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Influence of feedback mechanism on trainee academic performance in national examinations in TVET Institutions in Western Kenya

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Abstract

Feedback mechanism is an integral part of the teaching and learning process since it enables learners and teachers to know where they are in the process, identify whether they have or have not achieved the learning objectives and ultimately enhance the learning process. The purpose of this study was to analyze the nexus of feedback mechanism and trainee academic performance in national examinations in Technical and Vocational Education Training (TVET) institutions in Western Kenya. The study examined how feedback mechanisms from formative assessment influenced trainee academic performance in technical national examinations in TVET institutions in Western Kenya. The study was guided by the social cognitive theory, constructivism theory, and the diffusion of innovation theory. The target population consisted of 406 respondents who included 29 principals, 29 deputy principals in charge of academics, 29 registrars, 29 examination officers, and 290 heads of academic departments in the 29 public TVET institutions in Western Kenya. To have a representative sample, this study employed stratified sampling to select 21 respondents in National Polytechnics and 179 respondents in Technical and Vocational Colleges(TVCs) constituting a sample size of 200 respondents. Questionnaires and interviews were used as data collection instruments. Validity was established through expert opinion with the help of the supervisors. Using Cronbach's alpha, a reliability coefficient of 0.886 was established based on the results of the piloting of the research instruments. Data was analyzed using descriptive and inferential statistics. The study established that formative assessment mechanisms played a critical role in enhancing trainees' academic performance in TVET institutions. It found out that there are strong correlations between feedback clarity, management techniques, and formative assessment scores, emphasizing their predictive value for academic success. The study concludes that the combination of continuous feedback highly influences trainee performance in final examinations in TVET institutions. It advocates for structured feedback systems to support trainees, improve learning experiences, and achieve better academic outcomes.

Keywords: Feedback mechanisms; Academic performance; Trainee; Examinations

1. Introduction

Technical and Vocational Education and Training plays a crucial role in equipping individuals with the practical skills necessary for the workforce. Ideally, TVET institutions should provide high-quality training that aligns with industry standards; ensuring graduates are competent and employable. The Kenya National Examinations Council (KNEC) conducts examinations to assess the knowledge and competency of TVET trainees, serving as a benchmark for their readiness to enter the job market. However, recent trends indicate a concerning pattern of underperformance among TVET institutions and trainees in KNEC technical examinations.

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A study by Nazir *et al.,* (2020) opined that effectiveness of assessment management directly influences the performance of trainees in East African TVET institutions. Well-designed assessments provide valuable feedback, identify areas for improvement, and ensure that graduates are adequately prepared for the workforce. When assessments align with industry expectations, trainees are better positioned to contribute meaningfully to the economic development of the region. Therefore standardizing assessment frameworks and incorporating feedback from employers can further enhance the relevance and effectiveness of assessments. Thus assessment management in East African TVET institutions is a critical aspect of ensuring the quality and relevance of technical and vocational education.

The outcomes of national examinations not only impact individual trainees but also reflect on the overall quality of technical education in Kenya. A thorough examination of assessment management practices can identify strengths, weaknesses, and areas for improvement. Identifying challenges associated with assessment management is crucial for understanding the potential obstacles to optimal trainee performance. According to Nyangweso, Ngeera & Thuba (2022) these challenges may include inadequate resources, inconsistencies in assessment policies, and issues related to the clarity and relevance of exam questions.

Research by Were (2020) identifies significant challenges within the technical education system, particularly regarding formative assessment management, which directly impacts trainee performance in the KNEC examinations. One of the most pressing issues is the non-submission of trainee feedback, which jeopardizes the completeness of evaluations and can unjustly influence students' final academic outcomes. Additionally, there are notable discrepancies between the high marks submitted by trainers and the actual performance of trainees in final examinations as shown in Table 1. These inconsistencies raise serious concerns about the accuracy of assessments and the integrity of the evaluation process.

Table 1 Discrepancies between Mean of Course Work and Mean of Exams Marks

YEAR	SIRIES	MEAN CWA	MEAN EXAM	COURSE TYPE
2022	2	70.89653678	33.59873819	ARTISAN
2022	2	70.49798134	41.00090346	CRAFT
2022	2	70.93280475	41.54763339	DIPLOMA
2022	2	79.67840735	35.42725881	HIGHER DIPLOMA
2022	3	71.98869522	34.98926235	ARTISAN
2022	3	70.30217464	43.52063127	CRAFT
2022	3	71.24463078	41.6712769	DIPLOMA
2022	3	77.68922018	38.97821101	HIGHER DIPLOMA
2023	1	73.32274916	32.74459228	ARTISAN
2023	1	71.95819573	41.52253323	CRAFT
2023	1	73.05373167	40.02013008	DIPLOMA
2023	1	76.89189189	37.53153153	HIGHER DIPLOMA
2023	2	73.20784927	30.67076988	ARTISAN
2023	2	72.14871935	42.52654925	CRAFT
2023	2	73.29987656	42.99851628	DIPLOMA
2023	2	76.41756272	37.32258065	HIGHER DIPLOMA
2023	3	73.58113056	30.04868236	ARTISAN
2023	3	72.34757767	41.57559095	CRAFT
2023	3	73.00888267	42.11820571	DIPLOMA
2023	3	77.66003063	42.34992343	HIGHER DIPLOMA

Source: KNEC Examination Portal, 2024

The high failure rate of 50% per examination sitting further underscores systemic issues within assessment practices. Such a staggering statistic not only reflects poorly on the educational institutions but also raises alarms about the overall quality of technical education being provided. Moreover, there existed irregularities in formative assessment methodologies and grading standards adopted by TVET institutions that show flaws within the system. These challenges have dire consequences for trainees and the broader workforce. The high failure rates and inconsistent assessment practices undermine the employability of graduates, as employers may question the qualifications of the TVET trainees, leading to reduction in securing job opportunities.

A study by Haleem, Qadri and Suman (2022) emphasizes the value of formative assessment managements in enhancing trainee academic performance and readiness for the industry within Kenyan TVET institutions. The research findings underscore the significance of tailored feedback provided through formative assessment management, developed in collaboration with industry stakeholders to identify strengths and areas for improvement among Kenyan trainees. However, there was need for further investigation into the specific mechanisms through which formative assessment managements can be optimized to address the unique challenges faced by TVET institutions in Western Kenya.

1.1. Statement of the Problem

The discrepancies between formative assessments and summative evaluations affect not only trainee grades but also erode trust in the educational system. As a result, many trainees may become demotivated, perpetuating a cycle of poor performance and disengagement from their studies. This coupled with the prevalence and persistent high rate of student failure raises significant apprehensions regarding the efficacy of existing evaluation practices, driving some trainees to drop out of their programs altogether. Such attrition exacerbates the already pressing issue of skill shortages in the workforce, further complicating efforts to enhance employability among graduates. In an ideal scenario, formative assessments would be transparent, consistent, and aligned with the intended learning objectives, fostering an environment where trainees can thrive and achieve their academic goals as envisioned by competence based education and training (CBET). However, the current reality reflects a significant deficit in transparency and precision within formative assessment management practices. This misalignment not only affects trainee performance but also calls into question and jeopardizes the integrity and dependability of the entire technical and vocational education system. Therefore, it is imperative to address these pressing challenges to uphold the integrity of the formative assessment management process to curb against potential wastage and low external efficiency. By investigating the underlying issues contributing to the discrepancies in trainee performance and assessment practices, this study aims to enhance the quality of technical and vocational education and improve student achievement levels in KNEC examinations. Ultimately, addressing these challenges is essential for ensuring that TVET graduates are equipped with adequate knowledge, skills and competencies necessary for successful employment in a competitive job market.

1.2. Objectives of the Study

The specific objective of the study was to determine the influence of feedback mechanism from formative assessment on trainee academic performance in national examinations in TVET institutions in Western Kenya

1.3. Research Hypothesis

This study was guided by the following research hypothesis; H_{01}; *There is no significant statistical association between formative assessment management feedback mechanisms and trainee academic performance in examinations in TVET institutions in Western Kenya.*

1.4. Theoretical Framework

This study is grounded in three key theories: Social Cognitive Theory, Constructivism, and Diffusion of Innovations Theory, which collectively provide a framework for understanding how trainees acquire knowledge and adopt innovative practices in Technical and Vocational Education and Training (TVET) institutions.

- Social Cognitive Theory, proposed by Albert Bandura, emphasizes observational learning, self-efficacy, and the reciprocal relationship between personal, environmental, and behavioural factors. It highlights how trainers and trainees learn from one another, suggesting that self-beliefs significantly impact performance. This theory is particularly relevant for formative assessment management, as it underscores the importance of creating supportive learning environments that foster skill development through observation and interaction.
- Constructivism, attributed to scholars like Jean Piaget and Lev Vygotsky, posits that learners actively construct knowledge through experiences and social interactions. It advocates for active engagement and collaborative learning, essential for developing critical thinking and problem-solving skills. In the context of formative

assessment, constructivist principles can enhance feedback mechanisms by promoting personalized learning experiences that accommodate individual differences and prior knowledge.

- Diffusion of Innovations Theory, developed by Everett Rogers, examines how new ideas spread through social systems. It identifies factors influencing adoption, such as perceived advantages and communication channels. This theory is crucial for understanding how assessment management strategies can be effectively implemented and adopted by trainees. It provides insights into the dynamics of acceptance and adaptation of new technologies in educational contexts.

Together, these theories inform the design of formative assessment feedback mechanisms that not only enhance trainee performance but also facilitate the adoption of innovative educational practices within TVET institutions. By integrating these theoretical perspectives, the study aims to create a comprehensive approach to improving assessment strategies and learner outcomes.

1.5. Conceptual Framework

The conceptualize framework as shown in figure 1.1 below was designed to show how the independent variable; assessment feedback mechanism influences the dependent variable; trainee academic performance in KNEC exams. The intervening variables government policies and examination policies which are subject to change may be external factors that affect the trainee academic performance though in this study their effect was not analyzed due to resource limitations.
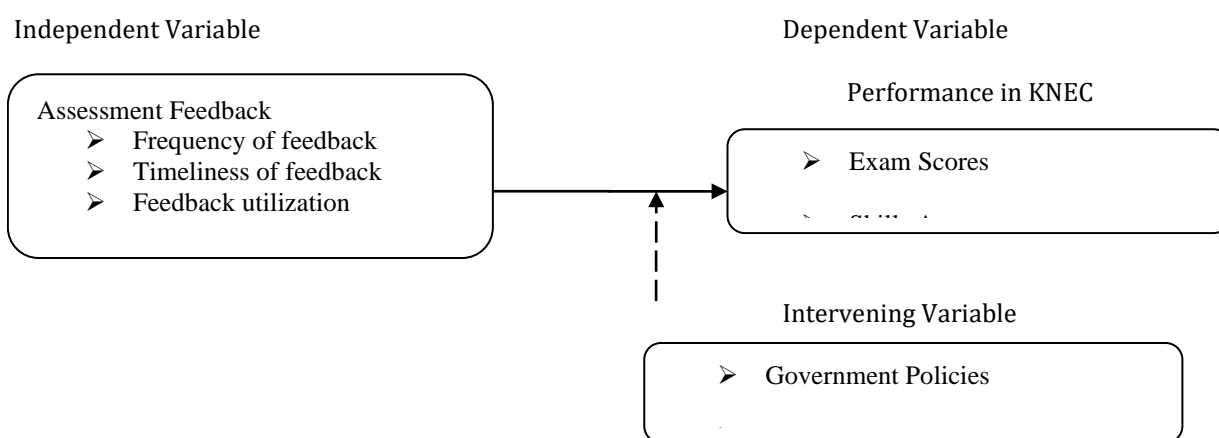
Figure 1 Conceptual Framework.

Source: Researcher, 2024.

2. Literature Review

This chapter discusses the gaps in the existing literature by various authors through a review of other literature on assessment management and trainee performance in KNEC examinations. Accordingly, the following aspects were examined: formative assessment feedback mechanisms and trainees' academic performance in public TVET institutions in Western Kenya, Kenya.

2.1. Formative Assessment Management Feedback Mechanisms and Trainees Academic Performance

The research on formative assessment management feedback in TVET institutions in Kenya highlights the critical role of tailored assessment strategies in enhancing trainee academic performance. Amado (2019) emphasized the importance of formative assessment in guiding trainees toward improvement. However, the current study aims to identify specific strategies relevant to the unique context of TVET institutions in Western Kenya to maximize effectiveness. Žalėnienė and Pereira (2021) focused on collaboration between TVET institutions and industry stakeholders, stressing the need for industry-relevant feedback mechanisms. Yet, the study lacked exploration of cultural factors that may influence the implementation of formative assessments in Western Kenya. Similarly, Haleem,

Qadri, and Suman (2022) noted the value of tailored feedback but called for further investigation into optimizing formative assessments to address local challenges.

Smith (2020) highlighted how formative assessment feedback bridges theory and practice, yet did not fully explore the unique institutional contexts affecting its effectiveness in Western Kenya. Thabede (2020) reinforced the importance of continuous feedback in aligning trainee skills with industry requirements, while also identifying the need for more research on specific challenges faced by trainees in the region. DeLuca, Ricke, and Coombs (2021) stressed integrating formative assessments to evaluate trainee performance comprehensively but noted a gap in addressing specific academic challenges in Western Kenya. Majiya (2023) discussed the ongoing support provided by formative assessment feedback, suggesting a need for research on its long-term impacts on academic performance and career readiness.

Nazir et al. (2020) emphasized portfolio assessments but did not delve into enhancing them for targeted feedback. Marope, Chakroun, and Holmes (2021) highlighted workplace-based assessments while calling for investigations into optimizing these assessments for local challenges. Nyangweso, Ngeera, and Thuba (2022) underscored the importance of diverse assessment methods in evaluating trainee performance. Their study revealed a gap in understanding how these methods, guided by formative assessment principles, could specifically impact academic performance in Western Kenya's TVET institutions. The current study aims to address this gap by exploring how tailored formative assessment strategies can enhance trainee outcomes and facilitate successful workforce entry.

2.2. Trainee Academic Performance

The landscape of TVET in Europe and Africa is evolving, with assessment management strategies significantly impacting trainee performance. Yusop *et al.,* (2022) highlight the importance of competency-based assessments in Europe, emphasizing their alignment with industry needs, which enhances practical skills and employability. The European Centre for the Development of Vocational Training (ECDVT) underscores work-based learning, as discussed by Hashim and Hamidon (2022), where trainees apply theoretical knowledge in real-world settings, improving performance. Digitalization, highlighted by Mafaralala (2020), streamlines assessment processes, engaging trainees through interactive tools that cater to diverse learning styles. The European Qualifications Framework (EQF) standardizes qualifications across Europe, facilitating recognition and enhancing trainees' job market prospects. In Asia, project-based assessments, noted by Liu, Geertshuis, and Grainger (2020) foster critical thinking and problem-solving skills, while industry linkages ensure assessments meet current market demands, improving performance. In Africa, Nyangweso (2022) emphasizes contextually relevant assessments that align with local socio-economic factors, positively influencing performance. The African Union's Strategy for TVET advocates practical assessments that simulate real-world environments. Community engagement, as discussed by Osumbah and Wekesa (2023), strengthens connections between TVET institutions and local communities, enhancing motivation.

In Kenya, practical assessments and the Competency-Based Education and Training (CBET) framework ensure relevance to the job market, while continuous assessment promotes deeper understanding and knowledge retention. Aligning assessments with national development goals, such as Kenya's Vision 2030, ensures trainees acquire relevant skills for socio-economic growth. The literature highlights the significance of practical assessments, the CBET framework, continuous assessment, and alignment with national priorities in enhancing TVET program effectiveness. These factors collectively prepare trainees for local job market demands, setting the stage for the current study on KNEC examination performance in Bungoma County.

2.3. Gaps of literature review

The literature on assessment management and trainee performance in Kenya's TVET sector reveals significant gaps. Much of the existing research is generalized, lacking a focus on the unique socio-economic and cultural factors that influence formative assessment and academic performance in Kenya. A context-specific approach is necessary to develop targeted strategies that meet the country's distinct needs (Karani & Waiganjo, 2022). While Kenya has implemented CBET, there is insufficient understanding of its challenges, successes, and impact on formative assessment. Research is needed to explore how CBET aligns with global practices (Njenga, 2022). The effectiveness of industry linkages in Kenya's TVET remains underexplored, particularly regarding their influence on assessment management and trainee performance. The integration of technology in TVET assessments also lacks specificity related to Kenya's context, necessitating research on technology adoption and its effects on assessment practices (Erima, 2021). Furthermore, understanding how inclusive education policies impact assessment fairness and trainee outcomes is crucial. Addressing these gaps will enhance comprehension of formative assessment management in Kenya's TVET sector, guiding policymakers and educators to developing effective interventions.

3. Research Methodology

3.1. Research Design

This study utilized a mixed-method research design, effective for analyzing educational settings within social contexts (Casteel & Bridier, 2021). This approach facilitated the collection of relevant data from a larger respondent pool (Lohr, 2021) and allowed natural observation of phenomena without manipulation. The study focused on public TVET institutions in Bungoma, Busia, Kakamega and Vihiga counties in Western Kenya, a region with a population of approximately 6.346 million (2019 census). The inhabitants of these counties value TVET education highly and have invested in it heavily.

3.2. Target Population

The target population was 406 who included 29 principals, deputy principals, registrars, examination officers, and 290 heads of academic departments from all the TVET institutions in Western Kenya region (Kenya Association of Technical Training Institutions, 2024).

3.3. Sampling Size and Sampling Techniques

Stratified sampling was used to ensure representativeness across National Polytechnics and Technical and Vocational Colleges (TVCs), resulting in a sample size of 200, with 21 from National Polytechnics and 179 from TVCs. There were 3 National Polytechnics and 26 TVCs thus the proportion of National Polytechnics to TVCS was 3:26; thus the Proportion of National Polytechnics = 3 / 29 ≈ 0.103; Proportion of TVCs = 26 / 29 ≈ 0.897. According to Casteel and Bridier (2021) the ideal sample size for the study (n) is 200. Therefore the sample size for National Polytechnics = 0.103 * 200 ≈ 20.6 (Round up to 21) while the sample size for TVETs = 0.897 * 200 ≈ 179.4 (Round down to 179). Purposive sampling was used to select the Principals, Deputy Principals in charge of academics (DPAC) and registrars and examination officers while simple random sampling was used to identify the heads of academic departments (HODS Academic).

3.4. Data Collection and Analysis Methods

Data collection involved use of questionnaire and interviews schedules. Validity was assessed through content, face, and construct measures, while reliability was determined using Cronbach's alpha which achieved a coefficient of 0.886. A pilot study refined the instruments and addressed potential issues. The analysis of data was conducted using descriptive statistics to obtain frequencies, percentages, standard deviations, and means. Prior to this analysis, the collected data were coded systematically to ensure accuracy and consistency. Each response was assigned a numerical code that facilitated the organization and interpretation of the data. The results were then presented using bar graphs, pie charts, and frequency tables. Additionally, regression analysis was utilized to determine the relationship between the independent and dependent variables under study.

4. Presentation and Discussion of Study Findings

This study sought to determine the influence of formative assessment feedback mechanisms and trainee academic performance in Western Kenya region. The results were analyzed and presented using both descriptive and inferential statistics.

4.1. Descriptive statistics Results

The descriptive statistics presented for each indicator reflect responses from 160 participants, including deputy principals, registrars, examination officers, and heads of academic departments, using a Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). These quantitative insights are complemented by qualitative data from 12 principals. The assessed variables include perceptions of feedback clarity, usefulness, alignment with learning objectives, engagement, timeliness, administrative support, and regularity of feedback sessions, with findings detailed in Table 2.

The study's findings reveal insights into formative assessment feedback mechanisms in TVET institutions, based on responses from 160 participants and qualitative data from 12 principals. Mean scores for feedback clarity, usefulness, and alignment with learning objectives, engagement, timeliness, administrative support, and regularity ranged from 3.26 to 3.30, indicating general agreement but substantial variability in perceptions. Principals noted that while feedback was often clear and constructive, it sometimes lacked specificity. They observed that, *"While feedback often connects to broader learning goals, it sometimes fails to address specific objectives directly".* Further they observed that the feedback lacked interactive elements that may lead to impacting engagement as they noted that, *"While feedback is*

occasionally engaging, it often lacks interactive elements that could enhance participant involvement". For instance, they mentioned that feedback sessions are typically one-way communications with limited opportunities for dialogue and expressed *"a desire for more engaging feedback methods, such as discussions or interactive feedback tools, to make the process more dynamic".* Timeliness was generally perceived positively, though delays were reported to diminish feedback effectiveness. Based on the qualitative data obtained from Principals, many noted that while feedback is generally timely, there are instances of delays that impact its effectiveness. For example, Principals reported that; "*Delays in receiving feedback by trainees can diminish its relevance and usefulness".* In addition Principals revealed that while feedback sessions are held, they are often not frequent enough to facilitate continuous improvement as they noted that; *"Infrequent feedback sessions limit their ability to make timely adjustments and improvements".* Administrative support varied, with some institutions providing robust backing while others fell short. The Principals were however unanimous that it was insufficient and expressed a; *"Need for more consistent administrative involvement in feedback processes to enhance their effectiveness".*

Table 2 Descriptive Statistics

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
Clear feedback	160	1	5	3.26	1.357
Understandable	160	1	5	3.29	1.394
Aligned to learning objectives	160	1	5	3.13	1.340
Engaging Actively	160	1	5	3.30	1.379
Timely Feedback	160	1	5	3.27	1.350
Supportive	160	1	5	3.28	1.356
Regular	160	1	5	3.27	1.363
Valid N (listwise)	160				

Source: Field Data 2024

The study emphasizes the need for clearer, more actionable feedback aligned with learning objectives, as well as increased engagement through interactive methods. Strengthening administrative support and increasing the frequency of feedback sessions are also critical for fostering continuous improvement. By addressing these factors, TVET institutions can enhance the effectiveness of feedback mechanisms, leading to more meaningful learning experiences and improved academic outcomes for trainees.

4.2. Normality Tests Formative Assessment Management Feedback Mechanisms
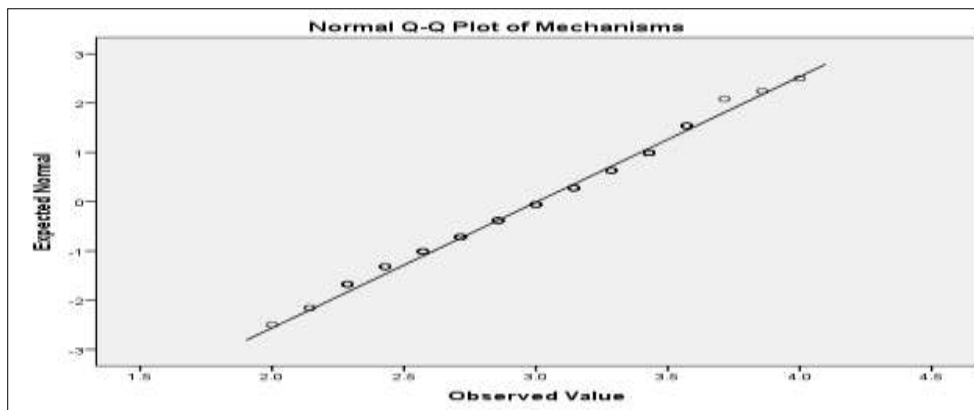
Figure 2 Displays the Normal Q-Q Plot for the "Feedback Mechanisms" variable, assessing the normality of the dataset. The plot compares observed values to those expected under normal distribution, with points near the diagonal indicating a normal distribution. Most points align closely with the diagonal, suggesting that the data approximately follows a normal distribution, although slight deviations at both ends indicate minor departures from normality. These deviations are minimal and do not significantly impact the overall assessment. The visual inspection supports the assumption of normality, allowing for the application of parametric tests, which enhances the robustness and reliability

of statistical analyses. This, in turn, strengthens the credibility of findings regarding how various feedback mechanisms influence trainee academic performance in TVET institutions.

4.3. Regression Analysis Findings

The regression analysis conducted in this study provides substantial evidence of a significant relationship between formative assessment feedback mechanisms and trainee academic performance in TVET institutions. The model summary indicates a very strong positive correlation ($R = 0.993$) and an R-squared value of 0.986, suggesting that approximately 98.6% of the variance in trainee academic performance can be explained by the feedback mechanisms. The low standard error (0.02854) further validates the model's precision.

ANOVA results confirm the model's efficacy, with a high F-statistic (11,217.336) and a p-value of 0.000, indicating that the predictor variable significantly enhances the model's explanatory power. The coefficients reveal that a one-unit increase in formative assessment feedback mechanisms results in a 0.975 unit increase in trainee performance, underscoring the predictor's strong influence.

The findings reject the null hypothesis; H_{01} that*; there is no significant statistical association between formative assessment management feedback mechanisms and trainee academic performance in examinations in TVET institutions in Western Kenya*, highlighting the critical role of formative assessment feedback in improving trainee' academic outcomes in the TVET sector. Recommendations include prioritizing clear, actionable feedback, regular sessions, and administrative support to enhance educational practices in TVET institutions. Overall, the study emphasizes formative assessments as vital for fostering trainee success.

The findings highlight the essential role of formative assessment feedback mechanisms in enhancing trainee academic performance in TVET institutions. Prioritizing these feedback strategies can significantly improve educational outcomes by bridging the gap between current performances and learning goals. Effective implementation includes regular feedback sessions, personalized feedback addressing individual strengths and weaknesses, and alignment with learning objectives. The study emphasizes the importance of timely and constructive feedback to foster a continuous improvement environment, ultimately contributing to academic success.

5. Conclusion

This study concludes that formative assessment feedback mechanisms significantly influence trainee academic performance in TVET institutions in Western Kenya. The findings underscore the need for tailored strategies to optimize these mechanisms, ensuring they effectively address the unique challenges faced by trainees.

5.1. Recommendations

Based on the findings, the study made the following recommendations on formative assessment management feedback mechanisms to realize improved performance of TVET trainees in national examinations:

Institutions should establish structured feedback systems that emphasize clarity and timeliness. This actionable feedback will help trainees identify areas for improvement, directly impacting their performance in exams.

Continuous professional development programs for educators are essential. Training should focus on effective formative assessment strategies, ensuring that educators can implement these techniques to enhance trainee outcomes.

TVET institutions should adopt a variety of formative assessment methods, such as practical assessments and peer evaluations. This diversity caters to different learning styles and promotes a comprehensive understanding of vocational skills, positively affecting academic performance.

Institutions should implement regular monitoring and evaluation processes. This will allow for continual assessment of the effectiveness of formative assessment strategies, enabling timely adjustments to enhance their impact on academic performance in national examinations.

Compliance with ethical standards

Statement of informed consent

Informed consent was obtained from all individual respondents who participated in this study.

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