curriculum there are no infrastructures to use for practical lessons and that make it more complicated* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *machine breakdown there are no equipment or enough machines that we can use in the institute thus lacking enough skills on other units* ***(QN-TRN-TC1)****.*

Reportedly, the HODs sought for means of filling such gaps through. They pointed out that they would often attempt to improvise, borrow from other institutions and hire from industries where possible.

> ***Head of Department:*** *We have worked with what we can in terms of improvisation, and borrowing and hiring. So, it's not been easy* ***(INT-HOD-TC3)****.*

Further, the big numbers of trainees were cited as a challenge that rendered resources insufficient. The trainers indicated that due to high enrolment, the available resources in school become limited for use during practical work. With respect to the teaching-learning process, the trainers felt that large class sizes impacted the trainer-trainee ration negatively indicating that fewer trainers were not able to individually attend to the trainees.

> ***Trainer:*** *There is a very gap in terms of the ratio between trainers and trainees. The trainees are way too many for the trainers to have that customized training so that you can cater for the needs of each trainee…****(INT-TR2-TC1)****.*
>
> ***Trainer:*** *CBET is a good program however, the challenge is with the number of trainees…it is easy to practically train maybe three people to perfection. What of a class of a hundred trainees to handle in practical session, it is difficult* ***(INT-TR1-TC1)****.*

(iii) High cost of materials

The respondents, especially trainers and HODs noted that the high costs of procuring essential equipment and materials, which were often expensive and difficult to acquire, posed a major issue. They mentioned that the reluctance of industries to loan equipment further added to this financial burden, leading to increased costs for both trainees and institutions. Respondents also indicated that certain units were impractical due to the lack of necessary resources and that institutions were strained by the need to either increase class sizes or reduce trainee numbers to maintain training quality.

> ***Trainer:*** *It is a very big challenge to procure equipment which are very expensive and most probably the industry is not willing to loan. So the implication would be it will*

> *cost more for the trainee because eventually the school fees will have to cater for that* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *It is true the training that comes with CBET is expensive. You find that some component, some equipment, some materials are very expensive…so it is either they increase trainers per class or they reduce trainees per class so that the efficiency of the delivery is boosted* ***(INT-TR1-TC1)****.*
>
> ***Head of Department:*** *We are also looking at consumption of materials…CBET requires a lot of consumption of materials and that brings in the aspect of cost* ***(INT-HOD-TC3)****.*
>
> ***Head of Department:*** *There is the aspect of equipment. Other than consumables, most of the institutions do not have modern equipment that the industry has that is suitable for training these trainees, they are expensive* ***(INT-HOD-TC3)****.*

(iv) Misalignment of CBET curriculum and assessment/ program relevance

The respondents indicated that the initial curriculum was structured chronologically, but the current one was disorganized and difficult to follow. Assessments were criticized for being overly theoretical, with insufficient emphasis on practical skills. The respondents also expressed frustration with the excessive workload and unclear guidelines provided by CDACC, the curriculum development body. Furthermore, they argued that the CBET program still heavily relied on a knowledge-based approach rather than a competency-based one.

> ***Trainer:*** *Some of the units are just impractical. You find that in the initial curriculum, the content were arranged in a chronological order…the current curriculum things are jammed and mixed up, you can't even understand where to start from and where to end* ***(INT-TR1-TC1)****.*
>
> ***Head of Department:*** *There's quite a lot of duplication. The syllabus of CDACC has challenges, a lot of duplication, a lot of ambiguity. It was not planned well to fit into the durations they have given us to submit. They have brought so much in the given units which cannot be covered within that time* ***(INT-HOD-TC3)****.*
>
> ***Head of Department:*** *The CBET we are using still a serious hang over of the knowledge-based approach* ***(INT-HOD-TC3)****.*
>
> ***Trainer:*** *On assessment, to much theory is still being tested. I think they should give more mandate to the trainers. They test, and keep a record of the performance of the trainees* ***(INT-TR1-TC1)****.*

In addition to the alignment issues, the respondents reported difficulties with the curriculum structure. They mentioned that certain units, such as electrical principles, were overly extensive and needed to be divided into smaller sections. Furthermore, they

expressed uncertainty about the required depth of content coverage, as this information was not clearly specified.

(v) Low trainee and trainer cooperation attitudes

The researcher examined the trainers' perceptions explicitly, and implicitly, the trainees' and employer perceptions about CBET implementation. The results showed issues of concern relating to attitudes and beliefs towards CBET programmes. Other issues related to trainee motivation and preparedness for workplace-based learning, and employer willingness to provide opportunities for trainees to gain practical experience were also singled out. Accordingly, the trainers pointed out that most of the trainees lacked the motivation to do things on their own which is indeed a key practice in the CBET approach.

In their comparison, it was noted that in the traditional approach, trainees would usually just sit and mostly wait to be taught. Secondly, results showed that trainers had been resistant to implementing CBET for a long time since its inception into the system. Lastly, the attitudinal factor experienced from the industry perspective was about relational gains where industries would want to know how they benefit from CBET engagements prior before committing.

> ***Trainer:*** *Trainee are not ready to take time themselves to learn, they don't have that drive to learn by themselves* ***(INT-TR2-TC1)****.*
>
> ***Head of Department:*** *The industry is also reluctant to collaborate with us and the reason is because industry is now focused on their core business so you try to get an MOU, they ask you how is the MOU benefiting me. I am bringing you there for two months three months then you are gone. You've taken away my knowledge and you are not paying us back* ***(INT-HOD-TC3)****.*
>
> ***Head of Department****: For a long time, we were resisting, for a looong time we resisted CBET. It was supposed to be there from the year 2018.* ***(INT-HOD-TC3)****.*

(vi) Lack of institutional support

The trainers observed a significant challenge in the implementation of CBET. They reported that despite the emphasis on practical skills, schools had often prioritized exam preparation over hands-on training due to the perceived costs associated with acquiring necessary materials. In their view, this practice by school administrators undermined the effectiveness of CBET, as the limited number of practical sessions had failed to equip trainees with the competencies they needed.

> ***Trainer:*** *Materials are not readily available. When you tell a principal you want these particular materials for practical training, they don't take it seriously…they are perceiving it as if it will be more costly. They tend to give attention to exam requirements compared to training requirements… so you find that before the exam is administered, the number of practicals is so low that it cannot achieve the intended purpose* ***(INT-TR1-TC1)****.*

(vii) Unstable industry partnerships/lack of industry opportunities

The researcher investigated the effectiveness of collaboration between TVET institutions and industry partners in developing and delivering CBET programmes. Consequently, the findings showed that while government bodies like TVETA and CDACC had visited the TVET institutions, industry engagement, particularly in the electrical engineering department, had not yet begun. In addition, it was reported that industry partners were reluctant to collaborate, as they were focused on their core business and saw little benefit in such partnerships, especially when there was no compensation for knowledge transfer.

> ***Head of Department:*** *TVETA keeps on visiting us, CDACC. We've not yet started having industry visits for the electrical engineering. Though I know for another department that is already happening. But for us we are yet to have industry players coming just to see whether we are doing the right thing…* ***(INT-HOD-TC3)****.*

> ***Head of Department:*** *The industry is also reluctant to collaborate with us and the reason is because industry is now focused on their core business so you try to get an MOU, they ask you how is the MOU benefiting me. I am bringing you there for two months three months then you are gone. You've taken away my knowledge and you are not paying us back* ***(INT-HOD-TC3)****.*

(viii) Perceived imbalances in CBET program activities

They respondents mentioned that while the practical training provided by the trainers had been effective, both trainees and trainers had faced considerable difficulties due to the structure and scheduling of the curriculum. Trainees had found the all-day classes exhausting, which had hindered their focus and retention. Similarly, trainers had struggled with the allocation of time for each unit, which often had not aligned with the content that needed to be covered. This misalignment had led to incomplete coverage of essential strands and difficulties in conducting timely assessments.

> ***Trainee:*** *in the field of electrical, the trainers are doing well in practicals, but the curriculum is more tiresome because the classes are running all over the day* ***(QN-TRN-TC1)****.*
>
> ***Trainer:*** *They their location of the unit sometimes is not commensurate with the time that has been assigned. So, you find the two terms are over you have not been able to complete the required strands. So, it becomes a challenge again for you to be able to gauge exactly where you're supposed to do assessment as well as the timing of the finishing of the assignment for the assessment or what the entire unit yeah* ***(INT-TR2-TC1)****.*

(ix) Lack of a piloting phase of CBET

Respondents highlighted the importance of a phased approach to CBET implementation. They emphasized the need for a pilot phase to identify and address challenges before full-scale rollout. However, the actual implementation process was described as rushed and chaotic, with simultaneous piloting, implementation, and expectation of results. This hurried approach led to numerous unforeseen challenges, diverting attention from the core implementation process. Consequently, most institutions focused more on managing emerging issues rather than effectively executing the CBET program.

> ***Head of Department:*** *We needed to have a gradual implementation…they do some piloting, they look at the grey areas. Then as we are piloting, they look at how effectively we can implement. But now we have a mixture of everything. We are piloting, we are implementing and we are expecting to have results* ***(INT-HOD-TC3)****.*

> ***Head of Department:*** *But because we did this thing hurriedly, we are having to fight more of emerging issues than doing the actual implementation* ***(INT-HOD-TC3)****.*

Despite the aforementioned challenges, trainers reported that the CBET approach had reduced their workload. They explained that they were able to delegate more tasks to trainees, allowing them to learn independently. This increased autonomy, they believed, facilitated the learning process. Additionally, trainers observed that trainees were more motivated due opportunities for practical application of knowledge.

4.3.5 Suggestions for Improving the Implementation of CBET in Electrical Programmes

In view of the challenges pointed out, an inquiry into ways of improving CBET implementation was carried out. Initially, the researcher asked trainees whether they would recommend the CBET approach to other trainees considering an electrical program. The feedback is shown in Figure 4.14.

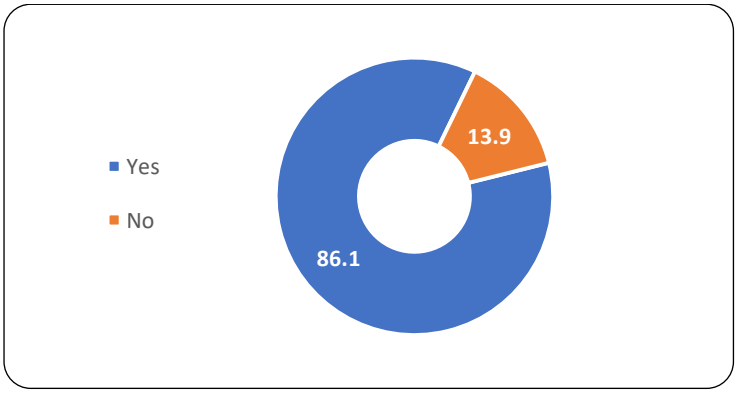

Figure 4.14: *Recommending CBET implementation in electrical programmes*

Evidently, a majority of the trainees (86.1%) indicated that they would recommend the use of CBET approach in the electrical programmes while 13.9% were on the contrary. The high positive response is grounded on earlier findings pointing to effective learning, focus on competency, practical application and assessment methods employed. Whether or not these factors were realized optimally due to the CBET

approach remains unclear although they reflect trainees' preferences on areas for improvement.

4.3.5.1 Recommending CBET implementation to other cohorts of trainees

The researcher sought to know whether trainees would recommend CBET implementation to other cohorts. This aimed at establishing whether they found CBET to be useful and what reasons they had for the same. As seen in Figure 4.14, 86.1% of the trainees indicated that they would readily recommend the use of CBET in future electrical programmes hence positioning CBET as a critical approach to technical training. They gave a number of reasons highlighting the key characteristics of CBET experienced by trainees including:

Emphasis on practical training: The practical nature of the CBET curriculum was the most prominent feature emanating from trainees' feedback. The results showed that trainees would engage in weekly sessions with high involvement of practicals in technical courses. Reportedly, involvement in practical work enhanced acquisition of skills and knowledge of electrical concepts including operation of electrical appliances. This was coupled with a focus on the ability of trainees to perform certain electrical-related tasks. The trainees were however of the opinion that the duration of learning should be reduced once they became competent.

> ***Trainee:*** *The CBET approach focuses on the ability of an individual which is a good thing since it helps in strengthening and improving one's ability* ***(QN-TRN-TC2)***.
>
> ***Trainee:*** *It has provided me with the skills in which we do them in practicals from the theory in which this is the best way of gaining skills and knowledge to operate electrical appliances* ***(QN-TRN-TC2)***.
>
> ***Trainee:*** *This is because electrical program is based on practicals to be provided every week and the years of learning to be reduced when one become competent* ***(QN-TRN-TC2)***.

The goal of assessment: The aim and nature of assessment was another favourable feature of the CBET approach. The trainees were particularly motivated by the fact that

assessments were fair especially for the technical courses, and that their future was not only determined by the outcome of their final exam but also by their classwork.

> ***Trainee:*** *It's good for technical courses because of the involvement of the practicals and fair exam setting* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *Because the trainee's future are not determined by final exams only but also classwork* ***(QN-TRN-TC1)****.*

Job Readiness: The respondents pointed out the CBET training aligned with the real-world job requirement. They reported that CBET enhances job opportunities by providing practical, job-like experiences within the institution, eliminating the need for internships. They said that the hands-on approach was particularly beneficial for those who struggled with theoretical learning, making them well-prepared for the job market. As such, they highly recommended the use of CBET in electrical programmes.

> ***Trainee:*** *CBET gives an individual a chance to practically engage in ones chosen course as it was a real job thus experiences can even be hained by learning at the institutions rather than waiting for a chance of internship in later days* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *This is because through CBET job opportunities are high since one is trained through practical and for those who don't get theories well they are able to understand* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *electricals program contains a lot of practicals and skills learned practically therefor recommend CBET approach since is mainly practical* ***(QN-TRN-TC3)****.*

On the other hand, there are certain characteristic about CBET that respondents found unfavourable. Based on these features, some respondents indicated that they would not easily recommend the use of CBET in future electrical programmes. First, there were concerns about the CBET standards that needed to be improved to make it more effective, Second, the workload on trainees was reported to be relatively heavy. The respondent reported that a majority of the workload was placed on trainees, making it difficult for them to understand the units properly. Third, the shift from the KNEC system to CBET was seen as problematic and poorly timed, especially right after 12

years of KNEC education. Lastly, while practicals were beneficial, the respondents felt that the theoretical component was burdensome and based on an outdated system.

> ***Trainee:*** *No, I don't suggest it because it is undermining us in terms of employment issues (QN-TRN-TC1).*
>
> ***Trainee:*** *It is not suitable since the workload is mostly laid upon the trainees thus giving them a hard time to get proper understanding of the units* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *... transitioning from KNEC in high school to CBET is completely insane. Most of us had gone through a very different system to begin with, but don't get me wrong KNEC had its ups and downs but CBET should not have been implemented towards us right after 12 years of KNEC. I won't be surprised if it fails in its first stages of development* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *practicals help improve on the hands-on skills but when it comes to theory it's a no because a lot of work and the system used is old* ***(QN-TRN-TC1)****.*

All in all, the respondents were of the view that sorting out the teething issues negatively impacting CBET implementation would raise its standards and enhance its effectiveness. The next section elaborates the actual strategies proposed for improving CBET implementation.

4.3.5.2 Proposed strategies for improvement of CBET implementation

The researcher analysed feedback from respondents concerning strategies to improve the implementation of CBET. The actual suggestions have been placed into six categories which were inductively produced by the researcher. These strategies are presented below and have been discussed in detail in the following sub-sections.

i. Emphasis on practical training
ii. Enhance the qualifications of trainers and institutional managers
iii. Invest in improved facilities and equipment
iv. Reduce program costs and workload
v. Review curriculum for content relevance
vi. Align CBET with the electrical industry/job market

(i) Emphasis on practical training

There was a clear and consistent call for increased practical training. Respondents emphasized the need for more hands-on experience, longer training durations, and a reduced focus on theory. They advocated for practical assessments and dedicated spaces for skill development. Essentially, this feedback highlights the existing gap between theoretical knowledge and practical application, suggesting that a stronger emphasis on practical skills is critical for effective teaching and learning and in the electrical programmes.

> ***Trainee:*** *Several quotes mention the need for more practical activities, workshops, and hands-on experience (QN-TRN-TC2, QN-TRN-TC3).*
>
> ***Trainee:*** *Reduce emphasis on theory and focus more on practical application (QN-TRN-TC2).*
>
> ***Trainee:*** *The duration of the course and embrace more on the practical because what is needed outside there is how skilful someone is (QN-TRN-TC2).*
>
> ***Trainee:*** *Installation of many practical assessment areas would be helpful in enhancing learning (QN-TRN-TC1).*

(ii) Upskill trainers and institutional managers

Effective implementation of CBET is largely influence by the quality of trainers. The results indicated a shortage of well-trained trainers who could effectively impart CBET principles in electrical programmes. While on one hance the trainee believed that CBET was a promising approach with government support, they stressed that provision of adequate training to trainers is key. As such, it would be correct to argue that enhancing trainer qualifications through targeted training programmes would help to bridge this gap. Based on the findings, it is also clear that trainers need to be adequately equipped with practical skills and knowledge to ensure successful CBET delivery.

> ***Trainee:*** *not until all trainers are first competent and be able to deliver in a manner that every student understands. Some trainers when it comes to skills and practicals, they are incompetent* ***(QN-TRN-TC3)****.*

> ***Trainee:*** *If the CBET approach is used well with well-informed trainers it can be very useful* ***(QN-TRN-TC2)****.*
>
> ***Head of Department:*** *Trainers must be retrained with time. I will be giving out trainees for dual training. The industry must also give us their curriculum. At one time the trainer must also be taken to the industry and be attached* ***(INT-HOD-TC2)****.*
>
> ***Trainer:*** *Capacity building for trainers because some skills are relatively new and ah the trainers are lacking in terms of the practical skills that they require* ***(INT-TR2-TC1)****.*

Still on the issue of qualified officers, respondents expressed concern about the leadership structure in the institutions. They indicated that the institutions, being technical in nature, required technical leadership. However, they observed that many leaders were from non-technical backgrounds such as finance, mathematics, and business.

(iii) Invest in improved facilities and equipment

Effective CBET implementation requires adequate facilities, equipment, and resources. Earlier feedback showed that most technical institutions still lacked requisite facilities and resources to implement CBET. Later on, the respondents suggested the need for improved laboratories, modern tools, and sufficient materials for practical training. Providing access to workshops, even for trainees without personal tools, was found to be crucial. Additionally, the findings showed that increasing the number of workshops and allocating more learning equipment to training institutions was essential to enhancing the overall quality of CBET electrical programmes and better preparing trainees for the workforce.

> ***Trainee:*** *Access to proper laboratories, equipment, and modern tools is crucial for effective practical training* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *the government to provide materials so that CBET will be good from the previous curriculum* ***(QN-TRN-TC3)****.*
>
> ***Trainer:*** *Equipping out workshops and laboratories so that we can have more time for practical where the material is enough for training* ***(INT-TR1-TC2)****.*

The trainers and HODs also emphasized several other strategies to enhance training programmes. For instance, they noted that optimizing class sizes and staggering trainee intake would better align with available resources, and that using technology, such as online platforms, could help alleviate the burden on physical resources. They equally proposed running exchange programmes between institutions to share equipment, thereby reducing the financial strain on individual institutions. The HODs especially recommended strengthening public-private partnerships to facilitate resource donations from industry and suggested that TVET institutions should specialize in specific courses to optimize resource allocation and reduce competition between departments.

> ***Trainer:*** *having smaller classes and also staggering intake so that we do not have so many intakes happening at the same time so that they fit the available resources* ***(INT-TR2-TC1)****.*
>
> ***Trainer:*** *The other way is Using technology such as committing other classes to online platforms and learning management systems will help in reducing the burden and also having the learning* ***(INT-TR2-TC1)****.*
>
> ***Head of Department:*** *Running exchange programmes where we share units so that may be for a given unit or a given skill set an institution will buy equipment for that and then another one buys so that we can be exchanging the trainees so that it doesn't become a burden for a single institution to have all the equipment* ***(INT-HOD-TC3)****.*
>
> ***Head of Department:*** *Have public private partnerships ties strengthened so that we can have some of the things from the industry being donated to the institutions within the industry setup* ***(INT-HOD-TC3)****.*
>
> ***Head of Department:*** *Let TVET institutions specialize in the courses they offer so that we do not offer everything. This is because we have to share resources with the other departments. So, when you are sharing resources then it now limits us.* ***(INT-HOD-TC3)****.*

(iv) Reduce the cost and workload for trainees

The respondents suggested a need to reduce program costs and workload to in order to ensure effective CBET implementation in the electrical programmes. They felt that decreasing costs associated with training, such as school fees, and regulating the amount of content delivered to trainees, institutions would make CBET programmes more accessible. Arguably, lowering financial burdens on trainees would potentially

encourage greater participation, while reducing workload allows trainees sufficient time to absorb information and apply practical skills.

> ***Trainee:*** *The cost of CBET programmes needs to be reduced to make them more accessible* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *Reduce the cost on the learning since it is too expensive to execute the required objectives* ***(QN-TRN-TC2)****.*
>
> ***Trainee:*** *Regulate the amount of workload to give trainees time to absorb the content* ***(QN-TRN-TC1)****.*

(v) Review curriculum for content relevance

Findings indicate that reviewing the CBET curriculum for content relevance can significantly influence perceptions of its effectiveness among trainers and trainees in electrical programmes. Respondents emphasized the need for practical skills alignment with industry demands, as evidenced by the call for more wiring-focused content. There were opposing views touching on the need to de-emphasise subjects like communication skills and entrepreneurship, while encouraging more visual learning. Undoubtedly, these views cast a debate about what content is most valuable in the curriculum. Further, there was also a notion that the current curriculum is overloaded, with concerns about reduced time for skill absorption. Consequently, the findings showed that CBET may be perceived as more effective if a curriculum revision emphasizes practical application, reduced workload, and a balanced skill set.

> ***Trainee:*** *After the end of my course of electrical engineering CBET should make me know a lot of skills in wiring and to enhance my skills in electrical engineering* ***(QN-TRN-TC1)****.*
>
> ***Trainee:*** *Elimination of subjects like communication skills and entrepreneurship* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *Just more projects and practicals. Reduction in entrepreneurial lessons and communication skills but more practicals. Frequent projects by CBET amidst the term than CATS* ***(QN-TRN-TC3)****.*
>
> ***Trainee:*** *the theory classes to be reduced and other unnecessary units (maths, digital literacy, OSH and the Practical classes to be increased like power lines and electrical installation* ***(QN-TRN-TC1)****.*

(vi) Align CBET with the electrical industry

Findings suggest that aligning CBET programmes with industry needs can significantly enhance implementation. For instance, a report on the need to use modern tools and equipment in training aligns closely with industry practices, facilitating a smoother transition for graduates. Additionally, integrating job opportunities and attachments as suggested by respondents not only provide practical experience but also strengthens the partnerships between technical institutions and the industry. It was also noted that developing job-competitive skills directly responds to industry demands, while the provision of field experience post-CDACC examination offers valuable insights for program improvement.

> ***Trainee:*** *Use modern tools and equipment to prepare trainees for the field (QN-TRN-TC2).*
>
> ***Trainee:*** *Provide job opportunities and attachment for trainees (QN-TRN-TC3).*
>
> ***Trainee:*** *Help trainees develop the skills they need to compete for jobs (QN-TRN-TC1).*
>
> ***Trainee:*** *Let us to go in the field after our July CDACC Examination for us to see how far we are (QN-TRN-TC3).*

In addition to the suggestions provided for aligning CBET to the job market, other respondents expressed the need to facilitate recognition in the employment market. Particularly, they opined that CBET graduates may be at a disadvantage compared to KNEC certificate holders due to employer familiarity with KNEC certifications, emphasizing the need to enhance the recognition of CBET qualifications by employers.

Furthermore, the findings of the study underscored the necessity of aligning the CBET approach with industry needs through adoption of dual training. This approach, as suggested by trainers and HODs, would involve alternating between industry and school settings, allowing trainees to gain practical experience without the need for educational institutions to invest heavily in specialized equipment. The respondents

emphasized that such a system would enhance the relevance and applicability of the skills being taught.

> ***Trainer:*** *Having dual training whereby we can integrate training in the industry together with training in the learning environment so that it makes it easier for the institutions not to but the equipment because we have them in the industry* ***(INT-TR2-TC1)****.*
>
> ***Head of Department:*** *If we had the dual learning such that industry three days, in school two days…****(INT-HOD-TC3)****.*
>
> ***Head of Department:*** *If we had the dual learning such that industry three days, in school two days…****(INT-HOD-TC3)****.*

In light of these findings, it is evident that successful implementation of CBET will require better linkages with industry.

4.4 Discussion of Findings

This section presents a discussion of the main findings of this study. The discussion has been organized according to the study objectives and aim to answer the guiding initial research questions. As a result, the researcher has conducted a comparison of the findings with existing literature in order to illustrate the similarities and discrepancies between the current results and those reported by previous researchers. Finally, the study provides a written analysis demonstrating the connection between the research findings and the Theory of Planned Behaviour, which forms the basis of this study.

4.4.1 Existing Training Approaches Used in Electrical Programmes

The findings of this study pertaining to the first research question revealed insights into the current training approaches in electrical programmes, particularly emphasizing the use of Competency-Based Education and Training (CBET). This contrasts with prior studies that focused on more traditional training approaches, such as On-the-Job Training (OJT), apprenticeships, and classroom-based instruction.

The results also suggested that while theoretical knowledge remains the foundation of technical training programmes, its delivery often mirrors traditional classroom-based methods, such as lectures and presentations. For this reason, there are rising concerns on whether these methods sufficiently meet the rigorous competency demands of CBET. In particular, the results of this study revealed a moderate alignment between current training programmes and industry needs, with an emphasis on practical work. However, the connection between training material and specific industry standards was not explicit, suggesting a potential gap in fully meeting industry expectations.

This contrasts the nature of traditional approaches as outlined in earlier studies, where there was often a disconnect between training content and training content and industry requirements. For instance, Smith and McNamara (2018) reported that traditional training methods basically focused on information transmission rather that development of specific competencies, arguably, leading to misalignment with program goals. These findings therefore highlight the importance of making industry standards more explicit within training curricula to strengthen the relevance of electrical programmes to labour market expectations.

Moreover, the findings revealed a continued dependence on written notes and classroom presentations despite the shift towards CBET approach. While presentations were appreciated by trainees for facilitating knowledge retention, the pre-dominance of lecture-based methods was indicative of traditional classroom-based training described by Eiris (2020). As much as this method is foundational, it lacked the hands-on experience emphasized in CBET and is undoubtedly less effective in promoting long-term retention as pointed out by Hung and Amida (2020). On the contrary, CBET advocates for more active and practical learning approached which agrees with Anane's (2013) description of CBET's learner-centred methods such as problem-solving and

research methods. This finding suggests that although policy shifts have promoted CBET, classroom practice still reflects traditional patterns. It underscores the need for sustained professional development of trainers to enable a full transition to learner-centred methods.

This reliance on traditional training methods is incongruent with the more dynamic and learner-centred approaches stressed by CBET proponents. For instance, Anane (2013) noted that CBET's efficacy stems from its emphasis on active learning strategies which fosters critical thinking and adaptability among trainees. However, the results showed that learner-centred methods were not fully utilized, potentially undermining the competency outcomes that CBET aims to achieve. Thus, the continued use of traditional lecture-based methods might be due institutional resistance to change or a lack of requisite resources, as postulated by Gessler and Peters (2020), who found that the implementation of CBET in Namibia remained heavily influenced by traditional educational structures with only little institutional adaptations. These findings, therefore, imply that the successful implementation of CBET cannot be achieved through curriculum reforms alone, but requires systemic changes supported by adequate institutional resources and trainer reorientation.

The examples of collaborative training techniques mentioned in the findings such as group work and practical sessions facilitated by ICT tools, reflect a modern adaptation of traditional training and on-the-job training models. These methods enable trainees to apply their theoretical knowledge in practical setups, aligning with the hands-on experience that is crucial to CBET. Empirical studies (e.g. Siddique et al., 2020) equally noted that CBET graduates demonstrated superior competency levels compared to those trained in traditional methods. This scenario supported the findings of the present study on the effectiveness of practical and collaborative approaches in modern training

programmes. The present findings therefore reinforce the importance of blended strategies, where collaborative and practical approaches are scaled up to bridge the gap between traditional practices and CBET demands.

The results also indicated the challenges of implementing effective CBET and particularly presented those related to assessment and industry alignment. This agrees with the work of Gyadu-Asiedu et al. (2017) who identified logistical and cost-related constraints in the implementation CBET, and additional issues regarding traditional assessment methods that did not accurately measure practical competencies. In the same token, Anane (2013) pointed out the importance of assessment in CBET, which focuses on verifying competence rather than simply measuring knowledge.

The findings of this study echoed this by emphasizing the need for assessment that align with industry standards and measure practical skills. These issues were a cited as a common challenge in the transition from traditional to competency-based training. This underlines the argument that reform in assessment practices is the most pressing issue for effective CBET implementation, since competencies cannot be adequately demonstrated through written tests alone.

Further, the findings showed that in spite of the shift towards CBET, assessments often remain entrenched in traditional formats, such as written tests, which may not sufficiently capture trainees' practical abilities. This significantly diverges from the CBET philosophy which prioritizes performance-based assessments to ensure that trainees can demonstrate the competencies required in real-world settings. Likewise, Gyadu-Asiedu et al. (2017) highlighted the shortcomings of traditional pen-on-paper assessments within CBET, arguing that they do not give an accurate measure of trainee competency. This study, therefore, points to the necessity of designing more authentic,

performance-based assessments that directly mirror workplace tasks. Without such measures, CBET risks losing its distinctiveness and effectiveness.

From the foregoing, it can be seen that while there had been efforts to align electrical programmes with CBET principles, traditional methods are still being practiced. This potentially limits the effectiveness of CBET. Such agree with previous research which emphasized the need for major reforms in training practices, methods of assessment, and resources to fully and effectively transition from traditional models to a competency-based approach. Notably, the continued dependence on older methods compounded by challenges in resources availability and industry alignment, suggested that the full adoption of CBET in electrical programmes remained work in progress.

4.4.2 Trainers' Perceptions on Use of CBET Approach

In relation to trainers' perceptions, the findings of this study showed that trainers had a general understanding of the concept of CBET, as they recognized it as a method focused on imparting skills, attitudes and knowledge to prepare trainees for the world of work. However, in spite of this understanding, many trainers were still perceived to be less prepared to effectively implement CBET. In particular, a significant portion of trainees (73%) were of the view that trainers lacked adequate preparedness, with only a minority of trainees perceiving them as well prepared. This gap between understanding and preparedness is noteworthy, as it undermines the central aim of CBET, which is to align learning outcomes with workplace readiness.

In addition, trainers were reported to have different levels of competence in implementing CBET. As such, while some were reportedly more skilled in theoretical instruction, some were stronger in practical application. Subsequently, a gap was identified between trainers' understanding of the electrical curriculum and their ability

to deliver the curriculum effectively. This scenario was strongly experienced in the curriculum aspects that required a practical approach. In the same measure, trainees noted a lack of practical engagement, and pointed out that trainers often failed to organize or adequately support practical sessions. This lack of practical engagement, which is integral to the CBET approach, contributed to the overall perception that trainers were not fully competent in delivering CBET. This finding highlights that competence in CBET cannot be sufficiently evaluated by theoretical mastery alone; rather, it is the ability to facilitate meaningful hands-on practice that determines its effective implementation.

This far, it is evident that these findings are aligned to the work of previous researches in the technical field. For instance, Kanyonga et al. (2019) and Pirzada et al. (2021) also reported that trainers had limited understanding of CBET hence inadequately prepared to implement of CBET methodologies effectively. Further, Kanyonga et al. (2019) pointed out that a majority of trainers in a study conducted in Tanzania, were not well versed in learner-centred CBET teaching methods and struggled with using assessment techniques that were deemed fit. This consistency between the present study and those conducted in the past highlights the persistent setback of effectively equipping trainers with the necessary skills to implement CBET, which influences the overall success of the program. This alignment reinforces the view that the challenge is not isolated but rather systemic across contexts.

A number of studies such as Noor et al. (2023) established positive perceptions about CBET. They indicated that trainers in technical programmes had a high-level perspective of curriculum aspects despite infrastructural challenges. In contradiction, the findings of the current study showed that trainers were underprepared and lacked

practical engagement. Moreover, while the likes of Noor et al. (2023) and other past studies stressed the importance of infrastructure in supporting vocational training, the present study weighed more on trainers' ability to deliver practical sessions. Arguably, this gap seemed to be more severe in the context of electrical programmes.

Moreover, the present study found that lack of preparedness among trainers negatively affected their competence in implementing CBET, which consequently raised concerns about the effectiveness of the programmes. This reinforced the findings of previous studies (e.g. Ismail et al., 2016; Deißinger & Hellwig, 2011) which presented trainers' attitudes and professional development as integral to the successful implementation of CBET. Notably, Deißinger and Hellwig were optimistic about the potential of CBET when trainers are well prepared and passionate. This was dissimilar for the present study where the findings suggested that the trainers were not as enthusiastic about the CBET program thus making its implementation less effective. This alignment reinforces the view that the challenge is not isolated but rather systemic across contexts. This finding underscores that both professional development and trainers' attitudes are not peripheral, but central to the effective realization of CBET.

Another study by Lai et al. (2019) found that trainers in technical institutions in Nigeria perceived various competencies as crucial ingredients of an effective training program. In contrast, the results of the present study suggested that trainers in the studies context might not have been fully equipped with these competencies, particularly in practical application. In comparison, while Lai and others indicated a positive perception of necessary competency elements, the present study pointed to a gap between theoretical understanding and practical delivery. This was indicative of the need for more targeted professional development is needed.

Ultimately, the results of the present study reflected Ayonmike's (2014) concerns about the inadequacies in TVET institutions, particularly in Africa. These were related to trainers' often lack of skills and resources to effectively implement CBET. Arguably, these findings have reinforced the call for more comprehensive professional development programmes and better resource allocation to guarantee that trainers both knowledgeable and competent in delivering the theoretical and practical aspects of CBET. These are without a doubt, integral practices for meeting the demands of modern technical education and workforce development. The implication here is that unless trainers are adequately supported in both skill acquisition and resource provision, the transformative potential of CBET will remain unrealized.

4.4.3 Trainees Views on Effectiveness of CBET in Electrical Programmes

In the aim to establish trainees' views on the effectiveness of CBET, the results revealed that a majority of the trainees had an initial neutral understanding of CBET. This seemed to suggest that the trainees were familiar with the CBET approach only to a limited extent. Indeed, some trainees mentioned having difficulties adapting to the CBET curriculum. They cited such challenges as insufficient time and lack of clarity about the program from their respective institutions. The present study also showed that 57.1% of the trainees felt that CBET's integration into the curriculum was not only complete. On the other hand, 86.3% of them opined that CBET had positively contributed to their development practical skills. Irrespective, there were issues of concern touching on the theory-practice balance, where most of the trainees noted that their exposure to practical experience was inadequate. There is an imbalance particularly significant, as it highlights the possibility that CBET's intended emphasis on practical learning is not being fully realized in practice.

Some of the areas where trainees reportedly gained practical skills included but limited to wiring, electrical installation and soldering. Even so, they indicated that additional practical sessions were still required in these areas so as to meet industry standards. Accordingly, while 38.1% of the trainees felt well-prepared for the industry due to CBET training, others pointed out that industrial training and the relevance of certain electrical units still had imminent gaps. In relation to previous research, the current study found out that trainees had a mixed understanding of CBET. Others even expressed difficulties in adapting to the approach due to insufficient time and unclear guidance from respective institutions. This contradicts the findings of earlier studies that reported a held a general positive perception about the approach. This shows that while CBET does provide important skill-building opportunities, its effectiveness is uneven, particularly when viewed against industry expectations.

For instance, in the work of Al-Ajlouni and Khreisat (2020) and Albekairy et al. (2021), trainees expressed high satisfaction with CBET attributable to its relevance to future careers and the opportunities it provided for hands-on learning. This divergence suggests that the effectiveness of CBET could be influenced by the quality of implementation and institutional support accorded to the program. This divergence suggests that the effectiveness of CBET is not universal but is strongly influenced by the quality of implementation and the nature of institutional support.

Moreover, a considerable alignment was identified between the present study and the work of Orellana-Rojas et al. (2018) who pointed out that trainees in a CBET program appreciated the personalized and flexible nature of the program that allowed them to focus on areas where they needed help. On the other hand, there was a notable contradiction with the study carried out by Sher and Hartley (2019) which showed that

some trainees felt overwhelmed by the self-directed nature of CBET. This caused them to struggle with such factors as time management. Likewise, Fossey and Shadiow (2018) reported on the nature of traditional, lecture-based learning that trainees in technical institutions were accustomed to. They further indicated that while transitioning to CBET, most trainees struggled with the self-motivation and self-direction required in the new program. These disparities seem to suggest that while CBET potentially enhances trainees' preparedness for the industry, its effectiveness may be reliant on how well trainees can adapt to its demands and the level of support provided by the institutions. These parallels and contrasts affirm my conclusion that while CBET has significant potential, its success depends on how effectively trainees are supported to adapt to its self-directed demands.

As earlier mentioned, about 86.3% of the trainees believed that CBET contributed positively to their practical skill development. This is consistent with findings from the work of Daymont and Blaschke (2017) and Lang et al. (2018) who also reported that trainees felt that CBET helped them to develop practical skills that were directly relevant to their careers. Even so, it is worth noting that while trainees in the present study raised concerns about balance between theory and practice, previous research (e.g. Daymong & Blaschke, ibid) presented very little concern in this regard. They findings actually showed that trainees were confident that CBET provided ample opportunities for practical learning. This contrast presents a potential gap in the practical application of CBET in technical institutions covered in this study. This suggests that while the CBET approach is maybe theoretically sound, its implementation may vary, resulting in differences in trainee experiences.

Based on these results, it is clear that most trainees had a positive perception of the effectiveness of CBET. Some of the perceived benefits included provision of hand-on learning opportunities, and spaces for self-directed learning and personal growth. However, some concerns were also captured relating to the need for greater effort and time management compared to the traditional learning approaches. Taken together, these findings suggest that while CBET is appreciated for its practical orientation, its effectiveness in this context is moderated by how well institutions balance theory with practice and how effectively trainees are supported to navigate the self-directed nature of the approach.

4.4.4 Challenges Facing CBET Implementation

The study reported that the implementation of CBET in electrical programmes at the sampled technical institutions was hindered by a myriad challenges. First, trainers often lacked the necessary industry experience, and also struggled with interpreting the curriculum and developing competency-based assessments tools. Moreover, inadequate resources, out of date equipment and large trainee enrolments rendered practical training difficult. There was also the challenge of high cost of materials which were mostly unavailable. In some instances, the institutions resorted to loan equipment from industries which were in return often reluctant to provide hence straining the institutions resource wise. The respondents further complained about the CBET curriculum citing that it was disorganized and theory-laden, with a poor alignment between the training offered and the assessment administered to measure development of competencies. Similarly, it was reported that the institutions focused more on exam preparation than practical training.

Another notable challenge was about resistance to the implementation of CBET from both trainers and trainees. The trainers were specifically slow in their adoption while the trainees felt lowly motivated for the self-directed learning nature of the new approach. While industry partnerships are integral in the success of CBET, their findings revealed limited opportunities for the same. This was the case as the benefits of such partnerships remained elusive in most cases. On the basis of project implantation procedures, most of the respondents cited the rushed nature of the CBET approach as a major challenge. They clarified that its implementation lacked a proper piloting phase hence giving rise to issues with content coverage, assessment timing and the overall effectiveness.

Indeed, these findings have several points of congruence than incongruence with previous studies on the implementation of CBET in TVET institutions. Just like the finding in the work of Ahmed et al. (2022) and Mulenga and Kabombwe (2019), the present study reported that insufficient knowledge and a lack of support from stakeholders (including trainers and employers) was a significant barrier to successful CBET implementation. The aforementioned studies pointed out that there was need for better alignment between industry requirements and the skills fostered in CBET programmes, which was a major concern in Zambia.

The findings of this study further corroborate the work of Aluoch (2021) and Brodie (2021) which showed that insufficient resources pertaining infrastructure, equipment, and qualified trainers, posed a challenged to CBET implementation. It is worth noting the presence of qualified trainers is one hand treated as availability of manpower and on the other hance viewed as a resource to support effective CBET implementation. Looking at this binary treatment, it can be argued that trainers' preparedness is indeed

integral in the implementation of any training related project including such a critical reform as CBET. The aforementioned challenges were replicated in countries like Pakistan, Zambia and even Kenya where they were repeatedly cited as an impediment to effective CBET delivery. Both the findings of this study and the previous ones captured suggest that addressing resources constraints is essential for improving CBET outcomes.

The findings were also a keen to a study by Mwagunga et al. (2020) which emphasized the risks of a skills mismatch and youth unemployment in the event that CBET is not effectively implemented. Such concerns are echoed in the present study where results, with a warning tone, indicated the possibility of a significant gap between the skills being taught and those needed in the job market. These agree with Onyango (2021) and Mwagunga (ibid) who suggested practical solutions to overcome CBET challenges. While suggesting solutions, both studies highlighted the importance of involving industry stakeholders in the curriculum design process, and ensuring the availability of qualified trainers and adequate resources.

Some slight incongruence was noted between the present findings and those in the work of Rahman et al. (2012) which presented additional challenges that were unique to Bangladesh. Such included: poor administrative support and bureaucratic pressures. In as much as the present study did not mention these issues explicitly, it rather acknowledged broader systemic challenges that could impede CBET implementation. This suggests that the specific barriers might vary depending on the regional and institutional context. Other studies by Obwoge and Edwin Obwoge (2016) and Oviawe and Anetekhai (2019) stressed the broader systemic issues facing TVET systems in Africa. In contrast, the present study focused more on the specific challenges related to

CBET in electrical studies. Although both the present study and previous studies highlighted the importance of aligning TVET with industry needs, the results provided a more targeted analysis of the electrical engineering sector, while the other studies offered a broader overview of TVET challenges across multiple disciplines.

Comparatively, Ndile (2018) found that CBET programmes in Nairobi County positively impacted youth employability where graduates of the competency-based program appeared more competence and outperformed those trained under the traditional approaches. This contradicts the results of the present study which identified poor alignment between training and assessment and a slow adoption of CBET methods, indicating a disconnect between CBET's theoretical framework and practical application.

Another notable challenge related to resistance among trainers and trainees to CBET methods and poor motivation for self-directed learning. This resonates with Mwagunga et al. (2020) who found that trainees in the coastal region exuded mixed perceptions about the CBET curriculum, where some viewed it as inferior to the traditional-based approach. While respondents were of the view that the rushed implementation of CBET was unwarranted, it is notable, that the same align to a considerable degree with previous studies. For instance, Mutua et al. (2019) found that trainers in Kenyan TVET institutions were not adequately prepared to implement CBET particularly for learners with visual impairments. In contrast, Mutua and Muriithi (2015) highlighted the potential of CBET to meet industry needs, especially in the construction sector, though their study did not directly address the challenges identified in this study.

Lastly, Ondieki et al. (2018) highlighted a number of deficiencies associated with CBET comprehension among graduates who were enrolled in an engineering program.

This supports the present study which highlighted results relating to the disorganization and theoretical nature of the CBET curriculum in electrical programmes. From both studies, there lays an emphasis on the need for better alignment between curriculum content and industry requirements to improve graduate employability. While this study presents results that are largely concordant with previous research, it also offers information on the specific challenges that are unique to the electrical programmes. Such may indeed differ from the broader setbacks identified in research work carried out in other regions and disciplines.

4.5 Connecting Findings to Theory

The Theory of Planned Behaviour (TPB) which was developed by Icek Ajzen as an attempt to predict human behaviour (Ajzen, 1991) explains how attitude toward a behaviour, subjective norm, and perceived behavioural control influence behavioural intention. In this regard, the researcher examined how the tenets of TPB align with the research themes so as to demonstrate the extent to which the findings of are consistent with the theory.

The findings of this study revealed trainers' and trainees' attitudes and perceptions regarding CBET implementation. For instance, many in relation to trainers competence and preparedness, many trainees felt that the trainers were ill-prepared implement the program. This was indicative of a potentially negative attitude towards the new approach possibly due to lack of familiarity. Conversely, while some of trainees expressed an appreciation towards the CBET approach, others indicated that they were dissatisfied due to inadequate practical engagement and insufficient resources thus reflective of mixed attitudes. These findings are adequately founded on TPB's first

principle which focuses on attitudes, pertaining to an individual's assessment of a behaviour as favourable or unfavourable.

The findings further showed that the trainees and trainers felt varying degrees of support from their institutions and even pointed to a lack of adequate support from industry players. Elsewhere, the results presented an existing confusion between the older KNEC curriculum and the CBET approach suggesting that institutional support and clarity were lacking, hence negatively impacting the perceived social pressure. Finally, regarding industry alignment, the trainees reported that the CBET approach was not well aligned to the industry demands, which could reflect a broader educational community that is not supporting the CBET approach. Such can be explained by the second principle of TPB relating to subjective norms. This principle involves the social pressures that individuals perceive

Consequently, the findings revealed a notable disparity in trainers' perceived capacity to efficiently conduct training of electrical programmes within the CBET approach. Furthermore, among the trainees reported that their trainers did not adequately possess the essential skills and knowledge of CBET which directly impacted their perceived behavioural control. This was compounded by the lack of adequate hands-on training and resources that further diminished both trainers' and trainees; perceived control in effectively implementing CBET. These findings are adequately explained by the third principle of TPB which focuses on perceived behavioural control, and relates to individuals' belief in their capability to carry out a behaviour. This behaviour needs to be influenced by their skills, and availability of resources whilst considering any possible barriers.

The Theory of Planned Behaviour suggests that intention to engage in a behaviour is the most direct indicator of actual behaviour. As such, positive attitudes, supportive subjective norms and a high perceived behavioural control result in strong intentions to participate in a behaviour. Accordingly, it was crucial to assess trainers' preparedness and willingness to adopt the CBET approach. Consequently, the conflicting attitudes, insufficient support from the educational sector, and trainers' low perceived behavioural control indicate their commitment to fully adopt and implement the CBET approach may be lacking. This is evident from the challenges faced during implementation and the trainers' tendency to partially stick to traditional training techniques.

From the foregoing, it is clear that the findings of this study align with the TPB theory in a number of ways. Concisely, positive attitudes towards CBET were limited by trainers' and trainees' experience with inadequate preparation and resources. Subjective norms were influenced by a clear institutional support and alignment with industry standards while perceived behavioural control was affected by the trainers' lack skills and practical engagement opportunities. Put together, these issues influence the intention to effectively implement the CBET approach.

4.6 Chapter Summary

This chapter has analysed and presented the research findings of this study. The chapter began by outlining the demographic data of the respondents, highlighting a significant response rate of 88.9%. Detailed preliminary information about the respondents was provided which included their gender, age, and type of institution, emphasizing a predominance of male trainees enrolled in the electrical programmes. The results were discussed in relation to four main research objectives focusing on training approaches,

trainers' perceptions, the effectiveness of the CBET approach and the challenges undermining its implementation. It has been revealed that while the CBET approach aims to align with industry standards, there are significant gaps in trainers' preparedness and practical engagement which influence the overall effectiveness of CBET training. The chapter concludes by indicating the key challenges affecting the implementation of CBET such as inadequate resources, theory-practical imbalances, and lack of industry partnerships, and suggests areas for future improvement. A discussion on the linkage between the findings and the underpinning theory has also been presented.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter indicates the extent to which the research objectives have been met. It presents the summary of the findings in response to the research questions, conclusions as discussed in chapter four, and recommendations for enhancing the implementation and hence effectiveness of CBET approach in electrical programmes in technical institutions. The recommendations are based on the implications of this study and also have highlighted areas for future research.

5.2 Summary of Findings

This section presents a summary of the study's findings, addressing four key objectives. The study examined the prevailing training methods in electrical programmes at Nairobi County TVET institutions, trainers' perspectives on the competency-based education and training (CBET), trainees' evaluations of CBET effectiveness, and challenges to its implementation.

5.2.1 Training Approaches Adopted by Trainers in Electrical Programmes

In the previous chapter, the researcher sought answers to the research question addressing this objective. Consequently, the various training approaches being employed in the electrical program and especially within the CBET window were discussed. The results revealed thin line between indicating an almost insignificant difference between the former traditional approaches and those aligned to CBET. As such, some sort of redundancy colouring the two methods was reported by respondents.

One of the findings in this respect captured the extent to which electrical training programmes aligned with industry needs in light of the training approached adopted. The results showed a moderate level of alignment where a mean agreement score of 58.9% was obtained. Further, it was found that the focus of electrical programmes weighed more on hands-on learning rather than the content of the curriculum to be covered, which is primarily a core feature of the CBET approach. Even so, the connection between the electrical programmes offered and the specific job roles in the industry received the lowest agreement score. This can be argued to mean the programmes were not fully aligned with the expectations of the industry.

Another major finding pertaining training approaches presented the use of written notes and classroom presentations as a common technique. Reportedly, trainers relied on PDF notes that were mostly not self-created, which they gave out and circulated among trainees. Consequently, the trainees their dissatisfaction with such an approach citing the lack of proper analysis and discussion of electrical themes in such notes. However, more positively, some of them appreciated that the participating in class presentations helped them in knowledge retention.

In addition, the findings revealed that collaborative training was commonly utilized in the electrical programmes. Particularly, the trainees would work in groups while undertaking project work during the practical sessions. Complementarily, the trainers stressed the use of a multi-layered approach where practical workshops, lab sessions, role play and site visits. These approaches aimed at enhancing trainees' hands-on experience and understanding of the theoretical concepts. Evidently, in spite of the emphasis on practicals, the lecture method was still preferred by the trainers. They pointed out that the lecture method was useful for introductory sessions and was

regarded as essential for laying the foundation before moving on to practical applications.

Furthermore, some of the respondents reported that there was just a slight difference between the CBET approach and the traditional methods, citing an increased emphasis on practical work in the latter approach. The trainers pointed out that practical work was not given much attention in the past and that some concepts and skills were not taught explicitly. As per the findings, it can be concluded that while CBET was intended to be more practical and industry-aligned, its implementation is still undergoing transition, with some trainers continuing to rely on traditional approaches.

5.2.2 Trainers' Perceptions on use of CBET Approach in Electrical Programmes

The second research questions sought answers to trainers' perceptions of the CBET approach with regard to competence, preparedness and the practical work they facilitated. In view of the findings, it was clear that trainers demonstrated a solid understanding of the CBET approach. They particularly acknowledged that the approach was designed to impart theoretical knowledge and practical skills among trainees whilst fostering the right attitudes needed for the industry. Notably, while on one hand trainers acknowledged the importance of these competencies, the trainees' responses indicated varying perceptions of trainers' preparedness. In particular, a significant proportion (42%) of the trainees perceived their trainers as only moderately prepared, with another 19.9% indicating they were somewhat prepared. A minority (11.1%) felt that the trainers were not well-prepared at all suggesting a general lack of understanding and readiness among trainers to fully implement the CBET approach.

In their view, trainees reported that while some trainers were perceived to be well prepared, especially in delivering theoretical content, there was still a clear gap relating

to practical work. For example, 55.8% of the trainees agreed that trainers were equipped and ready to deliver CBET while 54.8% believed that adequate support and resources were provided for practical engagement. This was indicative of a deficit in trainers' ability to integrated real-world application into the training process. This situation was further compounded by reports from trainees indicating that trainers often resorted to traditional lecture methods for some topics in the electrical curriculum that required hands-on experience. In some extreme cases, it was reported that the trainers did not carry out practical sessions completely. This lack of practical involvement was seen as a significant barrier to the successful implementation of the CBET approach.

Based on the findings, it was clear that the trainers had a theoretical understanding of CBET while lacking the practical implementation power. In this regard, feedback from trainees seemed to suggest the need to further develop and facilitate practical work and fully engage with the CBET curriculum in order to meet its objectives. The findings presented a crucial need to align trainers' competencies with the demands of the CBET approach so as to ensure that trainees are adequately prepared for the industry.

5.2.3 Trainees' Views on the Effectiveness of the CBET Approach

The third research questions sought answers to trainees' views on the effectiveness of the CBET approach in electrical programmes. The findings showed that initially, a majority of the trainees expressed a neutral understanding of CBET. A significant number of them on the other hand reported that they were still catching up with the older electrical curriculum. While justifying their limited knowledge of the CBET approach, some trainees cited lack of clarity offered by their institutions while others pointed out the approach come an equal share of complexities. Such issues made it

difficult for them to fully grasp CBET's principles and requirements in the electrical program.

With respect to CBET's design and impact, the trainees perceived the integration of its elements as partial. Concisely, they believed that CBET contributed moderately to the development of practical skills for electrical work. Even with such moderate success, trainees cited an imbalance between theory and practical work where theoretical knowledge often overshadowed practical applications. Such a discrepancy led to concerns about trainees' preparedness for the industry, as a lack of hands-on experience could hinder their competence in real-world scenarios. Irrespective of the concerns, they reported that their current program enabled them to perform various tasks related to electrical training. Such included soldering, wiring and electrical installation although learning such skills was carried out in isolation where limited opportunities for actual application were provided.

Still, while CBET provided industry preparedness to some extent, most of the trainees believed that certain units which were theoretical in nature, were irrelevant to the electrical industry. This further contributed to their sense of inadequate preparation. Moving to assessment, the trainees observed that the assessment methods employed within the CBET framework were not completely aligned to the program's intended outcomes. This is because, the methods often emphasized theoretical knowledge over practical competencies hence contradicting CBET's focus on hands-on skills. Such misalignment delinked what was taught from that which was evaluated, leading to frustration among trainees as they felt that their practical abilities were not either adequately assessed or recognized. Consequently, the trainees recommend the use of

varied forms of practical assessment that would better reflect their competencies whilst providing more accurate measures of their readiness for the electrical industry.

Furthermore, some trainees mentioned that their institutions had made an effort to equip them with the necessary tools and materials. Others indicated that the resources were not sufficient to meet the demands of the CBET curriculum. In particular, they pointed at instances where insufficient instructional materials, outdated equipment and limited access to workshops impeded their full engagement with practical components of the electrical program. This scenario both affected their learning experiences and also raised concerns about the overall effectiveness of CBET in preparing them for the world of work.

Finally, feedback from trainees showed that while the CBET approach had some positive aspects, there were still areas that needed improvement. Specifically, many trainees expressed the need for more industrial attachment and practical experiences that align to industry needs. In spite of some institutions' efforts to partner with companies for practical training, there was a general view from consolidated responses that more could be done to enhance the real-world applicability of the skills learners through the CBET approach.

5.2.4 Challenges Facing the Implementation of CBET Approach in Electrical Programmes

The fourth research question was aimed to seek answers relating to challenges that undermine the implementation of CBET in the sample TVET institutions. From the feedback generated, a number of issues were presented that impede the successful implementation of CBET. In this manner, the first challenge identified related to the lack of competent trainers. Most of the trainers were reported to be inadequately

prepared to implement CBET. This was partly justified by their training in the older KNEC curriculum. Trainers themselves admitted having difficulties in interpreting the CBET curriculum and occupational standards, and creating effective assessment tools for practical work. Notably, industry experience among trainers was also found to be missing hence a need for structured programmes and industrial attachments was emphasised to as to better equipe trainers with the requisite competencies.

The other significant challenges identified was on the existence of insufficient training and learning resources. Specifically, the findings showed that most institutions lacked adequate infrastructure such as workshops and labs, which were essential for conducting practical work. This was exacerbated by the large class sized caused by massive trainees enrolments thus rendering the available resources insufficient during practical lessons. As a way of addressing the shortage issue, most institutions reportedly resorted to improvisation or borrowing from other institutions or industries, a practice they mentioned was not sustainable.

High cost of materials was also found to be problematic as institutional leaders often had to procure the necessary equipment for CBET. Such were reported to be expensive thus made it difficult for institutions to maintain the quality of training. While some units were relatively impractical die to lack of essential resources, the financial burden was of equally spread to trainees in form of school fees. There was compounded by the fact that industries were reluctant to loan their equipment causing institutions to either increase class sizes or reduce number of trainees to manage costs.

Moreover, the findings revealed a misalignment between the CBET approach and the assessment methods adopted, which were mostly criticised for not sufficiently focusing on development of competencies. There was also a notion among respondents,

especially trainers and HODs, that CBET's implementation was rushed thus causing confusion among trainers about the depth and breadth of content coverage difficulties in carrying out timely assessments. As a result, the respondents pointed out that the CBET curriculum ought to have been piloted for earlier identification of potential impediments before full-scale implementation. They argued that the lack of piloting caused institutions to focus more on managing emerging issues rather than effectively implementing the CBET program.

5.3 Conclusion

The first research question sought answers about the existing training approaches adopted in the electrical programmes. Consequently, the study made a concluded that as much as CBET intended to align with industry needs and stress practical skills development, its implementation in the electrical programmes experienced a blend of traditional and CBET methods. Moreover, while practical work and collaborative learning were largely emphasized, such traditional methods like lectures and use of written notes still played a significant role, suggesting that the transition to a fully-fledged CBET approach was ongoing.

The second research question aimed at soliciting responses related to trainers' perception about CBET. This study concludes that while trainers demonstrated a solid theoretical understanding of the CBET approach, there was a significant gap in their practical implementation. Accordingly, while trainers recognized the importance of combining theory and practical work, some of them felt incapacitated. Most trainees equally perceived a lack of preparedness and engagement in the practical aspects of training by trainers. This disparity suggested a need to further development of trainers'

abilities to implement CBET through integration of real-world applications and provision of hands-on practices.

While seeking answers to establish trainees' views regarding CBET effectiveness, it was concluded that the program has a mixed level of effectiveness. Precisely, while the program had succeeded in developing some practical skills necessary for electrical industry, it fell short of fully integrating the skills in real-world applications. This lead to rising concerns about job market preparedness among trainees. Notably, considerable deficits were identified relating to resources, assessment techniques and industrial training opportunities. This study concluded that such areas required significant improvement so as to enhance the overall effectiveness of the CBET approach.

The answers to the last research question showed that the implementation of CBET faced significant challenges. The key obstacles included inadequacy of competent trainers, financial constraints, and a misalignment between CBET curriculum and assessment methods compounded by a lack of institutional support and industry collaboration. The lack of a piloting phase of CBET further exacerbated these setbacks hence leading to difficulties in achieving the desired outcome of the CBET program.

5.4 Recommendations

In light of the study findings and the ensuing conclusions, a number of key recommendations have been made with the aim of informing policy formulation and practice among stakeholders in the field of technology education.

i. TVET-CDACC and National Polytechnics in collaboration with relevant bodies to align CBET programmes with industry needs.
ii. KNQA to increase recognition of CBET qualifications through enhancing the recognition and acceptance of CBET certifications.

iii. Ministry of Education (SD-TVET) to provide adequate training facilities and equipment for effective practical training.

iv. TVET-CDACC and Qualification Awarding Institutions to undertake continuous review and improvement of the curriculum to ensure that the training programmes remain relevant and effective over time.

v. Kenya School of TVET and industries to offer continuous training and professional development opportunities for trainers to enhance their skills and familiarity with the CBET approach.

vi. TVET institutions to establish support systems to help trainers transition from traditional teaching methods to the CBET approach.

vii. Future research to undertake comparative studies to investigate and compare the outcomes of CBET programmes with traditional training methods to identify specific benefits and drawbacks.

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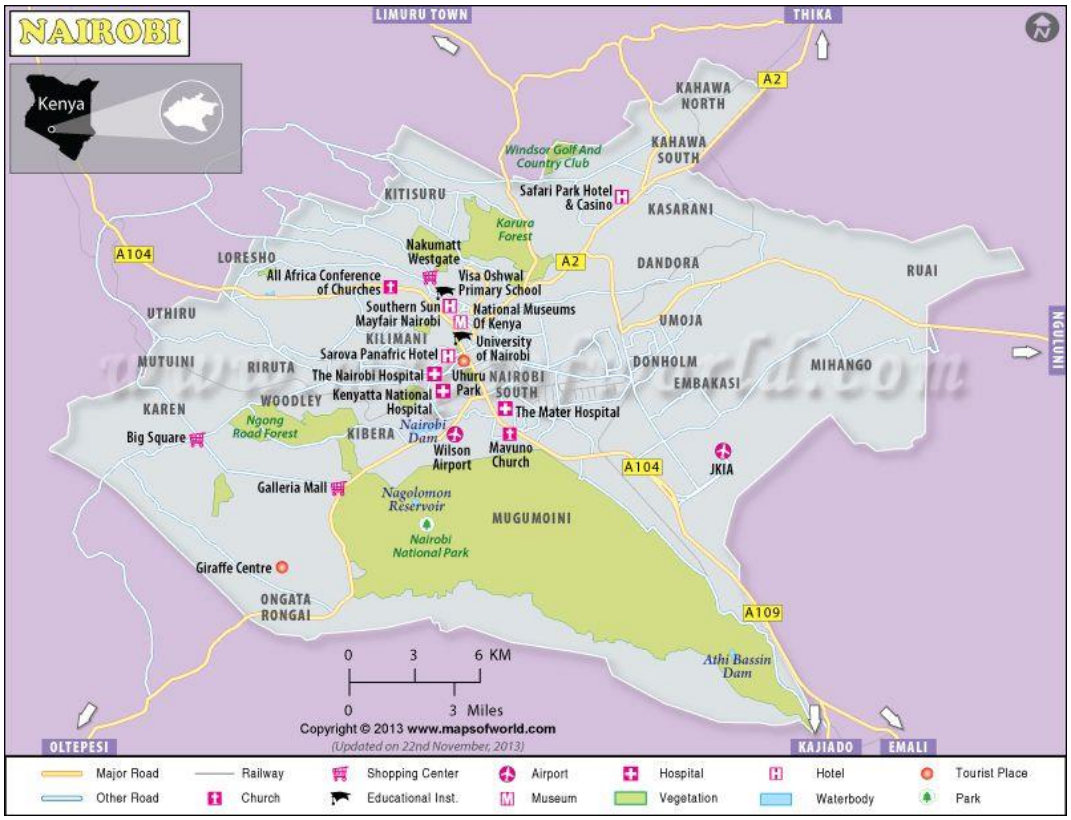
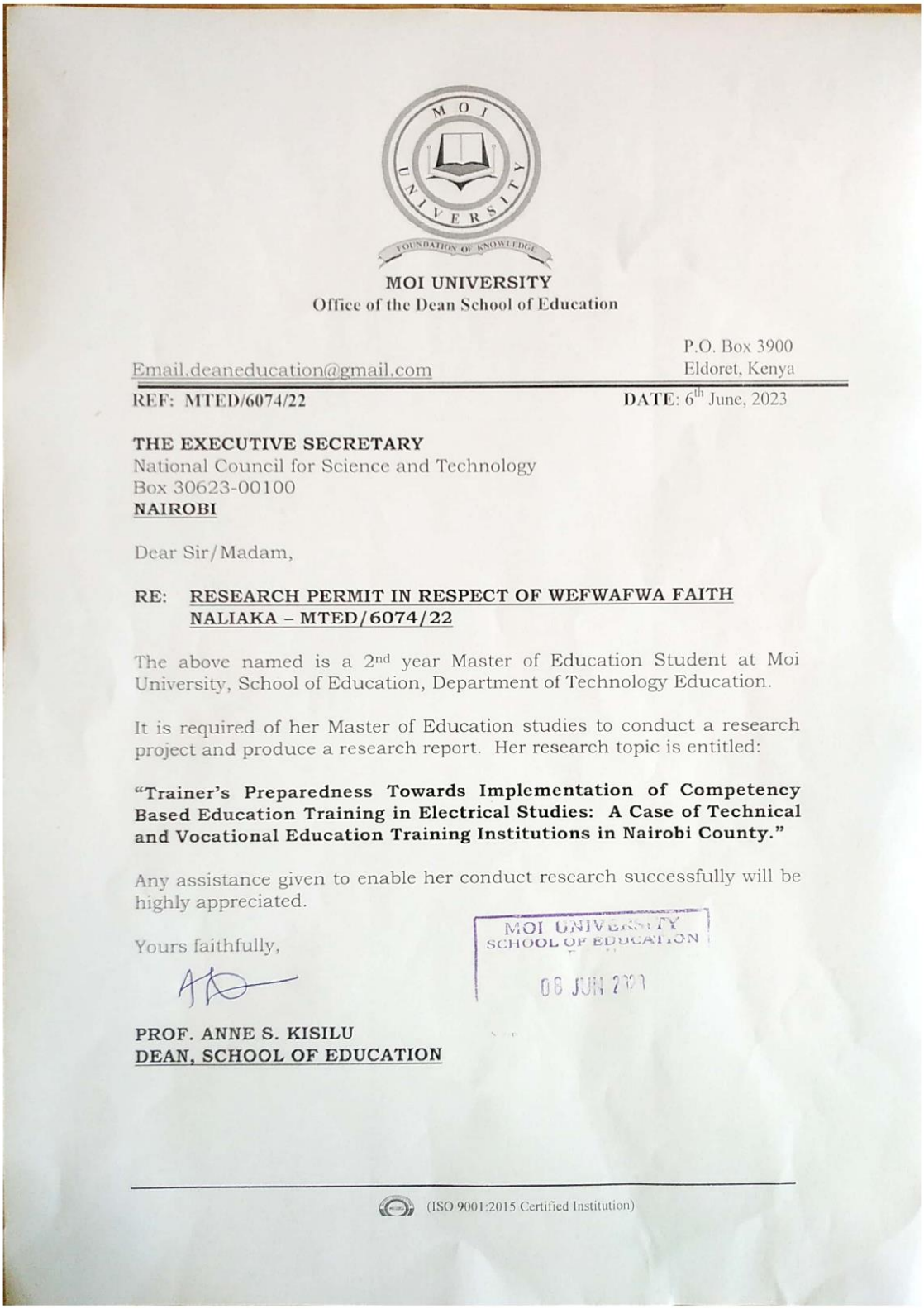
APPENDICES

Appendix 1: Map showing Location of Nairobi County



Appendix 2: Moi University Research Permit



MOI UNIVERSITY
Office of the Dean School of Education

P.O. Box 3900
Eldoret, Kenya

Email.deaneducation@gmail.com

REF: MTED/6074/22 DATE: 6th June, 2023

THE EXECUTIVE SECRETARY
National Council for Science and Technology
Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH PERMIT IN RESPECT OF WEFWAFWA FAITH NALIAKA – MTED/6074/22

The above named is a 2nd year Master of Education Student at Moi University, School of Education, Department of Technology Education.

It is required of her Master of Education studies to conduct a research project and produce a research report. Her research topic is entitled:

"Trainer's Preparedness Towards Implementation of Competency Based Education Training in Electrical Studies: A Case of Technical and Vocational Education Training Institutions in Nairobi County."

Any assistance given to enable her conduct research successfully will be highly appreciated.

Yours faithfully,

MOI UNIVERSITY
SCHOOL OF EDUCATION
06 JUN 2023

PROF. ANNE S. KISILU
DEAN, SCHOOL OF EDUCATION

(ISO 9001:2015 Certified Institution)

Appendix 3: NACOSTI Research Authorization

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **884080**

Date of Issue: **30/June/2023**

RESEARCH LICENSE

This is to Certify that Ms.. Faith Naliaka Wefwafwa of Moi University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Trainers' Preparedness Towards Implementation of Competency Based Education Training in Electrical Studies: A Case of Technical and Vocational Education Training Institutions in Nairobi County for the period ending : 30/June/2024.

License No: **NACOSTI/P/23/27204**

884080

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 4: Approval Letter for Research (Ministry of Education)

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL ADMINISTRATION
STATE DEPARTMENT FOR INTERNAL SECURITY AND NATIONAL ADMINISTRATION

Telegrams.....
Telephone: Nairobi 316845, 341666
When replying please quote

COUNTY COMMISSIONER
NAIROBI
P.O. Box 30124-00100
NAIROBI

REF: ED 10/6 VOL. XXVII (~~139~~ 141)

21st September 2023

Ms. Faith Naliaka Wefwafwa
Moi University
Eldoret

RE: RESEARCH AUTHORIZATION

Your letter dated 30/June 2023 refers.

This office has no objection and authority is hereby granted to conduct research on the topic **"Trainer's Preparedness Towards Implementation of Competency Based Education Training in Electrical Studies"** in Nairobi County for the period ending 30th June 2024.

MERCY KAVOI

FOR.COUNTY COMMISSIONER

Copy to: All Deputy County Commissioners

Appendix 5: Coding Key

Technical Institution	Respondent	Code
National Polytechnic	HOD	**INT-HOD-TC1**
	Trainer 1	**INT-TR1-TC1**
	Trainer 2	**INT-TR2-TC1**
	Trainee	**QN-TRN-TC1**
Technical Training Institute 1	HOD	**INT-HOD-TC2**
	Trainer 1	**INT-TR1-TC2**
	Trainer 2	**INT-TR2-TC2**
	Trainee	**QN-TRN-TC2**
Technical Training Institution 2	HOD	**INT-HOD-TC3**
	Trainer 1	**INT-TR1-TC3**
	Trainer 2	**INT-TR2-TC3**
	Trainee	**QN-TRN-TC3**

Appendix 6: Data Generation Tools

a) Semi-structured

SEMI-STRUCTURED QUESTIONNAIRE FOR TRAINEES

CODE: ……

Introduction

Thank you for dedicating your time to this survey, crucial for enhancing the transition to Competency-Based Education and Training (CBET) recently adopted by TVET institutions in Kenya. This questionnaire aims to gather your feedback on the relevance, engagement, skill development, practical application, knowledge transfer, and overall satisfaction with the CBET approach in the context of electrical programs. This will also help to evaluate the preparedness of your trainers for guiding you through this educational shift. Your anonymity is guaranteed, and this is not a test; there are no right or wrong answers. Your honest responses are essential for highlighting areas where additional trainer support may be necessary, ensuring optimal CBET training in electrical programs. Most questions only require a single tick (✓), and we appreciate your effort in completing each question.

PART A

1. Gender of respondent: Male ☐ Female ☐ Other ☐

2. Age: Below 20 yrs ☐ 21-25 yrs ☐ 26-30 yrs ☐ Above 30 yrs ☐

3. Category of TVET institution:

National Polytechnic ☐

Technical Training Institute ☐

Technical & Vocational College ☐

4. County: …… **Sub-County:** ……

5. Level of program: Level 5 ☐ Level 6 ☐

6. Current year of study: Year 1 ☐ Year 2 ☐

PART B

7. Please rate your understanding of the Competency-Based Education and Training (CBET) approach.

Completely unfamiliar ☐ Somewhat familiar ☐
Somewhat unfamiliar ☐ Extremely familiar ☐
Neutral ☐

8a. Rate your perception of the trainers' understanding and preparedness to implement Competency Based Education Training in the electrical program.

Not well prepared ☐ Well prepared ☐
Somewhat prepared ☐ Exceedingly well prepared ☐
Moderately prepared ☐

b. Please explain your answer in (**8a**).

……
……
……
……

9. Please describe any specific examples where you felt your trainers were well-prepared or unprepared to deliver the CBET program in the electrical program.

……
……
……
……

10. Indicate the extent to which you agree with the following statements about your trainers' readiness to implement Competency Based Education Training in an electrical program. **[*Tick appropriately using the scale of 1- strongly disagree (SD), 2- disagree (D), 3- neutral (N), 4- agree (A), 5- strongly agree (SA)*]**

Statement	SD	D	N	A	SA
i) Trainers possess the necessary skills and knowledge to effectively integrate CBET into the electrical program					
ii) Trainers assess and evaluate competencies accurately through CBET methods					
iii) Trainers have incorporated real-world applications and industry-relevant competencies into the electrical program using CBET approach					
iv) Trainers are well-equipped and ready to deliver effective CBET in the electrical program					
v) Trainers have provided adequate support and resources to help trainees succeed within the electrical program using CBET approach					

11. To what extent has your program incorporated CBET elements into its curriculum?

Not at all ☐ To a large extent ☐
To a small extent ☐ To a very great extent ☐
To some extent ☐

12. Indicate the extent to which you agree with the following statements about your current electrical program. **[*Tick appropriately using the scale of 1- strongly disagree (SD), 2- disagree (D), 3- neutral (N), 4- agree (A), 5- strongly agree (SA)*]**

Statement	SD	D	N	A	SA
i) Program explicitly links covered material to specific industry standards and job roles					
ii) Program outcomes focus on "what trainees will be able to do" rather than just content covered					
iii)Program offers multiple learning pathways and prior learning recognition					
iv)Trainees are allowed to demonstrate mastery and progress at their own pace, regardless of seat time					

13. To what extent do you believe the CBET approach has contributed to the development of practical skills relevant to electrical programs?

Not at all ☐ Very much ☐
Slightly ☐ Extremely ☐
Moderately ☐

14. Rate the effectiveness of the CBET approach in transferring theoretical knowledge into practical applications within electrical programs.

Highly ineffective ☐ Effective ☐
Ineffective ☐ Highly effective ☐
Neutral ☐

15. Please provide specific examples of how the CBET approach has helped you learn and apply practical skills in electrical work.

……
……
……
……

16. How engaged do you feel in your electrical program due to the CBET approach?

Completely disengaged ☐ Somewhat engaged ☐
Somewhat disengaged ☐ Highly engaged ☐
Neutral ☐

17. Explain what aspects of the CBET approach contribute to your engagement and motivation in learning.

……
……
……
……

18. How well does the CBET approach prepare you for the real-world demands of the electrical industry?

Not well prepared ☐ Well prepared ☐
Somewhat prepared ☐ Exceedingly well prepared ☐
Moderately prepared ☐

19. How confident do you feel in applying the knowledge and skills gained through CBET in real-world electrical scenarios?

Not confident at all ☐ Moderately confident ☐
Slightly confident ☐ Very confident ☐
Neutral ☐

20. What assessment methods do your trainers mostly use in the electrical programs? *(Tick only one that is most applicable)*

Observations ☐ Projects ☐
Oral Questioning ☐ Rubrics ☐
Portfolio ☐ Simulations ☐
Practical Exercises ☐ Written tests ☐

21a. Do you feel the assessments in your program accurately reflect the skills and knowledge needed for electrical jobs? *(Please explain your answer)*

Yes ☐ No ☐

b. Please explain your answer in (**21a**).

……
……
……
……

22. How helpful is the feedback you receive through the CBET approach in improving your knowledge and skills?

Not helpful at all	☐	Somewhat helpful	☐
Somewhat unhelpful	☐	Very helpful	☐
Neutral	☐		

23. Overall, how satisfied are you with the CBET approach as a method of instruction in electrical programs?

Very dissatisfied	☐	Satisfied	☐
Dissatisfied	☐	Very satisfied	☐
Neutral	☐		

24a. Would you recommend the CBET approach to other trainees considering an electrical program? *(Please explain your answer optional explanation)*

Yes ☐ No ☐

b. Please explain your answer in (**24a**).

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25. Suggest any improvements you would like to see in the CBET approach to enhance your learning experience.

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Thank you for your time!

b) Interview Guide for Trainers

Trainers' Preparedness for Competency Based Education Training Implementation in Electrical Programs: A Case of Technical and Vocational Education and Training Institutions in Nairobi County, Kenya

INTERVIEW GUIDE FOR TRAINERS

1. What do you understand by the term Competency-Based Education and Training (CBET)?

2. Can you provide examples of specific training methodologies that you currently employ in the electrical programs? *(Probe for traditional methods used in different units)*

3. What is your opinion about integrating CBET approach into electrical programs? *(Probe for experience of using CBET)*

4. Describe the instructional methods you have used to integrate CBET principles into the electrical programs you teach. *(Probe for integration in regular training practice)*

5. Describe the assessment methods you have used to measure learning outcomes including the development of key competencies among trainees.

6. How does the CBET approach contribute to the development of key competencies among trainees in electrical programs, compared to traditional methods? *(Probe for specific examples of positive or negative impacts observed)*

7. What are the challenges of implementing CBET in the electrical program?

8. Please suggest how the identified challenges can be addressed.

END

c) Interview Guide for Head of Department

INTERVIEW GUIDE FOR HEAD OF DEPARTMENT (HOD)

Introduction

Thank you for reading and signing the consent note. I wish to engage you in this interview by asking more specific questions. These questions seek to generate information on the understanding, practice and challenges of CBET implementation. The questions also take note of your role in leading and managing the electrical department, ensuring it delivers high-quality vocational and technical education and training.

General Understanding, Practice and Challenges of CBET Implementation

1. What do you understand by the term Competency-Based Education and Training (CBET)?

……
……
……

2. What is your opinion about integrating CBET approach into electrical programs*? (Probe for specific benefits)*

……
……
……

3. Can you provide examples of specific training methodologies currently employed by your electrical programs trainers? *(Probe for alignment with the latest industry standards and best practices)*

……
……
……

4. How would you describe the current level of familiarity with Competency-Based Education and Training (CBET) among electrical program trainers?

……
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……

5. How do you ensure that the curriculum for electrical programs aligns with the principles and objectives of CBET?

……
……
……

6. How do you assess the effectiveness of trainers in delivering competency-based education, and what indicators do you use?

……
……
……

7. Can you discuss any specific initiatives or programs that have been implemented to enhance trainers' readiness to implement CBET in electrical programs?

……
……
……

8. Are there any collaborations with external stakeholders or industry partners in place to verify that the electrical programs adhere to current industry standards and requirements within the CBET program?

……
……
……

9. What are the key considerations involved in transitioning electrical training programs to a Competency-Based Education and Training (CBET) approach, and what strategies can be employed to effectively address these considerations? *(Probe for any specific resource limitations, infrastructure needs, or technological barriers)*

……
……
……

10. Is there anything else you would like to share about the existing training approaches adopted by electrical programs trainers in your institution?

……
……
……

End of Interview!

Appendix 7: Plagiarism Report

SR797

ISO 9001:2019 Certified Institution

THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

WEFWAFWA FAITH NALIAKA

MTED/6074/22

In recognition for passing the University's plagiarism

Awareness test for Thesis **entitled: ASSESSMENT OF TRAINERS' PREPAREDNESS FOR COMPETENCY-BASED EDUCATION TRAINING IMPLEMENTATION IN ELECTRICAL PROGRAMMES: A CASE OF TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING INSTITUTIONS IN NAIROBI COUNTY, KENYA with** similarity index of 5% and striving to maintain academic integrity.

Word count:48939

Awarded by

Prof. Anne Syomwene Kisilu
CERM-ESA Project Leader Date: 03/03//2025