

Class Attendance Frequency and Timely Program Completion in Public TVET Institutions: The Moderating Role of Institutional Structural Factors in Trans-Nzoia County, Kenya

Matui Saleh Nawaji¹, Jane Barasa², Ben Nyongesa³

¹Graduate Student, Kibabii University, Kenya

²Senior Lecturer, Department of Educational Planning and Management, Kibabii University, Kenya

³Senior Lecturer, Department of English, Literature, Journalism & Mass Communication, Kibabii University, Kenya

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ABSTRACT

Background/Purpose: Delayed program completion under Competency-Based Education and Training (CBET) frameworks remains a major challenge within Kenya's vocational training sector, threatening public investments and skilled workforce supply. This study examined the influence of class attendance frequency on program completion within the standard duration and evaluated whether institutional structural factors moderate this relationship among trainees in public Technical and Vocational Education and Training (TVET) institutions in Trans-Nzoia County, Kenya.

Methodology: Rooted in a post-positivist philosophy, the study adopted a descriptive, cross-sectional survey design alongside concurrent document analysis. The target population comprised 1,770 trainees across three public TVET institutions (Kitale National Polytechnic, Kiminini Technical and Vocational College, and Endeless Technical Training Institute). A sample of 326 trainees was selected using stratified random sampling. Primary data were gathered via structured 5-point Likert-scale questionnaires, while institutional documents were systematically reviewed using a standardized checklist. Data analysis was executed via descriptive statistics and Hierarchical Binary Logistic Regression analysis to test direct and interaction pathways.

Findings: Descriptive analysis showed that while class attendance frequency was generally high, 25.5% of trainees still faced delayed program completion. Hierarchical logistic regression revealed that class attendance frequency alone was not a statistically significant direct predictor of timely completion after controlling for trainee baseline characteristics ($\beta = -0.158$, $p = 0.654$). However, institutional structural factors exerted a significant positive direct effect ($\beta = 0.842$, $p = 0.028$) and a highly significant positive moderating interaction effect on the relationship ($\beta = 1.241$, $p = 0.017$). This establishes a structural threshold effect, demonstrating that regular attendance only yields timely graduation when supported by functional institutional systems. Differential effects were observed across program tiers, with certificate levels and sub-county colleges displaying higher vulnerability to administrative lags.

Conclusion/Policy Implications: The study concludes that improving trainee attendance is a necessary but insufficient condition for timely program completion unless it is matched by robust institutional capacity. TVET administrators and policymakers should prioritize systemic structural interventions. These include enhancing CBET infrastructure, streamlining external competency assessment scheduling, reducing administrative bottlenecks, and optimizing resource coordination to ensure student engagement effectively translates into timely program completion.

Keywords: Class Attendance Frequency, Institutional Structural Factors, Timely Program Completion, TVET, CBET, Trans-Nzoia County.

INTRODUCTION

Technical and Vocational Education and Training (TVET) has increasingly become a strategic pillar of national development agendas due to its central role in producing skilled human capital for employment, entrepreneurship, and technological innovation. In both developed and developing economies, TVET systems are undergoing reforms aimed at improving the relevance and quality of training in response to rapid changes in labour market demands and technological advancement (UNESCO, 2022; OECD, 2023). These reforms have shifted emphasis from mere expansion of access to the efficiency and effectiveness of training systems, particularly under competency-based education frameworks that prioritize demonstrable skills and workplace readiness (International Labour Organization [ILO], 2023). Consequently, attention has increasingly moved beyond enrolment and graduation rates to focus on timely program completion as a key indicator of institutional efficiency. Timely completion reflects the ability of TVET systems to convert training inputs into qualified graduates within the prescribed duration, thereby reducing training costs, improving institutional productivity, and facilitating smooth transition into the labour market (World Bank, 2021; UNESCO, 2022).

While access and enrolment in Technical and Vocational Education and Training (TVET) have expanded significantly across many countries, increasing attention is being directed toward timely program completion as a critical measure of training system performance. Timely completion is not only an academic milestone but also a key indicator of efficiency, institutional productivity, and return on public investment in education and training systems. Delays in program completion often translate into increased training costs, overcrowding of training cohorts, and delayed entry of skilled graduates into the labour market, thereby weakening the responsiveness of TVET systems to economic demands (World Bank, 2021; OECD, 2023). From a policy perspective, prolonged training duration undermines workforce planning and delays the supply of skilled labour required for industrial and economic development (UNESCO, 2022). At the individual level, extended time-to-completion can also affect trainee motivation, financial burden, and transition opportunities into employment or entrepreneurship, thereby reducing the overall effectiveness of vocational training pathways (International Labour Organization [ILO], 2023). Consequently, timely program completion has become a central concern in evaluating the quality and effectiveness of TVET institutions globally.

Class attendance frequency has been widely recognized as a fundamental determinant of student engagement and academic success because it directly reflects the extent to which learners participate in structured instructional processes. In competency-based education and training (CBET) systems, such as those implemented in technical and vocational institutions, learning is highly practice-oriented and requires continuous participation in both theoretical and practical sessions to achieve mastery of occupational competencies (UNESCO, 2022; International Labour Organization [ILO], 2023). Regular attendance ensures consistent exposure to instructional content, timely feedback from instructors, and adequate opportunity for skill development, all of which are essential for progression through modular training frameworks. Empirical evidence suggests that students who consistently attend classes are more likely to perform better academically and complete their studies within expected timelines compared to those with irregular attendance patterns (OECD, 2023; World Bank, 2021). However, despite this established relationship, the extent to which attendance frequency translates into timely program completion within CBET-based TVET institutions remains underexplored, particularly in contexts where institutional and structural constraints may influence the effectiveness of student participation.

Empirical studies have consistently demonstrated a positive association between class attendance and academic performance, although much of this evidence originates from general higher education contexts rather than competency-based technical training environments. For instance, large-scale meta-analytic and longitudinal studies have shown that students with higher attendance rates tend to achieve better academic outcomes due to increased exposure to instructional content, structured learning activities, and continuous assessment opportunities (Credé, Roch, & Kieszczynka, 2010; Romer, 1993). Similarly, Marburger (2006) found that absenteeism negatively affects examination performance, highlighting the importance of consistent class participation in enhancing learning outcomes. However, while these studies establish a strong link between attendance and academic achievement, they primarily focus on grade performance rather than time-bound completion outcomes. More recent educational research further suggests that although attendance improves engagement and persistence, its predictive power may be influenced by institutional and contextual factors that

shape how learning opportunities are delivered and assessed (OECD, 2023; World Bank, 2021). This creates an unresolved gap in understanding whether attendance frequency directly translates into timely program completion, particularly within competency-based TVET systems where progression depends on mastery of practical competencies rather than traditional examination performance.

The pursuit of timely program completion has become particularly important in Sub-Saharan Africa, where many governments have adopted competency-based Technical and Vocational Education and Training (TVET) reforms to improve workforce readiness and address persistent youth unemployment. In Kenya, the transition to Competency-Based Education and Training (CBET) has redefined training delivery by emphasizing mastery of occupational competencies through continuous assessment, practical learning, and industry-responsive curricula. These reforms, coordinated through the TVET Authority (TVETA) and the Curriculum Development, Assessment and Certification Council (CDACC), are intended to enhance the quality, relevance, and efficiency of vocational training (Ministry of Education, 2019; TVET Authority, 2023). Despite these policy initiatives, evidence indicates that many public TVET institutions continue to experience delayed program completion arising from learner absenteeism, financial constraints, administrative bottlenecks, and inconsistencies in the implementation of CBET assessment processes (Ngware et al., 2022; Amuka, 2019). These challenges suggest that while individual trainee behaviours such as regular class attendance remain important, their influence on timely program completion may depend on the broader institutional environment within which training is delivered.

Kenya has made significant progress in reforming Technical and Vocational Education and Training through the adoption of Competency-Based Education and Training (CBET), an approach intended to align training with occupational standards and labour market needs. Under this framework, trainees are expected to demonstrate competence through continuous assessment and practical performance rather than relying solely on end-of-course examinations. The implementation of CBET has been supported by institutional and regulatory bodies, including the Curriculum Development, Assessment and Certification Council (CDACC), whose mandate is to develop occupational standards, coordinate competency assessments, and facilitate certification of trainees. Despite these reforms, timely program completion remains a persistent concern in many public TVET institutions. Delays continue to arise from institutional challenges such as inconsistencies in CBET implementation, scheduling of competency assessments, resource constraints, administrative inefficiencies, and variations in institutional support systems, all of which may hinder trainees from completing their programs within the prescribed duration even when they actively participate in learning activities (Ngware et al., 2022; TVET Authority, 2023; Ministry of Education, 2019).

Although previous studies have consistently reported positive associations between class attendance and academic performance, most have examined outcomes such as examination scores, grade point averages, or general academic persistence rather than completion within the prescribed program duration (Credé et al., 2010; Marburger, 2006). Within the TVET sector, existing studies have similarly concentrated on trainee engagement, retention, or institutional performance, with limited attention to timely program completion under competency-based training systems. Furthermore, the few studies conducted within the Kenyan TVET context have generally examined trainee characteristics and institutional factors as independent determinants of educational outcomes, providing little empirical evidence on how institutional structural factors may modify the relationship between class attendance frequency and program completion. Consequently, it remains unclear whether regular attendance alone is sufficient to facilitate timely completion or whether its influence depends on the institutional conditions under which training is delivered. This knowledge gap is particularly evident in public TVET institutions implementing CBET in Trans-Nzoia County, where empirical evidence on these relationships remains limited.

Despite sustained government investment in TVET reforms and the implementation of the Competency-Based Education and Training framework, delayed program completion continues to be reported in many public TVET institutions in Kenya. Failure to complete programs within the prescribed duration has implications beyond individual trainees, including increased institutional costs associated with prolonged training, congestion arising from accumulated cohorts, inefficient utilization of instructional resources, and delayed entry of skilled graduates into the labour market. These delays may also reduce the expected returns on government investment in TVET by slowing the supply of competent technical personnel required to support national development priorities.

Although trainee attendance is widely acknowledged as an important contributor to academic success, there remains insufficient empirical evidence on whether regular class attendance promotes timely program completion within CBET-oriented public TVET institutions or whether this relationship is influenced by institutional structural factors. Addressing this gap is essential for informing institutional policies and strengthening interventions aimed at improving program completion within the prescribed duration.

Against this background, the present study examined the influence of class attendance frequency on program completion within the prescribed duration and assessed whether institutional structural factors moderate this relationship among trainees in public TVET institutions in Trans-Nzoia County, Kenya. Specifically, the study sought to determine the influence of frequent class attendance on timely program completion and to establish whether institutional structural factors strengthen or weaken the relationship between class attendance frequency and program completion within the standard duration. To guide the empirical investigation, the study tested the following null hypotheses:

H₀₁: Class attendance frequency has no statistically significant influence on program completion within the standard duration in public TVET institutions in Trans-Nzoia County, Kenya.

H₀₂: Institutional structural factors do not significantly moderate the relationship between class attendance frequency and program completion within the standard duration in public TVET institutions in Trans-Nzoia County, Kenya.

LITERATURE REVIEW

Class Attendance Frequency and Timely Program Completion

Class attendance frequency refers to the regularity with which trainees participate in scheduled learning activities throughout the duration of their training program. Within educational research, attendance is widely regarded as a behavioural indicator of learner engagement because it reflects students' commitment to academic activities and their willingness to participate in structured learning experiences. In Technical and Vocational Education and Training (TVET), particularly under Competency-Based Education and Training (CBET), regular attendance assumes even greater significance because competence is developed through continuous interaction with instructors, repeated practice of occupational skills, and progressive assessment of learning outcomes. Unlike conventional knowledge-based education, where learners may compensate for missed classes through independent study, CBET emphasizes practical demonstrations, workplace simulations, and continuous competency assessment, making consistent attendance an essential condition for successful progression through the training program (UNESCO, 2022; International Labour Organization [ILO], 2023). Consequently, attendance frequency is increasingly viewed not merely as a measure of physical presence but as an important behavioural factor that supports competence acquisition, academic progression, and eventual program completion.

Evidence from international studies consistently demonstrates that regular class attendance is one of the strongest behavioural predictors of student success across different educational settings. A landmark meta-analysis by Marcus Credé, Sylvia G. Roch, and Urszula M. Kieszczynka found that class attendance exhibited a stronger relationship with academic performance than many traditional predictors, including prior academic achievement and standardized admission measures. More recent studies have reinforced these findings by showing that consistent attendance enhances learner engagement, participation in formative assessments, and overall course performance, thereby improving students' likelihood of progressing successfully through their programs (Lu & Cutumisu, 2022; Kassarnig et al., 2018). Although much of this evidence originates from universities and general higher education contexts, the underlying explanation remains consistent: regular attendance increases opportunities for interaction with instructors, collaborative learning, timely feedback, and continuous monitoring of student progress. These mechanisms are particularly relevant to competency-based training environments, where learning outcomes depend on sustained participation in both theoretical instruction and practical skill development. Nevertheless, existing international studies have largely concentrated on academic achievement

and course performance, with relatively limited attention given to whether regular attendance predicts **timely program completion**, especially within competency-based TVET systems.

Within the African context, empirical evidence examining the direct relationship between class attendance frequency and timely program completion in Technical and Vocational Education and Training (TVET) remains limited. Nevertheless, studies conducted across higher education and vocational training institutions consistently indicate that regular participation in learning activities is associated with improved academic engagement, persistence, and progression toward program completion. For example, research from South Africa has shown that students who consistently participate in scheduled learning activities are more likely to remain engaged with their studies and achieve favourable academic outcomes, particularly where institutional support mechanisms reinforce student participation (Cilliers et al., 2018). Similarly, studies conducted in Ghana and Nigeria have reported that absenteeism is associated with lower academic achievement, reduced student persistence, and increased likelihood of delayed completion, especially among learners experiencing financial and institutional challenges (Nyamapfene, 2010). Collectively, these studies suggest that although regular attendance promotes learner success, its contribution to timely program completion may depend on the institutional conditions under which learning occurs. However, evidence from African TVET institutions implementing competency-based training remains sparse, leaving uncertainty regarding whether attendance alone is sufficient to facilitate completion within the prescribed duration.

In Kenya, empirical studies examining class attendance as a direct predictor of timely program completion in public TVET institutions remain limited. Existing research has instead focused on the implementation of Competency-Based Education and Training (CBET), instructional quality, trainee engagement, and institutional preparedness. For example, Technical and Vocational Education and Training Authority has reported that the successful implementation of CBET depends on regular learner participation, effective instructional delivery, and continuous competency assessment, all of which require consistent attendance by trainees. Recent studies have similarly shown that although Kenyan TVET institutions have made considerable progress in implementing CBET, challenges related to trainer preparedness, infrastructure, assessment processes, and institutional capacity continue to affect the quality of training and learner progression (Kipngetich et al., 2021; Kibet et al., 2024). Likewise, a case study of Nyeri National Polytechnic found that incomplete implementation of CBET practices constrained the realization of competency-based learning outcomes despite ongoing policy reforms. These findings suggest that while regular class attendance is likely to enhance trainee learning and progression, its influence on timely program completion may be contingent upon the institutional environment within which competency-based training is delivered.

Although existing international, African, and Kenyan studies consistently suggest that class attendance is positively associated with student engagement, academic performance, and progression, the evidence remains largely concentrated on traditional academic achievement outcomes rather than timely program completion within competency-based training systems. In addition, most empirical studies have examined attendance as a direct predictor of student success, with limited attention given to the contextual conditions under which this relationship may be strengthened or weakened. In the TVET context, particularly under Competency-Based Education and Training (CBET), learning outcomes depend not only on learner participation but also on institutional processes such as assessment scheduling, availability of training resources, and implementation fidelity of competency standards. This implies that even where trainees maintain regular attendance, timely program completion may still be influenced by institutional structural factors that shape how effectively training is delivered and assessed. Consequently, there exists a clear gap in the literature regarding whether class attendance frequency directly predicts timely program completion in CBET-oriented TVET institutions and whether this relationship is contingent upon institutional structural conditions. This gap is particularly evident in Kenyan public TVET institutions, where empirical studies integrating trainee behavioural factors and institutional structural moderators remain scarce, especially within specific county contexts such as Trans-Nzoia.

Institutional Structural Factors as a Moderator

Institutional structural factors in Technical and Vocational Education and Training (TVET) refer to the internal organizational, administrative, and instructional systems that shape how training programs are designed, implemented, and assessed. These factors represent the enabling or constraining environment within which

learning occurs, thereby shaping both the quality and efficiency of training delivery. To provide a granular diagnostic view of how these institutional realities manipulate student outcomes, these factors are explicitly disaggregated into four core sub-dimensions:

- **Infrastructure Capacity:** This encompasses physical workshop adequacy, availability of modern industry-matched equipment, tools, and consumable training resources required under CBET guidelines to facilitate hands-on learning.
- **External and Internal Assessment Systems:** This concerns the reliability, predictability, and efficiency of competency evaluations managed internally and externally by assessment bodies like TVET CDACC, including timeline turnarounds for verification and grading.
- **Administrative Efficiency:** This addresses internal institutional management practices, such as modular enrollment processing, fee collection architectures, financial auditing rules, and official record-keeping speed.
- **Trainer Capacity and Preparedness:** This evaluates the training, pedagogical orientation, and continuous professional adjustment of instructional faculty regarding the operational delivery of competency-based curricula.

Within competency-based education and training (CBET) systems, institutional structures play a critical role in determining whether trainees are able to translate instructional exposure into demonstrable occupational competencies within the expected time frame. Unlike learner-level characteristics such as attendance or motivation, institutional structural factors represent the enabling or constraining environment within which learning occurs, thereby shaping both the quality and efficiency of training delivery. Consequently, even when trainees consistently attend classes, deficiencies in institutional structures may limit effective learning progression and delay program completion, while strong institutional systems may enhance the impact of attendance on timely completion (UNESCO, 2022; World Bank, 2021; TVET Authority, 2023).

International research on educational effectiveness consistently indicates that institutional structural conditions play a significant role in shaping student learning outcomes, persistence, and program completion across different education systems. Studies in higher education and vocational training contexts have shown that well-resourced institutions with adequate instructional facilities, effective academic management systems, and strong curriculum implementation frameworks tend to record higher student retention and completion rates compared to institutions with weaker structural capacity (OECD, 2023; World Bank, 2021). For example, research in competency-based and skills-oriented education systems suggests that the availability of workshops, laboratories, and learning materials significantly enhances the effectiveness of instructional delivery and improves students' ability to acquire practical competencies within expected timeframes (UNESCO, 2022). Similarly, institutional governance and assessment efficiency have been identified as critical determinants of timely progression, as delays in evaluation and certification processes often extend the duration of training even when learners are actively engaged in coursework (OECD, 2023). These findings collectively suggest that institutional structural factors do not operate in isolation but interact with learner-level behaviours, such as attendance and engagement, to influence educational outcomes, including program completion timelines.

Across many Sub-Saharan African education and training systems, institutional structural factors have been widely identified as key determinants of student learning outcomes, progression, and program completion. Studies conducted in technical and vocational institutions in countries such as Ghana, Nigeria, and South Africa indicate that inadequate training infrastructure, insufficient workshop equipment, limited instructional materials, and inconsistent implementation of competency-based curricula often constrain effective skills acquisition and delay student progression (Ayonmike & Okeke, 2016; Akoojee, 2019). In addition, weak institutional management systems and delays in assessment and certification processes have been shown to negatively affect the timely completion of training programs, even among students who remain actively engaged in learning activities. For instance, research in South African TVET colleges has highlighted that institutional inefficiencies and resource constraints can significantly reduce the effectiveness of training delivery, thereby affecting both learner performance and completion rates. Similarly, studies in West African vocational institutions have shown that institutional capacity strongly influences student persistence and transition through training programs, suggesting that learner-level behaviours alone are insufficient to explain completion outcomes. These findings imply that institutional structural conditions not only shape the quality of instruction but may also determine the extent to which learner engagement translates into successful program completion within expected timeframes.

In Kenya, the implementation of Competency-Based Education and Training (CBET) within public Technical and Vocational Education and Training (TVET) institutions has been accompanied by significant institutional restructuring aimed at improving training relevance, assessment quality, and alignment with labour market needs. Despite these reforms, empirical evidence indicates that many TVET institutions continue to face structural challenges that affect the efficiency of training delivery and student progression. Studies have reported persistent inadequacies in training infrastructure, including insufficient workshops, outdated equipment, and limited access to modern instructional materials, which constrain effective practical skills acquisition required under CBET frameworks (Kipngetich et al., 2021; Muthomi et al., 2024). In addition, challenges related to assessment administration and certification processes under the Curriculum Development, Assessment and Certification Council (CDACC) have been identified as contributing factors to delays in program completion, even among trainees who actively participate in learning activities. Institutional management capacity and variability in CBET implementation across institutions further exacerbate these challenges, resulting in inconsistencies in training quality and learner progression (Ministry of Education, 2024; TVETA, 2023). These findings suggest that in the Kenyan TVET context, institutional structural factors play a significant role in shaping the effectiveness of training processes and may influence the extent to which learner engagement translates into timely program completion.

Across global, African, and Kenyan literature, there is consistent evidence that institutional structural factors significantly influence the quality of training delivery, learner engagement, and program completion outcomes in Technical and Vocational Education and Training (TVET) systems. However, most existing studies have examined institutional conditions and learner behaviours as separate and independent predictors of educational outcomes, with limited attention to how these factors interact in shaping timely program completion. While class attendance has been widely recognized as an important determinant of student engagement and academic success, and institutional structural factors have been shown to influence training effectiveness, the combined effect of these two dimensions remains underexplored, particularly within competency-based education and training (CBET) systems. In addition, empirical studies in Kenya have largely focused on either CBET implementation challenges or learner characteristics in isolation, without sufficiently examining whether institutional structural conditions alter the strength or direction of the relationship between trainee attendance and program completion. Consequently, there is limited empirical evidence on whether institutional structural factors strengthen or weaken the influence of class attendance frequency on timely program completion in public TVET institutions. This gap is particularly evident in county-level contexts such as Trans-Nzoia, where institutional variation and implementation disparities may produce differing training outcomes even among trainees with similar attendance patterns. Addressing this gap is essential for understanding the conditional mechanisms through which learner participation translates into successful program completion under CBET systems.

Theoretical Framework

This study is anchored on an integrated theoretical framework comprising Vincent Tinto's Student Integration Theory (1975, 1993), Barbara Bean and Barbara Metzner's Nontraditional Student Attrition Model (1985), and Michael Fullan's Educational Change Theory (2007). Tinto's theory provides the primary explanation for the study by arguing that students who are academically integrated through active participation in learning activities are more likely to persist and complete their programmes. In this study, class attendance frequency represents academic integration and is therefore expected to positively influence timely programme completion.

Bean and Metzner's model complements Tinto's theory by recognizing that non-traditional learners are also influenced by their background characteristics and external circumstances. This provides the theoretical basis for controlling trainee characteristics, including entry academic qualifications, before examining the effect of class attendance frequency. Fullan's Educational Change Theory further argues that positive learner behaviours produce better outcomes only when supported by effective institutional systems. Accordingly, institutional structural factors are expected to strengthen or weaken the influence of class attendance frequency on timely programme completion.

Collectively, the three theories provide the foundation for the hierarchical binary logistic regression model adopted in this study. The first model controls for trainee characteristics based on Bean and Metzner's perspective, the second estimates the direct effect of class attendance frequency as explained by Tinto's theory, while the third

introduces institutional structural factors and the interaction term to test the moderating effect proposed by Fullan's Educational Change Theory.

Conceptual Framework

This study conceptualizes the relationship between class attendance frequency and timely program completion in public Technical and Vocational Education and Training (TVET) institutions as being influenced by institutional structural factors. Class attendance frequency is treated as the independent variable, while timely program completion within the standard duration is the dependent variable. Institutional structural factors are introduced as a moderating variable, meaning that they are expected to strengthen or weaken the relationship between class attendance frequency and program completion.

The conceptual framework is therefore based on the assumption that trainees who attend classes regularly are more likely to complete their programs within the expected duration due to increased exposure to instructional content, continuous assessment, and skill development opportunities. However, this relationship is not expected to be uniform across all institutions. In institutions with strong structural support systems such as adequate training facilities, well-equipped workshops, effective administrative systems, and efficient CBET implementation class attendance is likely to have a stronger positive effect on timely completion. Conversely, in institutions with weak structural systems, the effect of attendance may be reduced due to constraints that limit effective learning and progression.

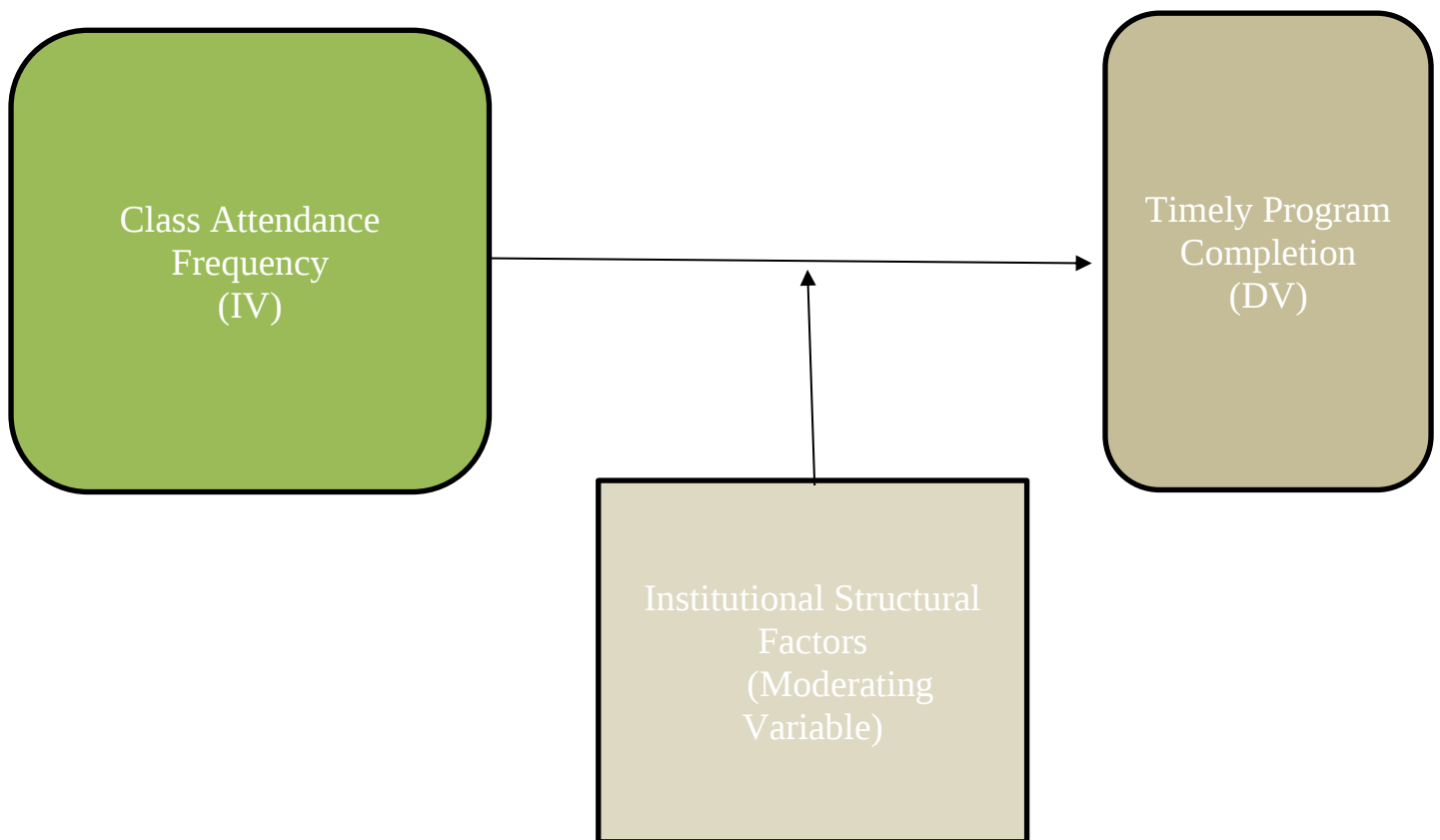


Figure 1: Conceptual Model for the influence of class attendance frequency on Timely Program completion

Explanation of the Model

- **Direct effect:**

Class Attendance Frequency → Timely Program Completion

- **Moderating effect:**

Institutional Structural Factors × Class Attendance Frequency → Timely Program Completion

METHODOLOGY

Research Design

This study adopts a post-positivist research philosophy utilizing a descriptive, cross-sectional survey research design. This design is appropriate for examining relationships among variables as they naturally occur, allowing for data collection at a single point in time from a defined population without experimental manipulation. Within the context of public Technical and Vocational Education and Training (TVET) institutions, this approach is well-suited for assessing the relationship between class attendance frequency and timely program completion, while simultaneously accounting for the moderating effect of institutional structural factors. Furthermore, the design supports the application of quantitative analytical techniques, specifically regression analysis, to determine the magnitude and statistical significance of these hypothesized relationships. To complement and triangulate the primary survey data, a concurrent document analysis was conducted. Institutional records—including admission documents, attendance registers, and academic progress logs—were systematically reviewed using a standardized checklist to validate and provide interpretive depth to the quantitative findings.

Study Area

The study was conducted in **Trans-Nzoia County, Kenya**, which hosts several public TVET institutions offering competency-based training programs. The county provides a relevant context for the study due to ongoing implementation of CBET reforms and reported variations in institutional capacity, learner engagement, and program completion rates.

Target Population and Sampling Frame

The target population comprised 1,770 trainees enrolled in Diploma (Level 6) and Certificate/Craft (Level 5) programs across three public TVET institutions in Trans-Nzoia County: Kitale National Polytechnic (KNP), Kiminini Technical and Vocational College (KTVC), and Endebess Technical Training Institute (ETTI). Using Yamane Taro's (1967) formula with a 5% margin of error, the minimum required sample size was determined to be 326 trainees:

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

A stratified random sampling technique was applied to ensure proportional representation across institutional boundaries and program tiers, as detailed in Table 1.

Table 1: Stratified Sample Distribution Frame

Institution	Diploma (Level 6)	Certificate/Craft (Level 5)	Total Population	Target	Proportional Allocation	Sample
KNP	320	450	770		142	
KTVC	200	350	550		101	
ETTI	180	270	450		83	
Total	700	1,070	1,770		326	

Data Collection and Questionnaire Development

Primary field data was captured using structured questionnaires comprising categorical items and 5-point Likert-scale blocks.

Item Generation Process & Content Validity Assessment:

Survey items were directly generated from the operationalized dimensions of Tinto's and Fullan's frameworks. To ensure content validity, an item pool was initially compiled and submitted to a panel of experts comprising two university supervisors in educational policy and three external TVET curriculum assessment auditors from

Kibabii University. These experts evaluated every question for domain relevance, thematic alignment, clarity, and simplicity using a 4-point rating index. The Content Validity Index (CVI) was calculated by dividing the items rated as highly relevant by the total number of items. Items registering a CVI below 0.80 were expunged or re-engineered to resolve semantic ambiguity, while items matching or exceeding 0.80 were preserved.

Specific Measurement Metrics:

To facilitate replication and transparency, the specific closed-ended metrics used to capture the institutional structural factors moderator variable included the following structured items:

- **ISF1:** The institution provides fully functional workshops, modern machinery, and adequate consumable tools required for our specific CBET practical exercises.
- **ISF2:** The scheduling and execution of external competency assessments by TVET CDACC are highly predictable and strictly match our academic term calendar.
- **ISF3:** Internal administrative units process and release continuous assessment feedback, module evaluations, and internal marks registries without unnecessary delays.
- **ISF4:** Institutional trainers display comprehensive pedagogical capacity, technical expertise, and preparedness in delivering our competency-based curriculum modules.
- **ISF5:** Administrative rules and internal balance collection systems (such as fee clearance enforcement) do not arbitrarily block or disrupt registration for final modular assessments.

Pilot Study:

To establish data collection stability, a pilot study was executed using a matched sample of $n = 30$ trainees at Matili Technical Training Institute in Bungoma County an institution sharing identical Competency-Based Education and Training (CBET) and TVET CDACC assessment parameters. Temporal stability evaluated via the Pearson Product-Moment Correlation Coefficient yielded an exemplary index of $r = 0.97$, while internal consistency evaluated through Cronbach's Alpha diagnostics achieved an acceptable threshold of $\alpha = 0.70$.

Data Analysis Model Specification

Quantitative data were cleaned, coded, and analyzed using SPSS Version 26. Since the dependent variable, timely programme completion, was binary (1 = completed within the standard duration; 0 = did not complete within the standard duration), Hierarchical Binary Logistic Regression Analysis was employed.

To address the study objectives, the analysis was conducted in three hierarchical models. Model 1 entered the control variables (entry academic qualifications and selected trainee characteristics) to account for baseline differences among trainees, consistent with Bean and Metzner's (1985) Nontraditional Student Attrition Model. Model 2 introduced the primary independent variable, class attendance frequency (X), to estimate its direct effect on timely programme completion, as explained by Tinto's (1975, 1993) Student Integration Theory. Model 3 added institutional structural factors (M) together with the interaction term ($X \times M$) to examine the moderating effect of institutional structural factors on the relationship between class attendance frequency and timely programme completion, as proposed by Fullan's (2007) Educational Change Theory.

The hierarchical binary logistic regression model was specified as:

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1(\text{Controls}) + \beta_2(X_1) + \beta_3(M) + \beta_4(X_1 \times M)$$

Where P represents the probability of timely program completion, β_2 is the direct effect coefficient of peer interactions, β_3 represents the direct structural effect, and β_4 measures the explicit moderating interaction effect. Model diagnostics were evaluated via Nagelkerke R^2 , the Omnibus test of coefficients, and the Hosmer-Lemeshow goodness-of-fit test. Deductive thematic analysis was applied to qualitative document extracts to triangulate the final regression pathways.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 presents the descriptive statistics for the study variables. Class attendance frequency recorded a relatively high mean score ($M = 3.779$, $SD = 0.553$), indicating that trainees generally attended scheduled theory and practical sessions regularly. Institutional structural factors also received favourable ratings ($M = 4.056$, $SD = 0.618$), suggesting that respondents perceived the implementation of Competency-Based Education and Training (CBET) and institutional support systems to be generally satisfactory, although some variations existed across institutions. The dependent variable further indicated that 74.5% of the trainees were on track to complete their programmes within the prescribed duration, while 25.5% experienced delayed completion.

Table 1: Descriptive Statistics of the Study Variables

Variable	Mean	SD
Class Attendance Frequency	3.779	0.553
Institutional Structural Factors	4.056	0.618
Timely Programme Completion	0.745	0.437

The descriptive findings suggest that regular class attendance alone may not guarantee timely programme completion. Despite the generally high attendance levels observed among trainees, approximately one-quarter of the respondents were still not on track to complete their programmes within the prescribed duration. This pattern points to the possible influence of institutional conditions beyond learner attendance and provides an initial indication that institutional structural factors may shape how attendance translates into successful programme completion. These descriptive observations provided the basis for the subsequent hierarchical binary logistic regression analysis.

Results And Discussion

Global Model Fit Summary

Hierarchical binary logistic regression analysis was conducted to examine the influence of class attendance frequency on timely program completion and to determine whether institutional structural factors moderated this relationship. Three successive models were estimated to assess the incremental explanatory power of the predictor variables. Model 1 entered the control variables to account for baseline trainee differences. This baseline model provided limited explanatory power and served as the reference model for subsequent analyses. Model 2 introduced class attendance frequency, resulting in an improvement in model fit as evidenced by the increase in the Omnibus Chi-square statistic and Nagelkerke (R^2), indicating that attendance contributed additional explanatory power beyond the control variables. The final model incorporated institutional structural factors together with the interaction term (Class Attendance Frequency $\times$ Institutional Structural Factors), producing the highest explanatory power among the three models. The increase in Nagelkerke (R^2), together with a significant Omnibus Test of Model Coefficients and an acceptable Hosmer–Lemeshow goodness-of-fit statistic, confirmed that the moderated model provided the best fit to the data. Furthermore, the final model achieved the highest classification accuracy, demonstrating its improved ability to correctly predict timely program completion.

Influence of Class Attendance Frequency on Timely Programme Completion

The direct effect of class attendance frequency on timely program completion was examined in Model 2 of the hierarchical logistic regression analysis. The results indicated that class attendance frequency was not a statistically significant predictor of timely programme completion ($\beta = -0.158$, $Wald = 0.201$, $p = 0.654$, $\text{Exp}(\beta) = 0.854$). Consequently, the null hypothesis that class attendance frequency has no statistically significant influence on timely program completion within the standard duration was not rejected.

The absence of a direct, statistically significant relationship between showing up to class and graduating on time reveals critical insights:

- **Theoretical Interpretation:** This finding challenges traditional student retention paradigms, such as classical interpretations of Tinto's Student Integration Theory, which assume a direct, unmediated linear path from academic integration (attendance) to institutional persistence and completion. In a highly practical, competency-based educational framework, physical or behavioral integration is structurally decoupled from progression if external administrative systems are unstable. Student compliance does not automatically equal academic advancement when systemic controls operate independently of learner behavior.
- **Practical Interpretation:** For institutional administrators and educational planners, this proves that policies focusing exclusively on student disciplinary management, attendance tracking apps, and reducing truancy are inadequate. If the core operational machinery of the training center is compromised, a student with a perfect attendance record will face the exact same probability of delayed graduation as a peer with lower engagement. Systemic institutional correction must take logical precedence over student-focused behavioral policing.

Moderating Effect of Institutional Structural Factors

The moderating effect of institutional structural factors was examined by introducing both the moderator and the interaction term (*Class Attendance Frequency* $\times$ *Institutional Structural Factors*) in Model 3. The results revealed that institutional structural factors exerted a significant positive direct effect on timely program completion ($\beta = 0.842$), $p = 0.028$, $\text{Exp}(\beta) = 2.321$). More importantly, the interaction term was positive and statistically significant ($\beta = 1.241$), $\text{Wald} = 5.739$, $p = 0.017$, $\text{Exp}(\beta) = 3.459$), indicating that institutional structural factors significantly moderated the relationship between class attendance frequency and timely program completion. Therefore, the null hypothesis that institutional structural factors do not significantly moderate the relationship between class attendance frequency and timely program completion was rejected.

Exploration of Potential Threshold Effects:

The dramatic shift between Model 2 (where attendance is non-significant) and Model 3 (where the interaction term is highly significant) points to a distinct structural threshold effect. Class attendance frequency operates as a latent asset that requires a minimum threshold of institutional capability to be unlocked. If an institution's workshops drop below operational capacity or if TVET CDACC assessment scheduling lags beyond a critical window, student attendance is neutralized. Trainee presence only translates into a higher probability of timely graduation $\text{Exp}(\beta) = 3.459$), once the underlying institutional mechanics cross into an acceptable baseline of administrative efficiency.

Disaggregated Sub-Dimensional Analysis:

To establish which specific structural domains matter most, the quantitative trends were evaluated across the four disaggregated components:

- **Assessment Systems (External/Internal):** Emerged as the primary bottleneck. Delays in executing external competency examinations directly suspended student cohorts regardless of class presence.
- **Infrastructure Capacity:** Functioned as the direct material link. Regular attendance in a practical welding or automotive module only yields progressive skills mastery if working machinery is accessible.
- **Administrative Efficiency:** Acted as an immediate gatekeeper. Rigid internal financial clearance timelines and slow internal processing of assessment registers caused students to miss registration windows, creating immediate modular backlogs.
- **Trainer Capacity:** Influenced internal classroom compliance and delivery, but its effect was heavily dependent on the availability of physical training materials.

Differential Effects Across Program Tiers and Institutional Levels:

Analysis of the data across distinct demographics revealed important operational observations:

- National Polytechnic vs. Sub-County TVCs: Trainees at sub-county institutions specifically Kiminini TVC and Endebess TTI exhibited a significantly higher vulnerability to delayed completion compared to Kitale National Polytechnic. This variation is tied to acute resource scarcity and less established internal administrative processes in newer sub-county establishments.
- Diploma (Level 6) vs. Certificate (Level 5): Level 6 programs span a longer duration and require more intense, long-term academic integration. Delays here were primarily tied to cumulative external assessment backlogs. Conversely, Level 5 certificate pathways were more sensitive to internal administrative friction and sudden fee-collection balance enforcement checks.

Triangulation with Qualitative Documentary Evidence:

Documentary evidence systematically reviewed during the study corroborated these findings. Review of institutional records illustrated the concrete administrative mechanisms behind the statistical blocks:

Documentary Excerpt A (Academic Progress Logs & CDACC Calendars):

"A review of internal assessment registration logs at sub-county TVCs indicates a significant time lag between module completion and external verification. While internal class attendance registers show 85% student compliance, final assessment schedules lag by up to two terms due to delayed external verification audits."

Documentary Excerpt B (Administrative Fee Tracking Policies):

"Financial ledger audits indicate that over 60% of trainees experiencing a programmatic delay (Progression Status = 0) had active class attendance records but were structurally locked out of exam registration due to unmitigated fee balances during final evaluation weeks."

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

This study examined the influence of class attendance frequency on timely programme completion and investigated the moderating effect of institutional structural factors among trainees in public TVET institutions in Trans-Nzoia County, Kenya. The findings revealed that class attendance frequency alone did not significantly predict timely programme completion after controlling for trainee characteristics. However, institutional structural factors had a significant positive effect on programme completion and significantly moderated the relationship between class attendance frequency and timely programme completion. These findings demonstrate that regular attendance is a necessary but insufficient condition for timely completion unless supported by effective institutional systems.

The study therefore concludes that improving trainee attendance alone is unlikely to substantially enhance completion rates without corresponding improvements in institutional capacity. Timely programme completion under the Competency-Based Education and Training (CBET) framework depends on the interaction between learner commitment and institutional effectiveness. Consequently, interventions aimed at increasing completion rates should simultaneously strengthen trainee engagement and institutional structures responsible for training delivery, assessment, and programme administration.

Policy Implications

The findings have important implications for TVET policy and institutional management in Kenya. First, TVET institutions should strengthen systems that promote consistent trainee attendance while simultaneously improving institutional structures that facilitate timely progression through training programmes. Priority should be given to enhancing CBET implementation through adequate training facilities, effective academic administration, timely scheduling of competency assessments, and efficient learner support services.

Second, policymakers, institutional managers, and quality assurance agencies should recognize that improving programme completion requires system-wide interventions rather than learner-focused strategies alone. Strengthening coordination between TVET institutions and competency assessment bodies, reducing administrative delays, and investing in institutional infrastructure will enhance the effectiveness of trainee participation and contribute to improved completion rates. Such interventions will increase the efficiency of public investment in TVET while supporting the development of a skilled workforce capable of contributing to Kenya's socio-economic development.

Limitations and Directions for Generalizability

- **Acknowledgment of Regional Focus:** A clear limitation of this study is its explicit geographical and structural focus on public TVET institutions within Trans-Nzoia County, Kenya. Consequently, the direct statistical parameters may not automatically generalize to private vocational training academies, or regions characterized by vastly different socio-economic configurations or alternative resource distribution architectures.
- **Mitigation and Transferability Framework:** This regional limitation is significantly mitigated by the study's adoption of a rigorous proportional stratified random sampling frame that captured a broad cross-section of trainees across multiple institutional tiers (National Polytechnics vs. Sub-County Colleges) and distinct certification levels (Level 5 vs. Level 6). Furthermore, because all sampled public institutions operate under the exact same national statutory frameworks managed by TVETA and TVET CDACC, the core operational insights, sub-dimensional interactions, and identified threshold effects remain highly transferable and conceptually generalizable to public TVET environments across the broader Kenyan landscape facing identical structural implementation adjustments.

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