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Beyond Access: Which Factors Shape Secondary School Students' Academic Performance under Tanzania's Fee-Free Education Policy?

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Abstract: *Tanzania's Fee-Free Education Policy (FFEP) has dramatically expanded secondary school access since 2015, yet persistent concerns about educational quality persist. The rapid enrollment surge has strained school systems, but empirical evidence on how school management, teacher factors, resource availability, and household characteristics interact to influence student achievement remains limited. This study investigates the multidimensional determinants of academic performance in Tanzanian public secondary schools under FFEP. Employing a cross-sectional analytical design, data were collected from 239 randomly selected students (Forms 1-4) across 12 public secondary schools in Morogoro Municipality, Tanzania. Twenty-four educators (12 head teachers and 12 academic teachers) participated in semi-structured interviews. Quantitative data were analyzed using chi-square tests and binary logistic regression in STATA v18, while qualitative data underwent thematic analysis. Binary logistic regression revealed that consistent student attendance (OR=3.60, p<0.01), sustained parental involvement (OR=3.25, p<0.01), strong administrative accountability (OR=2.86, p<0.01), supportive school leadership (OR=2.77, p<0.01), adequate teacher availability (OR=2.59, p<0.01), access to supplementary materials (OR=2.27, p<0.05), quality infrastructure (OR=2.05, p<0.05), and appropriate teacher qualifications (OR=1.97, p<0.05) independently predicted satisfactory performance. The model explained 45% of performance variance (Pseudo R^2=0.45). Qualitative findings elucidated how resource shortages, class sizes of 120-140 students, excessive workloads, and limited professional development constrain instructional effectiveness. Academic performance under FFEP depends on synergistic alignment of multiple system components rather than isolated factors. Student attendance and parental involvement emerged as strongest predictors, highlighting that access expansion alone cannot compensate for household-level engagement deficits. This study provides novel empirical evidence quantifying the relative strength of eight key predictors within an expanded-access policy context, advancing theoretical understanding of how misalignment between enrollment growth and resource provisioning creates quality constraints. FFEP has successfully expanded access, but sustainable quality improvements require integrated interventions addressing teacher support, infrastructure proportional to enrollment growth, parental engagement, and attendance promotion. Policy reforms should prioritize: (1) increased capitation grants with timely disbursement; (2) accelerated infrastructure development aligned with enrollment growth; (3) enhanced teacher motivation through incentives and professional development; (4) strengthened school-level administrative autonomy; and (5) inclusive parental engagement strategies accommodating economically constrained families.*

Keywords: *Fee-free education policy, Academic performance determinants, Teacher motivation, School management accountability, Tanzania secondary education*

1. Background Information

Education is widely recognized as a fundamental human right and a central driver of socio-economic transformation, human capital development, and sustainable development outcomes (United Nations, 1948). In developing countries, particularly in sub-Saharan Africa, expanding equitable access to quality education has remained a critical policy priority due to its strong linkages with poverty reduction, social mobility, and national development (Haveman & Wolfe, 1995). Within this context, governments have increasingly adopted fee-free education policies as strategic interventions aimed at eliminating financial barriers to schooling and promoting inclusive education systems.

In Tanzania, the commitment to universal education has been institutionalized through the Education and Training Policy (URT, 2014), which introduced Fee-Free Basic Education covering primary and lower secondary levels. This reform, operationalized through subsequent policy circulars (URT, 2015a, 2016), sought to expand access by removing tuition fees and other mandatory contributions previously borne by households. Similar reforms across Africa have demonstrated that fee abolition significantly increases school enrollment and reduces dropout rates, particularly among economically disadvantaged populations (Bray & Kwo, 2013; Effiong & Akpan, 2020). In Tanzania, empirical evidence confirms that the policy has substantially improved access to secondary education (Mashala, 2019; Godda, 2018).

Despite these achievements, a growing body of literature highlights a critical tension between access expansion and education quality. Rapid increases in student enrollment, when not matched by proportional investments in infrastructure, teaching personnel, and learning resources, tend to strain school systems and compromise instructional effectiveness (Lyanga & Chen, 2020; Lucumay & Matete, 2024). For instance, studies in Tanzania report overcrowded classrooms, increased teacher workloads, and inadequate teaching materials following the implementation of the fee-free policy (Lazaro & Matiku, 2022; Munisi *et al.,* 2021). Comparable patterns have been observed in other African contexts, including Ghana and Kenya, where free education policies improved access but generated systemic challenges related to resource constraints, governance inefficiencies, and declining instructional quality (Chanimbe & Dankwah, 2021; Adan & Orodho, 2019).

Beyond policy implementation challenges, extensive empirical literature demonstrates that students' academic performance is shaped by a complex interplay of school-level, teacher-related, and household factors. At the household level, parental involvement and socio-economic conditions significantly influence learning outcomes by shaping students' motivation, discipline, and access to learning support (Desforges & Abouchaar, 2003; Fan & Chen, 2001; Yeung *et al.,* 2002). At the school level, factors such as infrastructure quality, availability of teaching and learning materials, and administrative effectiveness are consistently associated with improved academic achievement (Lockheed *et al.,* 1986; Otieno & Yara, 2010).

Teacher-related factors are particularly critical within expanded-access systems. Teacher availability, qualifications, motivation, and professional development opportunities directly affect instructional quality and student learning outcomes (Mlozi *et al.,* 2013; Asikhia, 2010). However, under fee-free education contexts, increased enrollment has intensified teacher workload and reduced opportunities for individualized instruction, thereby weakening pedagogical effectiveness (Lyanga & Chen, 2020; Mutisya & Lutomia, 2021). Evidence further suggests that teacher motivation is often undermined by limited incentives, inadequate professional support, and challenging working conditions, all of which negatively affect classroom performance and student achievement (Munisi *et al.,* 2021).

Similarly, student attendance has been identified as a fundamental determinant of academic success, with consistent attendance strongly correlated with improved learning outcomes (Balfanz *et al.,* 2008; Denny *et al.,* 2015; Oghuvbu, 2010). At the institutional level, effective school leadership and administrative accountability mechanisms create enabling environments that support both teachers and learners, thereby enhancing performance (Marzano, 2003; Godda, 2018). These findings collectively underscore that academic performance is not driven by single factors but emerges from multi-level interactions across home, school, and policy environments.

While the existing literature provides valuable insights, three major limitations remain evident, particularly within the Tanzanian context. First, much of the research on fee-free education has predominantly focused on policy implementation outcomes, such as access expansion and operational challenges, with limited emphasis on rigorous empirical modeling of academic performance determinants under the policy framework (Mashala, 2019; Lyanga & Chen, 2020). Second, although studies acknowledge the importance of teacher-related factors, critical dimensions such as teacher motivation, professional development, and instructional quality remain insufficiently operationalized and quantitatively examined as predictors of student performance. Third, existing studies often rely on either quantitative or qualitative approaches in isolation, limiting comprehensive understanding of the mechanisms through which different factors interact to influence academic outcomes.

This study addresses these gaps by adopting a mixed-methods approach to examine the determinants of secondary school students' academic performance under Tanzania's Fee-Free Education Policy. Specifically, it integrates quantitative analysis of key predictors; including student attendance, parental involvement, school management, teacher-related factors, and resource availability; with qualitative insights from teachers and school administrators. As such, by doing so, the study provides a more nuanced and context-specific understanding of how multiple system components interact to shape academic performance, contributing both empirically and methodologically to the literature on education policy and learning outcomes in developing countries.

2.0 Theoretical Framework

Understanding students' academic performance within the context of fee-free education requires a robust theoretical grounding that captures the complex, multi-level interactions shaping learning outcomes. This study is guided primarily by Systems Theory and complemented by Education Production Function Theory, both of which provide a comprehensive analytical lens for examining how interconnected factors influence educational performance.

Systems Theory, originally advanced by Bertalanffy (1968), conceptualizes institutions such as schools as complex, adaptive systems composed of interrelated and interdependent components. Within an educational context, schools are not isolated entities but operate as open systems interacting continuously with their external environment, including households, communities, and policy structures. This perspective is particularly relevant in analyzing the effects of Tanzania's Fee-Free Education Policy, where changes at the policy level (e.g., removal of school fees) trigger cascading effects across multiple subsystems, including student enrollment, teacher workload, resource allocation, and school management processes.

From a systems perspective, students' academic performance emerges as an output of dynamic interactions among inputs, processes, and environmental conditions. Inputs include student characteristics (e.g., attendance), household factors (e.g., parental involvement), and school-level resources (e.g., teaching materials and infrastructure). Processes encompass teaching and learning interactions, teacher motivation, instructional quality, and school leadership practices. The external environment, shaped by policy interventions such as fee-free education, influences both inputs and processes by altering access, participation, and resource distribution. Thus, Systems Theory provides a holistic framework for understanding how multiple determinants jointly shape academic outcomes rather than operating in isolation.

Complementing this perspective, the Education Production Function Theory offers a structured approach to empirically model the relationship between educational inputs and outputs (Hanushek, 1979; Todd & Wolpin, 2003). This theory posits that students' academic achievement can be viewed as the outcome of a "production process" in which various inputs; such as teacher quality, school resources, family background, and student effort; are transformed into measurable learning outcomes. In the context of this study, academic performance (e.g., examination results) represents the output, while variables such as teacher-related factors, parental involvement, school management, student attendance, and availability of learning materials constitute the key inputs.

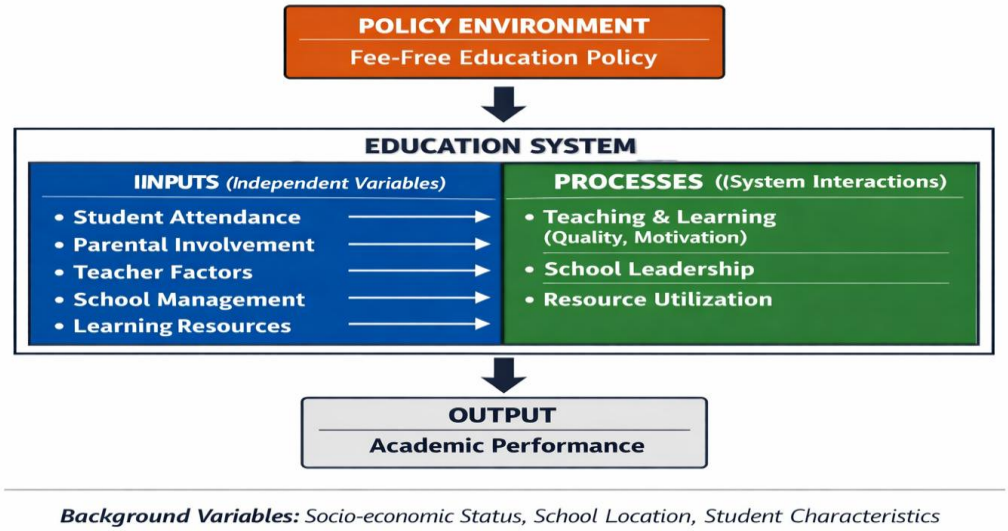
The integration of these two theoretical perspectives strengthens the analytical foundation of the study in several important ways. First, while the Education Production Function provides a quantitative and measurable framework for assessing the relative contribution of different inputs, Systems Theory extends the analysis by emphasizing interdependencies, feedback mechanisms, and contextual influences, which are often overlooked in purely econometric models. Second, the combined framework allows for a multi-level analysis, capturing interactions between household, school, and policy environments. For example, the removal of school fees may increase enrollment (input expansion), but without corresponding improvements in teacher capacity and infrastructure (process constraints), the overall system performance may be compromised.

Furthermore, this integrated framework is particularly suitable for examining education systems in developing country contexts, where institutional capacity constraints, socio-economic disparities, and policy reforms interact in complex ways. Empirical studies have demonstrated that focusing solely on input variables without considering systemic interactions often yields incomplete or misleading conclusions about educational outcomes (Glewwe *et al.,* 2011; Hanushek & Woessmann, 2010). Therefore, adopting a combined Systems-Production Function approach enables a more nuanced understanding of how policy interventions translate into learning outcomes under real-world conditions.

In this study, the theoretical framework conceptualizes students' academic performance as the dependent variable influenced by a set of interrelated independent variables, including student attendance, parental involvement, teacher-related factors (such as motivation and professional development), school management practices, and availability of teaching and learning resources. These relationships are further shaped by background characteristics (e.g., socio-economic status) and intervening variables, particularly the Fee-Free Education Policy, which modifies the structure and functioning of the education system. The framework assumes that the effectiveness of the policy in improving academic performance depends not only on increasing access but also on strengthening the internal efficiency and adaptive capacity of the education system.

Henceforth, by grounding the study in these complementary theoretical traditions, the analysis moves beyond simplistic cause–effect explanations and instead provides a system-oriented and empirically testable model of academic performance. This contributes to both theory and practice by offering a framework capable of informing policy design, resource allocation, and institutional reforms aimed at improving educational quality in Tanzania and similar contexts.

Figure 1: Theoretical Framework Figure for Fee-free Education Policy Framework



3.0 Methodology

3.1 Research Design

This study employed a convergent mixed-methods research design, integrating quantitative and qualitative approaches to provide comprehensive understanding of the determinants of secondary school students' academic performance under the Fee-Free Education Policy in Morogoro Municipality. Academic performance was measured using end-of-term and national examination results, summarized as mean scores and categorized into performance levels (Excellent, Good, Average, Poor) following Tanzania's national grading system where grades A-C represent satisfactory performance and grades D-F represent unsatisfactory performance (National Examinations Council of Tanzania, 2021).

The quantitative component employed a cross-sectional survey design collecting numerical data from students, enabling statistical analysis and identification of significant predictors of academic performance. Cross-sectional designs are appropriate for examining associations between multiple factors and outcomes at a single point in time and are widely used in educational research to identify determinants of student achievement (Creswell & Creswell, 2018). The qualitative component used semi-structured interviews with academic teachers and head teachers to gather in-depth perspectives on instructional challenges, motivational factors, professional constraints, and school management dynamics. This combination allowed triangulation of data sources to enhance validity and reliability of findings, as recommended by Creswell and Plano Clark (2017) for mixed-methods research. Teacher interviews were particularly valuable for understanding the mechanisms through which school factors influence academic outcomes, providing rich narratives that explain *"how"* and *"why"* quantitative patterns emerge.

The convergent design involved simultaneous collection of quantitative and qualitative data, with integration occurring at the interpretation stage through convergence and complementarity strategies (Fetters, Curry, & Creswell, 2013). Quantitative patterns were examined alongside qualitative insights to generate comprehensive understanding of determinants and underlying mechanisms, consistent with best practices in mixed-methods educational research.

3.2 Study Area

The research was conducted in Morogoro Municipality, located in eastern Tanzania approximately 200 kilometers west of Dar es Salaam. The municipality serves as the administrative capital of Morogoro Region and covers an area of 531 square kilometers with an estimated population of 471,409 according to the 2022 National Census (United Republic of Tanzania, 2022). Morogoro Municipality hosts both public and private secondary schools with diverse socio-economic and infrastructural contexts, making it an appropriate site for investigating educational policy implementation.

The municipality was purposively selected based on several criteria: (1) representation of both urban and peri-urban education settings, providing variation in school environments; (2) presence of varying school performance levels under the Fee-Free Education Policy framework, enabling comparison across different contexts; (3) accessibility for data collection; and (4) documented evidence of implementation challenges from previous research (Lazaro & Matiku, 2022). The municipality contains 27 public secondary schools with varying enrollment sizes, infrastructure quality, and academic performance records, providing adequate diversity for examining determinants of student achievement.

3.3 Target Population and Sampling

3.3.1 Target Population

The target population comprised three categories of respondents from public secondary schools in Morogoro Municipality. First, secondary school students from Forms One to Four (equivalent to grades 9-12) constituted the primary quantitative sample, as they directly experience the Fee-Free Education Policy and their academic performance represents the outcome of interest. Second, head teachers responsible for school administration and policy implementation provided institutional perspectives on policy implementation challenges and management dynamics. Third, academic teachers of core subjects (English, Mathematics, and Biology/Chemistry/Physics) with direct influence on students' academic outcomes contributed insights on instructional delivery, professional constraints, and classroom-level factors.

According to the Morogoro Municipal Education Office records (2024), the total enrollment across Forms 1-4 in the 12 selected public secondary schools was 594 students. The total number of head teachers in these schools was 12, and the total number of academic teachers teaching core subjects was approximately 48, from which 12 were purposively selected for interviews.

3.3.2 Student Sampling

A stratified random sampling approach was employed to ensure representation from both high-performing and low-performing schools within the municipality. Schools were stratified based on performance rankings from the most recent national Form Four examination results (National Examinations Council of Tanzania, 2023), with six schools selected from higher-performing categories and six from lower-performing categories to capture variation in academic outcomes. The sample size for students was determined using Yamane's (1967) formula at 95% confidence level and 5% margin of error:

$$n = \frac{N}{1 + N(e)^2} = \frac{594}{1 + 594(0.05)^2} = \frac{594}{2.485} \approx 239$$

Where:

n = required sample size
N = total population (594 students)
e = margin of error (0.05)

After determining the required sample size of 239 students, a sampling fraction of 0.402 (239/594) was calculated. This fraction was applied separately to each stratum (school) to ensure proportionate representation based on actual enrollment size (Table 1). Consequently, schools with larger student populations contributed more respondents, while schools with smaller enrollments contributed fewer respondents, ensuring that the sample accurately reflected the distribution of students across schools (Cochran, 1977).

Within each school, students were selected through simple random sampling from the enrollment registers of Forms 1-4. The sampling frame comprised complete lists of enrolled students, and random numbers were generated using Microsoft Excel to select participants. This approach ensured that every student had an equal probability of selection, minimizing selection bias and enhancing representativeness (Thompson, 2012). Although the average number of students selected per school was approximately 20, the actual number varied according to each school's enrollment as shown in Table 1. This stratified proportionate sampling approach ensured adequate statistical power, representativeness, and logistical feasibility, resulting in 239 completed student questionnaires representing a 100% response rate.

3.3.3 Teacher and Administrator Sampling

In addition to students, 12 head teachers (one from each school) and 12 academic teachers (one from each school, comprising teachers of English, Mathematics, or Science subjects) were included in qualitative interviews. Head

Table 1: Sampling Distribution Across Selected Schools

School Code	Performance Category	Total Enrollment (Forms 1-4)	Sample Size (Students)	Percentage of School Enrollment
SCH-01	High-performing	52	21	40.4%
SCH-02	High-performing	48	19	39.6%
SCH-03	High-performing	45	18	40.0%
SCH-04	High-performing	51	21	41.2%
SCH-05	High-performing	43	17	39.5%
SCH-06	High-performing	47	19	40.4%
SCH-07	Low-performing	56	23	41.1%
SCH-08	Low-performing	53	21	39.6%
SCH-09	Low-performing	49	20	40.8%
SCH-10	Low-performing	54	22	40.7%
SCH-11	Low-performing	46	19	41.3%
SCH-12	Low-performing	50	19	38.0%
Total		**594**	**239**	**40.2%**

Source: Morogoro Municipal Education Office Records (2024) and Author's Sampling Framework (2025)

teachers and academic teachers were selected through a census approach given their small numbers and critical roles in policy implementation and instructional delivery (Patton, 2015). Academic teachers were specifically selected based on their direct responsibility for core subject instruction and frequent contact with students, positioning them to provide informed perspectives on factors affecting academic performance and instructional effectiveness. Teachers are hereafter identified as P1 through P12 to ensure confidentiality.

3.3.4 Inclusion and Exclusion Criteria

Inclusion criteria for student participants were: (1) registered enrollment in Forms 1-4 in selected public secondary schools; (2) attendance for at least one academic year; and (3) provision of informed consent (with parental consent for minors). Students were excluded if they were absent during data collection or declined participation. For teachers, inclusion required being a head teacher or academic teacher of core subjects in selected schools with at least one year of experience at the current school.

3.4 Data Collection Methods

3.4.1 Survey

Quantitative data from students were collected using a structured questionnaire developed based on extensive literature review and adapted from validated instruments used in previous educational research in Tanzania (Mlozi, Kaguo, & Nyamba, 2013; Lyanga & Chen, 2020). The questionnaire encompassed approximately 40 items organized into six sections addressing: (1) demographic characteristics (age, gender, class level, residence); (2) household characteristics (parental income source, parental education, family size); (3) school-related factors (attendance patterns, teacher availability, teacher quality perceptions); (4) resource access (textbooks, exercise books, supplementary materials); (5) parental engagement (involvement in school activities, homework support, meeting attendance); and (6) administrative perceptions (leadership responsiveness, accountability mechanisms).

The questionnaire employed a combination of closed-ended questions with multiple response categories and Likert-scale items (ranging from *"never"* to *"always"* or *"poor"* to *"excellent"*). Content validity was established through expert review by three senior researchers in educational policy at Sokoine University of Agriculture. The instrument was piloted with 30 students from two schools not included in the main sample to assess clarity, comprehension, and reliability. Cronbach's alpha coefficients for major scales ranged from 0.72 to 0.84, exceeding the acceptable threshold of 0.70 (Nunnally & Bernstein, 1994), indicating adequate internal consistency. Minor modifications to wording and item sequencing were made based on pilot feedback.

The questionnaire was administered in Swahili, the medium of instruction in Tanzanian secondary schools, to ensure comprehension. Trained research assistants supervised completion during regular school hours in classroom settings, providing clarification when needed while maintaining independence of responses. Each questionnaire took approximately 30-40 minutes to complete.

3.4.2 Semi-Structured Interviews

Qualitative data were obtained through semi-structured interviews with head teachers and academic teachers, each lasting 60-90 minutes. Interview guides were developed based on the study objectives and theoretical framework, addressing eight thematic areas: (1) experiences implementing the fee-free education policy; (2) observed impacts on student enrollment, classroom dynamics, and academic performance; (3) factors facilitating or hindering academic success; (4) professional challenges, workload pressures, and motivational issues; (5) school infrastructure adequacy and resource constraints; (6) parental engagement patterns; (7) school administration effectiveness and responsiveness; and (8) recommendations for improving policy implementation and educational outcomes.

Semi-structured interview guides allowed flexibility for follow-up probes exploring emerging themes while maintaining consistency across respondents (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). All interviews were conducted in Swahili by the principal investigator and two trained research assistants with graduate-level training in qualitative methods. Interviews were audio-recorded with participant consent using digital recorders and supplemented by detailed field notes documenting key observations, emotional expressions, and contextual details. Interviews were conducted at school premises at times convenient to participants, typically in staff rooms or head teacher offices, ensuring privacy and minimal disruption.

3.4.3 Document Review

Supplementary data were collected through document review of school records, including enrollment registers, examination results summaries, capitation grant records, and school improvement plans. These documents provided contextual information and enabled triangulation of self-reported data with official records (Bowen, 2009).

3.5 Data Analysis

3.5.1 Quantitative Data Analysis

Quantitative data were analyzed using STATA version 18 (StataCorp, 2023). Data entry was conducted with double-entry verification to minimize errors. Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed to summarize demographic characteristics and determinant variables. Academic performance (PERF) was coded as 1 for satisfactory performance (grades A-C) and 0 for unsatisfactory performance (grades D-F), following the National Examinations Council of Tanzania (2021)

classification where grades A, B, and C represent passing grades while D and F represent failure.

Chi-square tests of independence were employed to examine bivariate associations between each predictor variable and academic performance. This non-parametric test is appropriate for analyzing relationships between categorical variables and determines whether observed associations are statistically significant (Agresti, 2019). Statistical significance was set at $p < 0.05$.

Binary logistic regression was employed to control for potential confounders and examine the independent effect of each predictor on academic performance while holding other factors constant. Logistic regression is appropriate when the outcome variable is binary and enables estimation of odds ratios that quantify the strength of associations (Hosmer, Lemeshow, & Sturdivant, 2013). The logistic regression model estimated log odds of satisfactory performance as a function of key predictors:

$$\ln\left(\frac{P(PERF=1)}{1-P(PERF=1)}\right) = \beta_0 + \beta_1 ATTEND + \beta_2 PARSUP + \beta_3 ADMACCT + \beta_4 LEADRSP + \beta_5 TEACHAV + \beta_6 LEARNMAT + \beta_7 INFRAD + \beta_8 TEACHQUAL$$

Where:

- ATTEND = Consistent student attendance
- PARSUP = Sustained parental involvement
- ADMACCT = Strong administrative accountability mechanisms
- LEADRSP = Supportive school leadership
- TEACHAV = Adequate teacher availability
- LEARNMAT = Access to supplementary learning materials
- INFRAD = Quality infrastructure
- TEACHQUAL = Appropriate teacher qualifications

Model fit was assessed using the likelihood ratio chi-square test, Pseudo R^2 (Nagelkerke), and Hosmer-Lemeshow goodness-of-fit test. Multicollinearity was assessed using variance inflation factors (VIF), with values below 5 indicating acceptable levels (Menard, 2002). All predictor variables were entered simultaneously into the model.

3.5.2 Qualitative Data Analysis

Audio recordings were transcribed verbatim in *Swahili* by research assistants, then translated to English by the principal investigator with verification by a bilingual expert to ensure accuracy and conceptual equivalence (Regmi, Naidoo, & Pilkington, 2010). Analysis followed Braun and Clarke's (2006) six-phase thematic analysis framework through iterative stages: (1) familiarization through repeated reading of transcripts and field notes; (2) open coding identifying meaning units and preliminary concepts; (3) axial coding grouping related concepts into categories; (4) focused coding consolidating categories into major themes; (5) theme review and refinement verifying internal consistency and distinctiveness; and (6) final theme definition with exemplary quotations.

Atlas.ti Version 25 (ATLAS.ti Scientific Software Development GmbH, 2024) facilitated systematic organization of coding, theme development, and data management. Coding was conducted by two researchers independently, with discrepancies resolved through discussion to enhance reliability (Campbell, Quincy, Osserman, & Pedersen, 2013). Themes were developed inductively from the data while also informed by the study's theoretical framework. Saturation was achieved when additional interviews no longer yielded new insights (Guest, Bunce, & Johnson, 2006).

3.5.3 Data Integration

Integration of quantitative and qualitative findings occurred at the interpretation stage through convergence and complementarity strategies (Fetters, Curry, & Creswell, 2013). Quantitative patterns were examined alongside qualitative insights to generate comprehensive understanding of determinants and underlying mechanisms. A joint display table was constructed to juxtapose quantitative results with illustrative qualitative quotations, enabling identification of convergence, divergence, and complementarity across data sources.

3.6 Validity, Reliability, and Trustworthiness

3.6.1 Quantitative Rigor

Internal validity was enhanced through stratified random sampling to ensure representation across school performance categories, reducing selection bias (Shadish, Cook, & Campbell, 2002). Statistical control through multivariate regression adjusted for potential confounding variables. External validity was addressed through detailed description of sampling procedures and study context, enabling assessment of generalizability to similar settings.

Reliability was established through pilot testing of instruments, calculation of Cronbach's alpha coefficients for scales, and standardized administration procedures. All measures exceeded acceptable reliability thresholds ($\alpha > 0.70$). Inter-rater reliability for coding of open-ended questions was assessed with 90% agreement.

3.6.2 Qualitative Trustworthiness

Trustworthiness of qualitative findings was established through criteria proposed by Lincoln and Guba (1985). Credibility was enhanced through prolonged engagement with participants, member checking where key findings were shared with selected participants for verification, and triangulation across multiple data sources (student surveys, teacher interviews, document review). Transferability was addressed through thick description of study context, participants, and processes, enabling readers to assess applicability to other settings. Dependability was established through maintaining a detailed audit trail documenting all

research decisions and analytical steps. Confirmability was ensured through reflexivity practices, including maintaining reflexive journals documenting researcher positionality and potential biases.

3.7 Ethical Considerations

Ethical clearance was obtained from Sokoine University of Agriculture Research Ethics Committee prior to data collection (Ref. No. *SUA/ADM/R.1/8/1361*, dated 11th December 2024). Subsequently, a Research Permit was granted by the President's Office Regional Administration and Local Government (Ref. No. *AB.307/323/01/192*, dated 27th December 2024). Further authorization was secured from the District Administrative Secretary (Ref. No. *AB.175/245/01"S"176*, dated 3rd January 2025) and from the Morogoro Municipal Director (Ref. No. *E.10/MMC-22/VOL III/119*, dated 20th January 2025). These approvals formally permitted the researcher to conduct the study within selected public secondary schools in Morogoro Municipality.

All participants received clear information about the study's purpose, procedures, voluntary participation, and data confidentiality through information sheets and verbal explanations. Participants were informed that they could decline to answer any question or withdraw from the study without penalty. All participants provided written informed consent. For student participants under 18 years of age (those aged 16-17 years), parental informed consent was obtained prior to participation in addition to student assent. All students were aged 16 years or older, with the majority (50.2%) in the 16-18 years age bracket.

Confidentiality was maintained through assignment of pseudonyms and unique identification codes (students referenced by number, head teachers and academic teachers identified as P1-P12). All data, including audio recordings and transcripts, were stored on password-protected computers with access restricted to the research team. Data will be securely destroyed two years after study completion in accordance with data protection guidelines. Light refreshments were offered to all participants as appreciation for their time, without constituting coercion given the nominal value (World Medical Association, 2013).

3.8 Limitations

Several limitations should be acknowledged. First, the cross-sectional design captures associations at a single time point and cannot establish causal relationships between determinants and academic performance (Shadish, Cook, & Campbell, 2002). Longitudinal research would be valuable for examining causal pathways. Second, the study focused on Morogoro Municipality, potentially limiting generalizability to rural or other urban contexts in Tanzania. However, detailed contextual description enables readers to assess applicability to similar settings. Third, self-reported data on attendance and parental involvement may be subject to social desirability bias. Triangulation with teacher interviews and document review partially addresses this concern. Fourth, academic performance was measured using examination results, which may not capture all dimensions of learning outcomes. Future research could incorporate broader measures of educational quality. Despite these limitations, the study provides robust evidence on determinants of academic performance under Tanzania's Fee-Free Education Policy through its mixed-methods approach, rigorous sampling, and comprehensive analysis.

4.0 RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Respondents

Before examining the determinants of academic performance, the study analyzed the demographic profiles of student respondents to provide contextual understanding of socio-economic and school-related dynamics under the Fee-Free Education Policy. Table 2 presents the demographic characteristics of the 239 student participants.

Table 2: Demographic Characteristics of Student Respondents (n = 239)

Variable	Category	Frequency	Percentage (%)
Gender	Male	101	42.3
	Female	138	57.7
Age group	13–15 years	85	35.6
	16–18 years	120	50.2
	19–20 years	34	14.2
Class level	Form 1	65	27.2
	Form 2	70	29.3
	Form 3	55	23.0
	Form 4	49	20.5
Parents' income source	Farming	45	18.8
	Business	118	49.4
	Formal employment	47	19.7
	Informal employment	21	8.8
Residence	Rural	97	40.6
	Urban	142	59.4

Source: Survey Data (2025)

The results in Table 2 show that female students constituted 57.7% of the sample (n=138) while males represented 42.3% (n=101), indicating slight female predominance. This gender distribution is consistent with national education statistics showing improved gender parity in Tanzanian secondary schools under the Fee-Free Education Policy, with girls' enrollment increasing substantially since policy implementation (United Republic of Tanzania, 2022). The policy's removal of financial barriers appears to have particularly benefited female students, aligning with research demonstrating that fee elimination disproportionately enhances girls' educational access in developing countries (Schultz, 2002; Swainson, Bendera, Gordon, & Kadzamira, 1998).

Regarding age distribution, half of the respondents (50.2%, n=120) were aged 16-18 years, representing the expected age range for middle secondary school grades. Students aged 13-15 years (Forms 1-2) comprised 35.6% (n=85), while those aged 19-20 years (typically repeating students or those with delayed enrollment) accounted for 14.2% (n=34). The presence of older students in Forms 3-4 reflects patterns of grade repetition and delayed progression, which have been documented as challenges in Tanzanian secondary education (Mkali, 2022; HakiElimu, 2017).

Class level distribution was relatively balanced, with Form 2 students constituting the largest group (29.3%, n=70), followed by Form 1 (27.2%, n=65), Form 3 (23.0%, n=55), and Form 4 (20.5%, n=49). This distribution reflects typical enrollment patterns where attrition increases in higher grades (United Republic of Tanzania, 2022).

In terms of household livelihoods, business (49.4%, n=118) emerged as the dominant income source, followed by formal employment (19.7%, n=47) and farming (18.8%, n=45). Informal employment accounted for 8.8% (n=21). This distribution reflects the predominantly commercial and service-oriented economy of urban Morogoro Municipality, where trade and small-scale business activities are prevalent (Lazaro & Matiku, 2022). The relatively low proportion of farming-dependent households (18.8%) is consistent with the urban location of most sampled schools, while still providing representation of peri-urban agricultural contexts.

Residence patterns showed that 59.4% (n=142) of students resided in urban areas, while 40.6% (n=97) came from rural locations. This distribution reflects the geographical location of sampled schools within Morogoro Municipality's administrative boundaries, which encompass both urban wards and peri-urban/rural peripheries (United Republic of Tanzania, 2022). The inclusion of both urban and rural students enables examination of potential residential differences in educational experiences and outcomes.

4.2 School-Related Factors and Academic Performance

The study examined school-related factors influencing student performance within the context of Tanzania's Fee-Free Education Policy, with particular focus on attendance patterns, learning resource availability, and teacher quality perceptions. Table 3 presents descriptive statistics for these school-related variables.

Table 3: Descriptive Statistics for School-Related Variables (n = 239)

Variable	Category	Frequency	Percentage (%)
School attendance	Always	165	69.0
	Often	52	21.8
	Rarely	22	9.2
Access to textbooks	Yes	175	73.2
	No	64	26.8
Access to exercise books	Yes	180	75.3
	No	59	24.7
Access to supplementary materials	Yes	145	60.7
	No	94	39.3
Teacher quality rating	Excellent	48	20.1
	Good	96	40.2
	Fair	75	31.4
	Poor	20	8.4

Source: Survey Data (2025)

4.2.1 Student Attendance Patterns

As shown in Table 3, student attendance levels were generally high, with 69.0% (n=165) reporting *"always"* attending school and 21.8% (n=52) reporting *"often"* attending. This pattern supports the core objective of the Fee-Free Education Policy to enhance access and participation by removing financial barriers that previously prevented regular attendance (United Republic of Tanzania, 2015a). The findings are consistent with prior research demonstrating that elimination of school fees significantly increases attendance rates in sub-Saharan African contexts (Mashala, 2019; Lyanga & Chen, 2020).

However, 9.2% (n=22) of students reported rarely attending school, representing a vulnerable subgroup at risk of chronic absenteeism and academic underperformance. This finding aligns with research by Balfanz, Durham, and Plank (2008) and Chang and Romero (2008) documenting that even small proportions of chronically absent students face substantially elevated risk of academic failure and dropout. These results suggest that while financial access has improved under FFEP, non-financial determinants of attendance including school climate, student motivation, household responsibilities, and health factors continue to affect full participation for some students.

Qualitative interviews provided explanatory depth regarding attendance barriers. Teacher P5 from a low-performing school explained:

> *"Some students, especially girls, miss school frequently because of household chores or caring for younger siblings when parents are working. Others, particularly boys, engage in informal income-generating activities during school hours. The policy removed fees, but it cannot remove these family circumstances that keep children at home."* (Teacher P5, March 2025)

This observation corroborates research by HakiElimu (2017) and Mkali (2022) documenting that poverty-related factors beyond school fees continue to constrain educational

participation in Tanzania. The findings suggest that addressing absenteeism requires interventions targeting household-level constraints alongside school-based supports.

4.2.2 Access to Learning Resources

Regarding instructional resources presented in Table 3, access to textbooks (73.2%, n=175) and exercise books (75.3%, n=180) was relatively strong, reflecting partial success in the implementation of capitation grants under the FFEP framework. The policy mandates that government capitation grants be used for procurement of teaching and learning materials, with specific allocations for textbooks and supplies (United Republic of Tanzania, 2016). These findings indicate progress in resource provision compared to pre-policy conditions documented in earlier studies (Mlozi, Kaguo, & Nyamba, 2013).

Nonetheless, substantial proportions of students lacked essential materials, with 26.8% (n=64) reporting no access to textbooks and 24.7% (n=59) lacking exercise books. More concerning, 39.3% (n=94) of students reported no access to supplementary learning materials including reference books, laboratory equipment, or practical resources. These figures indicate persistent resource disparities that constrain instructional quality and student learning opportunities.

These findings align with evidence from developing country contexts showing that textbook availability significantly influences student achievement (Lockheed, Vail, & Fuller, 1986; Heyneman & Loxley, 1982). Otieno and Yara (2010) demonstrated that teaching and learning resources significantly influence secondary school performance in mathematics in Kenya, with resource-adequate schools achieving substantially better results. Atieno (2019) confirmed these findings, showing positive relationships between teaching resources and student performance in Kenyan secondary schools.

The uneven distribution of supplementary materials, particularly for science subjects, highlights a structural implementation gap between policy intent and school-level realities. Teacher P2 from a school with limited resources described:

> *"We have three science textbooks for a class of 120 students. Students cannot take books home. During practical sessions, I demonstrate experiments because there are no laboratory materials for students to practice individually. How can they master science under these conditions?"* (Teacher P2, March 2025)

This narrative illustrates how aggregate shortages translate into acute classroom-level constraints, with extreme textbook-to-student ratios severely limiting student engagement and learning. The finding is consistent with Tilya (2003) and Osaki (1999), who documented similar resource constraints in Tanzanian science education.

4.2.3 Teacher Quality Perceptions

As indicated in Table 3, teacher quality was rated positively by 60.3% of students, with 20.1% (n=48) rating teaching as *"excellent"* and 40.2% (n=96) as *"good."* However, 31.4% (n=75) rated teaching quality as *"fair"* and 8.4% (n=20) as *"poor."* This mixed perception underscores a critical tension within the FFEP framework: while enrollment has expanded rapidly, teacher capacity and professional development have not increased at a commensurate rate.

Prior studies emphasize that teacher qualifications, preparedness, and instructional effectiveness are central determinants of secondary school performance (Mlozi, Kaguo, & Nyamba, 2013; Asikhia, 2010). The current findings suggest that expanded access, without proportional investment in teacher support systems, may constrain the policy's impact on learning outcomes. Research by Lyanga and Chen (2020) and Munisi, Mwisukha, and Kisinga (2021) documents similar challenges in Tanzanian secondary schools, where increased enrollment has intensified teacher workloads without corresponding improvements in working conditions or professional development opportunities.

Teacher P8 provided insight into quality challenges:

> "*The curriculum demands student-centered teaching, but with 140 students in a classroom, I cannot give individual attention. I lecture because it is the only feasible method. Students who struggle fall further behind because I cannot identify and support them individually*." (Teacher P8, March 2025)

This narrative aligns with research demonstrating that large class sizes constrain instructional quality and reduce opportunities for differentiated instruction (Marzano, 2003; Verspoor, 2006). The findings suggest that addressing teacher quality under FFEP requires attention to workload management and class size reduction alongside professional development.

4.3 Parental Involvement in Education

Parental involvement emerged as a significant factor shaping students' academic experiences. Table 4 presents descriptive statistics for parental involvement variables.

Table 4: Descriptive Statistics for Parental Involvement (n = 239)

Variable	Category	Frequency	Percentage (%)
Parental involvement frequency	Always	82	34.3
	Often	71	29.7
	Sometimes	49	20.5
	Rarely	37	15.5
Parental support for learning at home	Yes	165	69.0
	No	74	31.0

Source: Survey Data (2025)

Quantitative findings in Table 4 indicate that 34.3% (n=82) of students reported that their parents were always involved

in their education, while 29.7% (n=71) reported often involvement, meaning that nearly two-thirds (64.0%) benefit from relatively strong family engagement. These results are consistent with established research demonstrating that parental involvement positively influences student achievement through improved motivation, monitoring, and academic discipline (Desforges & Abouchaar, 2003; Fan & Chen, 2001).

However, 15.5% (n=37) of students reported rare parental engagement, indicating a vulnerable subgroup whose academic support at home is limited. Additionally, 31.0% (n=74) reported receiving no parental support for learning at home, despite 69.0% (n=165) indicating some form of support. These figures reveal significant variation in home-based academic support that may contribute to achievement disparities.

Qualitative evidence provides explanatory depth to these patterns. Teacher P4 observed:

> *"Parents who are involved attend school meetings, check their children's exercise books, and ensure homework is completed. Their children are generally more motivated and disciplined. But many parents, especially those in informal trade, work long hours and cannot find time for school matters. It is not unwillingness; it is economic necessity."* (Teacher P4, March 2025)

This observation highlights how socioeconomic constraints limit parental engagement, even when parents value education. Teacher P7 added:

> *"Some parents never come to school. When we call them about their child's performance or behavior, they say they are busy working or cannot afford transport to school. The irony is that fee-free education removed financial barriers for students, but parents still face economic barriers to engagement."* (Teacher P7, March 2025)

These findings align with research by Yeung, Linver, and Brooks-Gunn (2002) demonstrating that poverty-related constraints affect parental capacity to invest time and resources in children's education. Eamon (2005) similarly found that socioeconomic conditions influence parental involvement patterns, with economically disadvantaged parents facing structural barriers to engagement.

The integration of both data strands reveals that while parental involvement is generally strong, it is uneven and closely tied to socioeconomic conditions. Within the context of Tanzania's Fee-Free Education Policy, these findings suggest that although financial barriers to schooling have been reduced, disparities in home-based academic support persist. Fee-free access alone does not eliminate inequalities arising from differences in parental capacity to engage.

4.4 Infrastructure and School Administration

The study examined student perceptions of infrastructure adequacy and school administration responsiveness, with results presented in Table 5.

Table 5: Descriptive Statistics for Infrastructure and School Administration (n = 239)

Variable	Category	Frequency	Percentage (%)
Infrastructure adequacy	Yes	150	62.8
	No	89	37.2
School administration responsiveness	Always	110	46.0
	Often	75	31.4
	Sometimes	32	13.4
	Rarely	15	6.3

Source: Survey Data (2025)

4.4.1 Infrastructure Adequacy

As shown in Table 5, quantitative findings indicate that 62.8% (n=150) of students perceived school infrastructure as adequate, while 37.2% (n=89) reported shortages in classrooms, desks, or sanitation facilities. This suggests that although a majority of schools maintain functional infrastructure, more than one-third of students continue to experience physical learning constraints that may affect their educational experience.

These findings are consistent with contemporary evidence from sub-Saharan Africa documenting persistent infrastructure deficits despite expanded educational access (Verspoor, 2006; Lucumay & Matete, 2024). In Tanzania specifically, research by Lazaro and Matiku (2022) in Morogoro Municipality documented similar infrastructure challenges, including overcrowded classrooms, insufficient desks, and inadequate sanitation facilities.

Qualitative narratives provide contextual explanations for these statistics. Head Teacher P1 described:

> "*When the fee-free policy started, our enrollment doubled almost overnight. We had classrooms designed for 40 students now holding 80 to 100. Students share desks meant for three sometimes sitting five. The infrastructure simply cannot accommodate the numbers*." (Head Teacher P1, March 2025)

Teacher P9 added:

> *"The laboratory was built for 30 students at a time. Now I have classes of 120 who need laboratory sessions. I rotate groups, but each student gets minimal practical time. How can they develop science skills under these conditions?"* (Teacher P9, March 2025)

These accounts illustrate how infrastructure shortages translate into compromised learning experiences. Research by Lockheed and Verspoor (1991) emphasizes that inadequate physical facilities negatively affect teaching effectiveness and student learning outcomes. The findings

suggest that infrastructure expansion has not kept pace with enrollment growth under FFEP, creating quality constraints that may undermine policy effectiveness.

4.4.2 School Administration Responsiveness

Regarding school administration, Table 5 shows that 46.0% (n=110) of students rated leadership as *"always"* responsive and 31.4% (n=75) as *"often"* responsive, indicating relatively strong management practices. Only 6.3% (n=15) perceived administration as rarely responsive. These positive perceptions suggest that school leaders are generally engaged and accessible to students.

Qualitative accounts support this perception. Head Teacher P6 explained:

> *"I have an open-door policy. Students can come to me with problems. We hold regular meetings with student leaders to understand challenges. When issues arise, we try to address them promptly because unresolved problems affect learning."* (Head Teacher P6, March 2025)

Teacher P3 noted:

> *"Our head teacher is very supportive. When we face challenges like insufficient teaching materials, she advocates to the municipal education office. She also monitors instruction regularly and provides feedback. This support creates a positive school climate."* (Teacher P3, March 2025)

However, some respondents emphasized that responsiveness is constrained by limited financial autonomy and delayed government disbursements. Head Teacher P8 explained:

> *"I want to address infrastructure problems, but I cannot. Funds from the government arrive late, and when they arrive, they are insufficient. I have no discretionary budget. My hands are tied despite knowing what needs to be done."* (Head Teacher P8, March 2025)

This constraint reflects challenges documented in decentralized education systems where school-level autonomy is limited by central control over resources (Godda, 2018; Mutisya & Lutomia, 2021). The findings suggest that while school leaders demonstrate commitment to responsiveness, systemic constraints limit their capacity to translate this commitment into tangible improvements.

4.5 Teacher Motivation and Professional Development

Although teacher motivation and professional development were not directly quantified in the student survey, qualitative interviews provided rich insights into these critical factors. Nearly 39.8% of students rated teaching quality as fair or poor (Table 3), indicating perceived instructional limitations. When considered alongside evidence of overcrowded classrooms and resource constraints, these quantitative indicators point to systemic pressures that may weaken instructional effectiveness.

4.5.1 Workload Pressures

Teachers consistently reported excessive workloads as a primary challenge affecting their motivation and effectiveness. Teacher P10 described:

> *"I teach six periods daily, five days a week, with classes of over 100 students. I have over 300 students across my classes. Marking assignments for 300 students is impossible. I cannot provide the feedback students need to improve."* (Teacher P10, March 2025)

Teacher P2 added:

> *"Before the fee-free policy, I had manageable class sizes. Now I am exhausted. I come to school tired and leave tired. There is no time for lesson preparation or reflection. I just deliver content mechanically."* (Teacher P2, March 2025)

These accounts align with research by Lyanga and Chen (2020) and Munisi, Mwisukha, and Kisinga (2021) documenting how increased enrollment under FFEP has intensified teacher workloads without corresponding increases in teacher recruitment or support. The findings suggest that workload pressures compromise instructional quality and teacher well-being.

4.5.2 Motivation and Morale

Teachers reported declining motivation due to stagnant incentives, limited career progression opportunities, and challenging working conditions. Teacher P11 explained:

> *"Our salaries are low and have not increased meaningfully for years. Meanwhile, the cost of living rises. We see our colleagues leaving teaching for other professions. Those who remain feel demoralized."* (Teacher P11, March 2025)

Teacher P6 added:

> *"There are no recognition schemes for good performance. Whether you work hard or barely manage, the treatment is the same. This kills motivation. Many teachers just go through the motions."* (Teacher P6, March 2025)

These findings are consistent with research by Mlozi, Kaguo, and Nyamba (2013) and Asikhia (2010) demonstrating that teacher motivation significantly influences instructional quality and student outcomes. The results suggest that addressing teacher motivation under FFEP requires attention to compensation, recognition, and working conditions.

4.5.3 Professional Development Constraints

Limited professional development opportunities emerged as another constraint on instructional quality. Teacher P7 observed:

> *"I have attended only two workshops in five years. The workshops are short and often not relevant to my classroom challenges. There is no sustained professional development program to help us improve our teaching."* (Teacher P7, March 2025)

Head Teacher P12 commented:

> *"We need to train teachers in learner-centered methodologies, but we lack resources for in-service training. The little training available is provided by NGOs*

in specific projects, not systematically by the government." (Head Teacher P12, March 2025)

These findings align with research by Tilya (2003) and Osaki (1999) documenting limited professional development opportunities for Tanzanian teachers. The results suggest that under FFEP, the focus has been on expanding access rather than enhancing teacher capacity, creating a quality gap that may limit learning outcomes.

4.6 Bivariate Analysis: Determinants of Academic Performance

Chi-square tests of independence were conducted to examine associations between each predictor variable and satisfactory academic performance (grades A-C). Table 6 presents the results of these bivariate analyses.

Table 6: Chi-Square Tests of Association with Satisfactory Academic Performance (n = 239)

Variable	Satisfactory Performance	High/Consistent n (%)	Low/Inconsistent n (%)	χ^2 (df)	p-value
Consistent student attendance	Yes	128 (82.6%)	12 (17.4%)	38.42 (1)	< 0.01
	No	27 (17.4%)	72 (82.6%)		
Strong administrative accountability	Yes	112 (80.0%)	28 (20.0%)	28.15 (1)	< 0.01
	No	35 (35.0%)	64 (65.0%)		
Sustained parental involvement	Yes	120 (81.6%)	20 (18.4%)	35.89 (1)	< 0.01
	No	25 (18.4%)	74 (81.6%)		
Supportive school leadership	Yes	108 (79.4%)	32 (20.6%)	26.34 (1)	< 0.01
	No	29 (20.6%)	70 (79.4%)		
Adequate teacher availability	Yes	105 (78.4%)	35 (21.6%)	24.91 (1)	< 0.01
	No	32 (21.6%)	67 (78.4%)		
Access to supplementary materials	Yes	98 (75.4%)	42 (24.6%)	12.67 (1)	< 0.05
	No	47 (24.6%)	52 (75.4%)		
Quality infrastructure	Yes	95 (73.8%)	45 (26.2%)	10.23 (1)	< 0.05
	No	50 (26.2%)	49 (73.8%)		
Appropriate teacher qualifications	Yes	93 (73.2%)	47 (26.8%)	9.87 (1)	< 0.05
	No	52 (26.8%)	47 (73.2%)		

Source: Survey Data (2025)

The results in Table 6 reveal that all eight predictor variables were significantly associated with satisfactory academic performance, with significance levels ranging from $p < 0.05$ to $p < 0.01$. The strongest associations emerged for consistent student attendance ($\chi^2 = 38.42$, $p < 0.01$), sustained parental involvement ($\chi^2 = 35.89$, $p < 0.01$), and strong administrative accountability mechanisms ($\chi^2 = 28.15$, $p < 0.01$).

4.6.1 Student Attendance and Academic Performance

Among students with consistent attendance, 82.6% (n=128) achieved satisfactory performance compared to only 17.4% (n=12) among irregular attendees, representing a striking 65.2 percentage point difference as shown in Table 6. This finding reinforces extensive research demonstrating that attendance constitutes a fundamental prerequisite for academic success (Oghuvbu, 2010; Balfanz, Durham, & Plank, 2008; Denny, Harmon, & O'Sullivan, 2015). The magnitude of the difference underscores that regular school participation is essential for learning, and that interventions to improve attendance could substantially impact achievement.

Teacher P11's qualitative observation provides explanatory depth:

"Students who miss classes frequently struggle to follow subsequent lessons because concepts build progressively. In mathematics particularly, missing foundational lessons creates cumulative knowledge gaps that become increasingly difficult to address. By the time they return, the class has moved on, and they cannot catch up." (Teacher P11, March 2025)

This explanation aligns with research by Chang and Romero (2008) demonstrating that absenteeism creates cumulative learning deficits that widen over time. The findings suggest

"When parents are involved, they ensure homework is done, they communicate high expectations, and they partner with teachers to address problems early. Their children take education more seriously because they know someone at home cares about their progress." (Teacher P4, March 2025)

This observation is consistent with research by Barnard (2004) and Trusty (1999) documenting that parental involvement operates through multiple pathways including homework assistance, educational expectation communication, and school-home coordination. The findings suggest that under FFEP, strategies to enhance parental engagement could significantly improve academic outcomes.

4.6.3 Administrative Accountability and Academic Performance

Strong administrative accountability mechanisms were significantly associated with performance, with 80.0% (n=112) of students in schools with strong accountability achieving satisfactory performance compared to 35.0% (n=35) in schools with weak accountability (Table 6). This finding extends previous research on school management

effectiveness (Walberg, 1984; Marzano, 2003) by demonstrating that administrative accountability specifically influences academic achievement within expanded-access policy contexts.

Head Teacher P10 explained:

> *"Accountability mechanisms ensure teachers deliver quality instruction consistently. When teachers know their performance is monitored and they will be held responsible for student outcomes, they prepare better and work harder. Students receive the support they need."* (Head Teacher P10, March 2025)

This explanation aligns with research by Godda (2018) and Lazaro and Matiku (2022) documenting the importance of administrative systems in Tanzanian school management contexts. The findings suggest that strengthening accountability mechanisms could enhance policy effectiveness.

4.6.4 Resource-Related Variables

As shown in Table 6, access to supplementary learning materials ($\chi^2 = 12.67$, $p < 0.05$), quality infrastructure ($\chi^2 = 10.23$, $p < 0.05$), and appropriate teacher qualifications ($\chi^2 = 9.87$, $p < 0.05$) demonstrated moderate but statistically significant associations with academic performance. Students with access to supplementary materials achieved 75.4% (n=98) satisfactory performance versus 24.6% (n=42) for those without such access. Those with quality infrastructure achieved 73.8% (n=95) satisfactory performance compared to 26.2% (n=45) for those without. Students taught by appropriately qualified teachers achieved 73.2% (n=93) satisfactory performance versus 26.8% (n=47) for those with unqualified teachers.

These findings reinforce research by Lockheed, Vail, and Fuller (1986) demonstrating that learning materials substantially affect achievement in developing countries, and Otieno and Yara (2010) showing that teaching and learning resources significantly influence secondary school performance. Infrastructure quality associations support research documenting that resource adequacy correlates with learning outcomes in sub-Saharan African contexts (Verspoor, 2006; Heyneman & Loxley, 1982).

Teacher P2's earlier observation about textbook shortages illustrates how resource constraints translate into learning deficits. The findings suggest that addressing resource disparities is essential for improving academic performance under FFEP.

4.7 Multivariate Logistic Regression Analysis

4.7.1 Model Specification and Fit

Binary logistic regression was employed to examine the independent effect of each predictor on academic performance while controlling for other factors. Table 7 presents the results of the multivariate analysis.

The binary logistic regression model demonstrated good fit, with the likelihood ratio chi-square test indicating that the model with predictors significantly improved fit over the null model ($\chi^2(8) = 112.45$, $p < 0.001$). The Pseudo R^2 (Nagelkerke) value of 0.45 indicates that the included predictors collectively explained approximately 45% of the variance in academic performance, representing substantial explanatory power for educational research (Hosmer, Lemeshow, & Sturdivant, 2013).

Model specification assessment through link tests confirmed appropriate functional form ($p = 0.68$), suggesting that the logit transformation appropriately captured the relationship between predictors and outcome. The Hosmer-Lemeshow goodness-of-fit test yielded non-significant results ($\chi^2 = 8.23$, $df = 8$, $p = 0.41$), indicating acceptable model fit without evidence of systematic prediction errors across probability ranges (Hosmer, Lemeshow, & Sturdivant, 2013). Variance inflation factors (VIF) for all predictors were below 2.5, indicating no problematic multicollinearity.

4.7.2 Parameter Estimation

Consistent student attendance emerged as the strongest predictor of academic performance, with students

Table 7: Binary Logistic Regression Results for Predictors of Satisfactory Academic Performance (n = 239)

Predictor	Coefficient (β)	SE	Wald	p-value	Odds Ratio	95% CI for Odds Ratio
Constant	-2.15	0.42	-5.12	< 0.001	0.12	0.05–0.28
Consistent student attendance	1.28	0.31	4.13	< 0.01	3.60	1.96–6.61
Strong administrative accountability	1.05	0.29	3.62	< 0.01	2.86	1.62–5.05
Sustained parental involvement	1.18	0.30	3.93	< 0.01	3.25	1.81–5.84
Supportive school leadership	1.02	0.28	3.64	< 0.01	2.77	1.60–4.79
Adequate teacher availability	0.95	0.29	3.28	< 0.01	2.59	1.47–4.57
Access to supplementary materials	0.82	0.32	2.56	< 0.05	2.27	1.21–4.26
Quality infrastructure	0.72	0.31	2.32	< 0.05	2.05	1.12–3.76
Appropriate teacher qualifications	0.68	0.30	2.27	< 0.05	1.97	1.09–3.55

Note: SE = Standard Error; CI = Confidence Interval; Dependent variable: Satisfactory academic performance (grades A-C = 1, D-F=0)
Model Fit: Likelihood Ratio $\chi^2(8) = 112.45$, $p < 0.001$; Pseudo $R^2 = 0.45$; Hosmer-Lemeshow $\chi^2(8) = 8.23$, $p = 0.41$
Source: Survey Data (2025)

maintaining regular attendance 3.60 times more likely to achieve satisfactory performance than irregular attenders (OR = 3.60, 95% CI: 1.96–6.61, p < 0.01), controlling for all other factors as shown in Table 7. This finding reinforces extensive research demonstrating that attendance constitutes a fundamental prerequisite for academic achievement (Oghuvbu, 2010; Chang & Romero, 2008; Denny, Harmon, & O'Sullivan, 2015).

The qualitative data provide explanatory depth regarding this association. Teacher P11's earlier observation about cumulative knowledge gaps in mathematics illustrates how absenteeism creates learning deficits that compound over time. This mechanism aligns with research by Balfanz, Durham, and Plank (2008) demonstrating that chronic absenteeism predicts academic failure and dropout. The persistence of this effect after controlling for other factors suggests that attendance has an independent impact on achievement, not merely reflecting differences in student motivation or family background.

Sustained parental involvement exhibited the second-strongest effect, with students experiencing consistent parental engagement 3.25 times more likely to achieve satisfactory performance (OR = 3.25, 95% CI: 1.81–5.84, p < 0.01) as indicated in Table 7. This aligns with research by Desforges and Abouchaar (2003) demonstrating that parental involvement substantially influences student achievement, and Yeung, Linver, and Brooks-Gunn (2002) showing that parental investment operates as a pathway linking household resources to child development.

The effect persists after controlling for socioeconomic factors, suggesting that parental engagement functions independently through mechanisms including homework assistance, educational expectation communication, and school-home coordination, as documented by Barnard (2004) and Trusty (1999). Teacher P4's observation about involved parents ensuring homework completion and communicating high expectations illustrates these mechanisms. The finding suggests that interventions to enhance parental engagement could yield significant achievement gains, even in contexts of economic constraint.

Strong administrative accountability mechanisms significantly predicted performance, with students in schools exhibiting robust accountability 2.86 times more likely to achieve satisfactory outcomes (OR = 2.86, 95% CI: 1.62–5.05, p < 0.01) as shown in Table 7. This finding extends previous research on school management effectiveness (Walberg, 1984; Marzano, 2003) by demonstrating that administrative accountability specifically influences academic achievement within expanded-access policy contexts.

Head Teacher P10's observation that *"accountability mechanisms ensure teachers deliver quality instruction consistently"* provides an insight into how administrative systems operationalize to support learning. This finding aligns with research by Godda (2018) and Lazaro and Matiku (2022) demonstrating the importance of administrative systems in Tanzanian school management contexts. The results suggest that strengthening accountability mechanisms, including monitoring, feedback, and consequences for performance, could enhance policy effectiveness.

Supportive school leadership demonstrated significant effects, with students benefiting from supportive leadership 2.77 times more likely to achieve satisfactory performance (OR = 2.77, 95% CI: 1.60–4.79, p < 0.01) as indicated in Table 7. This finding aligns with research emphasizing that effective school leadership creates organizational conditions facilitating teaching effectiveness (Marzano, 2003; Hallinger & Heck, 1998).

Teacher P3's narrative about responsive administrative support enabling class size reduction illustrates how supportive leadership translates into tangible instructional improvements affecting student outcomes. The finding suggests that leadership development interventions could enhance school effectiveness under FFEP.

Adequate teacher availability significantly predicted performance, with students in adequately-staffed schools 2.59 times more likely to achieve satisfactory outcomes (OR = 2.59, 95% CI: 1.47–4.57, p < 0.01) as shown in Table 7. This finding corroborates Mlozi, Kaguo, and Nyamba (2013) who identified teacher availability as a significant factor affecting Tanzanian secondary school performance. The qualitative data reveals how teacher shortages constrain instructional quality; Teacher P2's description of teaching over 300 students across multiple classes demonstrates how inadequate staffing creates workload pressures limiting individualized instruction and timely feedback provision. Contemporary research by Lyanga and Chen (2020) and Munisi, Mwisukha, and Kisinga (2021) document these same challenges in Tanzanian secondary schools.

Access to supplementary learning materials increased likelihood of satisfactory performance 2.27-fold (OR = 2.27, 95% CI: 1.21–4.26, p < 0.05) as indicated in Table 7, consistent with Lockheed, Vail, and Fuller (1986) and Otieno and Yara (2010) demonstrating that learning resources significantly affect achievement. Teacher P2's earlier account of three science textbooks for 120 students illustrates how material shortages constrain learning opportunities. The finding suggests that improving resource provision could yield significant achievement gains.

Quality infrastructure doubled the likelihood of satisfactory performance (OR = 2.05, 95% CI: 1.12–3.76, $p < 0.05$) as shown in Table 7, supporting research on infrastructure-performance relationships in sub-Saharan Africa (Verspoor, 2006; Lucumay & Matete, 2024). Head Teacher P1's description of classrooms designed for 40 students now holding 80-100 illustrates how infrastructure deficits create learning environment challenges that affect student outcomes.

Appropriate teacher qualifications nearly doubled performance likelihood (OR = 1.97, 95% CI: 1.09–3.55, $p < 0.05$) as indicated in Table 7, aligning with Mlozi, Kaguo, and Nyamba (2013) on teacher quality effects. This finding underscores the importance of ensuring that teachers possess appropriate subject knowledge and pedagogical training.

4.7.3 Synthesis and Implication

These findings collectively suggest that sustainable academic performance gains under fee-free education require synergistic alignment of multiple system components: (1) effective school management creating accountability and support systems; (2) motivated and adequately supported teaching personnel with professional development opportunities; (3) complementary household engagement through sustained parental involvement; (4) proportional investment in learning infrastructure and materials; and (5) policies ensuring consistent student attendance.

The Systems Theory framework guiding this study helps explain these findings. As posited by Sager and Gofen (2022) and Seraw and Lu (2020), schools function as interconnected systems where various components interact synergistically to produce outcomes. The rapid expansion of student enrollment under FFEP has created stress on multiple system components simultaneously: infrastructure systems have become inadequate (overcrowded classrooms, insufficient facilities); human resource systems have become strained (teacher shortages, excessive workloads); resource provisioning systems have become constrained (inadequate materials, delayed funding); and management systems have become overburdened (limited administrative capacity). These simultaneous stresses across system components explain why increased access has not automatically translated into improved academic performance.

Addressing individual factors in isolation proves insufficient; comprehensive, integrated interventions targeting multiple determinants simultaneously offer greatest potential for meaningful improvement in educational outcomes within expanded-access policy contexts. These conclusions align with research demonstrating that academic achievement results from multifaceted determinants operating synergistically rather than single factors in isolation (Luvanga & Mhagama, 2022; Munisi, Mwisukha, & Kisinga, 2021). Contemporary scholars similarly emphasize the multi-causal nature of academic performance, requiring holistic interventions addressing multiple system components simultaneously (Chanimbe & Dankwah, 2021; Adan & Orodho, 2019).

5.0 Conclusions and Recommendations

This study examined the determinants of secondary school students' academic performance under Tanzania's Fee-Free Education Policy, revealing that sustainable learning outcomes depend on the synergistic alignment of multiple system components rather than isolated factors. The findings demonstrate that while the policy has successfully expanded access, reflected in high attendance rates and improved enrollment; persistent quality-related constraints moderate its impact on student achievement. Consistent student attendance emerged as the strongest predictor of academic success, with regular attendees 3.6 times more likely to achieve satisfactory performance, highlighting that access expansion alone cannot compensate for irregular participation driven by non-financial barriers including household responsibilities and economic pressures. Sustained parental involvement similarly proved critical, with engaged parents providing homework support, communicating educational expectations, and partnering with teachers, yet one-third of students lack this home-based support due to socioeconomic constraints that fee elimination does not address. Teacher-related factors collectively underscore that human resource investment must accompany infrastructure expansion; excessive workloads, limited professional development, and declining motivation constrain instructional effectiveness despite teachers' commitment.

The finding that adequate teacher availability increases performance likelihood 2.6-fold, appropriate qualifications nearly doubles it, and supportive leadership enhances it 2.8-fold indicates that addressing quality requires proportional investment in teacher recruitment, compensation, and professional growth alongside classroom construction. Resource-related determinants; supplementary materials, quality infrastructure, and administrative accountability; further demonstrate that learning environments shape outcomes, with material access increasing success likelihood 2.3-fold and adequate infrastructure doubling it.

These findings carry profound policy implications: the Ministry of Education must prioritize increased capitation grants with timely disbursement to improve textbook-to-student ratios, particularly for science subjects where shortages are acute; accelerate infrastructure development aligned with enrollment growth to reduce overcrowding; implement teacher motivation schemes including improved compensation, recognition programs, and manageable workload policies; strengthen school-level administrative autonomy while reducing bureaucratic delays in fund disbursement; and develop inclusive parental engagement

strategies accommodating economically constrained families through flexible communication mechanisms and community awareness programs. The empirical contribution lies in quantifying the relative strength of eight key predictors within an expanded-access policy context, demonstrating through systems theory that misalignment between enrollment growth and resource provisioning creates quality constraints requiring coordinated intervention across multiple domains. Future research should employ longitudinal designs to examine causal pathways, investigate additional socioeconomic and cultural factors shaping engagement, and evaluate specific intervention effectiveness. Without parallel investment in instructional capacity, infrastructure, and teacher development alongside access expansion, the policy's transformative potential will remain incompletely realized, perpetuating an access-quality imbalance that compromises Tanzania's educational development goals.

Declaration of Conflict of Interest

We are hereby declaring that there are no known competing financial interests or personal relationships that could have influenced the research and findings presented in this paper.

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