



Institutional Factors Influencing Technical Skill Development Under Competency-Based Education and Training in Nyeri County

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Abstract

Despite the implementation of the Competency-Based Education and Training (CBET) programme in Kenya's technical institutions, trainees still lack adequate practical engineering tool-handling skills. The purpose of this study was to examine the influence of institutional factors on the development of practical engineering tool-handling skills among trainees under the CBET programme in technical institutions in Nyeri County. The study was guided by Experiential Learning Theory of David Kolb. A descriptive research survey design was adopted in this study. The study targeted six principals, six Industrial Liaison Officers (ILOs), 265 trainers and 1,560 trainees from the six technical institutions in Nyeri County. Simple random sampling using 10% of the trainers' population was used to get a sample size of 27 trainers. Yamane's formula was employed to determine the sample size of 318 trainees using proportionate stratified sampling. The study employed questionnaires and an interview schedule to collect data, where institutional principals and ILOs were interviewed, while questionnaires were administered to trainers and trainees. Quantitative data were analysed using descriptive statistics such as frequencies, percentages, means and standard deviations, while qualitative data were analysed thematically. The findings of the study reveal that institutional factors moderately influenced practical engineering tool-handling skills, with 46.9%-59.1% of trainees and 48.1% -59.2% of trainers agreeing that institutional resources supported practical engineering training. The study's recommendations include strengthening industry partnerships and institutions to invest in modern training equipment. The study's findings will provide insights that can inform the improvement of CBET implementation and enhance practical engineering tool-handling skills development in TVET institutions.

Introduction

The current education system worldwide must produce graduates who possess both knowledge and industry-relevant skills. According to Sifuna and Obonyo (2019) Technical Vocational Education and Training (TVET), worldwide, it is acknowledged as a key factor in equipping students with the necessary technical skills. Also, TVET has emerged as a key pathway to developing a trained labour force that can facilitate innovation, industrialisation and long-term economic progress in both developed and developing nations. Ideally, institutional factors are the internal conditions and resources within the technical



institutions that support the effective implementation of Competency-Based Education and Training (CBET). On the other hand, practical engineering tool-handling skills are hands-on skills in which trainees learn to use tools, operate machinery, interpret technical drawings, solve problems, and use new technology in engineering. According to Verma, Kaushik and Madan (2025), these technical skills align with industry demands, making graduates more competent and job-ready. Therefore, to address the shortcomings of traditional educational systems and adapt to the industry's ever-changing needs, most countries, such as Kenya, have introduced CBET.

Despite the implementation of CBET in Kenya's TVET institutions, concerns persist about the extent to which trainees acquire the practical engineering tool-handling skills required in the labour market (World Bank, ILO, & UNESCO, 2023). Challenges such as a lack of proper training equipment and insufficient workshops remain evident in most technical institutions, hindering the effective implementation of the programme. A study done by Otieno and Musya (2024) reveals that youth unemployment remains high among TVET graduates, suggesting a mismatch between training outcomes and industry expectations. The national government has significantly invested in technical and vocational education in Nyeri County by increasing the number of technical institutions and incorporating CBET programmes to improve trainees' practical and employable skills (Ringeera, Muriithi & Sabina, 2025). Thus, Nyeri County provides a significant context for this study because it has several public TVET institutions that have implemented the CBET curriculum following the national government's investment in technical education. In addition, the County serves a growing industrial and manufacturing economy that requires graduates with practical technical skills in engineering. Therefore, evaluating CBET implementation in this context is essential to determine whether institutional factors support the development of practical engineering tool-handling skills required by industry.

Literature Review

The role of institutional factors in shaping the effectiveness of developing practical engineering tool-handling skills through Competency-Based Education and Training curricula is important, given considerations of infrastructure, human resources, policies, and implementation practices. The factors contribute to the quality of instruction, the provision of real-life learning experiences and the overall quality of training programmes in Technical and Vocational Education and Training institutions. According to a study in Meru County, the lack of teaching and learning materials, vague implementation rules, insufficient infrastructure and ineffective monitoring mechanisms are among the factors that make it difficult to implement CBET in training institutions (Kinoti, Kiplagat & Kutto, 2025). Some institutions reported having basic resources.

Still, many respondents indicated a significant gap in facilities. Equally, a study conducted in Narok County found that inadequate infrastructure and the lack of trainers' qualifications adversely influence the acquisition of practical skills among trainees (Sammy & Peter, 2025). The research concluded that the availability of well-equipped classrooms and workshops reduces trainees' opportunities to engage in practical learning. Moreover, a shortage of qualified trainers reduces the quality of instruction and monitoring during practical training sessions. As a result, the trainees might end up graduating without the technical skills required in the labour market, underscoring the significance of institutional preparedness for the successful execution of CBET. It is generally accepted among scholars that the effective development of technical skills through the Competency-Based Education and Training curriculum requires institutional support, such as adequate infrastructure and qualified instructors. The environment needed to support practical learning is achieved by having adequate learning facilities and qualified trainers, which are the main emphasis of CBET systems.

Research across various parts of Kenya indicates that institutions with well-equipped workshops, up-to-date tools and adequate training materials offer trainees more opportunities to engage in activities, thereby enhancing their practical skills. For instance, a study in Meru County reveals that the presence of modern



workshops, updated training equipment and conducive learning resources dramatically enhances the quality of competency-based training provided to trainees (Kinoti, Kiplagat & Kutto, 2025). With proper facilities in institutions, learners can perform technical duties repeatedly, thereby becoming more confident and skilled trainees (Sammy & Peter, 2025). On the same note, a study conducted in Narok County found that the availability of skilled instructors is important for training during practical exercises. Professional trainers can demonstrate proper methods, oversee learning and provide feedback that enables learners to develop their technical skills.

Although most researchers concur that institutional support is essential for implementing CBET, they differ in their focus on which institutional factors contribute most to the development of effective technical skills. The other studies emphasise the importance of institutional policies and administrative systems, whereas others place greater emphasis on physical and human resources. For example, a study found that explicit industrial policies, guidelines and management frameworks are needed to support this implementation. The research observes that poor policy structures, unspecified delivery processes and inadequate monitoring systems may hamper the systematic acquisition of technical skills by trainees. In the absence of clear policies and guidelines, the institutions might not be able to plan training activities, assessment procedures and curriculum delivery effectively.

In contrast, a study conducted in Narok County by Sammy and Peter (2025) emphasises the importance of material and human resources. Poor infrastructure, insufficient training facilities and inadequate training equipment are described as key obstacles to effective skills development in the study. Moreover, the lack of skilled professional trainers is identified as the most significant problem affecting the quality of practical training. Those restrictions deprive trainees of the opportunity to engage in hands-on learning and practice their skills. Although these studies have provided significant insights into the institutional factors influencing the adoption of Competency-Based Education and Training curricula, several limitations remain.

To start with, the description of the absence of resources in terms of infrastructure, equipment and qualified teachers, without extensively analysing how other institutional aspects can be applied to enhance the development of technical skills (Eze, Chinedu-Eze, Okik & Bello, 2020). To illustrate, little attention is paid to the roles of institutional leadership, strategic planning, and effective policy implementation in supporting CBET programmes. This is significant because leadership and management can strongly influence how available resources are used to achieve better training outcomes.

Moreover, the available literature is mainly cross-sectional, providing only a snapshot of the problems encountered in institutions at a given point in time. Limited longitudinal studies have investigated how positive changes in infrastructure, staffing and institutional policies over time may determine the development of technical skills among trainees. In addition, most studies are conducted in specific counties or institutions; hence, it is challenging to extend the results to other institutions of Technical and Vocational Education and Training (TVET) in Kenya or other nations. Moreover, while institutional support has been identified as a significant factor, research studies that delve into governance and accountability systems and policy enforcement strategies sufficient to maintain successful implementation of CBET and enhance skill development outcomes remain limited. Therefore, the literature review demonstrates that institutional readiness is a key factor in the effective implementation of Competency-Based Education and Training curricula and in increasing trainees' technical skills.

Adequate infrastructure, qualified trainers, institutional policies, and proper monitoring systems are institutional factors that support competency-based training and create a favourable learning environment. Once these factors are in place, training establishments are better positioned to deliver viable learning experiences that help trainees attain technical competencies relevant to the labour market. The results can be especially useful for the current study on the impact of institutional factors on the development of



technical skills among trainees enrolled in the CBET programme in Nyeri County, Kenya. The availability of sufficient training resources and institutional support determines the effectiveness of competency-based learning in most TVET institutions. Thus, analysing the institutional factors in Nyeri County's environment will help identify its strengths and the issues that influence the implementation of CBET.

Theoretical Framework

This research was anchored in David Kolb's (1984) Experiential Learning Theory (Joe and Okwaimung, 2024), which describes learners' cognitive and professional growth through a combination of practice and reflection. The Theory focuses on the construction of knowledge as a transformation of experience, in which learners engage in experiencing, thinking, reflecting, and acting. The Theory states that learning is a continuous process with four stages: practising, reflecting, conceptualising, and applying in real-life situations. The key assumption of the ELT is that learning is effective when the learner is actively involved, not passively, in the learning environment. The Theory emphasises learning by doing, critical reflection and the application of what is learned. Thus, the Theory supports personal learning, recognising that learners may enter the cycle at any point depending on their experiences and learning styles. The Experiential Learning Theory was highly applicable to this study because it emphasises practical learning methods, such as hands-on, learner-focused approaches, including practical training, simulations, projects and industry attachments.

Methodology

Research Design

According to Creswell (2019), research design is a blueprint that guides a researcher's data collection and analysis. This study adopted a descriptive survey design to systematically collect data on the CBET programme's influence on the development of practical engineering tool-handling skills among trainees in Nyeri County, Kenya. According to Sasfiani and Adelia (2024), the design was suitable because it helped the researcher collect and evaluate data from a large population in forms that accurately described the current status of CBET implementation and its impact on the development of practical engineering tool-handling skills, without any manipulation.

Location of the Study

The study location was Nyeri County. Nyeri County is located in the former Central Province, about 150 kilometres north of the capital city, Nairobi. The County is bordered to the north by Laikipia County, to the north-east by Meru County, to the east by Kirinyaga County, to the south by Muranga County and to the west by Nyandarua County. Nyeri County has six constituencies: Tetu, Kieni, Mathira, Othaya, Mukurweini, and Nyeri Town, each with a technical institution.

Target Population

The study targeted a population of 1,837 across six technical institutions in Nyeri County. The study targeted six technical institutions in the County, namely Nyeri National Polytechnic, Mathenge Technical Training Institute, Mukurweini Technical Training Institute, Tetu Technical and Vocational College, Kieni Technical and Vocational College, and Mathira Technical and Vocational College. Specifically, the study targeted six principals, 265 Trainers, 1,560 trainees and six ILOs across the six technical institutions as shown in Table 1 below.



Table 1: Targeted Population

Target	Nyeri NP	Mathenge TTI	Mukurwei ni TTI	Mathira TVC	Kieni TVC	Tetu TVC	Population
Principals	1	1	1	1	1	1	6
Trainers	100	30	80	20	20	15	265
ILOs	1	1	1	1	1	1	6
Trainees	800	200	230	100	80	150	1,560
Total	902	232	312	122	102	167	1,837

Source: TVET institution reports (2025)

Sample Size and Sampling Procedures

Census sampling was used to select the technical training institutions in Nyeri County. Purposive sampling was employed to select all six principals and six ILOs. The number of trainers who took part in the study was 10% of 265, or 27. According to Mugenda and Mugenda (2019), a sample size of ten per cent of the accessible population is sufficient for a descriptive study. To select the trainers, the researcher employed the lottery method of random sampling. The number of trainees who took part in the study was 318, and this was obtained by using Yamane's (1967) formula. Table 2 below shows the distribution of participants by technical institution in Nyeri County.

Table 2: Sample Distribution by Category

Category	Nyeri NP	Mathenge TTI	Mukurweini TTI	Mathira TVC	Kieni TVC	Tetu TVC	Sample	Method Of Sampling
Principals	1	1	1	1	1	1	6	Purposive
Trainers	10	3	8	2	2	2	27	Simple
ILOs	1	1	1	1	1	1	6	Random
Trainees	163	41	47	20	16	31	318	Purposive Proportionate Stratified
Total	175	46	57	24	20	35	357	

Source: Researcher (2026)

Research Instruments

A closed-ended questionnaire was used to collect data from trainers and trainees. At the same time, an interview schedule was used to get data from the ILOs and principals. The questionnaire was structured to help respondents maintain focus on examining the influence of institutional factors on the development of engineering tool-handling skills among the trainees under the CBET programme. Additionally, an interview schedule was developed to collect precise information on the influence of institutional factors on the development of practical engineering tool-handling skills among trainees in the CBET programme.

Validity and Reliability of The Research Tools

According to Repke, Birkenmaier and Lukas (2024), the degree to which a study accurately assesses what it is supposed to measure is known as validity. In this study, the researcher sought the opinions of the research supervisors to examine and validate the research tools used. Also, a pilot study was done with a selected group of participants to assess the appropriateness of the data collection methods and other procedures and to make changes where necessary.



Reliability

The reliability of an instrument is shown by its ability to produce the same results every time the process is repeated (Mugenda and Mugenda, 2019). Hence, to assess the dependability of the research tools, they were piloted with a random 10% sample from Nyandarua National Polytechnic, which shares characteristics with technical institutions in Nyeri County. The reliability of the instrument was assessed using Cronbach's alpha, which yielded coefficients of $\alpha = 0.811$ for trainers and $\alpha = 0.956$ for trainees, indicating a high level of internal consistency.

Data Analysis

In this study, the collected data were examined qualitatively and quantitatively. Data obtained from questionnaires completed by trainers and trainees were coded and analysed using the Statistical Package for the Social Sciences (SPSS) to produce quantitative results. It was summarised using descriptive statistics, including frequencies, percentages, means, and standard deviations. In addition, qualitative interview data were transcribed, grouped into themes, and analysed thematically to provide in-depth explanations of how institutional factors influenced the development of technical skills and to complement the quantitative findings.

Results and Discussions

The study sought to establish the extent to which institutional factors influence technical skill development under competency-based education and training in Nyeri County. Ideally, both trainers and trainees were asked to rate statements concerning the influence of institutional factors on the development of technical skills on a five-point Likert scale as (SD-Strongly Disagree (1), D-Disagree (2), N-Neutral (3), A-Agree (4), SA-Strongly Agree (5)). Their responses were tabulated, and the results are presented in Tables 3 and 4 below.

Table 3: Trainers' response

Statement	SD F %	D F %	N F %	A F %	SA F %	Mean	Std. Dev
The institution provides adequate tools and equipment for effective training.	4 14.8	4 14.8	6 22.2	11 40.7	2 7.4	3.11	1.219
Workshops and laboratories are well-equipped to support practical learning	3 11.1	4 14.8	6 22.2	11 40.7	3 11.1	3.26	1.196
Learning materials (manuals, guides, references) are sufficient for practical sessions.	2 7.4	6 11.1	6 22.2	12 44.4	4 14.8	3.48	1.122
Trainees have access to modern machines and technology aligned with industry requirements	3 11	2 7.4	6 22.2	11 40.7	5 18.5	3.48	1.221

Based on Table 3 above, trainers' responses to institutional factors. Concerning the statement that adequate tools and equipment are provided for effective training, 11 (40.7%) trainers agreed, two (7.4%) strongly



agreed, four trainers (14.8%) strongly disagreed, four trainers (14.8%) disagreed, and six trainers (22.2%) were neutral. The overall mean score is 3.11 (SD = 1.219), suggesting that trainers were generally satisfied with the availability of tools and equipment, although there were some concerns. Likewise, 11 trainers (40.7%) agreed, while three trainers (11.1%) strongly agreed that workshops and laboratories are properly equipped to facilitate learning by doing. By contrast, three trainers (11.1%) strongly disagreed, four trainers (14.8%) disagreed, and six trainers (22.2%) were neutral. The average score of 3.26 (SD = 1.196) suggests that trainers considered workshops and laboratories reasonably well-equipped. Still, some trainers believed they were insufficient to provide good practical training.

Regarding the statement that learning materials (manuals, guides, references) are sufficient for practical sessions, 12 trainers (44.4%) agreed, and four (14.8%) strongly agreed. On the other hand, two trainers (7.4%) strongly disagreed, three (11.1%) disagreed, and six (22.2%) were neutral. The mean score of 3.48 (SD = 1.122) indicated that most trainers agreed that the learning materials are adequate for carrying out competency-based training and practical learning activities. Also, the results indicate that 11 trainers (40.7%) agreed and 5 (18.5%) strongly agreed that the trainees have access to modern machines and technology required by the industry. However, six trainers (22.2%) were neutral, three trainers (11.1%) strongly disagreed, and two trainers (7.4%) disagreed. The scores indicated that trainers did not have the most accurate answer regarding whether trainees had access to adequate technology, with a mean of 3.48 (SD = 1.221). This suggests that, generally, trainers felt that trainees did have access to appropriate technologies, but noted that some technology was outdated and needed to be modernised. Therefore, the results indicate that the training resources and facilities facilitate the implementation of the CBET programme and the acquisition of skills by trainees. Most trainers reported that tools, equipment, workshops, learning materials, and technology were available, with mean scores (3.11–3.48) for these CBET components lower than those for other CBET components, suggesting that resource adequacy needs to be enhanced.

Table 4: Trainees' response

Statement	SD	D	N	A	SA	Mean	Std. Dev
	F %	F %	F %	F %	F %		
The institution provides adequate tools and equipment to support practical training	21 6.8	29 9.4	78 25.4	78 25.4	66 21.5	3.72	1.242
Workshops and laboratories are well-equipped for hands-on learning.	111 36.2	68 22.1	91 29.6	29 9.4	8 2.4	3.80	1.111
Learning materials (manuals, guides, and references) are sufficient for practical sessions.	114 37.1	24 7.8	91 29.6	68 22.1	10 3.3	3.82	1.116
I have access to modern machines and technologies aligned with industry requirements.	112 36.3	70 22.8	83 27.0	32 10.4	10 3.5	3.79	1.142

The results show that the influence of institutional factors is relatively strong in the development of technical skills trainees at CBET programmes. Concerning the provision of adequate tools and equipment for support during practical training, 78 trainees (25.4%) agreed, while 66 trainees (21.5%) strongly agreed.



But 21 trainees (6.8%) strongly disagreed, 29 (9.4%) disagreed, and 78 (25.4%) were neutral. The mean score of 3.72 (SD = 1.242) indicates that trainees moderately agree that tools and equipment are available; however, there are concerns that tools and equipment are inadequate in some institutions. Similarly, 111 trainees (36.2%) strongly agreed, and 68 (22.1%) agreed that the workshops and laboratories are sufficiently equipped to provide hands-on learning. On the other hand, eight (2.6%) strongly disagreed, 29 (9.4%) disagreed, and 91 (29.6%) were neutral. The mean score is 3.80 with SD = 1.111, indicating that most trainees felt the workshops/laboratories were moderately equipped to support practical learning skills. As regards whether the learning materials, such as manuals, guides, and references, were adequate for the practical session, 114 (37.1%) and 68 (22.1%) strongly agreed, respectively. On the other hand, 10 trainees (3.3%) strongly disagreed, and 24 trainees (7.8%) disagreed, while 91 trainees (29.6%) were neutral. The mean score of 3.82 (SD = 1.116) was the highest among all statements, indicating that, in general, trainees considered the learning materials adequate for supporting practical training and competency development. Also, the results showed that the trainees' facilities are provided with modern machines and technologies that meet the industry needs; 112 trainees (36.3%) strongly agreed, 70 trainees (22.8%) agreed, and the remaining 72 trainees (27.1%) neither agreed nor disagreed. But 10 trainees strongly disagreed, 32 disagreed, and 83 were neutral. The mean score is 3.79 (SD = 1.142), which suggests that the majority of trainees recognised access to modern equipment; however, for some, there was a need to increase availability and align with industry standards. Therefore, the results show that institutional factors moderately support the development of trainees' technical skills in technical institutions in Nyeri County, Kenya.

The results from interviews with the principals and ILOs showed that technical skills development under the CBET programme is significantly affected by institutional factors. Participants agreed that institutional-industry partnership is an important factor in the industrial attachment and workplace exposure of the trainees. The linkages were seen as crucial to filling the knowledge gap between training institutions and industry needs. Also, the study identified several institutional issues that are inhibiting CBET implementation. Some of these include a lack of training equipment, a low ratio of trainees to equipment, a lack of consumables for practical sessions and insufficient funds.

Therefore, the feedback shows that although the institutional structures and industry partnerships for implementing CBET are in place, the quality of skills development is limited by resource constraints within institutions. The findings align with the study by Sammy and Peter (2025), who noted that inadequate instructors and a lack of modern equipment also shaped the training programme, as it did not allow trainees to gain practical skills or provide hands-on training opportunities. Similarly, the study by Kinoti, Kiplagat and Kutto (2025) observed that inadequate teaching and learning resources, insufficient infrastructure, and weak implementation mechanisms hinder effective CBET delivery.

Conclusion

In conclusion, the purpose of the study was to examine the influence of institutional factors on the development of technical skills among trainees in the CBET programme at technical institutions in Nyeri, Kenya. The findings indicated that institutional resources such as training equipment, workshops, laboratories, learning materials, and the availability of modern technologies positively influence the development of trainees' technical skills. Notably, 46.9% of the trainees indicated that their institutions were equipped with adequate tools and equipment for practical training, and 58.3% of the participants agreed that the workshops and laboratories were well-equipped to support hands-on learning, suggesting that while the facilities were generally adequate for hands-on learning, there was not always enough equipment and tools available to accommodate trainees' needs. Additionally, 59.2% of the trainees stated that materials for the practical session were sufficient, and 59.1% indicated that they had access to modern machines and technologies which meet industry requirements. Therefore, the study concludes that institutional factors generally support the development of technical skills among trainees in technical



institutions in Nyeri County. Nevertheless, a lack of training equipment and resources and limited linkages with industry still hinder the ability to achieve the CBET curriculum objectives. Developing institutions' capacity to provide high-quality technical skills and improving cooperation with industry will help develop industry-relevant technical skills and trainees' employability.

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