INFLUENCE OF TRAINERS' COMPETENCIES AND TEACHING SELF-EFFICACY ON IMPLEMENTATION OF COMPETENCY-BASED EDUCATION AND TRAINING IN PUBLIC TECHNICAL INSTITUTIONS IN MERU COUNTY, KENYA

BY

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MOI UNIVERSITY

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been presented for a degree award in any other University. No part of this thesis may be reproduced without the prior written permission of the author and/or Moi University.

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DEDICATION

I dedicate this thesis to my parents, Mr. Joseph Marangu and Madam. Florence Gakii for their unconditional love, tireless sacrifices, and constant encouragement that have shaped me into the person I am today. Thank you for being my best teachers, pillar of strength, and source of inspiration throughout my scholarly journey.

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ABSTRACT

Competency-Based Education and Training (CBET) has received significant attention in 21st century Sub-Saharan Africa, as a comprehensive Technical and Vocational Education Training (TVET) educational framework to improve the quality of education and training. Although empirical studies have extensively discussed CBET implementation, the role of trainers' competencies and belief in their instructional abilities, particularly teaching self-efficacy and its mediating role, in CBET implementation remains relatively unexplored. Therefore, the aim of this study was to examine the influence of trainers' competencies and teaching self-efficacy on CBET implementation in public TVET institutions in Meru County, Kenya. The objectives of the study were: to assess the relationship between trainers' competencies and CBET implementation; to assess the relationship between trainers' competencies and teaching self-efficacy; to determine the effect of trainers' teaching self-efficacy on CBET implementation, to examine the mediating effect of teaching self-efficacy on the relationship between trainers' competencies and CBET implementation and to explore trainers' perception of competencies, teaching self-efficacy, and their influence on CBET implementation. The study was guided by Bandura's self-efficacy theory in conjunction with the Vocational Teacher Competencies model. This study adopted a mixed-methods approach positioned in the pragmatic paradigm and employed a convergent parallel one phase design. The target population consisted of 850 trainers and 20 Heads of Sections. A proportionate random sampling technique was used to select 265 trainers, while purposive sampling technique was used to select 12 Heads of Sections. Quantitative data was collected using a questionnaire and analyzed using hierarchical linear regression and Hayes Mediation test with the help of the SPSS Version 27.0 and Hayes Process Macro version 4.2 (Model 4). Qualitative data was generated using semi-structured interviews and analyzed thematically. Quantitative results showed the following: There was a relationship between trainers' competencies and CBET implementation ($F(4, 240) = 17.674$, $p<0.05$) with a significant positive effect ($\beta=.374$, $p<0.05$); there was a relationship between trainers' competencies and teaching self-efficacy ($F(4, 240) = 17.984$, $p <0.05$) with a significant positive effect ($\beta=.427$, $p<0.05$) and teaching self-efficacy had a significant positive effect on CBET implementation ($\beta=.488$, $p<0.05$). Results also indicated that teaching self-efficacy partially mediated the relationship between trainers' competencies and CBET implementation with a significant indirect effect ($\beta=.2103$, Boot CI [.1369, .2975]). The qualitative findings showed that trainers' beliefs in their instructional abilities was critical for successful CBET implementation. It was evident that trainers had self-assurance in their instructional abilities for CBET implementation. However, strengthening their self-beliefs through training and professional growth could further boost their confidence and enhance their teaching effectiveness for quality CBET implementation. This study therefore concludes that trainers' competencies and teaching self-efficacy have a significant positive influence on CBET implementation. The study recommends that continuous professional development training on CBET implementation should not only focus on enhancing trainers' competencies but also reinforcing their teaching self-efficacy for effective implementation of quality CBET. These findings will benefit TVET stakeholders, the Curriculum Development Assessment and Certification Council (CDACC), and TVET policymakers in developing targeted policies for CBET implementation.

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LIST OF ABBREVIATIONS AND ACRONYMS

CBA	Competency-Based Assessment
CBET	Competency-Based Education and Training
CDACC	Curriculum Development Assessment and Certification Council
CDP	Continuous Professional Development
EFA	Exploratory Factor Analysis
HOS	Head of Section
ICT	Information Communication and Technology
KSTVET	Kenya school of TVET
OS	Occupational Standards
PCA	Principal Component Analysis
SDG	Sustainable Development Goal
SSAC	Sector Skills Advisory Committee
TTI	Technical Training Institute
TVC	Technical and Vocational Training College
TVE	Technical and Vocation Education
TVET	Technical and Vocation Education and Training
TVETA	Technical and Vocation Education and Training Authority
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-UNEVOC	UNESCO Vocational Education

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

Technical and Vocational Education (TVE) has undergone a significant transformation worldwide, with Competency-Based Education and Training (CBET) receiving considerable attention as a comprehensive educational framework to improve the quality of training by meeting industry demands. The CBET approach focuses on imparting trainees with the requisite workplace skills, knowledge, and attitudes they will need for success in the world of work and beyond. Although CBET enhances the quality and relevance of TVET, its successful implementation heavily depends on competent trainers who possess the necessary competencies and demonstrate confidence in their abilities to adapt instructional strategies to meet diverse trainee needs. Trainers play a vital role in shaping the learning environment, facilitating trainee engagement, and ensuring practical skills development within TVET institutions. Therefore, understanding the role of trainers' competencies and teaching self-efficacy in CBET implementation would be of great importance to help design effective trainer professional development programs and improve the overall quality of CBET.

This chapter covers the background of the study, the problem statement, the research questions, and the study hypotheses. The chapter also highlights the study's justification, significance, scope, limitations, and assumptions. Finally, the chapter will describe the guiding theoretical lens in addressing the research problem and conceptual framework, highlighting the key study variables under investigation.

1.2 Background of the Study

Technical and Vocational Education and Training (TVET) is essential for a nation's socio-economic growth. It solves most challenges in developing countries, such as youth unemployment, lack of skilled labor, and poverty (Galguera, 2018). Although TVET is sometimes viewed as a "second educational option" since it is mainly for students who do not qualify for university admission, well-designed TVET educational programs effectively impart trainees with 21st-century workplace skills (UNESCO-UNEVOC, 2021).

In alignment with SDG 4 on quality education, UNESCO developed a strategy to support TVET in advancing life-long learning opportunities, technical skills for decent work, and entrepreneurship (UNESCO, 2019). This strategy underscores the TVET teaching staff's important role in delivering quality and relevant educational programs (Subrahmanyam & Law, 2020). Therefore, TVET teachers must possess the requisite competencies to deliver lesson content and create an effective learning environment to produce quality TVET graduates (Foong et al., 2020).

The Competency-Based Education and Training (CBET) educational framework was established in the United States in 1970 to enhance the quality of training in TVET institutions. Later, CBET was expanded to Europe and gained significant attention in the 21st century Sub-Saharan Africa (Chijioke, 2014). Internationally, countries embraced the CBET approach to prepare trainees more effectively for the world of work by considering industry requirements. CBET is an education framework with clearly defined objectives to assess a performed behavior upon completion (Preston, 2017). Therefore, CBET is a performance-based training where trainees are assessed against the real workplace

standards. It is focused on trainees' practical skills rather than theoretical knowledge (Léonard & de Dieu, 2021).

In Kenya, CBET is an outcome-based mode of training based on well-defined industry Occupational Standards (OS), prioritizing competence acquisition (Directorate of TVET, 2018). The CBET education framework places the trainee at the core of the teaching-learning process, and therefore, the trainer's role shifts from the "conventional teacher" to a facilitator (Dambudzo, 2018, pp. 86-87). Many African countries are moving towards integrating CBET into TVET as it enhances skill formation productivity in the global economy. However, quality and relevance are the critical components of TVET worldwide (Kufaine & Chitera, 2013; Zuva & Zuva, 2020)

The main strength of CBET is its ability to prepare trainees with requisite workplace competencies. Therefore, the country's economy will improve when TVET schools produce graduates who meet industry demands (Ndile, 2018). Although different CBET models are used worldwide and have different terminologies, the characteristics, objectives, and structure of CBET are similar (Olojuolawe & Adelowo, 2022). In Kenya, the CBET curriculum is envisioned to produce TVET graduates with relevant skills that match the industry's requirements to ensure employability (Mutua et al., 2019). CBET policy was introduced in Kenya in 2015 and officially launched in 2018, emphasizing acquiring workplace competencies in line with industry demands (TVETA, 2019).

To enhance CBET quality, the Kenyan Ministry of Education established the TVET Curriculum Development Assessment and Certification Council (CDACC) as a state corporation under the TVET Act No. 29 of 2013, Article 44 (1), to develop a TVET curriculum that meets the industry requirements. Furthermore, TVET Authority (TVETA)

was established to accredit TVET institutions and license trainers (Republic of Kenya, 2013).

The TVET CDACC has approved over 500 CBET curricula and Occupational Standards (OS) in various TVET institutions nationwide. These curricula are developed through industry partnerships with the approval of Sector Skills Advisory Committees (SSACs) to ensure they meet industry demands and are technically updated (Republic of Kenya, 2022).

The number of trainees enrolled in TVET and the number of TVET institutions in the country has kept an upward trend since 2013, with more than 450 thousand trainees enrolled by 2020, as shown in Figure 1.1 (Statista, 2022).

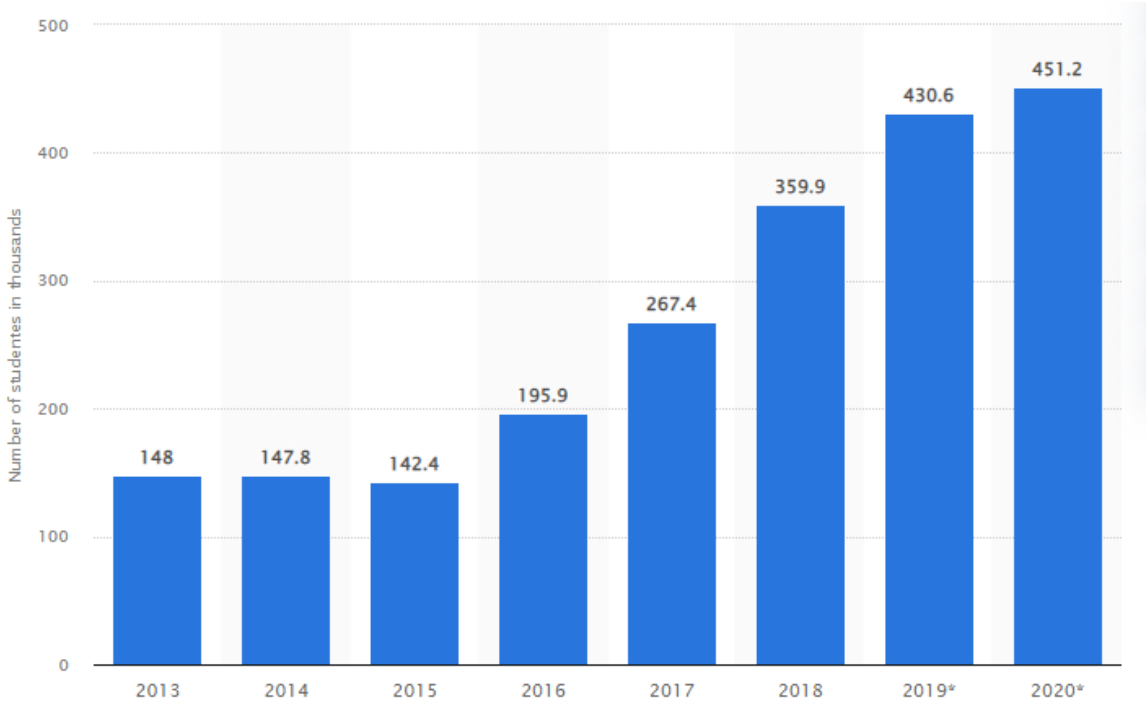

Figure 1.1: TVET Students' Enrollment in Kenya 2013-2020

Source: (Statista,2022)

According to Maurice-Takerei (2017), typical trainees come from low socio-economic families and have low intellectual abilities. He argued that a TVET trainer's role is to facilitate teaching and learning and guide the trainees with a strong sense of patience and understanding. Therefore, developing a strong TVET trainer workforce builds a robust TVET system. With the increasing student enrolment, TVET trainers must be competent and devoted to ensuring quality teaching (Mutua et al., 2019).

The CBET approach in technical education is tasking for trainers since it requires learning by doing, as Freire advocates (Lawyer, 2021). Classroom interactions build trainer-trainee relationships, enhancing teaching and learning quality (Pangeni & Karki, 2021). Therefore, a TVET trainer should facilitate the trainees' learning through engagement and motivation by ensuring that the basic principles of CBET are followed during training and assessment (Mwagunga et al., 2020). Moreover, trainers with high teaching self-efficacy are dynamic with new teaching approaches and are flexible in adjusting their teaching strategies to suit the classroom context (Lazarides & Warner, 2020).

The Kenyan government has put tremendous effort into preparing trainers and equipping TVET institutions for effective CBET implementation, hoping to increase employability and produce competent graduates (Republic of Kenya, 2022). However, re-tooling trainers for CBET implementation is not enough; more attention should be on how trainers conduct teaching practices in the classrooms, workshops, and laboratories and their teaching self-efficacy to ensure that trainees acquire the competencies needed to solve practical, real-life problems (Kanyonga et al., 2019; Lawyer, 2021). This necessitates examining the role of trainers' competencies and the self-belief in their instructional abilities, mainly teaching self-efficacy, for successful CBET implementation.

1.3 Statement of the Problem

CBET has received significant attention in 21st-century Sub-Saharan Africa as a comprehensive TVET educational framework to improve the quality of education and training by ensuring trainees acquire the requisite competencies needed for success in work and beyond. Successful CBET implementation depends on trainers' occupational skills, competencies, capacity to embrace the approach, commitment, self-efficacy, and determination to facilitate learning (Kipngetich et al., 2021; Lawyer, 2021).

The Kenyan government has heavily invested in TVET institutions by supplying and setting up the necessary infrastructure, employing qualified trainers, and re-tooling their pedagogical competencies to ensure trainees acquire the requisite workplace skills needed to attain global competitiveness toward attaining Kenya's Vision 2030 (Republic of Kenya, 2020).

Although most TVET trainers have been re-skilled and understand the CBET approach (Mwagunga et al., 2020), CBET is still facing implementation challenges, such as a large number of trainees in classrooms, lack of motivation to some trainers and low trainees' cooperation attitude (Tambwe, 2019). Additionally, the CBET concept has not sufficiently been mainstreamed in the TVET legal and policy frameworks (Miseda & Kitainge, 2021; TVETA, 2021).

Although empirical studies have extensively discussed CBET implementation (Kipngetich et al., 2022; Mutua et al., 2019; Mwagunga et al., 2020), the role of trainers' competencies and belief in their instructional abilities, mainly teaching self-efficacy and its mediating role in CBET implementation remains relatively unexplored. This necessitates examining

the influence of trainers' competencies and teaching self-efficacy on CBET implementation in public TVET institutions.

1.4 Purpose of the Study

This study aimed to examine the influence of trainers' competencies and teaching self-efficacy on CBET implementation in public TVET institutions in Meru County, Kenya.

1.5 Research Objectives

This research study was guided by the following specific objectives:

i. To assess the relationship between trainers' competencies and Implementation of CBET in Public TVET institutions in Meru County, Kenya.
ii. To assess the relationship between trainers' competencies and teaching self-efficacy in public TVET institutions in Meru County, Kenya.
iii. To determine the effect of teaching self-efficacy on implementation of CBET in Public TVET institutions in Meru County, Kenya.
iv. To examine the mediating effect of teaching self-efficacy on the relationship between trainers' competencies and implementation of CBET in public TVET institutions in Meru County, Kenya.
v. To explore trainers' perception of competencies, teaching self-efficacy, and their influence on the implementation of CBET in public TVET institutions in Meru County, Kenya.

1.6 Research Hypotheses

The following research hypotheses were tested, controlling for the confounding effects of trainers' gender, academic qualification, and teaching experience covariates at $\alpha=0.05$ level of significance in the study:

i. **H_{01}:** There is no statistically significant relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County, Kenya.

ii. **H_{02}:** There is no statistically significant relationship between Trainers' Competencies and Teaching Self-Efficacy in public TVET institutions in Meru County, Kenya.

iii. **H_{03}:** Teaching Self-Efficacy does not have a statistically significant effect on CBET Implementation in public TVET institutions in Meru County, Kenya.

iv. **H_{04}:** Teaching Self-Efficacy does not significantly mediate the relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County, Kenya.

1.7 Research Question

i. How do trainers' perceptions of their competencies and teaching self-efficacy influence implementation of CBET in public TVET institutions in Meru County, Kenya?

1.8 Justification of the Study

A quality teaching workforce in TVET institutions increases the number of young people who regularly attend and complete college and gain essential life and employment-related skills. This positively impacts the country's well-being since a more educated population is more aware of and knowledgeable about essential social, economic, political, and environmental issues.

The Kenyan government continues to re-tool trainers with the new demands of the CBET approach through capacity-building workshops (Kipngetich et al., 2021). However, there is a missing link between equipping trainers with CBET competencies and implementing the approach in the classroom. Implementing the CBET approach requires trainers to have high self-efficacy.

Failure to address the role of trainers' competencies and teaching self-efficacy in CBET implementation means that the ongoing capacity-building programs might focus only on refreshing trainers' competencies. As a result, the attainment of TVET CBET objectives, Kenya's Vision 2030, and SDG Goal 4 on quality education might remain an illusion. Therefore, this study was necessary to assess the influence of trainers' competencies and teaching self-efficacy on CBET implementation.

1.9 Significance of the Study

This study examined the role of trainers' competencies and teaching self-efficacy in CBET implementation in Public TVET institutions. The study benefits trainers, heads of Sections, TVET institution administrators, TVET CDACC, TVETA, and the state department of Technical and Vocational Education and Training.

The study findings are essential to trainers and TVET institution administrators in understanding the role of trainers' competencies and teaching self-efficacy for quality training. The findings will help the trainers understand how their competencies and teaching self-efficacy influence CBET implementation. The findings of this study will help the heads of sections and TVET institution administrators get insight into trainers' teaching self-efficacy in the classroom while implementing the CBET approach. The TVET CDACC will be able to evaluate and review the CBET/ CBA training. Finally, it is expected that the study findings will benefit TVETA and the Ministry of Education state Department of Vocational and Technical Training for strategic planning and formulation of targeted policies on CBET implementation.

1.10 Assumptions of the Study

This study was based on the following assumptions:

i. The target population operated in the same teaching and learning environment, resulting in constituent and dependable responses regarding CBET implementation in TVET institutions.

ii. Participants understood the CBET approach, willingly responded to the questions, and gave honest answers.

iii. The data collected exhibited a normal distribution, indicating that the study's findings can be applied beyond the sampled population.

iv. The study’s sample accurately represented the targeted population and was adequate for analysis and interpretation.

1.11 Scope of the study

This study confined itself to the influence of trainers' competencies and teaching self-efficacy on CBET implementation in public TVET institutions in Meru County. The study focused on three key constructs: trainers' competencies, teaching self-efficacy, and CBET implementation.

The study data was gathered using a mixed-methods approach. For the quantitative data, a standardized questionnaire was administered to TVET trainers because they are the key CBET implementers at the classroom level.

The qualitative data was generated using semi-structured interviews with the Heads of Sections (HoS) to determine how trainers perceived their competencies and self-efficacy to implement the CBET approach in their classrooms. The data collection process commenced between January 26th and March 27th, 2023.

1.12 Limitations of the Study

i. The study relied on self-reported data from the respondents. Research instruments were checked for validity and reliability to ensure the findings were verifiable and reflected the actual situation under study.

ii. The study only provided a snapshot of the influence of trainers' competencies and teaching self-efficacy on implementing CBET in TVET institutions in Meru County. Therefore, the study may not account for potential changes or developments in the variables over time.

iii. Trainers' self-efficacy in this study was confined to specific aspects: efficacy in trainees' engagement, classroom management, and instructional strategies. The broader construct of self-efficacy, which is theoretically and metacognitively

influenced by various personal characteristics (such as gender, academic qualification, and teaching experience) and environmental factors (such as classroom characteristics), was not fully explored. While the study acknowledges and controls for variations in gender, academic qualification, and teaching experience as covariates, the limited focus on only three aspects of teaching self-efficacy may restrict the comprehensive understanding of how these broader factors influence trainers' self-efficacy in the teaching context.

iv. The study was limited to TVET institutions in Meru County. Therefore, gathering information from other TVET institutions in Kenya was impossible.

1.13 Theoretical Framework

The study was guided by the self-efficacy theory by Albert Bandura (1997) in conjunction with the vocational teacher competencies model.

1.13.1 Self-Efficacy Theory by Albert Bandura (1997)

According to Bandura (1997), self-efficacy is an individual's conviction about their capability to complete a particular task or attain a desired result effectively. Bandura suggests that individuals with a higher self-efficacy are more likely to set challenging goals, exert greater effort, persevere in the face of adversities, and ultimately achieve better performance outcomes.

Self-efficacy expectations emanate from four sources: Direct experience, observing others, social encouragement, and psychological aspects. Direct experience involves successfully executing a behavior during training. Observing others succeed in tasks forms the vicarious experience. Self-efficacy can also develop through credible verbal and social encouragement. However, such encouragement must be believable, as persuaders need to

foster the belief that achieving success is feasible (Wentzel et al., 2016). Lastly, physiological factors and emotional states may promote or discourage individuals (González et al., 2018).

In teaching, teachers' self-efficacy is judgments about their capabilities to achieve desired student engagement and learning results, even with challenging or unmotivated students. Thus, teaching self-efficacy gauges teachers' perceptions of their capacity to influence student learning (Tschannen-Moran & Hoy, 2001).

When applied to this study, Bandura's theory asserts that trainers' beliefs in their teaching capabilities directly affect their approach to CBET implementation. Therefore, trainers with higher teaching self-efficacy could exhibit more enthusiasm for teaching, are more likely to adopt innovative teaching strategies, effectively manage the learning environment, and persist in overcoming challenges during CBET implementation (Shaukat & Iqbal, 2012).

1.13.2 Vocational Teacher Competencies Model

The Vocational Teacher Competencies Model suggests that a vocational high school teacher must possess the pedagogical competence required for classroom instruction. Secondly, professional competency emphasizes the mastery of content in the trade area, being aware and proactive with changing skill demands in the industry, and how technical education can be guided and integrated with the industrial context. In addition, the vocational aspect ensures the teacher has the necessary technical experience and competence, and lastly, the technological aspect of utilizing and using ICT for teaching and learning (Wahyuni & Sugihartini, 2021).

Although vocational teacher professionalism and competence requirements result from the changing paradigm of learning, TVET education policies, labor market, and technological developments, the model asserts that the pedagogical aspect is the most important competency aspect for vocational high school teachers (Köpsén & Andersson, 2017; Wahyuni et al., 2020). Figure 1.2 shows the Vocational teacher competencies model.

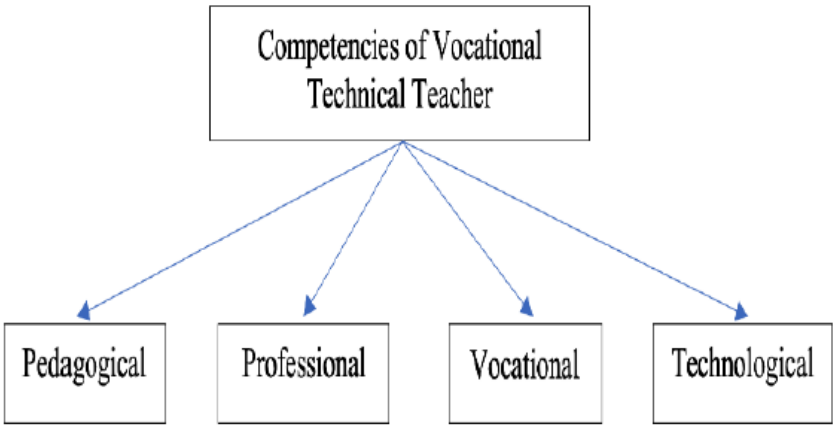

Figure 1.2: Vocational Teacher Competencies Model

Source: (Wahyuni & Sugihartini, 2021)

Trainers in TVET institutions are unique vocational teachers since they have undergone different training during their teacher preparation program. They come into the teaching profession possessing some industrial experience. They possess essential work skills like practical use of machinery and technology, problem-solving, and teamwork (Omar et al., 2019).

When applied to this study, the vocational teacher competencies model explains the trainers' competencies, an independent variable under investigation. In Kenya, the basic requirements for a TVET trainer are professional competence in the relevant area of specialization and pedagogy obtained from the Kenya School of TVET (KSTVET),

formally Kenya Technical Teachers Training College (KTTC) or any recognized university (Republic of Kenya, 2019b). A TVET trainer is, therefore, expected to possess the pedagogical and professional competencies required for classroom implementation of the CBET approach and be proactive with changing skill demands in the world of work.

By adopting Bandura's Self-Efficacy Theory in conjunction with the Vocational Teacher Competencies Model, this framework provides a theoretical lens to examine the influence of trainers' competencies and teaching self-efficacy on CBET implementation in Kenyan public TVET institutions. The framework acknowledges the interplay between trainers' competencies, teaching self-efficacy, and successful CBET implementation.

1.14 Conceptual Framework

A conceptual framework illustrates the interrelation of variables under investigation in a study. Figure 1.3 shows a conceptual framework of the relationship between trainers' competencies, teaching self-efficacy, and CBET implementation. The illustration shows that CBET implementation, the dependent variable (DV) in the study, was conceptualized in terms of the expected roles of a trainer in a CBET classroom during training and assessment. Trainers' competencies, the independent variable (IV) in the study, were conceptualized regarding pedagogical and professional competencies. Teaching self-efficacy, the study's mediating variable (M), was conceptualized regarding efficacy in trainees' engagement, classroom management, and instructional strategies. Lastly, trainers' gender, academic qualification, and teaching experience were covariates, and their confounding effects were controlled in the study.

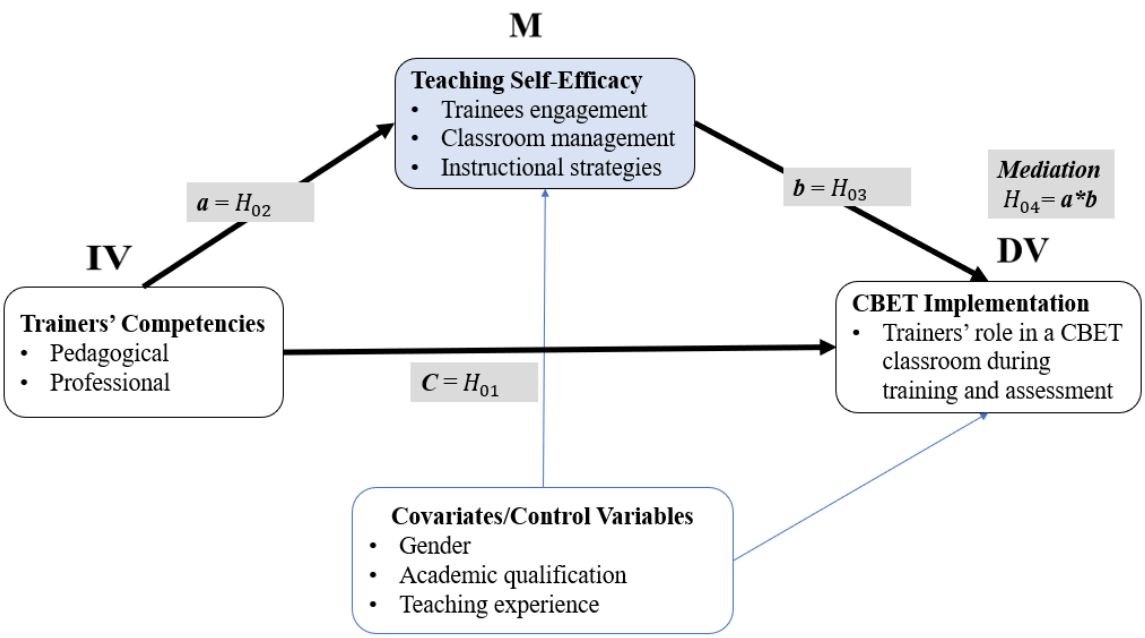

Figure 1.3: Conceptual Framework

Source: (Researcher, 2022)

1.15 Operational Definition of Terms

Assessment refers to the process through which the progress and achievement of a trainee or trainees are measured or judged.

Implementation of CBET refers to the process of how the trainers conduct CBET classrooms during training and assessment. This study used CBET implementation to mean implementation of Competency-Based Education and Training. It was assessed in terms of the expected roles of the trainer during training and assessment.

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

Occupation standards refer to a framework that outlines and entails an occupational profile that provides a good practice framework outlining benchmarks against which performance can be assessed. For someone competent in the occupation's duties (Directorate of TVET, 2018).

Teaching self-efficacy refers to the trainers' belief in their capabilities to achieve desired results regarding trainee engagement and learning, even with challenging or unmotivated trainees.

Trainee refers to a student in a TVET institution.

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

Trainers' Competencies refer to a set of requisite professional and pedagogical skills, knowledge, and attitudes for a TVET trainer.

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

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the overview of TVET and CBET in Kenya, concepts of trainers' competencies, teaching self-efficacy, CBET implementation, and pertinent scholarly contributions by other scholars. Finally, the chapter highlights the research gaps identified and the review summary.

2.2 Overview of TVET and CBET in Kenya

TVET equips individuals with the practical skills and knowledge required for gainful employment by providing specialized training in various vocational fields. Despite the crucial role TVET plays in fostering the country's economic progress, empirical evidence highlights a significant disparity between skills taught in TVET institutions and those demanded by industries. Thus, it emphasizes the necessity for training outcomes that better match industrial requirements, aiming to bridge the gap between TVET education and industry needs (UNESCO-UNEVOC, 2010).

The Kenyan government acknowledges that TVET possesses immense potential for driving the growth and development of other economic sectors by providing essential competencies for advancing manufacturing, infrastructure, agro-processing, extraction industries, and energy production (the Republic of Kenya, 2019a).

Since independence, Kenya has undergone curriculum changes that have impacted graduates and the national development plan in the TVET sector by unlocking employment opportunities and fostering economic development. To improve skills development, the

Kenyan government started revitalizing technical education through the expansion of TVET, increasing access by the provision of capitation, capacity building of trainers, and curriculum review to ensure quality and relevance in TVET (Osumbah & Wekesa, 2023; Republic of Kenya, 2012).

In response to the increasing focus on CBET to provide high-quality TVET programs, Kenya established and implemented the TVET Curriculum Development Assessment and Certification Council (TVET CDACC). The council must develop and reform TVET programs to be competency-based in liaison with industry to increase graduates' competencies and employability. The government also established the TVET Authority (TVETA) as an oversight and regulatory agency for TVET quality assurance and accredited TVET institutions (Republic of Kenya, 2013).

As a result, in 2015, CBET was introduced in technical and vocational institutions and officially launched by TVET CDACC on 24th October 2018 (TVETA, 2019). CBET curriculum in Kenya is envisaged to increase employability by producing graduates with the requisite competencies to match the industry's demands. Therefore, CBET prepares trainees to become more efficient in the work world by acquiring competencies aligned with the industry's requirements (Kitainge, 2017).

The policy suggestions originating from a CBET conference in Kenya, which centered around the theme of “Embracing CBET for quality and relevance in the TVET sector,” observed that there were notable disparities between the implementation strategies and the CBET policy framework in terms of industry responsibilities, training institutions, the provision of quality training and the role of trainer as the curriculum implementer (Republic of Kenya, 2020).

Most trainers have been retooled through CBET capacity-building workshops and possess the requisite competencies to implement the CBET approach in their classrooms (Kipngetich et al., 2021b; Mwagunga et al., 2020), there is still a missing link between the trainers' competencies and how CBET is implemented in the TVET classrooms since there is slow uptake of CBET courses (TVETA, 2021).

2.2 Concept of Trainers Competencies

The effectiveness of TVET education relies heavily on the capabilities of its instructors. TVET trainer competence frameworks should focus on essential skills to foster a transformative life-learning approach, enabling individuals to continually adapt to the evolving demands of 21st-century workplace skills (Chakroun, 2019).

In Iran, trainers' professional competencies encompass pedagogical and technical skills and the ability to effectively commercialize ideas and uphold high standards of professional ethics (Yeganegi, 2018). In Indonesia, Vocational accounting teachers possess core competencies encompass pedagogical, technological, collaborative, and creative skills, which are integrated to foster an environment of continuous learning (Mardi et al., 2021).

Ethiopia's TVET strategy mandates that trainers undergo specialized training and obtain certification before being able to work, and a commitment to continuous professional development to enhance their competencies (Tamrat, 2022). Teachers' competency is vital for trainees' "well development." However, these competencies depend on the extent to which trainers consistently engage in learning and enhance their knowledge and abilities (Njenga, 2018).

From the studies mentioned above, it is evident that a competent TVET trainer is a form of quality assurance for trainees' learning (Ismail et al., 2017). Therefore, trainer competencies are the capabilities of a trainer to apply or use a set of requisite professional, pedagogical, vocational, and technological knowledge, skills, and abilities to successfully implement the teaching and learning activities in TVET institutions (Wahyuni & Sugihartini, 2021).

2.3 Concept of Trainers' Teaching Self-Efficacy

Teaching self-efficacy refers to the trainers' belief in their capacity to execute actions that foster trainee engagement and facilitate learning, resulting in achieving desired outcomes, even when dealing with challenging or unmotivated trainees (Herrera, 2021).

Trainers' confidence in their competence to successfully manage the tasks, responsibilities, and difficulties associated with their professional role significantly impacts key academic outcomes, including trainees' accomplishments, motivation, and overall well-being within the workplace setting (Barni et al., 2019).

Teachers' self-efficacy beliefs are not a general outlook on a particular context but rather an individual's self-assessment linked to a specific domain of activity. Therefore, in this study, trainers' teaching self-efficacy is conceptualized in terms of distinct aspects, namely trainees' engagement, classroom management, and instructional strategies, rather than the overall application of the CBET approach.

Teachers' self-efficacy beliefs are not a general disposition of a context but rather a person's self-judgment specifically related to the activity domain. Hence, in this study, trainers' teaching self-efficacy is conceptualized concerning specific aspects, namely trainees'

engagement, classroom management, and instructional strategies, rather than the general implementation of the CBET approach in teaching and learning (Wu & Wei, 2021).

2.4 Concept of CBET Implementation

CBET implementation in TVET institutions has led to a paradigm shift in teaching and learning from the traditional knowledge-based to a competence-based system, a more outcome-based approach where trainees are expected to demonstrate competence in the world of work. (Republic of Kenya, 2020).

Trainers play a critical role in CBET implementation. They actively engage trainees in the learning process, foster and sustain motivation for learning, and utilize creative teaching and learning techniques (Murararaneza & Mtshali, 2018).

Implementing CBET in TVET institutions has changed the trainer's role during training (teaching and learning process) and assessment. For instance, during CBET assessment, trainees are not ranked in the order of their performance. i.e., distinction, credit, pass or fail, are regarded as competent or not yet competent after completing a unit of competence (CBET/CBA, 2019).

This study underscores the role of the trainers since they are key implementers of the approach at the institutional level. Therefore, implementing CBET is how trainers integrate the competency-based approach in teaching and learning during the training and assessment of trainees in the TVET institutions (TVETA, 2019).

2.4.1 Role of the Trainer in CBET Implementation during Training

In the context of Competency-Based Education and Training (CBET) implementation during the training phase, the trainer assumes a crucial role characterized by diverse responsibilities to facilitate trainees' comprehensive and practical learning experience. Firstly, the trainer ensures that trainees have the necessary personal protective equipment. This foundational step establishes a safe and secure learning environment, promoting the well-being of individuals undergoing training.

The trainer supplies learning guides and maps aligned with occupational standards and essential training tools for trainees. These materials provide a structured framework for the learning process, offering guidance on the competencies and skills that need to be acquired.

In addition to instructional materials, the trainer is responsible for supplying resources specific to each module. It includes providing the requisite materials, equipment, and tools for hands-on learning experiences and ensuring trainees can access the resources needed to develop their competencies.

Guiding the learning process is a vital aspect of the trainer's role. It involves overseeing that each trainee adheres to the instructions in the learning guides. The trainer facilitates a focused and purposeful learning environment by providing clear direction and supervision.

Encouraging a proactive approach to learning, the trainer motivates trainees to conduct self-assessments. Thus, it empowers individuals to evaluate their mastery of prescribed tasks independently before seeking instructor-led performance tests, fostering a sense of responsibility and self-awareness.

Demonstrating competence is integral to effective instruction. The trainer showcases task proficiency, skills, and knowledge when instructing trainees on performing designated activities. This demonstration is a model for trainees and instills confidence and clarity in learning.

Creating and maintaining a safe and conducive working environment is a paramount responsibility of the trainer. It includes implementing safety measures and practices to ensure the well-being of trainees and fostering an atmosphere that promotes focused learning and skill development.

In essence, the role of the trainer in CBET implementation during training encompasses the provision of resources, guidance in the learning process, encouragement of self-assessment, and the creation of a secure environment, all of which contribute to a holistic and practical training experience for the individuals under their instruction.

2.4.2 Role of the Trainer in CBET Implementation during Assessment

In the context of Competency-Based Education and Training (CBET) implementation during assessment, the role of the trainer is multifaceted, encompassing various responsibilities aimed at fostering effective learning and skill development among trainees. Firstly, the trainer is pivotal in guiding trainees towards attaining training and production performance criteria. It involves providing clear direction, support, and instruction to help individuals meet the established standards within the CBET framework.

Another crucial responsibility of the trainer is to conduct assessments and performance tests utilizing the CBET approach. It involves designing evaluation methods that align with

competency-based principles, ensuring that the assessments accurately reflect the skills and knowledge trainees are expected to acquire.

The trainer is also responsible for providing assessment tests to candidates who have adequately prepared for evaluation. This step emphasizes the importance of readiness and ensures that trainees are evaluated at a point where they can showcase their competency effectively.

In cases where trainees fail to meet the required standards, the trainer must take proactive measures. It involves providing additional learning time to address specific deficiencies or allowing trainees to re-take the assessment immediately, facilitating a constructive and supportive environment for improvement.

Furthermore, the trainer ensures that assessments are conducted at the training level and extend to the production performance level. The comprehensive approach ensures that trainees are equipped with theoretical knowledge and possess the practical skills necessary for real-world applications.

The trainer prepares and maintains comprehensive records to facilitate effective monitoring and documentation of trainees' progress. It includes keeping detailed attendance registers and compiling portfolios of evidence that showcase the trainees' achievements and proficiency levels over time.

In summary, the trainer's role in CBET implementation during assessment involves guiding, assessing, supporting, and documenting trainees' progress, ultimately contributing to developing competencies aligned with the training and production performance criteria.

2.5 Trainer Competencies and CBET Implementation

Globally, with the changing world of work and economy, nations seek, through CBET, to provide a more universal and market-driven quality technical and vocational education system (Maurer, 2021; Zuva & Zuva, 2020). The outcome of this process produces competent and self-reliant professionals committed to life-long learning (Murararneza & Mtshali, 2018).

CBET implementation in TVET has significantly changed the nature of trainers' roles by emphasizing the practical aspects of the training process. As a result, trainers should possess implicit pedagogical skills that can be applied in real-world scenarios, work-based learning, and apprenticeships. Similarly, it holds a significant potential for trainers to continually update and adjust their skill sets to meet the ever-changing industry demands (Tacconi et al., 2021).

A study done in Malaysia showed a positive correlation between teachers' competency and students' academic progress and skills development. Moreover, it also highlighted that enhancing teachers' competence supports their professional growth and enhances their instructional methodologies (Omar et al., 2018). Consequently, teachers' knowledge is critical in describing TVET teachers' competency in Malaysia. Thus, before engaging in teaching and learning, the teacher should possess holistic qualities that can be imparted to students, equipping them with the requisite skills for employability in both global and local markets (Omar et al., 2020). However, these studies adopted a quantitative approach with a smaller sample size. Against this backdrop, the current study employed a mixed-methods approach, and data was collected from a relatively larger sample.

Alajmi (2021) indicated that significant challenges in curriculum implementation include inadequacies in professional growth and training, deficiencies in assessment procedures, limited utilization of educational technology, and lack of teacher resources. In contrast, Elzahaf et al. (2021) postulated that Nigerian TVET educators were highly competent users of e-learning technologies.

The study also revealed a significant difference in the use of e-learning technologies between competency levels of male and female TVET educators. Correspondingly, learning technical subjects using innovative pedagogies like facilitated peer tutoring and modified industry-based approaches in classroom teaching positively influenced student performance (Doherty & Aneyo, 2019). However, these studies did not establish the relationship between trainers' competencies and competency-based curriculum implementation.

In Rwanda, a national survey on TVET trainers' instructional competencies showed that trainers' teaching behaviors improved after completing a Trainer of Trainers (ToT) program (Kim et al., 2019). thus, trainers better understood the instructional competencies of the TVET curriculum. The study focused on the importance of the trainers' continuous professional development programs for strengthening instructional skills. However, the study did not address the role of trainer competencies in TVET curriculum implementation.

Mutua et al. (2019) posited that trainers' qualifications in CBET implementation positively and significantly influenced the attainment of skills that enhance employability. The study showed that the effectiveness of CBET implementation relies heavily on the proficiency of TVET trainers. Although this study specifically examined the impact of trainers' qualifications on CBET implementation, it was context-specific for visually impaired

learners. It did not investigate the significance of trainers' competencies concerning CBET implementation.

Similarly, Mwagunga et al. (2020) indicated that trainers had a good understanding and a positive perception of the concept and objectives of the CBET Curriculum. However, in-service courses, pre-service training, and capacity-building workshops for trainers could enhance their competencies (Miseda & Kitainge, 2021). Although the two studies are related to the current, they did not examine the relationship between trainer competencies and CBET implementation.

In a study to establish the effectiveness of staff capacity building for effective integration of the CBET approach to learning, the findings indicated that even though TVET CDACC had lagged in capacity building, most of the sampled TVET colleges were much ahead of the CDACC regarding training. In addition, the trainers understood the concept of CBET effectively, and staff capacity building significantly contributed to the successful integration of the CBET approach, yielding positive outcomes (Kipngetich et al., 2022). The study underscored the role of staff capacity building in CBET implementation. However, it did not examine the relationship between trainer competencies and the integration of the CBET approach.

2.6 Trainers' Competencies and Teaching Self-Efficacy

Trainers' competency is a fundamental issue regarding quality teaching, innovation, general success, and effectiveness when dealing with the educational process (Simonović, 2021). The changing role of education exerts additional demands on education systems and educators (Olema et al., 2021).

In line with the current issues in TVET, CBET implementation forces trainers to alter familiar pedagogical beliefs, attitudes, and behaviors to be effective in producing graduates equipped to respond capably in a rapidly changing world of work (Curry & Docherty, 2017). In adapting to the new CBET approach, trainers' competencies and abilities must be enhanced to carry out their work competently (Arifin et al., 2021).

A TVET instructor must possess skills encompassing pedagogical expertise, industry experience, and academic knowledge. In order to effectively impart these skills to the learners, teachers should maintain a balance between their teaching proficiency and staying current with evolving industry practices (Rawkins, 2018).

In Turkey, Oskay (2017) indicated that teachers' confidence in educational instructional technology influences their pedagogical content knowledge. The study was done in a primary school setting and focused on technological pedagogy. It did not highlight other teacher competencies, such as professional competencies. Additionally, Tzafilkou et al. (2021) postulate that there is a strong association between transfer training competencies and ICT-related self-efficacy. Professional development significantly impacts teachers' self-efficacy in instructional ability (Jakhaia, 2018). Although the study is related to the variables under investigation, it was not done in a TVET context.

Pirzada et al. (2021) postulated that enhancing the training experience is achieved through effective trainer-trainee interaction, as well as providing clear expectations regarding the role of trainers is a fundamental requirement for successful CBET implementation. Although the study focused more on the role of the trainer in engaging classroom instruction to enrich the training experience, it did not address the role of trainers' competencies and their influence in the engaging classroom. The study adopted a

qualitative approach to collect data from 21 participants in Pakistan; hence, the findings may not be generalizable to the Kenyan TVET context.

A study conducted in Nigeria to examine the implementation of problem-based learning in higher education TVET systems showed that problem-based learning has positive implications for producing high-quality TVET graduates since teachers can employ innovative teaching methods (Okolie et al., 2021). The study explored an in-depth understanding of trainers' experiences through a qualitative inquiry into CBET implementation. However, it did not highlight how the trainers' competencies shaped their teaching self-efficacy in implementing problem-based learning.

Cheruiyot (2022) argues that TVETA should prioritize addressing training providers’ and learners’ attitudes towards these methods and empower training providers with the necessary resources and human capacity to achieve the quality technical education and CBET effectively envisioned by the TVET system. Similarly, Masai (2020) indicated that after teachers undergo an online training course, the technological competencies they acquire improve their teaching self-efficacy. However, the study was limited to the technological competencies and context-specific to secondary school science and mathematics teachers.

2.7 Trainers’ Teaching Self-Efficacy and CBET Implementation

Teaching self-efficacy is essential, as it connects with teachers' instructional methods and impacts their motivation and effectiveness and their students' accomplishments (Morris et al., 2017). Consequently, Otieno et al. (2016) indicated that personal teacher efficacy greatly influences classroom interactions and the choice of teaching methods. These

classroom interactions are meaningful because teachers spend much effort reaching even the weakest learners (Kihoro & Bunyi, 2017).

Love et al. (2020), in their study on self-efficacy, teacher engagement, and student outcomes, indicated that teachers' self-beliefs significantly impact their decision-making, the learning environment they create, and their interactions with the students. Thus, the development of teaching self-confidence relies on effectively managing the classroom, engaging students, and utilizing effective strategies. For instance, Atsoniou (2020) posited that preschool programs prioritize classroom management over pupils' involvement and teaching strategies.

However, these studies were purely quantitative and not conducted in TVET colleges. Additionally, they did not examine the influence of teachers’ self-beliefs on the teaching and learning process. Therefore, these findings may not directly apply to the context of CBET implementation.

In Malaysia, Sandaraj and Hashim (2022) found a significant positive correlation between teacher self-efficacy and student reading assessment achievement. Thus, teachers with a strong belief in their abilities tend to make dedicated efforts to identify the underlying reasons for their students' reading difficulties and implement appropriate interventions to enhance their reading skills. Hence, teachers' self-beliefs are positively linked to their assessment practices (Ahmad & Akbar, 2020).

Similarly, teachers who exhibit a high sense of efficacy in instructional strategies demonstrate better practicum performance, accompanied by pleasant emotions such as love and joy. Conversely, teachers with lower efficacy tend to experience negative emotions

such as fear, sadness, and anger, leading to a low practicum performance (Chen, 2019). However, these were purely quantitative and done in a primary context. Therefore, the study findings may not be generalizable in the Kenyan TVET context.

Teachers with higher teaching efficacy portray more enthusiasm for teaching and have a more outstanding commitment to teaching (Waweru et al., 2021). Although teaching efficacy is reinforced through in-service training, Kanyonga et al. (2019) highlighted that most trainers in Tanzania who received in-service training demonstrated limited knowledge and skills in effectively utilizing CBET teaching and learning methods and conducting students' assessments and evaluations.

Their level of knowledge and skills in these areas was inadequate, indicating a need for further improvement and support to enhance the implementation of CBET practices. However, the study was purely qualitative and did not examine the trainers' teaching self-efficacy and its role in CBET implementation.

Self-efficacy positively and significantly affects performance (Muema et al., 2020). Similarly, self-efficacy positively influences counseling program effectiveness (Kabutiei et al., 2022). In a study to evaluate the implementation of the CBET approach in classroom instruction, the findings indicated that effective implementation of classroom instructional strategies plays a vital role in fostering the integration of the CBET approach within TVET institutions (Kipngetich et al., 2021b). Although the study mainly focused on the trainers' use of direct discussion, small group, research, and problem-solving classroom instruction methods, it did not highlight the trainers' efficacy in choosing the instruction strategies.

2.8 Trainers' Competencies, Teaching Self-Efficacy and CBET Implementation

Teachers' self-beliefs and motivation significantly impact academic achievement (Taştan et al., 2018). Teaching self-confidence and attitudes toward the teaching profession in prospective teachers are strongly influenced by factors such as teachers' emotional state, mastery experience, and verbal persuasion from their colleagues (Arslan, 2019).

In Norway, Skaalvik and Skaalvik (2019) found that teacher self-efficacy mediates the relationship between collective teacher efficacy and engagement. This study implies that although trainers collaborate and work in teams, providing emotional and instrumental support for the actual CBET implementation, teachers are primarily independent and must rely on their competencies, skills, and abilities. Similarly, Arce-Saavedra and Blumen (2022) highlighted that teacher self-efficacy partially mediates the relationship between creative-innovative performance and teaching practices.

Bas (2022) states that teaching beliefs and attitudes to teach are strong predictors of motivation to teach. Furthermore, self-efficacy mediates the relationship between the attitude and motivation to teach. Correspondingly, Yildirim (2021) indicated that the instructors' communication competencies impact student teachers' attitudes and self-efficacy beliefs regarding the teaching profession. However, these studies adopted a purely quantitative correlation research model, and the unit of analysis was the university student teachers.

Fauth et al. (2019) indicated that teaching quality mediated the relationship between teacher competencies and learners' outcomes. Reid-Kane (2021) also indicated that training significantly impacts teacher self-efficacy and instructional implementation strategies.

However, these studies were limited to a quantitative approach and did not corroborate the qualitative views of the respondents.

In Iran, Hayat et al. (2020) postulated that metacognitive strategies and learning-related emotions mediate the relationship between students' efficacy and academic performance. Thus, the classroom's psycho-social climate influences the students' academic performance. Similarly, classroom management skills notably impact the classroom's psycho-social climate and teachers' self-beliefs (Azarboueh & Nastiezaie, 2022).

On the contrary, a study done in Indonesia showed that self-efficacy does not significantly affect performance. Nonetheless, the work environment significantly affects performance and mediates between self-beliefs and performance (Ambarita et al., 2022). However, the study was not done in an educational context and did not highlight the relationship between employee competencies, self-beliefs, and performance.

Teachers' competencies and self-confidence in implementing teaching and learning activities are developed and reinforced through in-service training (Mohamad & Osman, 2017). Additionally, teacher self-beliefs mediate the relationship between teacher-student support and teacher innovation (Cai & Tang, 2021). As the teachers' teaching self-efficacy improves, they tend to provide high-quality teaching to students, leading to better learning and, therefore, better student performance (Muchena & Moalisi, 2019). Thus, teacher competencies and self-beliefs predict quality teaching (Romel et al., 2021).

However, the studies were purely quantitative, utilized a relatively minor sample, and did not examine the mediating role of self-efficacy on the relationship between teacher quality and quality of teaching. Against this backdrop, the current study examines the mediating

role of trainers' self-beliefs on the relationship between trainers' competencies and CBET implementation in the Kenyan TVET context.

2.9 Research Gap

Despite CBET being fronted by several scholars as the best approach for training and assessment in technical education (Kufaine & Chitera, 2013; Mutua, Mulwa, et al., 2019; Ndile, 2018; Zuva & Zuva, 2020), developing countries like Kenya are still struggling in developing best policies for effective implementation of the approach (Okelo et al., 2021).

The reviewed empirical research, guided by the principles of social cognitive and social learning theories, has presented a compelling justification for how teachers' self-beliefs in their competencies can influence learners' educational achievements primarily through teachers' instructional strategies and students' engagement (Lauermann & Hagen, 2021).

The studies reviewed in the literature showed that teacher competencies have a positive and significant relationship with implementing classroom practices. However, most studies investigated the correlation between teachers' competencies and student educational outcomes or task performance. Most of the studies adopted a purely quantitative approach, and very few were done in the Kenyan TVET and more so on CBET implementation. Few studies conceptualized the implementation of CBET in terms of the expected roles of the trainers.

In addition, teacher competencies were conceptualized in terms of pedagogical or technological aspects. Since TVET trainers are exceptional teachers who bring hands-on skills to the classroom, there is a need to conceptualize trainers' competencies in terms of professional and pedagogical aspects.

Although the Kenyan TVET CBET underscores the role of the trainers during the training and assessment of trainees, the ongoing in-service CBET capacity building has not emphasized the role of teaching self-efficacy in the CBET implementation process. Therefore, the current study examines the influence of trainers' competencies and teaching self-efficacy on CBET implementation in the selected Kenyan TVET institutions.

2.10 Summary of the Review

This chapter has discussed an overview of TVET and CBET in Kenya and the role of the trainers during the training and assessment of trainees. Secondly, the chapter has described what trainer competencies, teaching self-efficacy, and CBET implementation in TVET institutions entail. The chapter also reviewed related studies from different scholars analyzing the relationship between the variables under investigation and teased out some conceptual, contextual, and methodological research gaps. Notably, the majority of the past empirical research applied mono methods. Furthermore, they mainly focused only on the direct effect of trainers' competencies on CBET implementation while ignoring the possible mediating effects of this relationship completely, thus necessitating the scholarly contribution of this study. The next chapter incorporates the research design and methodology that guided the study.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter entails how the researcher collected and analyzed the data. It consists of the paradigm that guided the study, research design, target population, sample size, sampling procedure, research instruments, measures taken to ensure validity and reliability, data collection procedure, techniques employed for data analysis, and ethical issues considered during the research process.

3.2 Research Paradigm and Design

Research paradigm, approach, and design collectively constitute the foundational framework that shapes the research process. The research paradigm represents the study's overarching philosophical stance, influencing the researcher's worldview, assumptions, and beliefs about the nature of reality and knowledge (Kivunja & Kuyini, 2017). The research approach pertains to the strategy and perspective employed to address research questions. Quantitative, qualitative, and mixed methods approaches represent distinct ways of gathering and analyzing data, each suited to different research contexts (Cohen et al., 2018). Finally, the research design outlines the detailed plan and structure of the study, specifying how data will be collected, analyzed, and interpreted. It involves decisions about sampling, data collection methods, and the overall strategy to answer the research questions. Integrating a specific paradigm with a chosen approach and design is fundamental to conducting rigorous and meaningful research, ensuring coherence and alignment throughout the research process (Creswell & Creswell, 2018).

3.2.1 Research Paradigm and Approach

The study was based on the pragmatic paradigm and employed a mixed-methods approach. The choice of a research paradigm reflects the researchers' underlying beliefs that shape their understanding of the world. Pragmatists believe that true and comprehensive knowledge can be obtained by combining quantitative and qualitative methods. The pragmatic paradigm provides a theoretical framework for mixed-method research (Bryman et al., 2021).

The mixed-methods approach was considered appropriate for this study because collecting quantitative and qualitative data would help the researcher understand the role of trainers' competencies and teaching self-efficacy in Competency-Based Education and Training (CBET) implementation in breadth and depth.

3.2.2 Research Design

The study employed a convergent parallel mixed-methods one-phase research design. The underlying procedure for convergent mixed methods one-phase research design involves simultaneously collecting and analyzing quantitative and qualitative data, allowing for a comprehensive understanding of the research question (Creswell & Creswell, 2018; Saunders et al., 2019). A research design is an inquiry within a quantitative, qualitative, or mixed-methods approach that provides an appropriate framework and procedures for conducting research (Creswell & Creswell, 2018).

Convergent mixed methods one-phase research design enables the researcher to integrate both data types to reveal convergence or divergence between quantitative and qualitative findings. By synthesizing these findings, the researcher gains a holistic understanding of the research problem, providing comprehensive, integrated results and interpretations (Cohen et al., 2018; Creswell & Plano Clark, 2018).

The convergent mixed methods one-phase research design was considered the most appropriate design for this study to comprehensively understand respondents' opinions, feelings, perceptions, and views on the influence of trainers' competencies on CBET implementation and how teaching self-efficacy mediates this relationship.

3.3 Study Location

The study was based in Meru County, Kenya (Appendix 3). The county is situated on the eastern side of the Mount Kenya region. Meru County borders Isiolo, Tharaka Nithi, Nyeri, and Laikipia counties. It comprises nine (9) sub-counties: Imenti Central, Imenti North, Imenti South, Tigania East, Tigania West, Igembe Central, Igembe North, Igembe South and Buuri. The county covers an area of 7,006.3 square kilometers with a population of 1,545,714 (KNBS, 2019).

The main economic activity in the county is agriculture. The county has a total of eight (8) accredited public technical and vocational training institutions comprising one (1) National Polytechnic (NP), five (5) Technical Training Institutions (TTIs), and two (2) Technical and Vocational Colleges (TVCs). The study location was appropriate because Meru County was among the first six counties where CBET implementation in TVET institutions was piloted (Republic of Kenya, 2020).

3.4 Target Population

The target population is a subset of the general population achieved by excluding individuals whose participation in the study would conflict with the aim of the study (Asiamah et al., 2017). The study targeted 870 in-service trainers employed by the Public Service Commission and the management board, comprising twenty (20) heads of sections and 850 trainers teaching CBET courses in public TVET institutions in Meru County. Table 3.1 shows the study's target population.

Table 3.1: Target Population

Target population	Population Size (N)
Heads of Sections	20
Trainers	850
Total	**870**

Source: (Researcher, 2022)

3.5 Sample Size Determination

The study used Kothari's sample size determination table (Appendix 4) to obtain a sample of 265 respondents from the targeted 850 trainers (Kothari, 2004). Sampling involves selecting individuals from a general population to represent the entire population. On the other hand, a sample is the selected representative of the entire population that a researcher intends to study to draw conclusions that can be generalized to the whole population (Kumar et al., 2019).

3.6 Sampling Procedure

The researcher employed a proportionate random sampling technique to select 265 trainers from the eight (8) public TVET institutions in Meru County, Kenya. The number of trainers selected from each institution was proportionate to the total number of trainers. Utilizing random sampling is an essential aspect of inferential statistics as it helps to reduce the likelihood of biased samples, guaranteeing that the obtained results using the sampled population would closely approximate what would have been found out if the entire population had been studied (Rahman et al., 2022). Proportionate random sampling was considered suitable in this study to ensure that the sample selected from every TVET institution was adequately represented within the study population. The sampling procedure for Trainers is shown in Table 3.2

Table 3.2: Proportionate Random Sampling for Trainers

TVET Institution	Number of Trainers	Sample Size
Meru National Polytechnic	260	80
Nkabune TTI	130	40
Mukiiria TTI	105	33
Karumo TTI	100	31
Kiirua TTI	95	30
Mitunguu TTI	80	25
Tigania East TVC	50	16
Kaelo TVC	30	10
TOTAL	**850**	**265**

Source: TVETA MIS Report, 2020

Additionally, purposive sampling was used to select 16 Heads of Sections (HoS) from the departments offering CBET courses comprising two heads of sections from each of the 8 TVET institutions (Appendix 6). Table 3.3 summarizes how the sample size was obtained for both data types.

Table 3.3: Sample Size and Sampling Procedure

Study Population	Target Population	Sample Size	Sampling Procedure
Trainers	850	265	Proportionate Random Sampling
Heads of Sections	20	16	Purposive Sampling
TOTAL	**870**	**281**	

Source: Researcher, 2022

3.7 Research Instruments

The researcher employed a standardized questionnaire to gather quantitative data and an interview schedule to generate the qualitative data. A research instrument is a tool for answering research questions that enable the researcher to collect data (Sharma, 2022). The questionnaires were administered to trainers, while the semi-structured interviews were conducted with heads of sections. The questionnaire provided data on trainer competencies, teaching self-efficacy, and CBET implementation. On the other hand, qualitative interviews gathered deeper insights into how trainers perceived their competencies and confidence to implement the CBET approach within their classrooms.

3.7.1 Questionnaires

The researcher employed a standardized questionnaire to gather the quantitative data from the trainers in the study. All trainers were given a questionnaire with similar questions arranged in the same order. A questionnaire is a research instrument comprising well-thought questions to help the researcher get specific information from the respondents. The expected data from a questionnaire should be able to cover the contents of the study objectives (Boparai et al., 2018).

A questionnaire was appropriate for data collection because it helped the researcher gather rich data on trainers' competencies, teaching self-efficacy, and CBET implementation from a relatively large number of respondents. Additionally, it allows easy coding of responses for statistical analysis.

The trainers' questionnaire comprised five (4) sections labeled A, B, C, and D, containing 39 items. Section A contains background information, including gender, the highest academic qualification, and teaching experience.

Section B obtained data on CBET implementation and had 13 items. The items were formulated from the roles of the trainer during training (teaching in the classroom and carrying out practical sessions in workshops) and assessment of the trainees (internal and external evaluations) (Directorate of TVET, 2018). The scale posed statements for trainers to respond to how often they did what was required for CBET implementation during training and assessment of trainees. For instance, "Conducting assessment and performance tests using the CBET approach."

Section C obtained data on trainers' competencies, which were conceptualized in pedagogical and professional aspects and had 14 items. The items were adapted from the Vocational Teacher Competencies model (Wahyuni & Sugihartini, 2021). Trainers' competencies were modified to fit in the Kenyan TVET CBET context. The scale posed statements for trainers to respond on their level of agreement with competencies for CBET implementation. For instance, “I am familiar with the strategies for implementing CBET.”

Section D obtained data on trainers' teaching self-efficacy and had 12 items comprising efficacy in trainee engagement, classroom management, and instructional strategies, critical aspects of teaching self-efficacy adapted from the Teachers' Sense of Efficacy Scale (TSES) (Tschannen-Moran & Hoy, 2001). The trainer and trainee replaced the teacher and student in the TSES scale. Trainers were asked, for instance, "How much can you do to help your trainees value learning?"

3.7.2 Semi-structured Interviews

The researcher conducted semi-structured interviews with the heads of sections. The interview method generates participant data through verbal responses (Kothari & Garg, 2019). The interviews facilitated probing if more clarification is needed (Obuya & Ong'ondo, 2021). It was appropriate to use semi-structured interviews to generate qualitative data for this study because it sought to obtain a deeper understanding of how trainers' competencies influenced their confidence to implement the CBET approach in their classrooms.

3.8 Validity and Reliability of Research Instruments

Validity refers to how accurately a research tool assesses its intended measure, while reliability pertains to its ability to yield constituent outcomes (Cohen et al., 2018).

The questionnaire was tested for face, content, and construct validity to ascertain if it measured the constructs it was intended to measure. The researcher involved supervisors, departmental and CBET experts from the Kenya School of TVET in assessing the questionnaire to check whether it contains an adequate range of items to test all the concepts under investigation.

The researcher conducted a pilot study using three (3) heads of sections and forty (40) trainers from two (2) public TVET institutions from the neighboring Nyeri county before the actual study to check for the validity and reliability of the research instruments. A Pilot study helps assess the validity and reliability of the research tool. It helps the researcher identify and refine any areas needing improvement before undertaking the main study (Fraenkel et al., 2019).

The respondents selected for the pilot study were presumed to exhibit similar characteristics to those of the population targeted in the main study. Notably, the pilot data was explicitly used to validate the questionnaire and was not used in the final analysis.

Exploratory factor analysis (EFA) was performed on the pilot data using the principal component analysis (PCA) method with variable rotation to establish the construct validity of the questionnaire items. The EFA aimed to identify underlying factors and assess the extent to which items loaded onto these factors represented the latent theoretical constructs being measured and was obtained through testing for convergent validity, which examined whether items measuring similar constructs are highly correlated, and discriminant validity, which examined whether different constructs are strongly related to each other (Hair et al., 2019).

The analysis extracted three (3) factors from the data at a factor loading cut-off of 0.5, indicating the three distinct constructs under investigation within the questionnaire. Notably, all the items from the questionnaire loaded perfectly onto their respective factors, with no cross-loading observed. This result indicates strong construct validity, suggesting that the items measured the intended constructs effectively (Appendix 7).

Furthermore, the Cronbach's alpha (α) coefficients for each factor were above the recommended threshold of 0.7. thus, the questionnaire was reliable, and the items demonstrated internal consistency and met the convergent and discriminant validity criteria. Therefore, the researcher retained all 39 questionnaire items to gather comprehensive data for the research objectives from a larger sample during the main study.

On the other hand, to ensure consistency and dependability in the study's qualitative part, the researcher purposively selected only those heads of sections that could provide key information for the analysis, reviewed responses with the participants, and sought clarifications during the interviews to ensure the accuracy of the researcher's and the participant's account, their trustworthiness, and credibility (Creswell & Poth, 2018). The researcher further documented the data generation process and the data analysis procedure to ensure transferability and enable an external audit (Yin, 2016).

3.9 Data Collection Procedure

The researcher obtained an introductory letter from Moi University and then applied for a research permit from the National Commission of Science, Technology, and Innovation (NACOSTI). The researcher sought permission from the gatekeepers and TVET institutional Heads to conduct a study in their institutions. Data was collected using questionnaires and semi-structured interviews. The researcher administered the questionnaires to trainers and interviewed the Heads of sections in person. They were issued during tea and lunch breaks when most trainers were in the staff room to ensure high questionnaire return rates.

The questionnaire had an introductory section that gave respondents instructions on how to fill in the questionnaire. The respondents were assured that their supplied information would be exclusively used for academic purposes. They were also informed not to indicate their names or those of their institutions in the questionnaire for confidentiality purposes.

The collection of quantitative and qualitative data was conducted concurrently. As the trainers filled in the questionnaires, the researcher conducted face-to-face interviews with the heads of sections. Before performing the interviews, the participants were briefed on the purpose of the study and ethical considerations such as confidentiality and anonymity and issued with consent forms. Participation in the survey was voluntary, and any other clarifications needed by the researcher or participants were addressed. The interviews were conducted in the TVET institutions at the participants' convenience. Each interview session lasted for 30 to 40 minutes. The researcher finally collected all the filled questionnaires on the same day and thanked the participants.

3.10 Data Analysis Procedure

Subsequently, data analysis involved concurrently analyzing both quantitative and qualitative data and identifying patterns and themes from both sources concurrently (Creswell & Plano Clark, 2018; Creswell & Creswell, 2018). The quantitative data from the questionnaires underwent preliminary processing, coding, and tabulation to prepare for statistical analysis. Data cleaning was done at the prescreening stage to improve the quality of the results. The Quantitative data was analyzed using hierarchical linear regression and the Hayes Mediation test with the help of the SPSS version 27 and Hayes PROCESS macro Version 4.2 (Model 4).

Before testing the study hypotheses, the researcher tested for underlying assumptions of the regression model, such as univariate and multivariate outliers, normality, linearity, homoscedasticity, and multi-collinearity. The study's null hypotheses were tested at α=0.05 significance level while controlling for trainers' gender, academic qualification, and teaching experience covariates to eliminate the confounding effects so that the model reflects the actual relationship between the variables under investigation. Table 3.4 shows the tested hypotheses in the study.

Table 3.4 Hypotheses Testing

	Hypothesis	Statistic	Decision
H_{01}	There is no statistically significant relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Hierarchical Linear Regression	Sig. at $p \leq .05$,
H_{02}	There is no statistically significant relationship between Trainers' Competencies and Teaching self-efficacy in public TVET institutions in Meru County.	Hierarchical Linear Regression	Sig. at $p \leq .05$,
H_{03}	Teaching Self-Efficacy does not statistically affect CBET Implementation in public TVET institutions in Meru County.	Hierarchical Linear Regression	Sig. at $p \leq .05$,
H_{04}	Teaching Self-efficacy does not significantly mediate the relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Hayes Mediation Test (Model 4) with Bootstrapping	Sig. at $p \leq .05$ & no Zero between LCI-UCI

Source:(Researcher, 2023)

On the other hand, the researcher analyzed the qualitative data from the interview transcripts using thematic analysis. The interview data was transcribed into a Microsoft Word document using a computer to search for patterns of meaning to help the researcher identify information that was closely linked to form a basis for generating themes (Braun & Clarke, 2019).

The researcher checked for commonalities between the data to generate codes for organizing data into meaningful patterns. The generated codes were identified and combined according to shared meanings to form themes. The researcher reviewed the themes to check if they formed a coherent pattern and gave the most appropriate interpretation of the data. Then, the researcher report write-up was made in a logical narrative.

After separately analyzing the quantitative and qualitative data, the researcher synthesized and integrated the findings using a side-by-side narrative method to identify areas of convergence or divergence between the two data sources to gain a more comprehensive understanding and multifaceted perspective on CBET implementation in TVET institutions (Cohen et al., 2018; Creswell & Creswell, 2018).

3.10.1 Regression Model

The hierarchical regression model was used to test hypotheses H_{01}, H_{02}, and H_{03}, as shown in equations (i-iii). Each model grouped the predictors into the covariates and the main predictor. All the predictor variables were added to the model at once without any stepwise addition or selection process to explain the variance in the outcome variable (CBET implementation) at $\alpha=0.05$ level of significance. The simultaneous entry of predictors in

the hierarchical model provides a clearer picture of how the collective set of predictors influences outcome variables (Woltman et al., 2012).

i. $Y = \beta_0 + C + \beta_1 X + \varepsilon$……..…..……..…. ($H_{01}$)

The regression model of the independent variable (Trainers Competencies) predicting the dependent variable (CBET Implementation) while controlling for the covariates.

ii. $M = \beta_0 + C + \beta_1 X + \varepsilon$…… ($H_{02}$)

The regression model of the independent variable (Trainers' Competencies) predicting the mediating variable (Teaching Self-efficacy) while controlling for the covariates.

iii. $Y = \beta_0 + C + \beta_1 M + \varepsilon$…….…… ($H_{03}$)

The regression model of the mediating variable (Teaching self-efficacy) predicting the dependent variable while controlling for the covariates.

Where;

Y = Dependent variable, X = Independent Variable, M = Mediating Variable, C = Covariates, β_0= Constant, β_1= Coefficient of the Independent Variable, and ε= Error term.

3.10.2 Testing Mediation

Hayes' 2013 PROCESS simple mediation (model 4) with bootstrapping was used to test hypothesis (H_{04}). This procedure was adopted because it is easy to apply, has simplified interpretation, and reduces the need to employ multiple linear regressions, each performing a specific function (Hayes, 2013). Figure 3.1 shows the adopted simple mediation model.

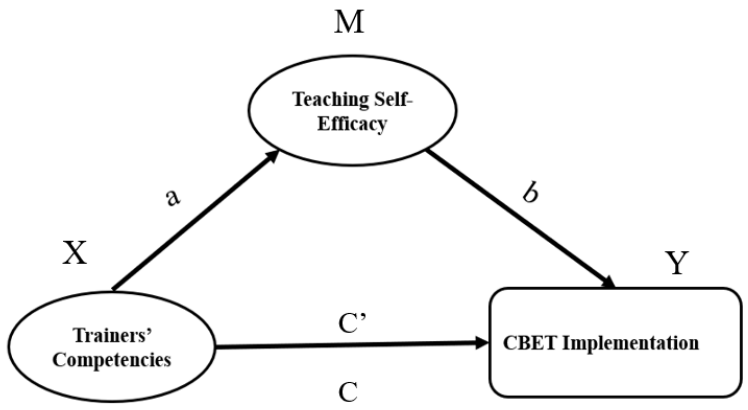

Figure 3.1: Simple Mediation Model

Source: (Hayes, 2013)

For mediation to occur, the following conditions must be met (Mackinnon, 2012);

i. X (Trainers' Competencies) must affect Y (CBET Implementation) (Path C)
ii. The effect of X on Y shrinks upon adding M to the model.

If all the conditions hold in the predicted directions (both direct and indirect effects are significant), then a partial Mediation is reported. A complete mediation would be reported if the independent variable no longer transmits the effect to the dependent variable while controlling for the mediator. Lastly, no mediation would be reported if the mediator does not significantly influence the dependent variable.

Considering the conditions above, the researcher utilized a simplified Hayes PROCESS macro (version 4.2) to generate an output to aid in understanding the resulting nature of mediation and its significance (Hayes, 2022). Bootstrapping was executed with 5,000 Bootstrap samples to provide point estimates and confidence intervals for assessing the potential significance of the indirect effect (Hayes & Preacher, 2014).

The decision rule was that if the confidence intervals obtained from the bootstrapping method did not contain a zero, it would be considered evidence of a significant indirect impact of teaching self-efficacy.

Mediation was determined by obtaining the product of the coefficients a and b (a*b) or (Total effect – Direct effect) as shown in equation i.

i. Mediation = a*b……..……(H_{04})

Therefore, the Total effect was obtained by calculating the indirect and direct effect sum, as shown in Equation ii.

ii. Total effect (C) = (a*b) + C’

Where X= Independent Variable, Y= Dependent Variable, M= Mediating Variable, C = Total effect, C'= Direct effect, and (a*b) = Indirect effect.

3.10.3 Data Analysis Summary

The study's data was analyzed within the distinct five research objectives; Table 3.5 summarizes the relationships explored through statistical analyses, including hierarchical linear regression and the Hayes mediation test with bootstrapping. The thematic analysis further enhanced the quantitative results' interpretation, contributing to a comprehensive overview of the relationships between the variables under investigation.

Table 3.5: Data Analysis Summary

	Objective	Independent Variable/s	Dependent Variable	Statistical Test
i.	To assess the relationship between the Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Trainers' Competencies	CBET Implementation	Hierarchical Linear Regression
ii.	To assess the relationship between Trainers' Competencies and Teaching Self-Efficacy in public TVET institutions in Meru County.	Trainers' Competencies	Teaching Self-Efficacy	Hierarchical Linear Regression
iii.	To determine the effect of Teaching Self-Efficacy on CBET Implementation in public TVET institutions in Meru County.	Trainers' Teaching Self-Efficacy	CBET Implementation	Hierarchical Linear Regression
iv.	To examine the mediating effect of Teaching Self-Efficacy on the relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County	Teaching Self-Efficacy, Trainers' Competencies	CBET Implementation	Hayes Mediation Test (Model 4) with Bootstrapping
v.	To explore trainers' perception of competencies, teaching self-efficacy, and their influence on the implementation of CBET in public TVET institutions in Meru County, Kenya.			Thematic Analysis

Source: (Researcher, 2023)

3.11 Ethical Considerations

The study observed ethical considerations for conducting research in Kenya (Appendix 8-11). The researcher sought ethical clearance from the research ethics committee of Moi University and also obtained a national research permit from NACOSTI to conduct research in Kenya.

The researcher then sought informed consent from the participants and had the consent forms duly signed before participation. The informed consent was based on the participants' awareness of the entire research process and their rights to withdraw from the study whenever they felt uncomfortable. Participation in the study was entirely voluntary.

Privacy, confidentiality, and anonymity in data collection were ensured throughout the study by assigning pseudo codes to heads of sections. In addition, trainers were not required to indicate any personal identifying information on the questionnaires.

The researcher interviewed heads of sections at their time and places of convenience to avoid interfering with their daily activities and the institutional programs. The evidence gathered was securely stored and used only for the study.

3.12 Chapter Summary

This chapter has provided an overview of the research philosophy and design that formed the foundation of the study. It also discussed the sampling techniques employed to select respondents, data collection instruments, their validation, data analysis, and interpretation procedures that led to the key findings. The subsequent chapter presents a detailed description of these key findings.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter provides an overview of data analysis, interpretation, and presentation of the study's findings on the influence of trainers' competencies and teaching self-efficacy on CBET implementation in Public TVET institutions. A mixed-methods approach was employed, with questionnaires used to gather quantitative data and semi-structured interviews for qualitative data.

The researcher analyzed the quantitative data using hierarchical linear regression and the Hayes Mediation test with the help of the SPSS version 27 and Hayes PROCESS macro Version 4.2 (Model 4). The following research hypotheses were tested, controlling for the confounding effects of trainers' gender, academic qualification, and teaching experience covariates at $\alpha=0.05$ level of significance in the study:

i. **H_{01}:** There is no statistically significant relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County, Kenya.

ii. **H_{02}:** There is no statistically significant relationship between Trainers' Competencies and Teaching Self-Efficacy in public TVET institutions in Meru County, Kenya.

iii. **H_{03}:** Teaching Self-Efficacy does not have a statistically significant effect on CBET Implementation in public TVET institutions in Meru County, Kenya.

iv. **H_{04}:** Teaching Self-Efficacy does not significantly mediate the relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County, Kenya.

In addition, the qualitative data on how trainers perceived their competencies, teaching self-efficacy, and their relationship with CBET implementation was generated to gain a comprehensive understanding of the research problem and was analyzed thematically. Both quantitative and qualitative data were analyzed separately but concurrently. The two data sets were integrated and compared to establish their convergence and divergence following the convergent one–phase research design strategy using the side-by-side narrative method. This entailed writing quantitative results and qualitative findings together on a theme-by-theme or concept-by-concept basis instead of separate presentations to facilitate a more comprehensive discussion of the research outcomes (Creswell & Plano Clark, 2018).

4.2 Pre-Data Analysis

The collected data was subjected to preliminary exploration and refinement stages, including data processing, preparation, and screening. These fundamental steps lay the foundation for a comprehensive understanding of the dataset, ensuring its suitability for meaningful analysis. Special attention was given to examining missing data, unengaged responses, and analysis of univariate outliers. Pre-data analysis involves the preliminary steps and considerations undertaken before exploring the actual analysis of the dataset. This phase encompassed data cleaning and organization and established a clear understanding of the data's context and relevance. It sets the foundation for the entire data analysis workflow. It acts as the gateway through which data is transformed from its raw

state into a format conducive to meaningful exploration and interpretation (Ridzuan & Wan, 2019). This process aimed to ensure the data's quality, integrity, and usability, paving the way for more accurate and reliable analytical analysis.

4.2.1 Data Processing, Preparation, and Screening

After data collection, 257 out of the 265 administered questionnaires were returned. The questionnaires were organized and coded, and the data was inputted into the SPSS statistical software. Before coding, questionnaires were checked for completeness, and as a result, five questionnaires were incomplete and thus excluded from further analysis. The remaining questionnaires in the data file were 252.

The data file was counter-checked against the original data on the questionnaire to establish whether it was entered correctly. Additionally, the researcher conducted spot checks on the entered data to screen for accuracy. Lastly, the data file was examined for missing data, entry errors, and values outside the expected range.

4.2.2 Examining the Missing Data

The researcher examined if there was any missing data by reviewing each variable's missing value representation in the "variable view" window. As a result, no missing data was identified in the data file. Each variable was complete, with no observations containing missing values. This allowed for the entire data file to be used for subsequent analysis.

4.2.3 Unengaged Responses

These are respondents who provide similar answers for all the questionnaire items, leading to insufficient responses (Hong et al., 2020). The researcher visually inspected the data file and obtained the standard deviation across the respondents to identify any unengaged

responses in the data set. Respondents whose responses had a standard deviation equal to 0.05 were excluded from the data file for further analysis. Seven (7) out of the remaining 252 questionnaires were unengaged responses and thus excluded from further analysis. The remaining questionnaires were 245.

4.2.4 Analysis of Univariate Outliers

The researcher first explored the data set for the existence of univariate outliers (i.e., outliers in a single variable) before subjecting the data to further parametric tests that only work with a normal distribution.

The result of the frequency tables showed the non-existence of univariate outliers arising from errors in data entry. Graphically, the results of Stem-and-Leaf box plots revealed some cases with outliers (both extremely high-5 and extremely low-1 observations). The researcher obtained the standardized values (z-scores) for every case, and all cases with Z-scores lying outside the +2.5 and -2.5 were considered univariate outliers (Field, 2018). All the study variables were associated with some cases of outlier values, as shown in Table 4.1.

Table 4.1 Univariate Outlier Analysis

Variable	Number of Univariate Outlier Cases	Cases Associated with Outliers	Z-Scores of the Outlier Cases	Corrected Z-Score
Trainers' Competencies	3	152	-3.3666	-2.4681
		233	-2.7944	-2.4681
		6	-2.7424	-2.4681
Teaching Self-efficacy	2	70	-2.9779	-2.445
		31	-2.8057	-2.445
CBET Implementation	5	31	-2.9381	-2.3389
		58	-2.6599	-2.3389
		26	-2.6171	-2.3389
		79	-2.5529	-2.3389
		90	-2.5529	-2.3389

Source: Field data (2023)

Table 4.1 shows that the researcher identified three (3) outliers associated with trainers' competencies, two (2) with teaching self-efficacy, and five (5) with CBET implementation. Consequently, all outliers were corrected to the nearest high value close to the cut-off under each variable (Field, 2018). The stem and leaf Box plots (Appendix 12) showed that all study variables were clean from univariate outliers.

4.3 Response Rate

The response rate refers to the proportion of individuals participating or responding to a given questionnaire or study. It is a crucial indicator of the effectiveness and representativeness of data collection efforts. A high response rate often indicates a more accurate and reliable dataset, reflecting a broader engagement from the target population. Conversely, a low response rate may raise concerns about the potential for sampling bias or the generalizability of findings (Fincham, 2008). Table 4.2 shows that the overall response rate for the study's instruments was 91%, whereas for interviews, it was 75%.

Specifically, the questionnaires had a response rate of 92%, which exceeds the acceptable rate of 70% for subsequent quantitative analysis in research studies (Draugalis et al., 2008).

Table 4.2 Response Rate

Instruments	Initial Sample Size	Declined	Effective	Percentage
Questionnaires	265	20	245	92%
Interviews	16	4	12	75%
Total	**281**	**24**	**257**	**91%**

Source: Field data (2023)

4.4 Demographic Characteristics of the Respondents

The demographic characteristics of respondents were collected in categorical form and summarized using a frequency distribution table (Table 4.3).

Table 4.3 Demographic Characteristics of the Respondents

Variable		Frequency	Percentage (%)
Gender	Male	177	72.2
	Female	68	27.8
	Total	**245**	**100**
Highest Academic Qualification	Diploma	38	15.5
	Higher National Diploma	55	22.4
	Bachelors	135	55.1
	Masters/Ph.D.	17	6.9
	Total	**245**	**100**
Teaching Experience	Below 5years	147	60
	6-10 years	58	23.7
	11-15 years	23	9.4
	Above 15years	17	6.9
	Total	**245**	**100**

Source: Field data (2023)

Table 4.3 shows that the majority, 177 (72.2%) of the respondents, were males while females were the minority, 68 (27.8%), hence an unbalanced distribution of the respondents in relation to gender category in the study. This disparity indicates that most trainers in technical departments in Kenyan TVET institutions are male.

The results show that the majority, 135 (55.1%) of the respondents were Bachelor's Degree holders, 55 (22.4%) had a Higher National Diploma, and 38 (15.5%) were Diploma holders. Only 17 (6.9%) respondents had a master's degree qualification and above. This reflects well with the requirements for teaching in Kenyan TVET institutions. The minimum requirement to teach in a TVET institution is a technical education diploma attained by all trainers who participated in the study (Republic of Kenya, 2019b).

Teaching experience is a critical dimension, shedding light on the professional tenure of the trainers who were the key respondents in the study. The majority, 147 (60%), had teaching experience below five years, and 58 (23.7%) had between 6 and 10 years. Only 17 (6.9%) respondents had teaching experience over 15 years. This indicates diversity in teaching experiences and trainers' stability and growth within the profession (Omar et al., 2020). The teaching experience shows that most trainers can implement the CBET approach launched in 2019 in TVET institutions (Republic of Kenya, 2020).

4.5 Descriptive Statistics for Study Variables

The researcher employed means and standard deviations to provide a descriptive analysis of the study’s variable items. This descriptive approach offered a solid foundation for subsequent inferential analyses and facilitated a more robust interpretation of the study's findings.

4.5.1 CBET Implementation

Trainers were asked to indicate how often they did what was expected for CBET implementation during training and assessment of trainees. The results are shown in Table 4.4.

Table 4.4 Descriptive Statistics on CBET Implementation

Item Code	Tested Item	Mean	SD
CIMP1	Ensuring trainees have the right Protective PPEs	4.339	0.861
CIMP2	Providing program learning guides as provided in the OS	4.204	0.882
CIMP3	Providing resources for specific modules	4.433	0.725
CIMP4	Ensuring that trainees follow learning guide instructions	4.559	0.691
CIMP5	Ensuring trainees carry out a self-check	4.082	0.865
CIMP6	Utilizing tasks when demonstrating to trainees	4.433	0.690
CIMP7	Maintaining a conducive and safe working environment	4.482	0.728
CIMP8	Guiding trainees in achieving the requisite competencies	4.563	0.660
CIMP9	Conducting assessment tests using the CBET approach	4.257	0.938
CIMP10	Providing assessment tests to trainees	4.347	0.843
CIMP11	Referring back trainees who do not meet standards	4.110	0.996
CIMP12	Assessing trainees at the institution and the industry	4.200	1.054
CIMP13	Preparing and maintaining trainees' progress records.	4.604	0.655
	Valid N=245		
	Grand Mean	**4.355**	**0.814**

Source: Field data (2023)

Results in Table 4.4 show trainers' perceptions of the implementation of the CBET approach in their classrooms. For instance, item CIMP12 (mean=4.200, SD=1.054) had the highest standard deviation, implying that respondents had varied opinions on whether trainees are assessed at the training institution and the industry as stipulated in the Occupational Standards (OS). However, item CIMP13, with the highest mean (4.604) and a low standard deviation (0.655), suggests a high level of agreement among respondents about preparing and maintaining trainees' progress records.

ItemCIMP6 (mean=4.433, SD=0.690) underscores the effectiveness of using tasks during demonstrations in a CBET classroom. This active learning approach contributes to a practical and hands-on training environment, enhancing the educational experience. This practical nature of CBET motivated trainers to research more and actively engage with the trainees and their colleagues. This engagement helped trainers adequately prepare for lessons and sessions, provide proper guidance for trainees during training and assessment, and evaluate whether they have acquired the requisite competencies outlined in the occupational standards. For instance, the participants alluded that;

"CBET is a more practical-based approach, so trainees always ask different questions. Therefore, the trainer is tasked with explaining for clarifications. Whenever I encounter a challenging task, I always consult my colleagues" [HoS 12]

"Effectiveness in evaluation and the practical nature of CBET have helped me prepare and deliver content sequentially in perfect manner. This has motivated the trainees, leading to a high classroom turnover and few absenteeism cases." [HoS 9]

Item CIMP9 (mean=4.57, SD= 0.938) indicates a moderate level of perceived effectiveness in conducting assessment tests using the CBET approach. This implied that trainers had specific concerns or challenges that needed to be addressed to implement quality CBET effectively. The above results were not different from the findings arising from the semi-structured interviews.

Most participants raised concerns about the huge trainers' workload, the large number of trainees in some technical classrooms, and inconsistencies in the instructional content in

some Occupational Standards. These emerged as challenges they faced when implementing the CBET curriculum. For instance, participants had this to say;

"Some classes are huge, it becomes a challenge to demonstrate to every trainee based on the Practical nature of CBET." [HoS 6]

"With my vast industry and classroom experience, some content included, for example, in Level 4 qualification may be too deep for their level" [HoS 7]

"increased trainer workload and the large numbers of trainees in the classroom are biggest challenges." [HoS 2]

"This term, I have a workload of 30 hours. Though I give the best to my trainees, it is challenging." [HoS 12]

On the contrary, Tambwe (2019) highlighted that some teachers' low understanding of the CBET concept and lack of motivation were among the challenges facing CBET implementation in Tanzania. The contradictions in CBET implementation challenges between Kenya and Tanzania can be attributed to contextual differences, including structural and logistical difficulties in Kenya, such as trainers' workload and large class sizes. At the same time, Tanzania faces intrinsic issues like teachers' low understanding of CBET concepts and a lack of motivation. Educational infrastructure and resource disparities play a role, with Kenya's challenges linked to practical constraints like insufficient trainers and Tanzania grappling with issues related to the quality of training resources and educators' grasp of the CBET framework. Additionally, variations in CBET implementation strategies and policies contribute to the disparities, with flaws in policy

implementation in Kenya and issues in the effectiveness of teacher training programs in Tanzania.

Overall, a high grand mean (4.355) in CBET implementation items implies a large extent of CBET approach implementation amongst the trainers in TVET institutions. The low overall Variance (SD=0.814) indicates a strong positive response in the CBET implementation items. This implies that, generally, trainers have a positive perception of CBET implementation in their classrooms. The findings are in tandem with a study on trainees' perception of CBET implementation, which showed that trainers in the Kenyan coastal region understood the concept and objectives of the CBET Curriculum (Mwagunga et al., 2020).

4.5.2 Trainers' Competencies

To obtain responses on trainers' competencies, respondents were asked to indicate their level of agreement with the competencies needed for CBET Implementation (Table 4.5). These competencies extend beyond subject matter expertise to include pedagogical proficiency, communication skills, and the ability to create an inclusive and engaging learning environment. A competent trainer deeply understands the content and adapts teaching strategies to cater to diverse learning styles. Additionally, the capacity to assess and respond to the evolving needs of trainees, coupled with effective classroom management skills, distinguishes a proficient trainer. Taguma, Feron, and Lim (2018) postulated that trainers' competencies often bridge the gap between theoretical knowledge and practical application, nurturing the development of skills that are directly applicable in real-world scenarios.

Table 4.5 Descriptive Statistics of Trainers' Competencies

Item Code	Tested Item	Mean	SD
TCMP1	I have attended the CBET capacity-building workshop	3.955	3.444
TCMP2	The workshop equipped me with CBET skills	4.020	2.061
TCMP3	I am familiar with the strategies for implementing CBET	3.910	0.979
TCMP4	I communicate effectively in class while teaching	4.510	0.705
TCMP5	I can recognize trainees' personalities in my class	4.261	0.761
TCMP6	I can prepare CBET assessment tools	4.298	0.847
TCMP7	I can conduct internal assessments and evaluate my trainees	4.416	0.740
TCMP8	I assess trainees during the industrial attachment period	4.461	0.744
TCMP9	I have mastered the content knowledge in my trade area	4.580	0.557
TCMP10	I can apply my content knowledge in teaching my trainees	4.641	0.514
TCMP11	I can carry out self-development in a sustainable manner	4.408	0.650
TCMP12	I work productively with other colleagues in my department	4.498	0.605
TCMP13	I always reflect on my practice in the classroom	4.465	0.617
TCMP14	I strive to ensure that the trainees meet CBET requirements	4.425	0.689
	Valid=245		
	Grand Mean	**4.346**	**0.994**

Source: Field Data (2023)

Results in Table 4.5 show that trainers' competencies items had a high grand mean (4.346) and a low overall standard deviation (0.994), indicating a strong positive perception of respondents' competencies for implementing the CBET approach. For instance, item TCMP10, "*I can apply my content knowledge in teaching my trainees,"* had a high mean (4.641) and lowest standard deviation (0.514). This suggests that most respondents expressed confidence in utilizing their content knowledge to teach students in their classrooms. Participants also said that this confidence was shaped by their years of teaching experience in TVET training and played a vital role in implementing quality CBET. They indicated that their practical knowledge and expertise gave them a solid foundation in delivering CBET. For instance, participants reported the following;

"I am competent with over fifteen years of industry experience. I can deliver content to trainees with confidence following the set CBET guidelines" [HoS 7]

"Having experience in the industry gives me the capability to task through challenges within and without a classroom set-up. Every challenge can be tackled with a combination of both industry and classroom experience." [HoS 2]

On the contrary, item TCMP1, *"I have attended CBET capacity-building workshop/ seminar,"* had a relatively low mean (3.955) and the highest standard deviation (3.444). The large standard deviation indicates that participants had varied opinions on whether they had attended the CBET capacity-building workshop. Similar findings emerged from the interviews. For instance, the majority of the participants indicated that a combination of training attended and institutional support received improved their confidence to implement the CBET approach in their classrooms. Participants had this to say:

"I feel confident in my competencies, and specifically the TVET CDACC capacity building positively influenced my confidence to implement CBET." [HoS 3]

"TVET CDACC did a good job of offering our trainers capacity building. Our institution hosted the training, and we were retooled on the competence-based assessment and the demands of CBET. I feel my competencies to implement CBET approach are strong, especially in developing assessment tools" [HoS 11]

Although most participants felt that the TVET CDACC capacity-building workshops reinforced their confidence in implementing the CBET approach, most were limited to one-week training sessions focused on providing a foundational understanding of CBET concepts. Participants felt these sessions were brief and lacked opportunities for trainers to

exchange best practices and address their concerns regarding effective CBET implementation. For instance, participants reported the following form the interviews:

“The workshop was brief. We were not able to address the challenges we faced while teaching the CBET courses” [HoS 4]

"The CDACC team conducted a training on the overview of CBET and Competency-Based Assessment for one week. From then on, no follow-up or more comprehensive training on concerns and challenges of CBET implementation was done for trainers." [HoS 7]

These results agree with Kipngetich et al. (2022), who highlighted that although most of the trainers understood the concept of CBET, and most of the TVET colleges were much ahead of the CDACC in terms of training; the TVET CDACC body had lagged in building the capacity of trainers for effective implementation of CBET.

4.5.3 Teaching Self-efficacy

To obtain responses on teaching self-efficacy, trainers were asked to indicate how much they could do to implement the CBET approach in their classroom activities. The results in Table 4.6 provide a multifaced glimpse into trainers' self-efficacy across various dimensions of their instructional responsibilities. Each item in the table corresponds to a specific aspect of teaching self-efficacy, from fostering a positive attitude toward learning to addressing disruptive behavior and adapting strategies for diverse trainees’ needs.

The presented descriptive statistics, including mean scores and standard deviations, offer valuable insights into the trainers' perceived self-confidence in their instructional capabilities when implementing the CBET approach in their classrooms. The descriptive analysis of these self-efficacy indicators unravels the intricate dynamics shaping the

trainers' readiness and confidence in implementing the CBET approach within the classroom setting.

Table 4.6 Descriptive Statistics on Teaching Self-Efficacy

Item Code	Tested Item	Mean	SD
TSEF1	Helping trainees value learning	4.547	0.596
TSEF2	Motivating trainees who show low interest in schoolwork	4.437	0.635
TSEF3	Improving the understanding of a trainee who is failing	4.474	0.675
TSEF4	Getting through the most difficult trainees	4.278	0.733
TSEF5	Getting trainees to follow classroom rules	4.551	0.596
TSEF6	Making clear expectations about trainee behavior	4.498	0.644
TSEF7	Controlling disruptive behavior in the classroom	4.510	0.644
TSEF8	Keeping a few problem trainees from ruining the lesson	4.469	0.698
TSEF9	Responding to difficult questions from trainees	4.527	0.650
TSEF10	Providing appropriate, challenging tasks for very capable trainees	4.514	0.618
TSEF11	Implementing alternative strategies in the classroom	4.437	0.615
TSEF12	Providing an alternative explanation when trainees are confused	4.633	0.539
	Valid N=245		
	Grand Mean	**4.489**	**0.637**

Source: Field Data (2023)

As indicated in Table 4.6, the results reveal a high confidence level among trainers in implementing the Competency-Based Education and Training (CBET) approach in their classrooms. The descriptive statistics show a consistent positive perception across various aspects of teaching self-efficacy. For instance, trainers expressed strong capabilities in areas such as helping trainees value learning (item TSEF1, mean=4.547, SD=0.596), motivating trainees with low interest in schoolwork (item TSEF2, mean=4.437, SD=0.635), and improving the understanding of failing trainees (item TSEF3, mean=4.474, SD=0.675). Additionally, they exhibited confidence in managing challenging scenarios, including getting through to the most difficult trainees (item TSEF4,

mean=4.278, SD=0.733) and controlling disruptive behavior in the classroom (item TSEF7, mean=4.510, SD=0.644).

The grand mean of 4.489 reflects an overall high level of teaching self-efficacy, with a relatively low standard deviation of 0.637, indicating a high degree of agreement among respondents. These findings suggest that trainers feel well-prepared and confident to the implement CBET approach effectively in diverse classroom situations. These results were not different from the qualitative findings, where most participants expressed a strong sense of self-assurance and confidence in their competencies. Participants felt they possessed the necessary knowledge and skills to implement CBET training effectively, manifested by the positive feedback they received from their trainees. For instance, one participant alluded that;

"I have received positive feedback from trainees, which can be reflected in their Portfolio of Evidence." [HoS 4]

In addition, participants revealed that their pedagogical competencies improved their confidence in implementing the CBET approach in their classrooms. This was manifested through an improved trainer-trainee relationship. For instance, some participants reported the following:

“My competencies have boosted my confidence in coming up with assessment tools and objective evaluation of trainees.” [HoS 1]

"Although I assimilate CBET skills in class, getting through some trainees can be challenging. However, learning their behavior and creating a conducive environment helps these trainees express how they understand whatever is being taught." [HoS 6]

Overall, trainers have self-assurance in their instructional abilities for CBET implementation. However, strengthening their self-beliefs through training and professional growth could further boost their confidence and enhance their teaching effectiveness for quality CBET Implementation.

These findings indicate that trainers had a strong sense of self-assurance and confidence in their competencies and that their competencies played a vital role in influencing their confidence to implement quality CBET training in their classrooms. This confirms studies that have shown that personal teacher efficacy greatly influences classroom interactions and the choice of teaching methods, and these classroom interactions are meaningful because teachers spend much effort reaching even the weakest learners (Kihoro & Bunyi, 2017; Otieno, Charagu, & Mogire, 2016). Similarly, Waweru et al. (2021) indicated that teachers with higher teaching efficacy portray more enthusiasm for teaching and have a more outstanding commitment to teaching.

However, these findings contradicted Kanyonga et al. (2019), who suggested that TVET trainers in Tanzania had a limited understanding of the CBET curriculum. This contradiction could be attributed to distinct contextual issues in CBET implementation, potentially leading to different approaches and executions of the framework in each country. Additionally, variations in training and professional development initiatives might contribute to the contradiction. Kenyan trainers may have had more access to comprehensive and tailored programs, enhancing their confidence and understanding of

CBET. In contrast, Tanzanian trainers may face limitations in exposure to practical CBET-oriented training. Furthermore, differences in institutional support and allocated resources for CBET programs could play a role, with Kenyan institutions providing better-equipped environments for trainers than their Tanzanian counterparts.

4.6 Data Reduction Analyses

Data reduction analysis is a critical process in statistical analysis involving transforming large and complex datasets into more manageable forms while preserving essential information. Various techniques are employed in data reduction analyses (Chumney, 2012). This study used Factor analysis and Principal Component Analysis (PCA) and to uncover the underlying factor structure explaining observed correlations among variables. The primary objective of data reduction is to simplify the dataset for easier subsequent analysis and interpretation.

4.6.1 Factor Analysis

Factor analysis is a data reduction statistical technique employed to determine the interrelationships among various items within a variable. Its primary function is to streamline an extensive array of items into a more concise set of factors that exhibit close connections, effectively capturing and representing the principal dimensions inherent in the dataset (Hair et al., 2019 ; Pituch & Stevens, 2016). Before conducting factor analysis, a comprehensive examination of the following assumptions was undertaken to ensure the validity and reliability of the data. Notably, these assumptions apply to other multivariate techniques like Structural Equation Modelling (SEM) and regression analysis (Kline, 2018).

4.6.1.1 Sample to Variable Ratio

For Factor Analysis to produce reliable results, it is advisable to have a sample size exceeding 100. Maintaining a sample size beyond this threshold ensures the robustness and accuracy of the outcomes derived from the Factor Analysis procedure, thus contributing to the statistical validity and generalizability of the findings (Hair et al., 2019). Hence, a larger sample size provides a more comprehensive representation of the population, enhancing the reliability of the identified factors and their relationships within the analyzed data. Saunders et al. (2019) suggests that a sample-to-variable ratio of 15:1 meets the criteria of acceptable sample sizes before conducting factor analysis. In this current study, the sample size was 245 with three (3) variables, resulting in an impressive ratio of 81:1. This ratio significantly exceeds the established threshold of 15:1, thus affirming the adequacy of the sample size for conducting Factor Analysis. This substantial ratio indicates a robust dataset that ensures a reliable and meaningful exploration of the relationships between variables in the study (Hair et al., 2019).

4.6.1.2 Assessment of Multivariate Outliers

Although factor analysis is not explicitly sensitive to outliers, their presence can affect the robustness and validity of the results, such as distortion of factor loadings, which might lead to a misrepresentation of the underlying factor structure (Zygmont & Smith, 2014). The researcher thoroughly examined the presence of outliers in the data set to guarantee that the factor analysis yielded meaningful insights into the inherent data structure. This careful consideration and handling of outliers were crucial to maintaining the accuracy of the factor analysis results, ensuring a more precise representation of the relationships among variables in the dataset (Hair et al., 2019; Hayes, 2018).

Although the dataset was clean of univariate outliers, as earlier discussed in this chapter, necessary for multivariate analysis, it is not a sufficient condition for detecting multivariate outliers (Pituch & Stevens, 2016, p. 29). This assumption holds that data must be free from significant outliers across variables. When these outliers are not cleaned, they affect statistical coefficient estimates, causing Type I or II errors (Pituch & Stevens, 2016; Tabachnick & Fidell, 2013). The researcher explored the dataset for multivariate outliers by calculating Mahalanobis Distance (D2) measures using the linear regression method to develop Mahalanobis D2 scores. The results (Appendix 13) show that all cases had Mahalanobis D2 scores ranging from .017 (minimum) to 11.027 (maximum), Mean= 1.992, Std. Dev. =2.024 and N=245.

In identifying which specific Mahalanobis D2 score(s) could be associated with multivariate outliers, the researcher computed probability Mahalanobis D2 Chi-square value distribution using 3 degrees of freedom since the hypothesized Model in this study had two (2) predictor variables and one (1) outcome variable. Hair et al. (2019) suggest that a probability Mahalanobis D2 test value of less than .001 ($p<.001$) shows the presence of multivariate outliers and, therefore, should be expunged from the dataset. As a result, all probabilities of Mahalanobis D2 were greater than .001. Therefore, the dataset did not contain any multivariate outliers (Appendix 12).

4.6.1.3 Multicollinearity and Singularity

Multicollinearity occurs when a high correlation ($r>.8$) exists between two or more independent variables in a multiple regression model. In contrast, singularity occurs when there is a perfect linear relationship between two or more independent variables ($r=1$), making the correlation matrix non-invertible (Ernst & Albers, 2017).

Multicollinearity and singularity affect the stability and interpretability of factor analysis results. Multicollinearity hampers the differentiation between unique contributions and shared variance among observed variables, thus affecting the accuracy of identifying latent factors. Similarly, singularity makes it difficult for factor analysis to find a distinct solution, thus compromising the reliability of the analysis and the clear identification of underlying factors (Bayo et al., 2021; Ernst & Albers, 2017).

The researcher conducted Pearson's product-moment correlation test to ascertain the potential presence of multicollinearity and singularity, revealing associations among study variables. Correlation results (Table 4.7) showed a positive and significant association between trainers' competencies and CBET implementation (r =0.397, $p<0.01$). Further, teaching self-efficacy was positively and significantly associated with CBET implementation (r =0.525, $p<0.01$). Finally, a positive and significant association was found between Teaching Self-Efficacy and CBET Implementation (r =0.447, $p<0.01$). Notably, these correlations fell below the critical threshold of 0.8, indicating that the study variables neither exhibited high Multicollinearity nor singularity, ensuring the robustness of the data for factor analysis without compromising its reliability.

Table 4.7 Correlation Analysis Matrix (N=245) for Main Study Variables

	CBET Implementation	Trainers' Competencies	Teaching Self-efficacy
CBET Implementation	1		
Trainers' Competencies	.397**	1	
Teaching Self-efficacy	.525**	.447**	1

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

Further to confirm this assumption, an additional step was taken to conduct a collinearity diagnostic test on the hypothesized model, specifically to assess the presence of multicollinearity. Tolerance statistics (TOL) and its reciprocal Variance Inflation Factor (VIF) were examined. Researchers suggest different cut-off points for the above multicollinearity statistical test statistics. For this study, a cut-off of Tolerance values exceeding 0.1 (TOL>0.1) and VIF values less than ten (VIF<10) indicated the non-existence of Multicollinearity (Field, 2018; O'Brien, 2007).

The collinearity diagnostic test results (Table 4.8) show that all the predictor variables had Tolerance Values above 0.1 and VIF values less than 2 (<2). This statistic confirms that Multicollinearity was not a problem since predictor variables were not highly correlated.

Table 4.8 Test for Multicollinearity

Variable	**Collinearity Statistics**	
	Tolerance	**VIF**
Teaching Self-Efficacy	0.799	1.252
Trainers' Competencies	0.769	1.300

4.6.1.4 Test for Normality of the Study Variables

The researcher first examined univariate normality to investigate whether each variable was normally distributed. This was first done by analyzing the study variables' skewness and kurtosis coefficients (Table 4.9).

Table 4.9 Skewness and Kurtosis Coefficients of the Original Study Variables

	N=245			
	Skewness		Kurtosis	
Variable	Statistic	Std. Error	Statistic	Std. Error
Trainers' Competencies	-0.590	0.156	-0.248	0.31
Teaching Self-efficacy	-0.576	0.156	-0.224	0.31
CBET Implementation	-0.628	0.156	-0.371	0.31

Source: Field Data (2023)

Results in Table 4.20 show that skewness and kurtosis coefficients for all the study variables are approximately -0.5. This indicates that the variable scores showed a moderately negatively skewed distribution (Mertler & Reinhart, 2017). The researcher then transformed the dataset using a two-step transformation by modifying the scores using the fractional rank method and *Idf.Normal (fractional rank, mean, Standard. deviation)*to normality (Templeton, 2011). The skewness and kurtosis values of the transformed variables (Appendix 14) were found to be close to zero. This observation indicates that the data exhibited an approximate normal distribution. Furthermore, the histograms and Normal Q-Q plots presented in Appendix 15 confirm that the study variables were approximately normally distributed.

4.6.2 Exploratory Factor Analysis (EFA)

Upon satisfying the prerequisite assumptions for factor analysis, construct validity was assessed, involving an exploration of items within the three study variables for data reduction through Exploratory Factor Analysis (EFA). The extraction of factors was carried out using Principal Component Analysis (PCA) with an orthogonal rotation

(Varimax) method aimed at examining the underlying latent factor structure and gauging the degree to which items loaded onto these factors (Hair et al., 2019).

Principal Component Analysis (PCA) was chosen due to its proficiency in establishing linear components within a dataset and aligning factors that explain common and unique variance in a set of measured variables. The orthogonal rotation (Varimax) method was chosen because of its capability to maximize the dispersion of loadings within factors. Factor loadings serve as indicators of the significance that a particular item holds within a designated factor. It is noteworthy that, for statistical identifiability, each component should ideally have three (3) to five (5) items without any cross-loadings (Hair et al., 2019). Items exhibiting low loadings (<0.50) were deemed insufficient and consequently suppressed from the final factor structure. Additionally, the extracted factors demonstrated Eigenvalues exceeding one (>1), affirming their ability to adequately account for the common variance within the set of measured variables (Hair et al., 2019).

4.6.2.1 Exploratory Factor Analysis for Trainers' Competencies

Trainers' competencies formed the independent variable in the study, which was conceptualized as a multi-dimensional construct measured using a total of 14 items anchored on a 5-point Likert scale. Principal Component Analysis was conducted to check item loadings through which redundant items were identified and deleted from further analysis (Appendix 16). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of trainers' competencies was 0.828, indicating that sampling was adequate for factor analysis to proceed.

The significant chi-square value for Bartlett's test of sphericity ($\chi 2$ = 936.446, $p<0.05$) confirmed that the observed correlation matrix was significantly different from an identity matrix, suggesting correlations in the data. This implies that the data on trainers' competencies had a sufficient structure for meaningful and adequate factor extraction (Hair et al., 2019). Table 4.10 shows the KMO and Bartlett's test for trainers' competencies.

Table 4.10 KMO and Bartlett's Test for Trainers' Competencies

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.828
Bartlett's Test of Sphericity	Approx. Chi-Square	936.446
	df	91
	Sig.	.000

Source: Field Data (2023)

A rotated component matrix was run for trainers' competencies indicators using a Varimax rotation method with Kaiser Normalization (Table 4.11). There was no cross-loading observed. Therefore, no item was deleted. The 14 items extracted loaded on four dimensions: internal assessment proficiency, which loaded five (5) items; mastery of content knowledge, which loaded six (6) items; CBET skills acquisition, which loaded two items (2); and CBET workshop participation, which loaded one item (1).

Table 4.11 Rotated Component Matrix for Trainers' Competencies

Rotated Component Matrix

Code	Items	Component			
		Internal assessment proficiency	**Mastery of content knowledge**	**CBET skills acquisition**	**CBET workshop participation**
TCMP7	I can conduct internal assessments and evaluate my trainees	0.782			
TCMP8	I assess trainees during the industrial attachment period	0.763			
TCMP4	I communicate effectively in class while teaching	0.757			
TCMP6	I can prepare CBET assessment tools	0.695			
TCMP5	I can recognize trainees' personalities in my class	0.609			
TCMP9	I have mastered the content knowledge in my trade area		0.746		
TCMP11	I can carry out self-development in a sustainable manner		0.720		
TCMP14	I strive to ensure that the trainees meet CBET requirements		0.711		
TCMP12	I work productively with other colleagues in my department		0.653		
TCMP10	I can apply my content knowledge in teaching my trainees		0.598		
TCMP13	I always reflect on my practice in the classroom		0.542		
TCMP2	The workshop equipped me with CBET skills			0.821	
TCMP3	I am familiar with the strategies for implementing CBET			0.721	
TCMP1	I have attended the CBET capacity-building workshop				0.792

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 7 iterations.

The four extracted components (Table 4.12) cumulatively accounted for 60.066% of the total Variance in trainers' competencies. Comparatively, internal assessment proficiency accounted for 31.004%, mastery of content knowledge accounted for 12.652%, CBET skills acquisition accounted for 9.118 % of the total Variance in trainers' competencies, and CBET workshop participation accounted for 7.292%.

Table 4.12 Total Variance Explained for Trainers' Competencies

Total Variance Explained

Component	**Initial Eigen Value**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1. Internal assessment proficiency	4.341	31.004	31.004	3.008	21.488	21.488
3. Mastery of content knowledge	1.771	12.652	43.657	2.833	20.238	41.726
3. CBET skills acquisition	1.276	9.118	52.775	1.481	10.576	52.301
4. CBET workshop participation	1.021	7.292	60.066	1.087	7.765	60.066

Extraction Method: Principal Component Analysis

This implies that the most important component of trainers' competencies is internal assessment proficiency, contributing significantly with a noteworthy 31.004% of the total variance. Therefore, this underscores the vital role of trainers' ability to internally assess and evaluate the progress and understanding of their trainees. A high level of internal assessment proficiency not only reflects on the trainers' competence but also signifies a critical aspect of effective teaching and learning within the Competency-Based Education and Training (CBET) framework.

These results are consistent with Vocational Teacher Competencies Model which postulated that pedagogical competencies is the most important competency aspect for Vocational High School teachers (Wahyuni & Sugihartini, 2021).

Following closely in importance is the mastery of content knowledge, representing 12.652% of the total variance. This underscores the fundamental significance of trainers' in-depth understanding and command over the subject matter they are imparting. A trainer's mastery of content knowledge is crucial in fostering a rich and comprehensive learning environment, aligning with the principles of CBET that emphasize a practical-oriented approach to learning.

Acquisition of CBET skills, contributing 9.118%, emerges as another critical factor shaping trainers' competencies. This highlights the need for trainers to acquire specific skills for implementing quality CBET, which may include instructional design, assessment strategies, and competency-based teaching methodologies. These skills are vital in enhancing the trainer's overall competence and effectiveness in delivering quality CBET.

Lastly, participation in the CBET workshop accounts for 7.292% of the total variance, marking its significance in influencing trainers' competencies. Workshop participation allows trainers to engage with evolving CBET methodologies, exchange best practices, and refine their instructional approaches. Although it has a slightly lower impact than other factors, participation in CBET workshops remains a valuable contributor to trainers' overall competencies.

Notably, all four components had eigenvalues greater than 1. These latent constructs represented a composite variable called "trainers' competencies." Therefore, the items of each latent construct were aggregated using the simple averaging (mean) method into a single variable that formed the study's independent variable, as suggested by (Rose et al., 2019).

4.6.2.2 Exploratory Factor Analysis for Teaching Self-efficacy

Teaching self-efficacy formed the mediating variable in the study and was operationalized as a tri-dimensional construct measured using a total of 12 items anchored on a 5-point Likert scale. Principal Component Analysis was conducted to check item loadings through which redundant items were identified and deleted from further analysis (Appendix 17). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of teaching self-efficacy was 0.860, indicating that sampling was adequate for factor analysis to proceed (Beavers et al., 2013).

The significant chi-square value for Bartlett's test of sphericity ($\chi 2 = 843.384$, $p<0.05$) confirmed that the observed correlation matrix was significantly different from an identity matrix, suggesting that there were correlations in the data, implying that the data on teaching self-efficacy had a sufficient structure for meaningful and adequate factor extraction (Hair et al., 2019). Table 4.13 shows the KMO and Bartlett's test for teaching self-efficacy.

Table 4.13 KMO and Bartlett's Test for Teaching Self-efficacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.860
Bartlett's Test of Sphericity	Approx. Chi-Square	843.384
	df	66
	Sig.	.000

Source: Field Data (2023)

The rotated component matrix (Table 4.14) for teaching self-efficacy indicators was run using a varimax rotation. There was no cross-loading observed. However, one item (TSEF8) did not load into any factor and was therefore dropped. The 11 items extracted loaded highly on 2-dimension components: classroom management, which loaded seven (7) items, and trainee engagement, which loaded four (4) items.

Table 4.14 Rotated Component Matrix for Teaching Self-efficacy

Rotated Component Matrix

Code	Items	Component	
		Classroom management	**Trainee engagement**
TSEF6	Making clear expectations about trainee behavior	0.719	
TSEF7	Controlling disruptive behavior in the classroom	0.708	
TSEF10	Providing appropriate, challenging tasks for very capable trainees	0.669	
TSEF12	Providing an alternative explanation when trainees are confused	0.661	
TSEF11	Implementing alternative strategies in the classroom	0.624	
TSEF9	Responding to difficult questions from trainees	0.519	
TSEF5	Getting trainees to follow classroom rules	0.508	
TSEF4	Getting through the most difficult trainees		0.777
TSEF3	Improving the understanding of a trainee who is failing		0.773
TSEF2	Motivating trainees who show low interest in schoolwork		0.699
TSEF1	Helping trainees value learning		0.531

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

The two extracted components (Table 4.15) cumulatively accounted for 46.674% of the total Variance in teaching self-efficacy. Comparatively, classroom management accounted for 38.459%, and trainee engagement accounted for 9.215%.

Table 4.15 Total Variance Explained for Teaching Self-efficacy

Total Variance Explained

Component	**Initial Eigen Value**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1. Classroom management	4.615	38.459	38.459	3.29	27.413	27.413
2. Trainee engagement	1.106	9.215	47.674	2.431	20.261	47.674

Extraction Method: Principal Component Analysis

This implies that the most important factor in trainers' teaching self-efficacy is classroom management, contributing remarkably with a dominant 38.459% of the total variance. This underscores the vital role that effective classroom management plays in shaping trainers' self-efficacy. Maintaining discipline, creating an organized and conducive learning environment, and addressing behavioral issues impact trainers' confidence in their teaching abilities. Classroom management, as a cornerstone of effective teaching, profoundly influences educators' overall self-efficacy. Therefore, a well-managed classroom fosters a positive and conducive learning environment.

Following in importance is trainee engagement, representing 9.215% of the total variance in teaching self-efficacy. This highlights the significance of trainers' ability to involve and engage their trainees in the learning process actively. Trainers who can effectively capture and maintain their trainees' attention, encourage participation, and foster an engaging learning experience are likely to experience higher levels of self-efficacy. The positive

relationship between trainee engagement and teaching self-efficacy underscores the importance of dynamic and interactive teaching methods in educators' confidence in their instructional capabilities.

Notably, the two components had Eigen values greater than one (>1). These latent constructs represented a composite variable called "teaching self-efficacy." Therefore, the items of each latent construct were aggregated using the simple averaging (mean) method into a single variable that formed the mediating variable of the study, as suggested by (Rose et al., 2019).

4.6.2.3 Exploratory Factor Analysis for CBET Implementation

CBET implementation formed the dependent variable in the study and was measured using a total of 13 items anchored on a 5-point Likert scale. Principal Component Analysis was conducted to check item loadings through which redundant items were identified and expunged from further analysis (Appendix 18). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value of teaching self-efficacy was 0.849, indicating that sampling was adequate for factor analysis to proceed.

The significant chi-square value for Bartlett's test of sphericity ($\chi 2 = 884.201$, $p<0.05$) confirmed that the observed correlation matrix was significantly different from an identity matrix, suggesting that there were correlations in the data, implying that the data on teaching self-efficacy had a sufficient structure for meaningful and adequate factor extraction (Hair et al., 2019). Table 4.16 shows the KMO and Bartlett's test for teaching self-efficacy.

Table 4.16 KMO and Bartlett's Test for CBET Implementation

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.849
Bartlett's Test of Sphericity	Approx. Chi-Square	884.201
	df	78
	Sig.	.000

Source: Field Data (2023)

A unidimensional component matrix for CBET implementation was extracted using an unrotated factor solution (Table 4.17). As a result, one item (CIMP3) had a factor loading below 0.5 and thus was dropped. The 12 items extracted loaded highly on a unidimensional component labeled CBET implementation and were aggregated using the simple averaging (mean) method into a single variable that formed the study's dependent variable.

Table 4.17 Component Matrix for CBET Implementation

Component Matrix

Code	Items	Component 1
CIMP5	Ensuring trainees carry out a self-check	0.690
CIMP7	Maintaining a conducive and safe working environment	0.688
CIMP13	Preparing and maintaining trainees' progress records.	0.647
CIMP6	Utilizing tasks when demonstrating to trainees	0.647
CIMP11	Referring back trainees who do not meet standards	0.643
CIMP2	Providing program learning guides as provided in the OS	0.623
CIMP9	Conducting assessment tests using the CBET approach	0.577
CIMP12	Assessing trainees at the at the institution and the industry	0.577
CIMP8	Guiding trainees in achieving the requisite competencies	0.573
CIMP10	Providing assessment tests to trainees	0.558
CIMP1	Ensuring trainees have the right Protective PPEs	0.545
CIMP4	Ensuring that trainees follow learning guide instructions	0.521

Extraction Method: Principal Component Analysis.
a 1 component extracted.

4.7 Construct Reliability

Construct reliability refers to the extent to which a measurement instrument, such as a survey or test, consistently and accurately measures the underlying construct it is designed to assess. This metric evaluates the stability and dependability of the instrument in capturing the actual characteristics of the concepts under investigation (Cohen et al., 2018).

Bolarinwa (2015) postulates that after items are extracted using factor analysis, they must be subject to reliability testing to ensure internal consistency across multiple items employed to measure a specific construct. Reliable measurement items assure consistent outcomes across multiple administrations (Sujati et al., 2020).

In this study, the researcher utilized the results of the Cronbach Alpha coefficient (α) statistical test to assess the level of internal consistency among the extracted items measuring a particular study construct. Items were considered reliable with a Cronbach alpha coefficient ranging from at least 0.7 to not exceeding .95 [$.7 \leq \alpha \leq .95$] (Hair et al., 2019). The reliability scores for each study construct are presented as follows:

4.7.1 Reliability Analysis for Trainers' Competencies

The aggregated composite scale (with 14 items) extracted using EFA to measure trainers' competencies was subjected to a reliability statistical test. Cronbach alpha (α) coefficient test was used to check for internal consistency of the measurement items used. The outcomes of this assessment are detailed in Table 4.18, revealing a Cronbach alpha coefficient score of .714 and Cronbach alpha based on standardized (z) items of .814. These values slightly surpassed the minimum acceptable Cronbach alpha coefficient of 0.7, affirming the reliability of the items used to measure trainers' competencies (Hair et al., 2019).

Table 4.18 Reliability Analysis for Trainers' Competencies

Code	Items (14)	CI-TC	CAID	(α)	α based on Z-Items
TCMP1	I have attended the CBET capacity-building workshop	0.114*	0.702	0.714	0.814
TCMP2	The workshop equipped me with CBET skills	0.188*	0.713		
TCMP3	I am familiar with the strategies for implementing CBET	0.523	0.719		
TCMP4	I communicate effectively in class while teaching	0.485	0.707		
TCMP5	I can recognize trainees' personalities in my class	0.382	0.708		
TCMP6	I can prepare CBET assessment tools	0.463	0.720		
TCMP7	I can conduct internal assessments and evaluate my trainees	0.507	0.729		
TCMP8	I assess trainees during the industrial attachment period	0.375	0.732		
TCMP9	I have mastered the content knowledge in my trade area	0.327	0.724		
TCMP10	I can apply my content knowledge in teaching my trainees	0.296*	0.730		
TCMP11	I can carry out self-development in a sustainable manner	0.346	0.724		
TCMP12	I work productively with other colleagues in my department	0.254*	0.722		
TCMP13	I always reflect on my practice in the classroom	0.341	0.730		
TCMP14	I strive to ensure that the trainees meet CBET requirements	0.343	0.707		

Notes: CI-TC*=Corrected Item-Total Correlation,* ***CAID****= Cronbach Alpha if Item Deleted, *=CI-TC<.30,* **α***=Cronbach alpha*

Source: Field Data (2023)

However, specific items coded as TCMP1 (.114*), TCMP2 (.188*), TCMP10 (.296*), and TCMP12 (.254*) exhibited Correlated Item-Total Correlation (CI-TC) values below .30. Items with CI-TC values below .30 often fall outside the scope of measuring a designated variable of interest. Consequently, it is recommended to exclude such items from further analysis or subject them to additional confirmatory factor analysis (Field, 2018; Olatunji

et al., 2007). This study excluded the four items with CI-TC values below .30 from further analysis.

4.7.2 Reliability Analysis for Teaching Self-efficacy

The aggregated composite scale (with 11 items) extracted using EFA to measure teaching self-efficacy was subjected to a reliability statistical test. Cronbach alpha (α) coefficient test was used to check for internal consistency of the measurement items used (Table 4.19).

Table 4.19 Reliability Analysis for Teaching Self-efficacy

Code	Items (11)	CI-TC	CAID	(α)	α based on Z-Items
TSEF1	Helping trainees value learning	0.568	0.827	0.844	0.845
TSEF2	Motivating trainees who show low interest in schoolwork	0.498	0.833		
TSEF3	Improving the understanding of a trainee who is failing	0.498	0.833		
TSEF4	Getting through the most difficult trainees	0.555	0.828		
TSEF5	Getting trainees to follow classroom rules	0.466	0.835		
TSEF6	Making clear expectations about trainee behavior	0.588	0.825		
TSEF7	Controlling disruptive behavior in the classroom	0.581	0.826		
TSEF9	Responding to difficult questions from trainees	0.468	0.835		
TSEF10	Providing appropriate challenging tasks for very capable trainees	0.542	0.829		
TSEF11	Implementing alternative strategies in the classroom	0.494	0.833		
TSEF12	Providing an alternative explanation when trainees are confused	0.511	0.832		

Notes: CI-TC*=Corrected Item-Total Correlation,* ***CAID****= Cronbach Alpha if Item Deleted, *=CI-TC<.30,* ***α****=Cronbach alpha*

Source: Field Data (2023)

The results presented in Table 4.19, revealed a Cronbach alpha coefficient score of .844 and Cronbach alpha based on standardized (z) items of .845. These values fell above the minimum acceptable Cronbach alpha coefficient (α) of .7, suggested by Hair et al. (2019), confirming that the 11 items extracted to measure the latent construct of teaching self-efficacy were reliable.

4.7.3 Reliability Analysis for CBET Implementation

The unidimensional scale (with 12 items) extracted using EFA to measure CBET implementation was subjected to a reliability statistical test. Cronbach alpha (α) coefficient test was used to check for internal consistency of the measurement items used. The results of this test presented in Table 4.20, revealing a Cronbach alpha coefficient score of .845 and Cronbach alpha based on standardized (z) items of .849. These values were above the minimum acceptable Cronbach alpha coefficient (α) of .7, suggested by Hair et al. (2019), confirming that the 12 items extracted to measure the latent construct of CBET implementation were reliable.

Table 4.20 Reliability Analysis for CBET Implementation

Code	Items (12)	CI-TC	CAID	(α)	α based on Z-Items
CIMP1	Ensuring trainees have the right Protective PPEs	0.462	0.836	0.845	0.849
CIMP2	Providing program learning guides as provided in the OS	0.541	0.831		
CIMP3	Providing resources for specific modules	0.360	0.842		
CIMP4	Ensuring that trainees follow learning guide instructions	0.420	0.839		
CIMP5	Ensuring trainees carry out a self-check	0.592	0.827		
CIMP6	Utilizing tasks when demonstrating to trainees	0.540	0.832		
CIMP7	Maintaining a conducive and safe working environment	0.578	0.829		
CIMP8	Guiding trainees in achieving the requisite competencies	0.466	0.836		
CIMP9	Conducting assessment tests using the CBET approach	0.490	0.835		
CIMP10	Providing assessment tests to trainees	0.477	0.835		
CIMP11	Referring back trainees who do not meet standards	0.560	0.830		
CIMP12	Assessing trainees at the at the institution and the industry	0.492	0.836		
CIMP13	Preparing and maintaining trainees' progress records.	0.549	0.832		

Notes: CI-TC*=Corrected Item-Total Correlation,* ***CAID****= Cronbach Alpha if Item Deleted, *=CI-TC<.30,* ***α****=Cronbach alpha*

Source: Field Data (2023)

4.8 Test for Statistical Assumptions

Before testing the study's hypotheses, the researcher examined the underlying statistical assumptions for multiple linear regression analysis of the aggregated variables obtained after conducting factor analysis and reliability analysis. These assumptions included sampling adequacy, Normality of residuals, Linearity of residuals, Homoscedasticity, and test of Independence of errors.

4.8.1 Sampling Adequacy

Sampling adequacy refers to the sufficiency of the data sample to provide reliable and valid results when performing regression analysis (Hair et al., 2019). An adequate sample size increases statistical power by reducing the sampling error and improving data normality (Uttley, 2019). Hierarchical multiple regression analysis requires that the minimum ratio of valid cases to independent variables be at least 5:1, although a ratio of 20:1 is considered ideal. If the enter all method is used without stepwise introduction of predictors in the regression model is used, a ratio of at least 40:1 is recommended (Tabachnick & Fidell, 2013). The hypothesized Model in this study had two (2) predictor variables, and usable data came from 245 respondents. This gave a ratio of 122:1, which was way above the minimum threshold of 40:1. Therefore, the requirement for an adequate sample size for hierarchical multiple linear regression was met (Appendix 19).

4.8.2 Normality of residuals

One essential requirement of multiple linear regression is that the residuals (errors between the actual and predicted values) should be normally distributed. This can be verified by plotting a histogram or a Q-Q plot. Figure 4.1 shows a histogram depicting an approximate normal curve. This implies that, by extension, the data fits well, and the normality assumption was met.

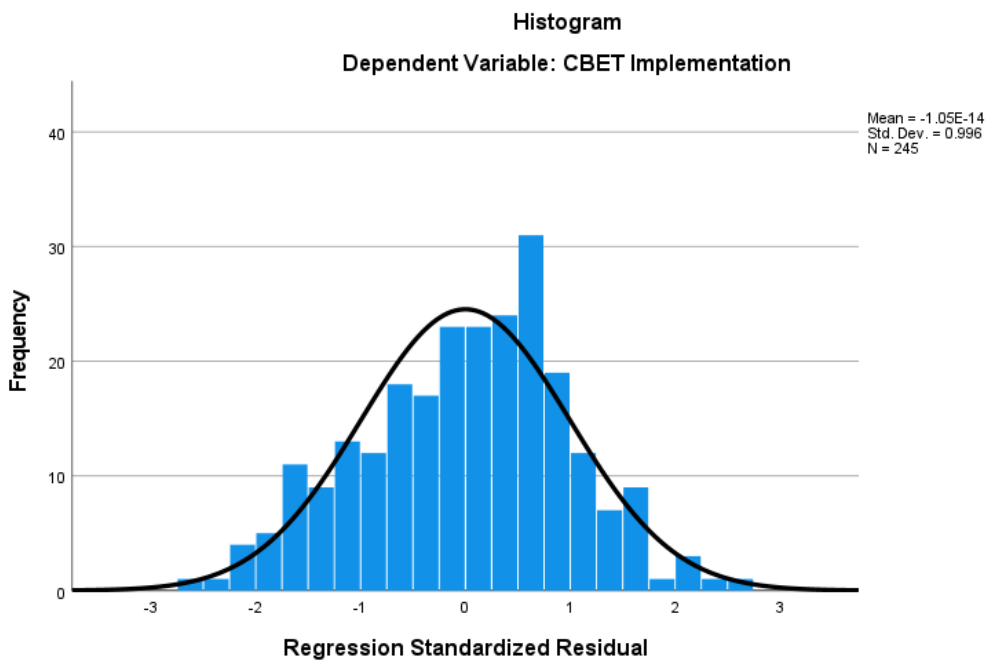

Figure 4.1 Histogram with Normal Curve

Source: Field data (2023)

4.8.3 Linearity of Residuals

This statistical assumption holds that a linear association exists between the predicted and the observed variables (Ernst & Albers, 2017). The researcher conducted the linearity test by inspecting the normal probability-probability (P-P) plots. When the expected cumulative probabilities were plotted against the observed cumulative probabilities, the data points closely followed a straight line. Therefore, by extension, the linearity of residuals assumption was met. Figure 4.2 shows the Normal P-P plot of the regression standardized residual.

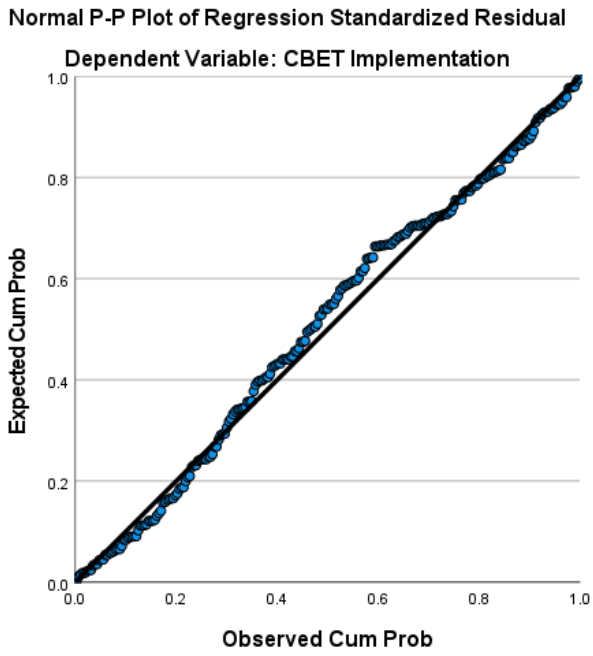

Figure 4.2 Linearity Normal P-P Plot

Source: Field data (2023)

4.8.4 Homoscedasticity

Homoscedasticity, a critical statistical assumption in regression analysis, posits that the variance is uniform across all values of the predicted dependent variable. This assumption holds significant importance as its violation can introduce bias and unreliability into the estimates of regression coefficients, potentially leading to erroneous conclusions regarding the statistical significance of predictors (Knief & Forstmeier, 2021; Tranmer et al., 2020).

To inspect the homoscedasticity assumption within the dataset, the researcher employed a visual examination, by creating a scatter plot of the dependent variable (CBET Implementation) against the standardized residual.

The resulting Figure 4.3 indicates that the data adhered to homoscedasticity, signifying that the spread of variances remained consistent across all levels of predictor variables. This confirmation of homoscedasticity assures the reliability of regression estimates and strengthens the validity of the statistical inferences drawn from the analysis.

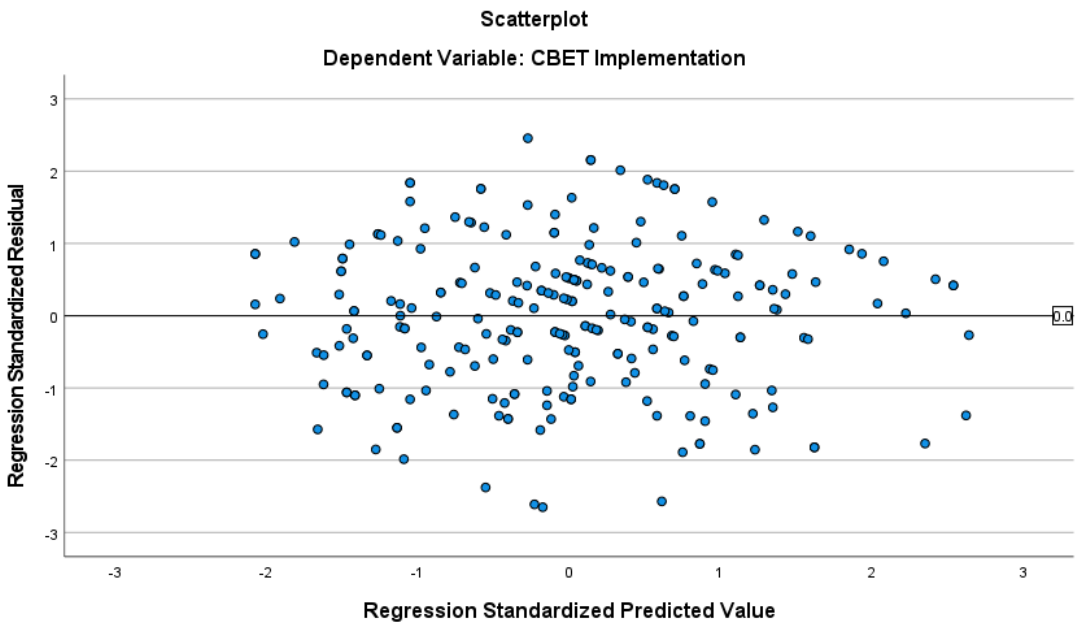

Figure 4.3 Homoscedasticity Scatter Plot

Source: Field data (2023)

4.8.5 Independence of Errors

This statistical assumption in regression analysis holds that the errors or residuals resulting from the regression model are not correlated with each other (Hair et al., 2019). The researcher conducted the Durbin-Watson test for independence of errors to establish if the residuals were serially correlated. Durbin-Watson's values between 1.5 and 2.5 indicate that the residuals in the regression model are independent and, hence, not correlated (Turner, 2018). Table 4.21 shows a Durbin-Watson statistic=1.705, indicating that error terms (residuals) were positive and not serially correlated.

Table 4.21 Test for Independence of Errors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	$.591^{a}$	0.394	0.335	0.36296	1.705

4.9 Hypotheses Testing

Hierarchical regression analysis (Appendix 20-22) was used to test the study's null hypotheses (H_{01}, H_{02}, and H_{03}). For each Model, the coefficient of determination (R^2), Standardized beta coefficient (β), and the p-value test statistic were computed at α=0.05 level of significance while controlling for Gender, Academic Qualification, and Teaching Experience covariates.

4.9.1 Regression Analysis of Trainers' Competencies and CBET Implementation

H_{01} = There is no statistically significant relationship between trainers' competencies and CBET Implementation in public TVET institutions in Meru County, Kenya.

Hierarchical linear regression was performed at a 95% confidence level to assess the predictive ability of trainers' competencies on CBET implementation. The analysis controlled for trainers' Gender, Academic Qualification (AQ), and Teaching Experience (TE) covariates. The results of this regression analysis are presented in Tables 4.22, 4.23, and 4.24.

Table 4.22 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Sig. F Change
1	$.299^{a}$	0.09	0.078	0.42741	0.09	.000
2	$.477^{b}$	0.228	0.215	0.39453	0.138	.000

a Predictors: (Constant), Gender, TE, AQ
b Predictors: (Constant), Gender, TE, AQ, Trainers' Competencies
c Dependent Variable: CBET Implementation

The model summary results in Table 4.22 indicate a significant positive relationship between trainers' competencies and CBET implementation (r =0.477, p<.005). The change in the coefficient of determination (R^2 change = 0.138) indicates that the linear relationship between trainers' competencies and CBET implementation accounts for approximately 13.8 % of the total variation in CBET implementation.

Moreover, the covariates in the regression model accounted for approximately 9 % (R^2 = 0.09, p<0.05) variance in CBET implementation. Hence, the remaining 77.2% (100-9%-13.8%) of the Variance in CBET implementation is explained by other variables not included in the Model.

To test the hypothesis that there is no statistically significant influence of trainers' competencies on CBET implementation, a test of significance of the regression model in predicting the dependent variable was done, and ANOVA output was examined as shown in Table 4.23

Table 4.23 Model Fitness

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.337	3	1.446	7.914	$.000^b$
	Residual	44.025	241	0.183		
	Total	48.362	244			
2	Regression	11.004	4	2.751	17.674	$.000^c$
	Residual	37.358	240	0.156		
	Total	48.362	244			

a Dependent Variable: CBET Implementation
b Predictors: (Constant), Gender, TE, AQ
c Predictors: (Constant), Gender, TE, AQ, Trainers' Competencies

The results in Table 4.23 indicate that the regression model was significant in predicting the dependent variable at **F (4, 240) = 17.674, p<0.05**. This, therefore, indicates that trainers' competencies predict CBET implementation. The regression coefficient output was examined to determine the contribution of the independent variable to the overall Model, as shown in Table 4.24.

Table 4.24 Regression Coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta (β)**	**t**	**Sig.**
1	(Constant)	4.12	0.124		33.284	.000
	Gender	0.226	0.061	0.227	3.679	.000
	Academic Qualification	-0.071	0.034	-0.134	-2.095	.037
	Teaching Experience	0.074	0.031	0.152	2.382	.018
2	(Constant)	2.062	0.335		6.161	.000
	Gender	0.212	0.057	0.214	3.747	.000
	Academic Qualification	-0.061	0.031	-0.115	-1.946	.053
	Teaching Experience	0.053	0.029	0.110	1.853	.065
	Trainers' Competencies	0.463	0.071	0.374	6.545	.000

a Dependent Variable: CBET Implementation

The standardized regression coefficient **(β)** results in Table 4.24 indicate that Trainers' Competencies had a significant positive effect on CBET implementation **(β=.374, p<0.05).** The positive β value implies that an increase of 1 standard deviation in trainers' competencies will likely increase CBET implementation by 0.374 standard deviations. This means that if a trainer's competencies increase by one standard deviation, the likelihood of them effectively implementing CBET increases by 37.4%.

The optimal Model was;

$$\mathbf{CIMP = 2.062 + 0.214GE - 0.115AQ + 0.110TE + 0.374TCMP}$$

Where, CIMP= CBET Implementation, TCMP=Trainers' Competencies, GE=Gender, AQ=Academic Qualification and TE=Teaching Experience.

H_{01} proposed that there was no statistically significant relationship between trainers' competencies and CBET implementation

The results of the model summary, ANOVA analysis, and regression coefficient indicate a statistically significant and positive association between trainers' competencies and CBET implementation. The results also reveal a significant positive effect of trainers' competencies on CBET implementation **(β=.374, p<0.05).** This suggests that improving trainers' competencies results in an equivalent improvement in CBET Implementation. Since p<0.05, we reject the proposed null hypothesis (**H_{01}**) and conclude that trainers' competencies have a significant positive relationship with CBET implementation.

These results concur with Istiqomah et al. (2019), who indicated that vocational high school teacher competencies directly affect the student's learning outcomes. Similarly, Nduku et al. (2019) found that trainers' background in CBET Implementation positively

and significantly enhanced the acquisition of employable skills. Finally, the study's findings also agreed with Langat et al. (2021), suggesting a significant correlation between trainers' competencies and training efficacy.

Trainers' competencies play a vital role in effectively delivering quality CBET. Trainers with a strong mastery of content in the area of specialization and pedagogical knowledge are better positioned to deliver quality CBET. Kipngetich et al. (2022) suggested that trainers who continually enhance their competencies through professional development activities such as capacity-building workshops are better equipped to design and deliver CBETs that meet trainees' needs and are aligned with industry demands.

This implies that highly competent trainers are more likely to deliver quality CBET training, hence improved trainee outcomes and increased effectiveness in CBET implementation. This is because their expertise enables them to identify individual trainees' learning needs, employ appropriate instructional strategies, and use competency-based assessment methods to evaluate if trainees have acquired the requisite competencies underlined in the occupational standards.

Moreover, a positive significant effect of trainers' competencies on CBET implementation highlights the importance of continuous professional development for trainers. This means that providing trainers with opportunities for collaboration and knowledge sharing, investing in trainers' skills development, and keeping them abreast of industry advancements can lead to continuous improvement in CBET implementation.

Lastly, trainers with strong competencies can develop robust assessment tools, provide constructive feedback to trainees, and ensure the validity and Reliability of competency-

based assessments. Therefore, developing and nurturing trainers' competencies implies better training delivery, improved trainee outcomes, increased program effectiveness, enhanced quality assurance in CBET, and continuous improvement in CBET implementation.

4.9.2 Regression Analysis of Trainers' Competencies and Teaching Self-Efficacy

H_{02} = There is no statistically significant relationship between trainers' competencies and teaching self-efficacy.

A hierarchical linear regression was performed at a 95% confidence level to assess the predictive ability of trainers' competencies in teaching self-efficacy. The analysis controlled for trainers' Gender, Academic Qualification (AQ), and Teaching Experience (TE) covariates. The findings of this regression analysis are presented in Tables 4.25, 4.26, and 4.27.

Table 4.25 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Sig. F Change
1	$.225^{a}$	0.051	0.039	0.38363	0.051	.006
2	$.480^{b}$	0.231	0.218	0.34608	0.180	.000

a Predictors: (Constant), Gender, AQ, TE
b Predictors: (Constant), Gender, AQ, TE, Trainers' Competencies
c Dependent Variable: Teaching Self-Efficacy

The model summary results in Table 4.25 indicate a significant positive relationship between Trainers' competencies and Teaching Self-Efficacy (r =0.480, p<.005). The change in the coefficient of determination (R^2 change = 0.18) indicates that the linear

relationship between trainers' competencies and teaching self-efficacy accounted for approximately 18% of the total variation in teaching self-efficacy.

Moreover, the covariates in the regression model were significant and accounted for approximately 5.1 % (R^2 = 0.051, p<0.05). Hence, the remaining 76.9% (100% -5.1-18%) of the Variance in teaching self-efficacy is explained by other variables not included in the Model. To test the hypothesis that there is no statistically significant influence of trainers' competencies on teaching self-efficacy, a test of significance of the regression model in predicting the dependent variable was done, and ANOVA output was examined, as shown in Table 4.26.

Table 4.26 Model Fitness

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.892	3	0.631	4.286	.006[b]
	Residual	35.469	241	0.147		
	Total	37.361	244			
2	Regression	8.616	4	2.154	17.984	.000[c]
	Residual	28.745	240	0.12		
	Total	37.361	244			

a Dependent Variable: Teaching Self-Efficacy
b Predictors: (Constant), Gender, AQ, TE
c Predictors: (Constant), Gender, AQ, TE, Trainers' Competencies

The results in Table 4.26 indicate that the regression model was significant in predicting the dependent variable at **F (4, 240) = 17.984, p <0.05**. This, therefore, indicates that trainers' competencies predict teaching self-efficacy. The regression coefficient output was examined to determine the contribution of the independent variable to the overall Model, as shown in Table 4.27.

Table 4.27 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta (β)**	**t**	**Sig.**
1	(Constant)	4.244	0.111		38.2	.000
	Gender	0.106	0.055	0.122	1.929	.055
	Academic Qualification	-0.037	0.031	-0.079	-1.204	.230
	Teaching Experience	0.079	0.028	0.184	2.827	.005
2	(Constant)	2.177	0.294		7.418	.000
	Gender	0.093	0.05	0.106	1.867	.063
	Academic Qualification	-0.027	0.028	-0.057	-0.966	.335
	Teaching Experience	0.058	0.025	0.136	2.299	.022
	Trainers' Competencies	0.465	0.062	0.427	7.492	.000

a Dependent Variable: Teaching Self-Efficacy

The standardized regression coefficient **(β)** results in Table 4.27 indicate that trainers' competencies had a significant positive effect on teaching self-efficacy **(β=.427, p<0.05).** The positive β value implies that an increase of 1 standard deviation in trainers' competencies is likely to increase teaching self-efficacy by 0.427 standard deviations. This means that if a trainer's competencies increase by one standard deviation, there is a likelihood that the level of teaching self-efficacy increases by 42.7%.

The optimal Model was;

$$\mathbf{TSEF = 2.177 + 0.106GE - 0.057AQ + 0.136TE + 0.427TCMP}$$

Where **TSEF**= Teaching self-efficacy, **TCMP**=Trainers' Competencies, **GE** = Gender, **AQ**= Academic Qualification, and **TE**= Teaching Experience.

H_{02} proposed there was no statistically significant relationship between trainers' competencies and teaching self-efficacy.

The results of the model summary, ANOVA analysis, and regression coefficient indicate a statistically significant and positive association between trainers' competencies and teaching self-efficacy. The results also revealed a significant positive effect of trainers' competencies on teaching self-efficacy **(β=.427, $p<0.05$)**. This suggests that an improvement in trainers' competencies results in an equivalent improvement in teaching self-efficacy. Since $p<0.05$, we reject the proposed null hypothesis (**H_{02}**) and conclude that trainers' competencies have a significant positive relationship with teaching self-efficacy.

These results are in tandem with Bonnes et al. (2020), who indicated trainers' media-didactical competence had a positive and significant relationship with media-didactical self-efficacy. Correspondingly, Masai (2020) posited that after undergoing an online ICT training course, the technological competencies acquired by the teachers improved their teaching self-efficacy.

Trainers' competencies play an important role in shaping teaching self-efficacy. Trainers who possess a high mastery of content in their area of specialization and pedagogical knowledge are better equipped to design and deliver effective instructional strategies. This expertise enhances their confidence in trainee engagement, classroom management, and choice of appropriate instructional strategies, thus positively impacting their teaching self-efficacy.

This implies that providing supportive contexts that recognize and promote trainers' competencies can positively influence their teaching self-efficacy. Trainers feel empowered When they receive institutional support, resources, and opportunities for professional collaboration and growth. This fosters competence and efficacy, enabling TVET trainers to approach their training and assessment responsibilities confidently. Therefore, understanding and nurturing Trainers' Competencies and Teaching Self-Efficacy can improve the quality of TVET training and enhance trainers' effectiveness in preparing trainees for the world of work.

4.9.3 Regression Analysis of Teaching Self-efficacy and CBET Implementation

H_{03} proposed that there was no statistically significant effect of teaching self-efficacy on CBET implementation.

A hierarchical linear regression was performed at a 95% confidence level to assess the predictive ability of teaching self-efficacy on CBET implementation. The analysis controlled for trainers' Gender, Academic Qualification (AQ), and Teaching Experience (TE) covariates. The findings of this regression analysis are presented in Tables 4.28, 4.29, and 4.30.

Table 4.28 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Sig. F Change
1	$.299^{a}$	0.09	0.078	0.42741	0.09	.000
2	$.562^{b}$	0.316	0.304	0.37136	0.226	.000

a Predictors: (Constant), Gender, AQ, TE
b Predictors: (Constant), Gender, AQ, TE, Teaching Self-Efficacy
c Dependent Variable: CBET Implementation

The model summary results in Table 4.28 show a significant positive relationship between teaching self-efficacy and CBET implementation (r =0.562, p<.005). The change in the coefficient of determination (R^2 change = 0.226) indicates that the linear relationship between teaching self-efficacy and CBET implementation accounted for approximately 22.6 % of the total variation in CBET implementation.

Moreover, the covariates in the regression model accounted for approximately 9 % (R^2 = 0.09, p<0.05) variance in CBET implementation. Hence, other variables not included in the model explain the remaining 68.4% (100%-9%-22.6%) of the variance in CBET implementation.

To test the hypothesis that there is no statistically significant influence of teaching self-efficacy on CBET implementation, a test of the significance of the regression model in predicting the dependent variable was done, and ANOVA output was examined, as shown in Table 4.29.

Table 4.29 Model Fitness

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.337	3	1.446	7.914	$.000^b$
	Residual	44.025	241	0.183		
	Total	48.362	244			
2	Regression	15.265	4	3.816	27.672	$.000^c$
	Residual	33.097	240	0.138		
	Total	48.362	244			

a Dependent Variable: CBET Implementation
b Predictors: (Constant), Gender, AQ, TE
c Predictors: (Constant), Gender, AQ, TE, trainers' Teaching Self-efficacy

The results in Table 4.29 indicate that the regression model significantly predicted the dependent variable at **F (4, 240) = 27.672, p<0.05**. This, therefore, suggests that teaching self-efficacy predicts CBET implementation. The regression coefficient output was examined to determine the contribution of the independent variable on the overall model, as shown in Table 4.30

Table 4.30 Regression Coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta (β)**	**t**	**Sig.**
1	(Constant)	4.12	0.124		33.284	.000
	Gender	0.226	0.061	0.227	3.679	.000
	Academic Qualification	-0.071	0.034	-0.134	-2.095	.037
	Teaching Experience	0.074	0.031	0.152	2.382	.018
2	(Constant)	1.764	0.286		6.176	.000
	Gender	0.167	0.054	0.168	3.104	.002
	Academic Qualification	-0.051	0.03	-0.096	-1.716	.088
	Teaching Experience	0.03	0.027	0.062	1.103	.271
	Teaching Self-Efficacy	0.555	0.062	0.488	8.902	.000

a Dependent Variable: CBET Implementation

The standardized regression coefficient **(β)** results in Table 4.30 indicate that teaching Self-efficacy had a significant positive effect on CBET implementation **(β=.488, p<0.05).** The positive β value implies that an increase of 1 standard deviation in teaching self-efficacy is likely to increase CBET implementation by 0.488 standard deviations. This means that if a trainer's level of teaching self-efficacy increases by one standard deviation, the likelihood of them effectively implementing CBET increases by 48.8%.

The optimal model was;

$$\mathbf{CIMP = 1.764 + 0.168GE - 0.096AQ + 0.062TE + 0.488TSEF}$$

Where **CIMP**= CBET Implementation, **GE**= Gender, **AQ**= Academic Qualification, **TE**= Teaching Experience and **TSEF**=Teaching Self-efficacy

H_{03} proposed that there was no statistically significant effect of teaching self-efficacy on CBET implementation.

The Model Summary, ANOVA analysis, and Regression coefficient results indicated a statistically significant and positive association between teaching self-efficacy and CBET implementation. The results also revealed a significant positive effect of teaching self-efficacy on CBET implementation **(β=.488, $p<0.05$)**. This suggests that an improvement in teaching self-efficacy results in an equivalent improvement in CBET implementation. Since $p<0.05$, we reject the proposed null hypothesis (**H_{03}**) and conclude that teaching self-efficacy significantly affects CBET Implementation.

These findings align with Paschal & Srivastava (2021), suggesting a positive and significant association between teacher efficacy and teaching effectiveness among secondary school teachers. Similarly, Sehgal et al. (2017) postulated that teacher self-efficacy significantly impacts teacher effectiveness. Furthermore, the study findings are also in tandem with Oviawe & Omoh (2021), who suggested that technical teachers' self-efficacy positively correlates with learners' academic success.

From the above findings, it is evident that teaching self-efficacy plays a vital role in CBET implementation. Trainers who exhibit a high level of Self-Efficacy are more confident in their abilities to design and implement quality CBET. They are more likely to create a

supportive and engaging trainee-centered classroom environment that promotes mastery of requisite competencies, positively impacting CBET implementation.

This implies that institutional support systems recognizing and promoting trainers' self-efficacy can significantly influence successful CBET implementation. When trainers are provided with adequate support, resources, and opportunities for professional development, their sense of competence and teaching self-efficacy is reinforced, thus enhancing CBET implementation. Therefore, through understanding and promoting the relationship between trainers' teaching self-efficacy and CBET implementation, TVET institutions can improve the quality of CBET and empower trainers to effectively prepare trainees with the requisite competencies for success in the world of work.

4.9.4 Mediation Analysis

H_{04} = Teaching self-efficacy does not significantly mediate the relationship between trainers’ competencies and CBET implementation.

The researcher conducted mediation analysis (Appendix 23) using the Hayes PROCESS (Model 4) using a bias-corrected accelerated bootstrapping of the sampling distribution of the indirect effect to aid in understanding the resulting nature of mediation and its significance (Hayes, 2022). Figure 4.4 presents Hayes' simple mediation model (Model 4), showing direct, indirect, and total effects.

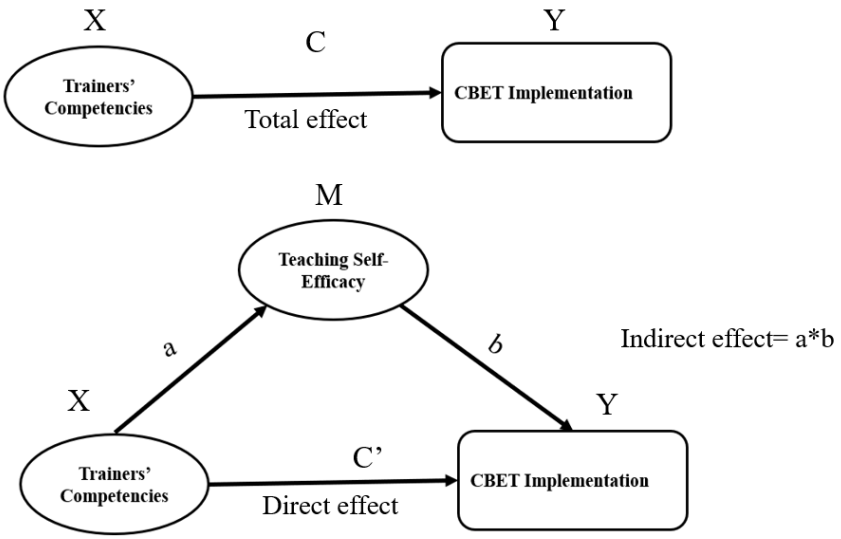

Figure 4.4 Simple Mediation Model Effects

Source: (Hayes, 2013)

The analysis controlled for the confounding effects of trainers' gender, academic qualification, and teaching experience covariates. The results are shown in Tables 4.31 and 4.32.

Table 4.31 Path Estimates

				95%Confidence Interval			
Path		**Coefficient (β)**	**SE**	**Lower**	**Upper**	**t**	**p**
a	Effect of X on M	0.4653	0.0621	0.3430	0.5876	7.4924	.000
b	Effect of M on Y	0.4520	0.0677	0.3186	0.5853	6.6762	.000
C	Total Effect of X on Y	0.4634	0.0708	0.3239	0.6028	6.5447	.000

Source: Field data (2023)

The unstandardized path estimates in Table 4.31 indicate that trainers' competencies (X) had a significant positive effect on teaching self-efficacy (M) (β =.4653, p< 0.05). Secondly, teaching self-efficacy (M) had a significant positive impact on CBET

implementation (Y) (β =.4520, p<0.05). Lastly, trainers' competencies (X) had a significant positive total effect on CBET implementation (Y) (β =.4634, p<0.05). These results imply that paths **a, b**, and **c** in the mediation model were significant and positive when controlling for the covariates.

Bootstrapping was conducted with 5,000 bootstrap samples to evaluate the potential significance of the indirect effect. This process generated mediation estimates and confidence intervals, providing insights into the nature of mediation, as depicted in Table 4.32.

Table 4.32 Mediation Estimates

			95%Confidence Interval				
Effect	**β**	**SE**	**Lower**	**Upper**	**t**	**p**	**% Mediation**
Indirect (a*b)	0.2103	0.0407	0.1369	0.2975			45.4
Direct (C')	0.2531	0.0724	0.1105	0.3956	3.4976	.000	54.6
Total (C)	0.4634	.07080	0.3239	0.6028	6.1219	.000	100

**Performed at 5,000 Bootstrap Samples for percentile Bootstrap Confidence Intervals (BCI)*

The mediation estimates in Table 4.33 indicated that both direct effect (β= 0.2531, CI [0.1105, 0.3956], p< 0.05) and indirect effect **(β=.2103, Boot CI [.1369, .2975])** of the model were found to be statistically significant. Additionally, the lower and upper limits bootstrap confidence intervals did not contain a zero in between. The results also revealed that approximately **45.4%** of the total effect of trainers' competencies on CBET implementation was mediated by teaching self-efficacy.

While the remaining 54.6% is a direct effect that is not explained by the mediating variable. This implied that teaching self-efficacy partially mediated the relationship between trainers' competencies and CBET implementation. Hence, we reject the proposed null

hypothesis (**H_{04}**) and conclude that Teaching Self-efficacy significantly mediates the relationship between trainers' competencies and CBET implementation.

The findings revealed that the direct effect of trainers' competencies on CBET implementation was also statistically significant. It was also found that the indirect effect of trainers' competencies on CBET implementation, through its influence on teaching self-efficacy, was positive and significant. This implied that teaching self-efficacy partially mediated the relationship between trainers' competencies and CBET implementation.

These findings concur with Tekin (2023), who suggested teacher Self-Efficacy plays a mediating role in predicting teachers' research attitudes. These findings also support previous research that posited teaching self-efficacy strengthened and mediated the association between educators' emotional intelligence and their effectiveness in teaching. (Anwar et al., 2021).

The mediating effect of teaching self-efficacy emphasizes that trainers' teaching efficacy is a mechanism through which trainers' competencies influence CBET implementation. Trainers' competencies positively affect their teaching self-efficacy, enhancing their ability to implement quality CBET successfully.

This implies that by considering trainers' teaching self-efficacy as a mediating variable, TVET stakeholders and policymakers can better understand the relationship between trainers' competencies and CBET implementation. Therefore, this knowledge can inform the design of professional development programs and interventions to improve trainers' competencies and enhance their teaching self-efficacy. This could lead to a more successful CBET implementation. Table 4.33 presents a summary of the study hypotheses test results.

Table 4.33 Summary of the Study Hypotheses Test Results

	Hypothesis	Decision	Result
H_{01}	There is no statistically significant relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Sig. at $p \leq .05$,	**Rejected**
H_{02}	There is no statistically significant relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Sig. at $p \leq .05$,	**Rejected**
H_{03}	Teaching Self-Efficacy does not have a statistically significant effect on CBET Implementation in public TVET institutions in Meru County.	Sig. at $p \leq .05$,	**Rejected**
H_{04}	Teaching Self-efficacy does not significantly mediate the relationship between Trainers' Competencies and CBET Implementation in public TVET institutions in Meru County.	Sig. at $p \leq .05$ & no Zero between LCI-UCI	**Rejected**

Source: Field Data (2023)

4.10 Chapter Summary

The chapter presented quantitative results from the trainers' questionnaire and qualitative findings (verbatims) obtained from the interview transcripts conducted with the Heads of Sections. The analysis led to the rejection of all the four null hypotheses examined. The subsequent chapter summarizes the findings, presents conclusions, offers recommendations, and suggests areas for further research.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This study investigated the influence of trainers' competencies and teaching self-efficacy on the implementation of Competency-Based Education and Training (CBET) in public technical and vocational education and training (TVET) institutions in Meru County, Kenya. The objectives of the study were to assess the relationship between trainers' competencies and CBET implementation, to assess the relationship between trainers' competencies and teaching self-efficacy, to determine the effect of trainers' teaching self-efficacy on CBET implementation, to examine the mediating effect of teaching self-efficacy on the relationship between trainers' competencies and CBET implementation and to explore trainers' perception of competencies, teaching self-efficacy, and their influence on CBET implementation. This Chapter presents a summary of the findings, conclusions, recommendations, and suggested areas for further research.

5.2 Summary of the Findings

Based on the study objectives, the following is the summary of the findings:

5.2.1 Trainers' Perception of Competencies, Teaching Self-efficacy, and Implementation of CBET.

Trainers' views on CBET implementation were diverse, with differing opinions on whether trainees are adequately assessed as per Occupational Standards. The study highlighted the effectiveness of task-based demonstrations in CBET classrooms, promoting interactive training environments. However, trainers expressed moderate confidence in conducting

assessment tests using the CBET approach citing challenges like heavy workloads, large class sizes, and inconsistencies in instructional content across different levels of training.

Trainers exhibited a strong positive perception of their competencies for implementing the CBET approach, suggesting strong confidence in their competencies among respondents. Their confidence is rooted in extensive teaching experience in TVET, providing a solid foundation for delivering quality CBET. However, there was a contrasting perspective regarding attendance at CBET capacity-building workshops. Whereas majority felt that a combination of training and institutional support enhanced their confidence in CBET implementation, concerns arose about the brevity of one-week sessions provided by TVET CDACC.

Trainers exhibited high confidence in implementing the CBET approach in their classrooms, as indicated by consistently positive perceptions across various aspects of teaching self-efficacy. Descriptive statistics revealed strong capabilities in areas such as motivating disengaged trainees and managing challenging scenarios, resulting in an overall high teaching self-efficacy. Although participants expressed a strong sense of self-assurance and competence in their instructional capabilities, strengthening trainers' self-beliefs through ongoing training and professional development could enhance their confidence and contribute to the quality implementation of CBET.

5.2.2 Relationship between the Trainers' Competencies and CBET Implementation

Trainers with higher competencies are more likely to implement CBET effectively, and this relationship was statistically significant, meaning that it was not due to chance. The effect size **(β=.374, $p<0.05$)** was moderate, suggesting that trainers' competencies significantly impact CBET implementation. In other words, for every one standard

deviation increase in trainers' competencies, there is a predicted 0.374 standard deviations increase in CBET implementation.

This means that if a trainer's competencies increase by one standard deviation, the likelihood of them implementing CBET effectively increases by 37.4%. Hence, by increasing trainers' competencies through training and development, the trainers can better understand and apply CBET principles, leading to more effective learning outcomes.

5.2.3 Relationship between Trainers' Competencies and Teaching Self-efficacy

Trainers with higher competencies exhibit a high level of teaching self-efficacy. The relationship between trainers' competencies and teaching self-efficacy was statistically significant. The effect size of **(β=.427, $p<0.05$)** was strong, suggesting that trainers' competencies significantly impact teaching self-efficacy. In other words, for every one standard deviation increase in trainers' competencies, there is a predicted 0.427 standard deviations increase in teaching self-efficacy.

This means that if a trainer's competencies increase by one standard deviation, there is a likelihood that the level of teaching self-efficacy increases by 42.7%. The study's findings suggest that by increasing trainers' competencies through professional development, trainers can feel more confident in their ability to teach, leading to more effective learning outcomes for their trainees.

5.2.4 Effect of Trainers' Teaching Self-Efficacy on CBET Implementation

Trainers with higher levels of teaching self-efficacy are more likely to implement CBET effectively. The relationship between teaching self-efficacy and CBET implementation was statistically significant. The effect size **(β=.488, $p<0.05$)** was strong, suggesting that

teaching self-efficacy has a significant impact on CBET implementation. In other words, for every one standard deviation increase in teaching self-efficacy, there is a predicted 0.488 standard deviations increase in CBET implementation.

This means that if a trainer's level of teaching self-efficacy increases by one standard deviation, the likelihood of them implementing CBET effectively increases by 48.8%. Hence, by reinforcing trainers' levels of teaching self-efficacy through professional development, the trainers can better understand and apply CBET principles, leading to more effective learning outcomes.

5.2.5 Mediating Effect of Teaching Self-efficacy on the Relationship between Trainers' Competencies and CBET implementation.

Teaching self-efficacy partially mediated the relationship between trainers' competencies and CBET implementation. Both the direct effect of trainers' competencies on CBET implementation ($\beta = 0.2531$, CI [0.1105, 0.5801], $p < 0.05$) and the indirect effect **(β=.2103, Boot CI [.1369, .2975])** through teaching self-efficacy were positive and statistically significant. The results also revealed that approximately **45.4%** of the total effect of trainers' competencies on CBET implementation was mediated by teaching self-efficacy. Hence, enhancing trainers' competencies and reinforcing their confidence in teaching CBET courses through additional support, professional development, and mentorship could equip trainers to implement quality CBET effectively.

5.3 Conclusion

Trainers have positive perceptions of their competencies and high confidence in the implementation of the CBET approach in their classrooms. However, there is a potential for improvement through ongoing professional development. Hence, enhancing training methods, fostering continuous professional growth, and addressing CBET implementation challenges such as large workload, large class sizes, and inconsistencies in the Occupational Standards (OS) could further reinforce trainers' confidence and contribute to the continued success and quality implementation of CBET.

Trainers' competencies have a positive relationship with CBET implementation. Developing and nurturing trainers' competencies can enhance the quality delivery and effectiveness of CBET courses, resulting in better-prepared trainees who possess the requisite competencies for success in the world of work and beyond.

Trainers' competencies have a positive relationship with teaching self-efficacy. Providing supportive contexts that recognize and promote trainers' competencies, such as capacity-building opportunities for professional collaboration, empowers trainers in their roles, enhances trainers' effectiveness, and improves the quality of TVET training.

Teaching self-efficacy has positive predictive power on CBET implementation. Providing supportive contexts such as opportunities for professional development reinforces trainers' teaching self-efficacy. It enhances the quality of CBET training by empowering trainers to effectively prepare trainees with the requisite competencies for success in the world of work.

Teaching self-efficacy mediates the relationship between trainers' competencies and CBET implementation. Understanding and recognizing the interplay between trainers' competencies, teaching self-efficacy, and CBET implementation has practical implications for policy decisions and the designing of trainers' Continuous Professional Development (CDP) programs.

5.4 Recommendations

Based on the conclusion of the study findings, the following recommendations were made to enhance the effective implementation of quality CBET in Kenyan TVET institutions.

i. The government should support TVET trainers by providing opportunities to develop and nurture their competencies through industrial partnerships and scholarships to enhance quality CBET delivery.

ii. TVET institutions should provide opportunities for trainers to collaborate and grow professionally. By fostering collaboration, trainers can learn from each other's experiences, gain confidence in their roles, and collectively contribute to delivering high-quality CBET.

iii. The TVET Curriculum Development and Assessment and Certification Council (TVET CDACC) should prioritize a well-structured and focused continuous professional development program for trainers on CBET implementation. This can be achieved through capacity-building workshops, conferences, or in-service training programs.

iv. TVET institutions can conduct a CBET implementation needs assessment based on trainers' competencies and teaching self-efficacy to identify areas of improvement.

Based on these assessments, CBET capacity-building programs can be customized to ensure that training interventions are relevant and aligned with specific competencies trainers need to develop or enhance. This will maximize the effectiveness of CBET capacity-building programs and support trainers in reaching their full potential for quality CBET implementation.

v. Trainers' professional development programs, such as the ongoing CBET capacity-building workshops, should enhance their competencies and reinforce their teaching self-efficacy. This will equip trainers to implement quality CBET effectively.

5.5 Study's Contributions and Significance of the Findings

The contributions of this study are multifaceted, ranging from practical insights for improving Technical and Vocational Education to novel theoretical perspectives that enrich our understanding of the dynamics in CBET implementation. The study's findings provide both practical and theoretical insights that extend the current understanding of CBET implementation and offer a valuable foundation for future research and policy development in the broader field of TVET.

5.5.1 Theoretical Significance of the Study Findings

The theoretical implications of the study findings validate Albert Bandura's Self-Efficacy Theory, demonstrating its relevance in the context of vocational education. The results support the idea that teaching self-efficacy plays a crucial role in implementing CBET successfully, providing empirical evidence for Bandura's theoretical framework.

Furthermore, the study findings confirm the Vocational Teacher Competencies Model developed by Wahyuni and Sugihartini in 2021, emphasizing the importance of trainers' professional and pedagogical competencies for effective CBET implementation.

This contributes to the theoretical understanding of the comprehensive competencies required in Technical and Vocational Education.

Lastly, the study findings extend theoretical insights into the mediation analysis in educational research. It is worth noting that a critical discussion has emerged regarding the consequences of reporting only the direct effects without acknowledging the mediating role of teaching self-efficacy. For instance, neglecting the mediating effect of teaching self-efficacy could result in an overestimation of the direct effect of trainers' competencies on the implementation of CBET. The unmediated model might inadequately capture the complex relationship between trainers' competencies and Implementation of CBET, potentially leading to misleading conclusions or incomplete policy recommendations. Thus, policymakers and practitioners relying solely on the unmediated model might implement interventions that inadequately account for the mediating influence of trainers' teaching self-efficacy. This analysis of complex relationships may inspire further research exploring the mediating role of other variables in educational settings, contributing to the ongoing development of educational theories.

5.5.2 Relevance of the Study Findings to Policy Development

From a policy perspective, the study findings advocate for developing and implementing policies that support continuous professional development for TVET trainers. These policies should outline the necessary competencies, provide a targeted framework for

training programs, and establish mechanisms for assessing and improving trainers' skills over time.

Moreover, policies should create support systems, including mentorship programs and regular feedback mechanisms, to foster teaching self-efficacy among trainers. Recognition and reward policies can motivate trainers to enhance skills and contribute to successful CBET outcomes. Additionally, policies should explicitly integrate components contributing to teaching self-efficacy within broader teacher training and development programs such as CBET, ensuring a comprehensive approach to Technical and Vocational Education.

5.5.3 Practical Application of the Study Findings

The practical implications of the study findings emphasize the need to invest in enhancing trainers' competencies to facilitate the successful implementation of Competency-Based Education and Training (CBET) in public TVET institutions in Meru County. This underscores the importance of targeted training programs and continuous professional development initiatives for trainers.

Furthermore, recognizing the significant relationship between trainers' competencies and teaching self-efficacy, practical interventions should foster teaching self-efficacy through mentorship, support systems, and strategies that boost trainers' confidence in their teaching abilities. The study findings also highlight the importance of addressing teaching self-efficacy, as it significantly affects the successful implementation of CBET. Strategies to promote teaching self-efficacy include creating conducive teaching environments, providing resources, and recognizing effective teaching practices. Finally, the study findings suggest a dual approach, advocating for interventions that enhance trainers'

competencies and strengthen their teaching self-efficacy for successful implementation of quality CBET.

5.6 Suggested Areas of Further Research

This section suggests areas of further research on unexplored issues that emerged due to the current study but existed beyond its scope. The following are the key areas of further research:

i. A study investigating the moderating effect of contextual factors such as institutional support and trainees' characteristics on the relationship between trainers' competencies, teaching self-efficacy, and CBET implementation.

ii. A Structural Equation Modelling (SEM) approach focuses on complex relationships to investigate how trainers' competencies and teaching self-efficacy influence trainees' outcomes such as learning, motivation, engagement, and skill acquisition, and how these outcomes, in turn, contribute to the success of CBET implementation.

iii. Investigating how other trainers' characteristics, such as motivation, attitudes, and past experiences, influence teaching self-efficacy and its mediating role in CBET implementation.

iv. A longitudinal study that follows trainers and their CBET implementation over an extended period could provide insights into how teaching self-efficacy changes and impacts CBET learning outcomes.

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APPENDICES

Appendix 1: Trainers' Questionnaire

I am a masters' student at Moi University pursuing a degree in Educational Research and Evaluation. The purpose of this questionnaire is to assess the influence of trainers' competencies and teaching self-efficacy on Competency-Based Education and Training (CBET) implementation in Kenyan TVET institutions. Kindly respond to the questions below by ticking on the preferred choice or writing a brief statement where provided. The information you provide will be used for academic purposes only, and confidentiality will be highly observed. **Please do not write your name or your institution's name.**

SECTION A: BACKGROUND INFORMATION.

1. Please indicate your gender.

   (1) Male ☐ (2) Female ☐

2. What is your highest academic qualification?

   (1) Diploma ☐ (2) H/Diploma ☐

   (3) Bachelors ☐ (4) Masters/Doctorate. ☐

3. What is your teaching experience?

   (1) Below 5 yrs. ☐ (2) 6-10 yrs. ☐

(3) 11-15 yrs. ☐ (4) Above 15 yrs. ☐

SECTION B: Competency-Based Education and Training (CBET) implementation.
This section seeks to assess critical aspects of CBET implementation in TVET institutions. Kindly respond to the following statements.

How often do you do the following when training and assessing your trainees?

(1) Never, (2) Rarely, (3) Sometimes, (4) Often, (5) Always.

	Item	1	2	3	4	5
CIMP1	Ensuring trainees have the right Protective Personal Equipment (PPE)					
CIMP2	Providing program learning guides and maps as provided in the occupational standards.					
CIMP3	Providing resources for specific modules (materials, equipment, and tools)					
CIMP4	Facilitating the learning process by ensuring that each trainee follows learning guide instructions					
CIMP5	Ensuring trainees carry out a self-check as they progress through the learning guides to gauge how well they have mastered the prescribed tasks.					
CIMP6	Competently utilizing tasks, skills, and knowledge when demonstrating to trainees how to perform laid out tasks.					
CIMP7	Maintaining a conducive and safe working environment in the workshop.					
CIMP8	Guiding trainees in achieving the requisite competencies					
CIMP9	Conducting assessment and performance tests using the CBET approach					
CIMP10	Providing assessment tests to candidates who are ready to be assessed.					
CIMP11	Ensuring trainees who do not perform to required standards are either referred back or retake the assessment straight away.					
CIMP12	Ensuring that Assessment is done at two levels: at the institution and the industry					
CIMP13	Preparing and maintaining trainees' progress records, such as attendance registers and portfolios of evidence					

SECTION C: Trainers' Competencies

This section is designed to help gain a better understanding of the requisite TVET trainers' competencies.

What is your level of agreement with the following statements on trainers' competencies and CBET implementation?

(1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree.

	Item	1	2	3	4	5
TCMP1	I have attended CBET capacity- building workshop/ seminar					
TCMP2	The capacity-building workshop I attended equipped me with the requisite knowledge and skills on CBET implementation					
TCMP3	I am familiar with the strategies for implementing CBET.					
TCMP4	I communicate effectively in class while teaching my trainees					
TCMP5	I can recognize trainees' personalities in my class					
TCMP6	I am conversant with the preparation of assessment tools					
TCMP7	I can conduct internal assessments and evaluate my trainees					
TCMP8	I am able to assess trainees during the industrial attachment period					
TCMP9	I have mastered the content knowledge in my area of specialization					
TCMP10	I can apply my content knowledge in teaching my trainees					
TCMP11	I can carry out self-development in a sustainable manner					
TCMP12	I work productively with other colleagues in my section/ department					
TCMP13	As a trainer, I always reflect on my own practice in the classroom					
TCMP14	I always strive to ensure that the Trainees meet their learning requirements as per the CBET curriculum					

SECTION D: Trainers' Teaching Self-efficacy and Competency-Based Education and Training (CBET) Implementation.

This section is designed to help gain a better understanding of the things that create difficulties for trainers in implementing CBET approach in their classroom activities. ***Please indicate your opinion about each of the following statements.***

(1) Nothing, (2) Very little, (3) A little, (4) Quite a bit, (5) A greater deal.

	Items	1	2	3	4	5
TSEF1	How much can you do to help your trainees value learning?					
TSEF2	How much can you do to motivate trainees who show low interest in schoolwork?					
TSEF3	How much can you do to improve the understanding of a trainee who is failing?					
TSEF4	How much can you do to get through the most difficult trainees?					
TSEF5	How much can you do to get trainees to follow classroom rules?					
TSEF6	How much can you do to make your expectations clear about trainee behavior?					
TSEF7	How much can you do to control disruptive behavior in the classroom?					
TSEF8	How much can you do to keep a few problem trainees from ruining an entire lesson?					
TSEF9	How much can you do to respond to difficult question from your trainees?					
TSEF10	How much can you do to provide appropriate challenging tasks for very capable trainees?					
TSEF11	How much can you do to implement alternative strategies in your classroom?					
TSEF12	How much can you do to provide an alternative explanation or an example when trainees are confused?					

Appendix 2: Interview Guide for Heads of Sections

Dear participant,

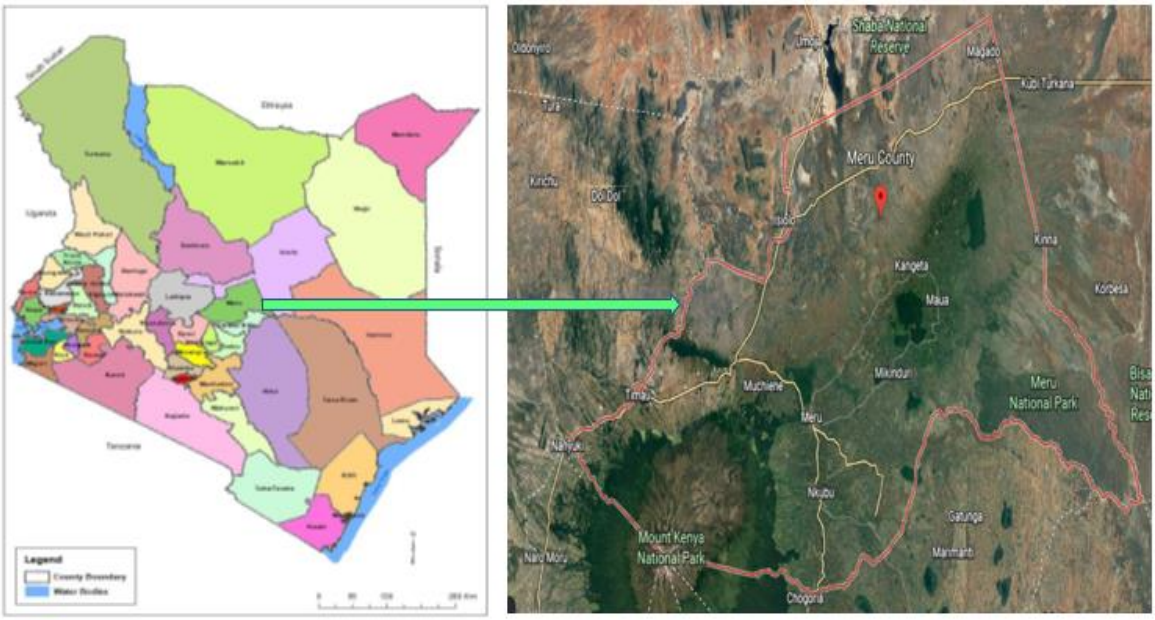
I am a Moi University student pursuing a Masters of Education in Educational Research. The purpose of this interview is to seek your views on Influence of Trainers' Competencies and Teaching Self-Efficacy on Competency-Based Education and Training Implementation (CBET) in Public TVET Institutions.

The interviewer shall also use probing questions so as to gain complete understanding on the responses.

1. How do you perceive your competencies for implementing CBET?
2. How do you perceive your confidence for implementing CBET courses?
3. Have your competencies influenced your confidence to implement CBET approach in your classroom?
    a) If Yes…, Kindly elaborate
    b) If No...., What challenges do you face when Implementing the CBET approach in your classroom?

Thank you for your participation

Appendix 3: Map of Meru County, Kenya



Source: Google Earth

Appendix 4: Kothari's Sample Size Determination Table

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Appendix 5: Workplan Schedule

	June /22	July /22	Aug /22	Sep /22	Oct /22	Nov /22	Dec /22	Jan /23	Feb /23	March /23	April /23	May /23	June-Aug /23	Oct /23
Proposal writing														
Proposal defense														
Obtaining ethical clearance														
Data collection														
Data analysis														
Thesis writing														
Thesis submission														
Thesis defense														

Appendix 6: List of Targeted sections in pubic TVET institutions in Meru County offering CBET Courses

TVET Institution	Number of Sections
Meru National Polytechnic	5
Nkabune TTI	3
Mukiiria TTI	2
Karumo TTI	2
Kiirua TTI	2
Mitunguu TTI	2
Tigania East TVC	2
Kaelo TVC	2
TOTAL	**20**

Appendix 7: Questionnaire Validity and Reliability at Pilot Test

Summary of Validity and Reliability at Pilot Study

Item Code	Components	Factor Loading	Eigen Value	% of Variance	Cumu-lative	Cronbach's α
FACTOR 1:			9.531	24.438	24.438	0.857
	Teaching Self-efficacy					
TSEF8	Keeping a few problem trainees from ruining the lesson	0.827				
TSEF7	Controlling disruptive behavior	0.767				
TSEF1	Helping trainees value learning	0.758				
TSEF10	Providing appropriate challenging tasks for very capable trainees	0.743				
TSEF3	Improving the understanding of a trainee who is failing	0.735				
FACTOR 2:			5.036	12.912	37.35	0.771
	CBET Implementation					
CIMP2	Providing learning guides	0.826				
CIMP12	Assessing trainees	0.634				
CIMP10	Providing CBET assessment tests	0.618				
CIMP3	Providing module resources	0.612				
CIMP1	Ensuring trainees have the right Protective PPEs	0.586				
FACTOR 3:			3.082	7.904	45.254	0.841
	Trainers' Competencies					
TCMP14	Meeting trainees' CBET requirements	0.773				
TCMP7	Conducting CBET assessments	0.723				
TCMP12	Working with other colleagues	0.680				
TCMP9	Mastering content knowledge	0.588				
TCMP10	Applying content knowledge	0.580				
	KMO and Bartlett's Test					
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy					0.532
	Bartlett's Test of Sphericity, Approx. Chi-Square					1510.79
	Df					741
	Sig.					0.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Source: Pilot Data, 2023

Appendix 8: Moi University Ethical Clearance

MOI UNIVERSITY
Office of the Dean School of Education

Tel. Eldoret (053) 43001-8/43620
Fax No. (053) 43047

P.O. Box 3900
Eldoret, Kenya

REF: MS/R/5880/22

DATE: 24th October, 2022

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

Dear Sir/Madam,

RE: RESEARCH PERMIT IN RESPECT OF KENNETH MUTHOMI – MS/R/588/22

The above named is a 2nd year Master of Education Student at Moi University, School of Education, Department of Educational Management & Policy Studies.

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

"Impact of Trainers' Competencies and Teaching Self-Efficacy on Competency-Based Education and Training Implementation in Public Technical Institutions in Meru County, Kenya."

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

Yours faithfully,

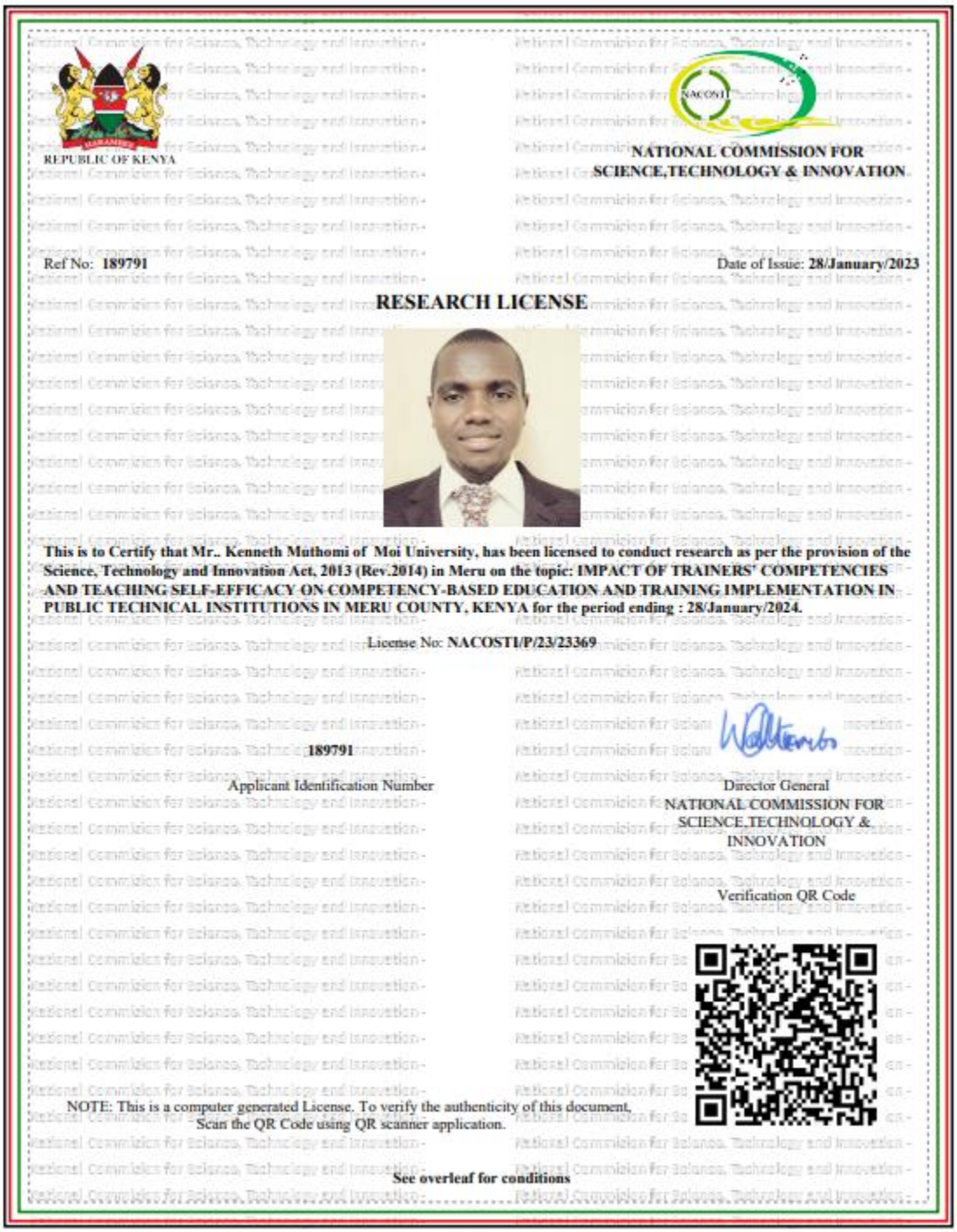
MOI UNIVERSITY SCHOOL OF EDUCATION 24 OCT 2022 P.O. BOX 3900-30100, ELDORET

24/10/2022

PROF. JOHN K. CHANG'ACH
DEAN, SCHOOL OF EDUCATION

(ISO 9001:2015 Certified Institution)

Appendix 9: NACOSTI Research Permit



REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 189791

Date of Issue: 28/January/2023

RESEARCH LICENSE

This is to Certify that Mr.. Kenneth Muthomi of Moi University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Meru on the topic: IMPACT OF TRAINERS' COMPETENCIES AND TEACHING SELF-EFFICACY ON COMPETENCY-BASED EDUCATION AND TRAINING IMPLEMENTATION IN PUBLIC TECHNICAL INSTITUTIONS IN MERU COUNTY, KENYA for the period ending : 28/January/2024.

License No: NACOSTI/P/23/23369

189791

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

Appendix 10: An Informed Consent for Heads of Sections

Study title: Influence of Trainers' competencies and Teaching self-efficacy on CBET Implementation in Public TVET institutions in Meru County Kenya.

Principal Researcher: Kenneth Muthomi

Institution: Moi University

Background:

I would like to invite you to participate in my research study. The researcher is a postgraduate student at Moi University, Kenya pursuing a Masters of Education in Research. After the study has been explained to you, any questions you may have been answered, you have agreed to take part in this research, you shall be asked to sign a consent which you will receive a copy. This research is intended to examine the influence of Trainers' competencies and Teaching Self-efficacy on CBET implementation.

A Brief Description of the Research Project Funders.

This research study has been funded by Germany Academic Exchange Service (DAAD) through the East and South African- German Centre of Excellency (CERM-ESA). This is a joint project among Moi University (Kenya), Nelson Mandela Metropolitan University (South Africa), University of Dar es Salaam (Tanzania), and, University of Oldenburg (Germany), and Uganda Management Institute (Uganda).

Study Purpose

This study aims to examine the influence of Trainers' Competencies and Teaching Self-efficacy on CBET Implementation in Public TVET Institutions.

The findings will be significant to Trainers, Heads of Sections/ Departments, Institutional administrators, TVET CDACC and TVET stakeholders and Policy makers.

Procedure.

Participating in this research study will require a personal face to face interview and will last for between 30 to 40 minutes. With the participants' permission, the interviews will be directed by the researcher, tape-recorded and later transcribed to analyze the data. There are no set/specific answers, therefore, feel free to give your opinions. The audiotapes will be stored securely for purposes of confidentiality. The interview will be conducted at your own time of and place of convenience.

Confidentiality.

The researcher will use pseudo codes e.g. HOS 1 as an anonymity strategy to protect your privacy and confidentiality. Data collected shall only be accessible by the research team. The findings of the study will be published as a research paper in a professional journal.

Benefits.

The research findings will be used to address pertinent issues on CBET implementation. No monetary benefits will be given when participating in this study.

Alternatives and Cost:

If you are not interested, you do not have to participate in this study. You shall not lose any benefit in case of no participation. There will not be any extra cost incurred as a result of participating in this research study.

Further questions and follow up.

In case of any question related to the study during the entire study process or information on your rights as a research participant, you are welcome to ask freely. Furthermore, if you have any further information on the study, kindly contact

Principal researcher: Kenneth Muthomi

Contact: +254 708227 874

E-mail: keneth.muthomi@gmail.com

Participation

Your participation in this study is entirely voluntary and you reserve a privilege to withdraw from this study whenever you wish without any consequences whatsoever.

Consent Statement

I confirm that the study purpose, the study procedure, the possible risks, and, discomforts, as well as benefits have been explained to me. All the emergent questions have been answered and the I agree to participate in the study. I therefore append my signature as a sign of willingly consenting to take part in the study. A duplicate of this form shall be given to me.

Participant's signature……. Date……

Researcher's signature…… Date……...….

Appendix 11: Plagiarism Report

SR243

ISO 9001:2019 Certified Institution

EDU 999 THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

Kenneth Muthomi

MS/R/5880/22

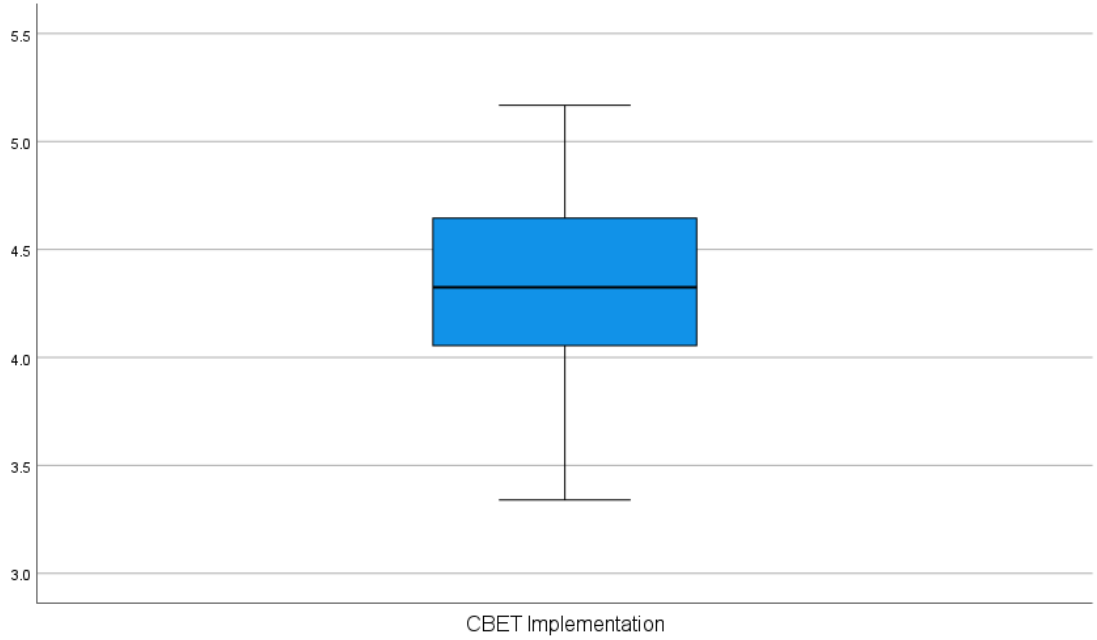
In recognition for passing the University's plagiarism

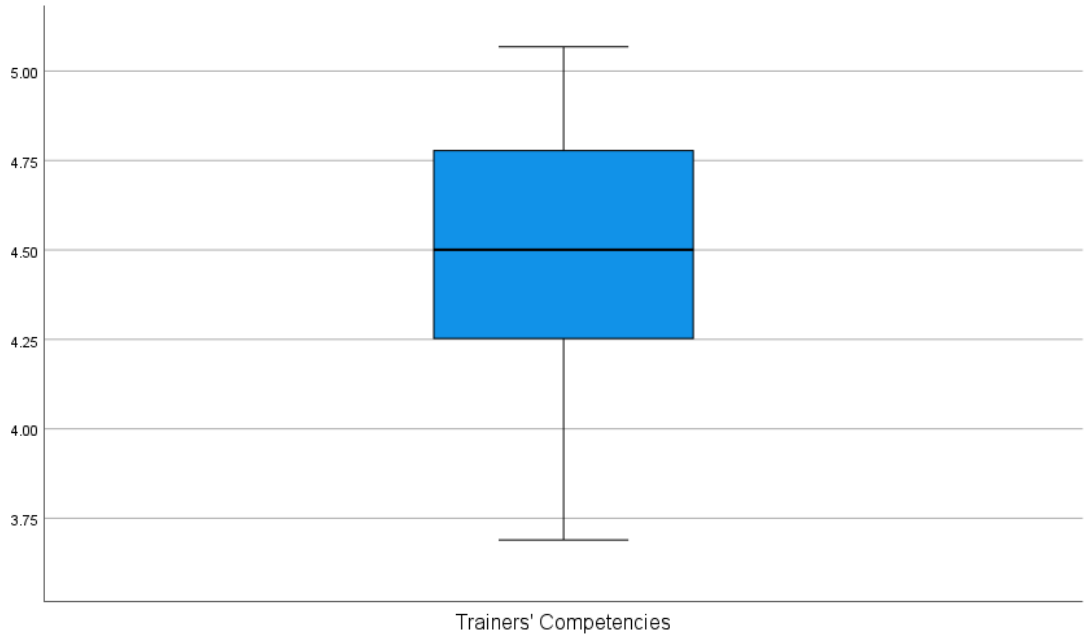
Awareness test for thesis: **INFLUENCE OF TRAINERS' COMPETENCIES AND TEACHING SELF-EFFICACY ON COMPETENCY-BASED EDUCATION AND TRAINING IMPLEMENTATION IN PUBLIC TECHNICAL INSTITUTIONS IN MERU COUNTY, KENYA** with a similarity index of 5% and striving to maintain academic integrity.

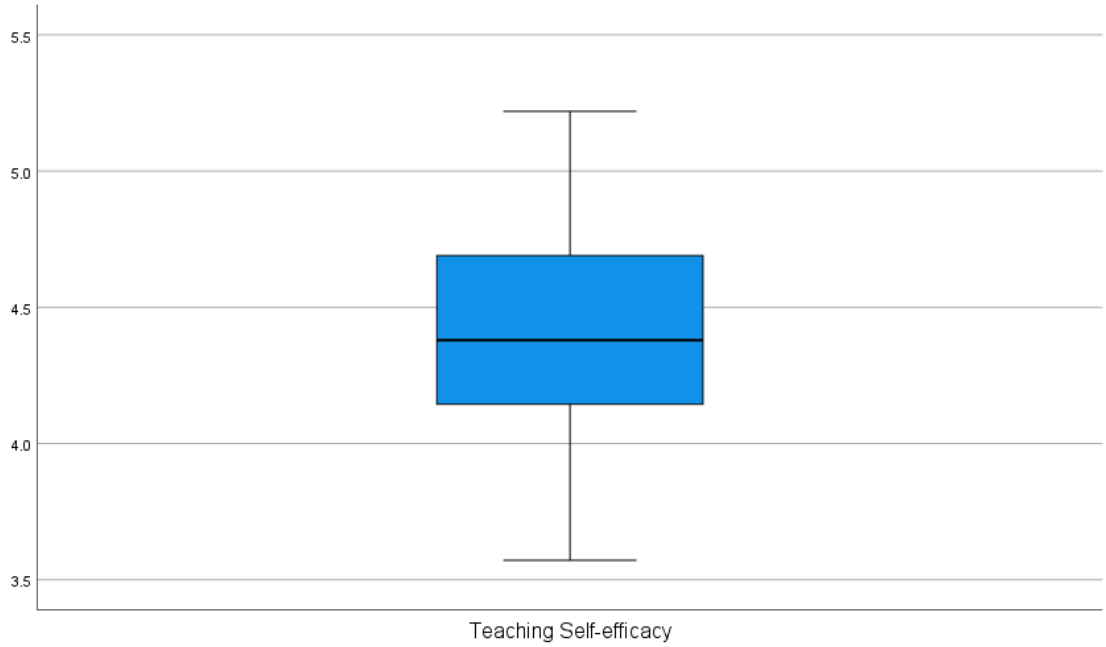
Awarded by:

Prof. Anne Syomwene Kisilu
CERM-ESA Project Leader Date: 14/08/2023

Appendix 12: Stem and Leaf Uni-variate Outlier Analysis (Box plots)






5.5
5.0
4.5
4.0
3.5
Teaching Self-efficacy

Appendix 13: Mahalanobis Distance Multivariate Outliers' Analysis

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.6164	4.7638	4.3459	.25647	245
Std. Predicted Value	-2.844	1.629	.000	1.000	245
Standard Error of Predicted Value	.025	.085	.040	.013	245
Adjusted Predicted Value	3.6039	4.7732	4.3457	.25668	245
Residual	-1.10485	.78006	.00000	.38100	245
Std. Residual	-2.888	2.039	.000	.996	245
Stud. Residual	-2.898	2.056	.000	1.002	245
Deleted Residual	-1.11220	.79285	.00017	.38562	245
Stud. Deleted Residual	-2.943	2.070	-.001	1.005	245
Mahal. Distance	**.017**	**11.027**	**1.992**	**2.024**	**245**
Cook's Distance	.000	.026	.004	.005	245
Centered Leverage Value	.000	.045	.008	.008	245

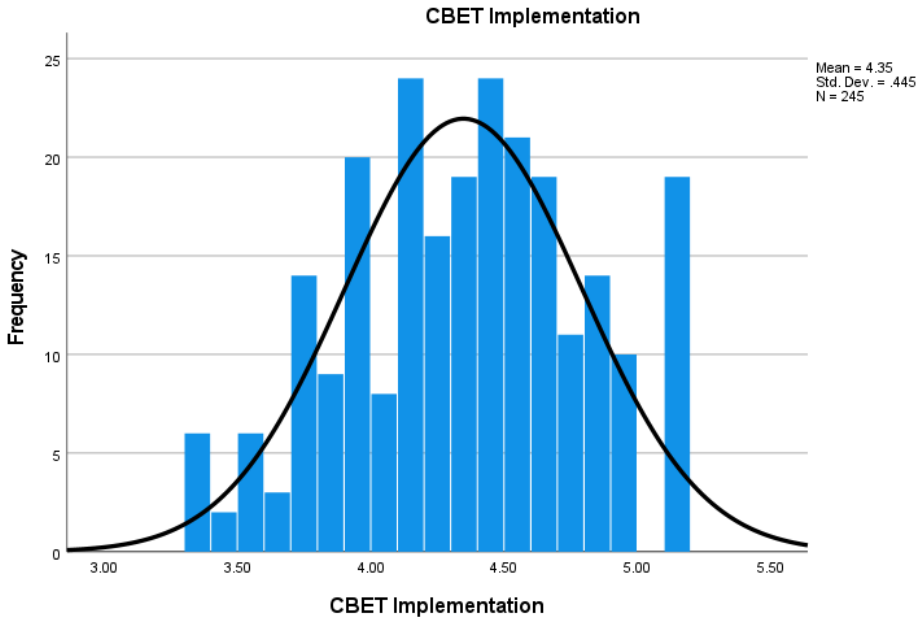
a. Dependent Variable: CBET Implementation

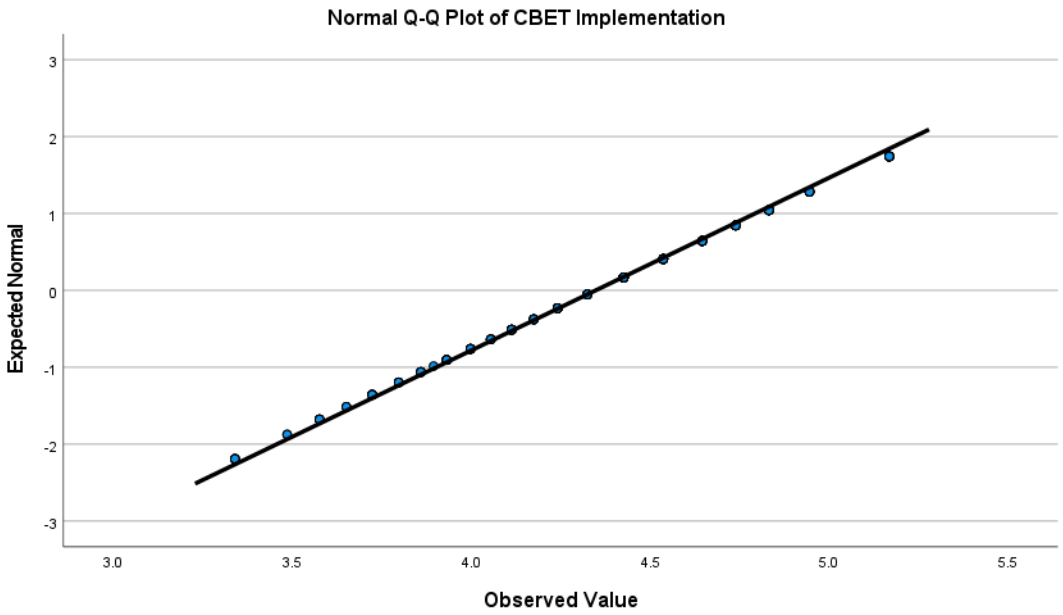
Appendix 14: Skewness and Kurtosis Coefficients of the Transformed Variables

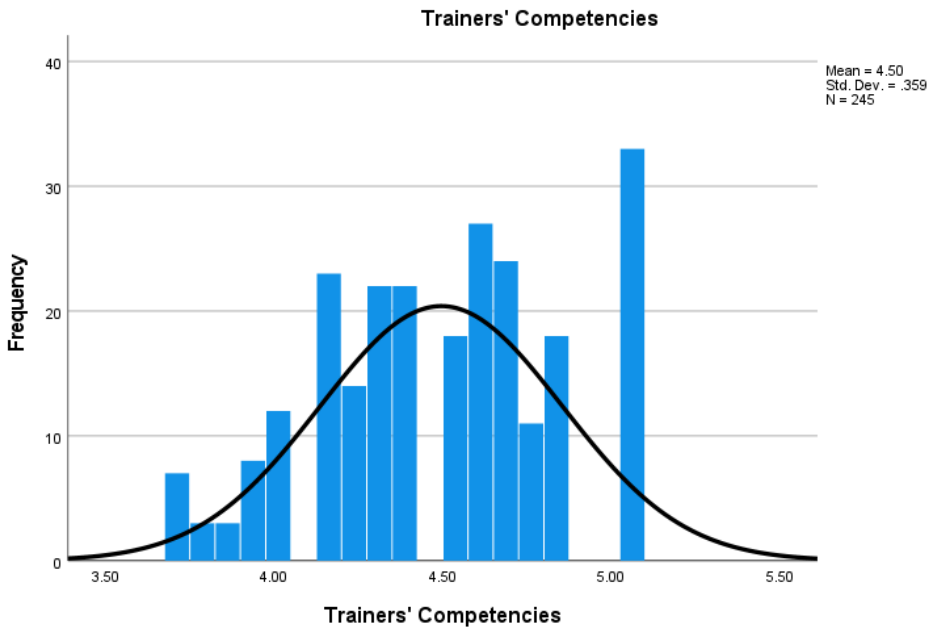
Descriptive Statistics

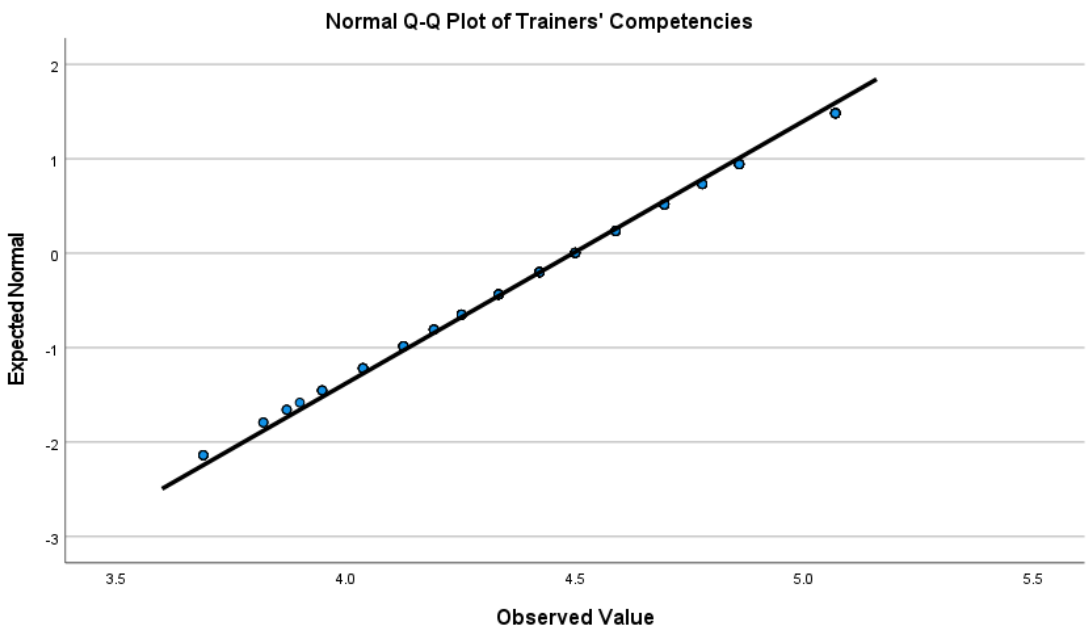
	N	Min	Max	Mean	Std. Dev	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CBET Implementation	245	3.34	5.17	4.3478	.44520	.198	.056	.156	.472	.310
Trainers' Competencies	245	3.69	5.07	4.4958	.35931	.129	.014	.156	.601	.310
Teaching Self-Efficacy	245	3.57	5.22	4.4148	.39130	.153	.011	.156	.418	.310
Valid N (listwise)	245									

Appendix 15: Histograms and Normal Q-Q Plots






Trainers' Competencies
Mean = 4.50
Std. Dev. = .359
N = 245
Frequency
40
30
20
10
0
3.50
4.00
4.50
5.00
5.50
Trainers' Competencies


Normal Q-Q Plot of Trainers' Competencies
Expected Normal
2
1
0
-1
-2
-3
3.5
4.0
4.5
5.0
5.5
Observed Value

Teaching Self-efficacy
Mean = 4.41
Std. Dev. = .391
N = 245
Frequency
30
20
10
0
3.50
4.00
4.50
5.00
5.50
Teaching Self-efficacy

Normal Q-Q Plot of Teaching Self-efficacy
Expected Normal
3
2
1
0
-1
-2
-3
3.0
3.5
4.0
4.5
5.0
5.5
Observed Value

Appendix 16: Exploratory Factor Analysis for Trainers' Competencies

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.828
Bartlett's Test of Sphericity	Approx. Chi-Square	936.446
	df	91
	Sig.	.000

Communalities

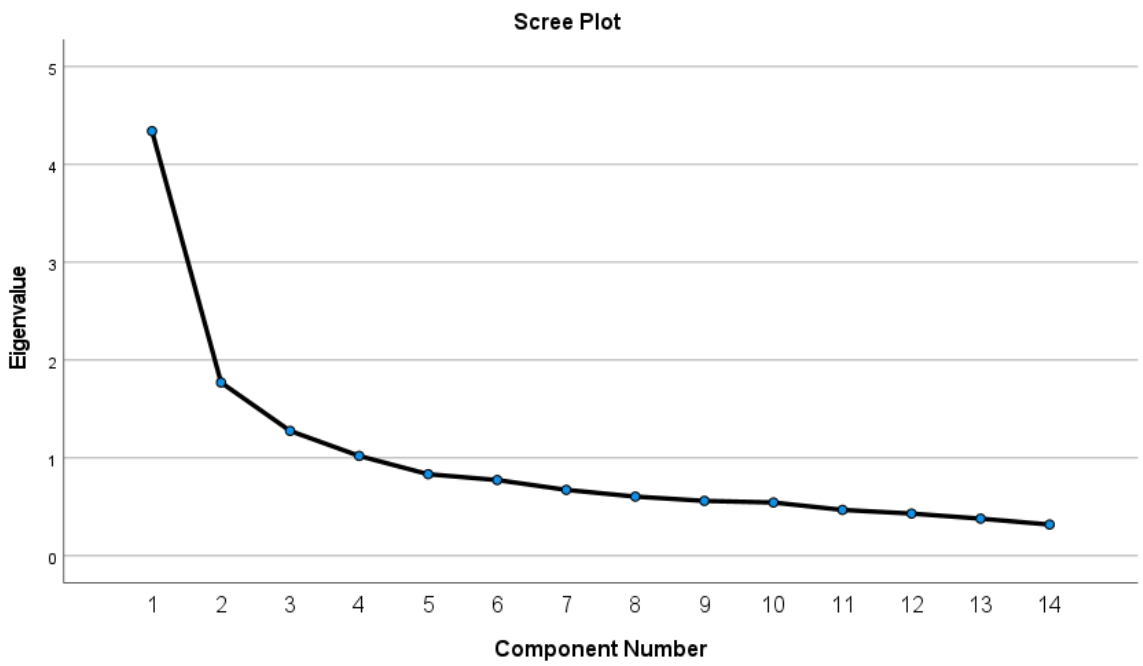
	Initial	Extraction
TCMP1	1.000	.678
TCMP2	1.000	.680
TCMP3	1.000	.701
TCMP4	1.000	.617
TCMP5	1.000	.418
TCMP6	1.000	.549
TCMP7	1.000	.676
TCMP8	1.000	.615
TCMP9	1.000	.662
TCMP10	1.000	.632
TCMP11	1.000	.629
TCMP12	1.000	.512
TCMP13	1.000	.496
TCMP14	1.000	.544

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.341	31.004	31.004	3.008	21.488	21.488
2	1.771	12.652	43.657	2.833	20.238	41.726
3	1.276	9.118	52.775	1.481	10.576	52.301
4	1.021	7.292	60.066	1.087	7.765	60.066
5	.834	5.955	66.022			
6	.774	5.529	71.551			
7	.674	4.811	76.362			
8	.605	4.321	80.682			
9	.561	4.008	84.690			
10	.544	3.889	88.580			
11	.469	3.349	91.929			
12	.431	3.081	95.009			
13	.380	2.712	97.721			
14	.319	2.279	100.000			

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component			
	1	2	3	4
TCMP7	.782			
TCMP8	.763			
TCMP4	.757			
TCMP6	.695			
TCMP5	.609			
TCMP9		.746		
TCMP11		.720		
TCMP14		.711		
TCMP12		.653		
TCMP10		.598		
TCMP13		.542		
TCMP2			.821	
TCMP3			.721	
TCMP1				.792

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Appendix 17: Exploratory Factor Analysis for Teaching Self-efficacy

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.860
Bartlett's Test of Sphericity	Approx. Chi-Square	843.384
	df	66
	Sig.	.000

Communalities

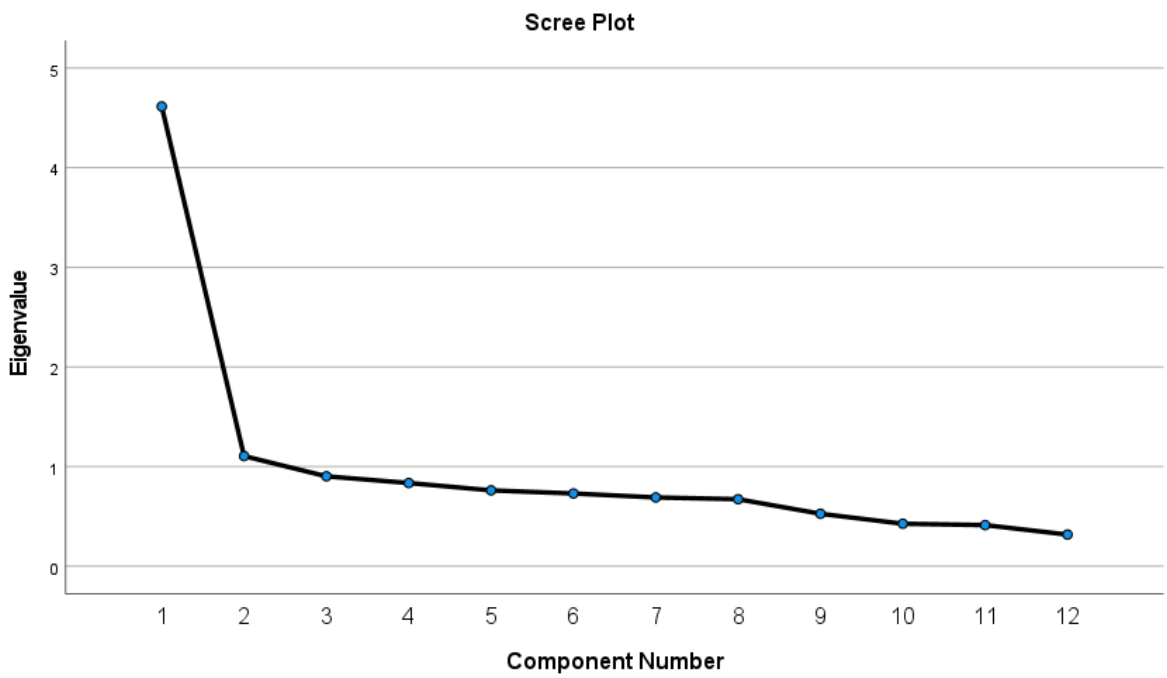
	Initial	Extraction
TSEF1	1.000	.449
TSEF2	1.000	.529
TSEF3	1.000	.623
TSEF4	1.000	.650
TSEF5	1.000	.336
TSEF6	1.000	.558
TSEF7	1.000	.540
TSEF8	1.000	.345
TSEF9	1.000	.333
TSEF10	1.000	.484
TSEF11	1.000	.416
TSEF12	1.000	.458

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.615	38.459	38.459	4.615	38.459	38.459	3.290	27.413	27.413
2	1.106	9.215	47.674	1.106	9.215	47.674	2.431	20.261	47.674
3	.903	7.523	55.197						
4	.836	6.964	62.161						
5	.762	6.348	68.509						
6	.730	6.087	74.596						
7	.691	5.756	80.352						
8	.673	5.609	85.961						
9	.527	4.391	90.352						
10	.427	3.556	93.908						
11	.413	3.443	97.351						
12	.318	2.649	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
TSEF6	.719	
TSEF7	.708	
TSEF10	.669	
TSEF12	.661	
TSEF11	.624	
TSEF9	.519	
TSEF5	.508	
TSEF8		
TSEF4		.777
TSEF3		.773
TSEF2		.699
TSEF1		.531

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Appendix 18: Exploratory Factor Analysis for CBET Implementation

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.849
Bartlett's Test of Sphericity	Approx. Chi-Square	884.201
	df	78
	Sig.	.000

Communalities

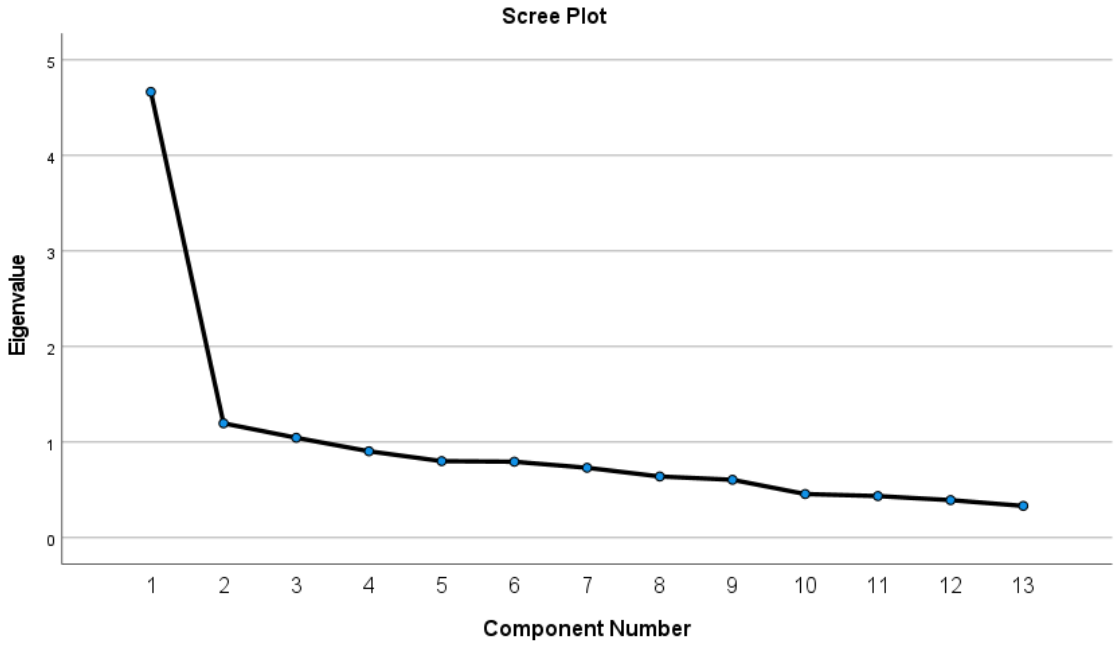
	Initial	Extraction
CIMP1	1.000	.298
CIMP2	1.000	.389
CIMP3	1.000	.200
CIMP4	1.000	.271
CIMP5	1.000	.477
CIMP6	1.000	.419
CIMP7	1.000	.474
CIMP8	1.000	.329
CIMP9	1.000	.333
CIMP10	1.000	.311
CIMP11	1.000	.413
CIMP12	1.000	.333
CIMP13	1.000	.419

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.665	35.884	35.884	4.665	35.884	35.884
2	1.196	9.204	45.088			
3	1.045	8.042	53.130			
4	.904	6.954	60.083			
5	.801	6.160	66.243			
6	.795	6.112	72.355			
7	.731	5.625	77.980			
8	.640	4.924	82.905			
9	.606	4.659	87.563			
10	.457	3.512	91.075			
11	.435	3.348	94.423			
12	.393	3.021	97.445			
13	.332	2.555	100.000			

Extraction Method: Principal Component Analysis.



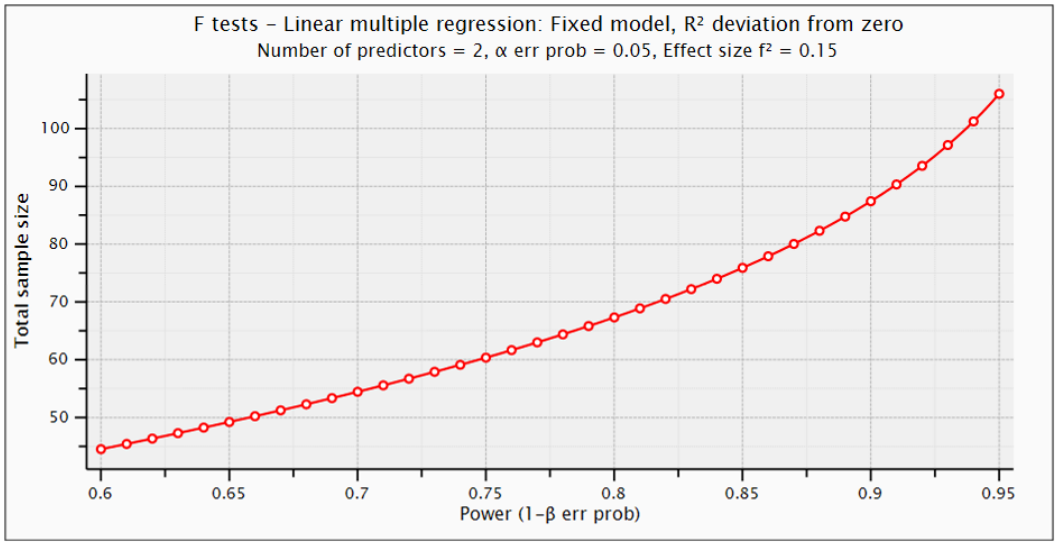
Component Matrix[a]

	Component 1
CIMP5	.690
CIMP7	.688
CIMP13	.647
CIMP6	.647
CIMP11	.643
CIMP2	.623
CIMP9	.577
CIMP12	.577
CIMP8	.573
CIMP10	.558
CIMP1	.545
CIMP4	.521
CIMP3	

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix 19: Statistical Power Analysis using G*Power (Version 3.1) Method



Appendix 20: Hierarchical Multiple Linear Regression Analysis (H01: SPSS Output)

Descriptive Statistics

	Mean	Std. Deviation	N
CBET Implementation	4.3478	.44520	245
Gender	1.2776	.44871	245
Academic Qualification	2.5347	.83704	245
Teaching Experience	1.6327	.91647	245
Trainers' Competencies	4.4958	.35931	245

Correlations

		CBET Implementation	Gender	Academic Qualification	Teaching Experience	Trainers' Competencies
Pearson Correlation	CBET Implementation	1.000	.244	-.112	.126	.397
	Gender	.244	1.000	-.080	.040	.044
	Academic Qualification	-.112	-.080	1.000	.262	-.024
	Teaching Experience	.126	.040	.262	1.000	.101
	Trainers' Competencies	.397	.044	-.024	.101	1.000
Sig. (1-tailed)	CBET Implementation	.	.000	.040	.025	.000
	Gender	.000	.	.105	.268	.244
	Academic Qualification	.040	.105	.	.000	.354
	Teaching Experience	.025	.268	.000	.	.057
	Trainers' Competencies	.000	.244	.354	.057	.
N	CBET Implementation	245	245	245	245	245
	Gender	245	245	245	245	245
	Academic Qualification	245	245	245	245	245
	Teaching Experience	245	245	245	245	245
	Trainers' Competencies	245	245	245	245	245

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Teaching Experience, Gender, Academic Qualification[b]	.	Enter
2	Trainers' Competencies[b]	.	Enter

a. Dependent Variable: CBET Implementation

b. All requested variables entered.

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.299[a]	.090	.078	.42741	.090	7.914	3	241	.000	
2	.477[b]	.228	.215	.39453	.138	42.833	1	240	.000	1.771

a. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Trainers' Competencies

c. Dependent Variable: CBET Implementation

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.337	3	1.446	7.914	.000[b]
	Residual	44.025	241	.183		
	Total	48.362	244			
2	Regression	11.004	4	2.751	17.674	.000[c]
	Residual	37.358	240	.156		
	Total	48.362	244			

a. Dependent Variable: CBET Implementation

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

c. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Trainers' Competencies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.120	.124		33.284	.000					
	Gender	.226	.061	.227	3.679	.000	.244	.231	.226	.990	1.011
	Academic Qualification	-.071	.034	-.134	-2.095	.037	-.112	-.134	-.129	.923	1.084
	Teaching Experience	.074	.031	.152	2.382	.018	.126	.152	.146	.927	1.078
2	(Constant)	2.062	.335		6.161	.000					
	Gender	.212	.057	.214	3.747	.000	.244	.235	.213	.988	1.012
	Academic Qualification	-.061	.031	-.115	-1.946	.053	-.112	-.125	-.110	.921	1.086
	Teaching Experience	.053	.029	.110	1.853	.065	.126	.119	.105	.916	1.091
	Trainers' Competencies	.463	.071	.374	6.545	.000	.397	.389	.371	.986	1.014

a. Dependent Variable: CBET Implementation

Appendix 21: Hierarchical Multiple Linear Regression Analysis (H02: SPSS Output)

Descriptive Statistics

	Mean	Std. Deviation	N
Teaching Self-efficacy	4.4148	.39130	245
Gender	1.2776	.44871	245
Academic Qualification	2.5347	.83704	245
Teaching Experience	1.6327	.91647	245
Trainers' Competencies	4.4958	.35931	245

Correlations

		Teaching Self-efficacy	Gender	Academic Qualification	Teaching Experience	Trainers' Competencies
Pearson Correlation	Teaching Self-efficacy	1.000	.135	-.040	.168	.447
	Gender	.135	1.000	-.080	.040	.044
	Academic Qualification	-.040	-.080	1.000	.262	-.024
	Teaching Experience	.168	.040	.262	1.000	.101
	Trainers' Competencies	.447	.044	-.024	.101	1.000
Sig. (1-tailed)	Teaching Self-efficacy	.	.017	.266	.004	.000
	Gender	.017	.	.105	.268	.244
	Academic Qualification	.266	.105	.	.000	.354
	Teaching Experience	.004	.268	.000	.	.057
	Trainers' Competencies	.000	.244	.354	.057	.
N	Teaching Self-efficacy	245	245	245	245	245
	Gender	245	245	245	245	245
	Academic Qualification	245	245	245	245	245
	Teaching Experience	245	245	245	245	245
	Trainers' Competencies	245	245	245	245	245

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Teaching Experience, Gender, Academic Qualification[b]	.	Enter
2	Trainers' Competencies[b]	.	Enter

a. Dependent Variable: Teaching Self-efficacy

b. All requested variables entered.

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.225[a]	.051	.039	.38363	.051	4.286	3	241	.006	
2	.480[b]	.231	.218	.34608	.180	56.137	1	240	.000	1.403

a. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Trainers' Competencies

c. Dependent Variable: Teaching Self-efficacy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.892	3	.631	4.286	.006[b]
	Residual	35.469	241	.147		
	Total	37.361	244			
2	Regression	8.616	4	2.154	17.984	.000[c]
	Residual	28.745	240	.120		
	Total	37.361	244			

a. Dependent Variable: Teaching Self-efficacy

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

c. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Trainers' Competencies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.244	.111		38.200	.000					
	Gender	.106	.055	.122	1.929	.055	.135	.123	.121	.990	1.011
	Academic Qualification	-.037	.031	-.079	-1.204	.230	-.040	-.077	-.076	.923	1.084
	Teaching Experience	.079	.028	.184	2.827	.005	.168	.179	.177	.927	1.078
2	(Constant)	2.177	.294		7.418	.000					
	Gender	.093	.050	.106	1.867	.063	.135	.120	.106	.988	1.012
	Academic Qualification	-.027	.028	-.057	-.966	.335	-.040	-.062	-.055	.921	1.086
	Teaching Experience	.058	.025	.136	2.299	.022	.168	.147	.130	.916	1.091
	Trainers' Competencies	.465	.062	.427	7.492	.000	.447	.435	.424	.986	1.014

a. Dependent Variable: Teaching Self-efficacy

Appendix 22: Hierarchical Multiple Linear Regression Analysis (H03: SPSS Output)

Descriptive Statistics

	Mean	Std. Deviation	N
CBET Implementation	4.3478	.44520	245
Gender	1.2776	.44871	245
Academic Qualification	2.5347	.83704	245
Teaching Experience	1.6327	.91647	245
Teaching Self-efficacy	4.4148	.39130	245

Correlations

		CBET Implementation	Gender	Academic Qualification	Teaching Experience	Teaching Self-efficacy
Pearson Correlation	CBET Implementation	1.000	.244	-.112	.126	.525
	Gender	.244	1.000	-.080	.040	.135
	Academic Qualification	-.112	-.080	1.000	.262	-.040
	Teaching Experience	.126	.040	.262	1.000	.168
	Teaching Self-efficacy	.525	.135	-.040	.168	1.000
Sig. (1-tailed)	CBET Implementation	.	.000	.040	.025	.000
	Gender	.000	.	.105	.268	.017
	Academic Qualification	.040	.105	.	.000	.266
	Teaching Experience	.025	.268	.000	.	.004
	Teaching Self-efficacy	.000	.017	.266	.004	.
N	CBET Implementation	245	245	245	245	245
	Gender	245	245	245	245	245
	Academic Qualification	245	245	245	245	245
	Teaching Experience	245	245	245	245	245
	Teaching Self-efficacy	245	245	245	245	245

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Teaching Experience, Gender, Academic Qualification[b]	.	Enter
2	Teaching Self-efficacy[b]	.	Enter

a. Dependent Variable: CBET Implementation

b. All requested variables entered.

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.299[a]	.090	.078	.42741	.090	7.914	3	241	.000	
2	.562[b]	.316	.304	.37136	.226	79.238	1	240	.000	1.644

a. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Teaching Self-efficacy

c. Dependent Variable: CBET Implementation

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.337	3	1.446	7.914	.000[b]
	Residual	44.025	241	.183		
	Total	48.362	244			
2	Regression	15.265	4	3.816	27.672	.000[c]
	Residual	33.097	240	.138		
	Total	48.362	244			

a. Dependent Variable: CBET Implementation

b. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification

c. Predictors: (Constant), Teaching Experience, Gender, Academic Qualification, Teaching Self-efficacy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.120	.124		33.284	.000					
	Gender	.226	.061	.227	3.679	.000	.244	.231	.226	.990	1.011
	Academic Qualification	-.071	.034	-.134	-2.095	.037	-.112	-.134	-.129	.923	1.084
	Teaching Experience	.074	.031	.152	2.382	.018	.126	.152	.146	.927	1.078
2	(Constant)	1.764	.286		6.176	.000					
	Gender	.167	.054	.168	3.104	.002	.244	.196	.166	.975	1.026
	Academic Qualification	-.051	.030	-.096	-1.716	.088	-.112	-.110	-.092	.917	1.090
	Teaching Experience	.030	.027	.062	1.103	.271	.126	.071	.059	.898	1.114
	Teaching Self-efficacy	.555	.062	.488	8.902	.000	.525	.498	.475	.949	1.053

a. Dependent Variable: CBET Implementation

Appendix 23: Hayes Mediation Analysis Output

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 4.2 beta ***************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : CIMP
    X  : TCMP
    M  : TSEF

Covariates:
 gender   academc  exprnc

Sample
Size:  245

**************************************************************************
OUTCOME VARIABLE:
 TSEF

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4802      .2306      .1198    17.9837     4.0000   240.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.1772      .2935     7.4177      .0000     1.5990     2.7553
TCMP          .4653      .0621     7.4924      .0000      .3430      .5876
gender        .0927      .0497     1.8671      .0631     -.0051      .1906
academc      -.0266      .0276     -.9655      .3352     -.0810      .0277
exprnc        .0581      .0253     2.2988      .0224      .0083      .1078

**************************************************************************
OUTCOME VARIABLE:
 CIMP

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5907      .3490      .1317    25.6205     5.0000   239.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.0776      .3413     3.1573      .0018      .4052     1.7499
TCMP          .2531      .0724     3.4976      .0006      .1105      .3956
TSEF          .4520      .0677     6.6762      .0000      .3186      .5853
gender        .1703      .0525     3.2453      .0013      .0669      .2736
academc      -.0491      .0290    -1.6954      .0913     -.1062      .0080
exprnc        .0271      .0268     1.0123      .3124     -.0256      .0798

************************* TOTAL EFFECT MODEL ***************************
OUTCOME VARIABLE:
 CIMP
```

```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4770      .2275      .1557    17.6742     4.0000   240.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.0616      .3346     6.1612      .0000     1.4024     2.7207
TCMP          .4634      .0708     6.5447      .0000      .3239      .6028
gender        .2122      .0566     3.7474      .0002      .1006      .3237
academc      -.0612      .0314    -1.9455      .0529     -.1231      .0008
exprnc        .0533      .0288     1.8529      .0651     -.0034      .1101


************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .4634      .0708     6.5447      .0000      .3239      .6028

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .2531      .0724     3.4976      .0006      .1105      .3956

Indirect effect(s) of X on Y:
         Effect     BootSE   BootLLCI   BootULCI
TSEF      .2103      .0407      .1369      .2975

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```