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Influence Of Teacher Student Relationship On Students' Performance In Mathematics In Public Secondary Schools In Kwanza Sub-County, Kenya

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Abstract: ***This research examined the influence of teacher-student relationships on mathematics performance in public secondary schools in Kwanza Sub-County, Kenya. The study was grounded on the fact that there is an ongoing low performance in mathematics among students in this Sub-County and across Kenya, thus affecting achievement of national educational goals aimed at fostering all rounded individuals who contribute to national development and global citizenship. The research utilized social-cultural theory and used a mixed-methods approach, specifically a convergent parallel design. Research instruments included questionnaires, interviews, and document analysis. The sample was: 10 public secondary schools, focusing on all directors of studies, mathematics teachers, and students in Kwanza Sub-County. Both probability and non-probability sampling techniques, specifically stratified, systematic, and purposive sampling, were employed to sample the population. The quantitative data analysis employed SPSS for descriptive statistics, summarizing data using percentages, and applied inferential statistics, particularly ANOVA, to draw conclusions. Qualitative data analysis involved transcription, coding, and theme development, supported by discussions and direct quotations from the original data to strengthen findings. The results of the inferential statistics indicated significant differences, highlighting that effective communication between teachers and students is essential for academic success ($F = 7.345$, $p = 0.010$). Descriptive statistics revealed variations in average mathematics performance across three years, peaking in 2023 (mean = 3.5) and declining in 2024 (mean = 2.9), indicating the influence of systemic factors beyond student effort. The study established the significance of cultivating positive teacher-student relationships to enhance mathematics performance. It was recommended that the Ministry of Education and school leadership integrate structured communication training strategies into teacher training programs to enhance performance in mathematics.***

Keywords: Teacher Student Relationship; Students' Performance

I. INTRODUCTION

Teacher-student relationships are student interactions characterized by two-way trust and respect (Sabbar, 2024). The teacher-student relationship in the classroom is defined as a positive connection between teacher and student to foster trust and respect (Vanner et al., 2022). This relationship involved getting to know students better, providing choices, and encouraging students to become stronger learners daily (Fitzmorris et al., 2022). The teacher-student relationship (TSR) shapes students' emotions, behavior, and academic achievement (Balimuttajjo & Mutarutinya, 2023). A harmonious and supportive teacher-student relationship motivates students to learn and improve academic

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performance (Wang et al., 2024). This study examined the influence of teacher-student relationships on students' mathematics performance in Kwanza, Kenya. It measured the dynamics of teacher-student relationships by examining communication from both the teacher's and the student's viewpoints.

Mathematics is a science, technology, and engineering (STEM) subject that deals with applying the cognitive domain and making computations (Byiringiro, 2024). Mathematics skills can be utilized in various career developments, such as in the software industry (Akdur, 2020), actuaries, statisticians, data scientists, cybersecurity experts, and woodworkers (Jade & Oco, 2023). Mathematics also plays a vital role in the effective functioning of daily life (Donohue, 2020), promoting problem-solving skills, logical reasoning, creative thinking, and sharpening memory. However, mathematics performance consistently remains low in Africa and globally. Research conducted by Meltzer (2024) indicated a significant drop in mathematics performance in the United States between 2019 and 2023, according to the Program for International Student Assessment (PISA). Mathematics performance in numerous African countries typically exhibited lower levels than in other academic areas (Mabena et al., 2024).

Despite commendable government and donor-funded initiatives aimed at enhancing mathematics performance, such as the CEMASTEA program supported by JICA and the Reading to Learning program implemented by the Aga Khan Foundation, there remains a pressing need for ongoing research into mathematics outcomes, particularly in regions like Kwanza Sub-County. The inclusion of mathematics as a core subject in the Kenyan curriculum highlights its essential role in influencing students' academic and professional trajectories (Mutoko, 2023) and in fostering national development and global competitiveness (Sele & Wanjiku, 2024). Recent analyses, including the 2023 KCSE report and Kwanza sub-county conference proceedings (Barasa, 2023), reflect a worrying tendency of continually low mathematics performance, with children frequently achieving mean scores ranging from D to below, and mean scores remaining below expected levels. The outcomes underscore systemic challenges and the pressing necessity for localized studies to examine specific factors influencing performance, such as gender disparities (Simiyu et al., 2019). Consequently, additional research on Kwanza is necessary to guide targeted interventions and promote equitable and effective mathematics education for all students.

The study measured teacher communication and its influence on students' mathematics performance in Kwanza Sub-County. A survey by Asrar et al. (2018) established that a good relationship would be much easier if the teacher and the students had good communication skills and understood the importance of their communication. Research on the impact of effective communication, achievement sharing, and positive classroom environment on learning performance indicated that teachers who created a sense of community and responded to students fostered positive relationships that influenced students to be more engaged and enthusiastic about learning, leading to better academic performance (Tariq & Ullah, 2024). A study on the influence of communication on students' performance established that communication between parents and students dramatically affected students' academic performance (Kaptich et al., 2019). Therefore, the study examined effective communication to establish its influence on students' performance in mathematics in Kwanza Sub-County, Kenya.

STATEMENT OF THE PROBLEM

Kwanza Sub-County is experiencing significant educational and social crises demonstrate by persistently inadequate mathematics performance, as only 17% of the 2023 KCSE candidates met the criteria for direct university admission. This trend adversely influences students' futures, constraining their access to career options and in certain instances, exacerbating crime rates. Mathematics, a fundamental discipline impacting professional decisions and national progress, continues to pose a significant challenge, particularly for girls in the region. The sub-county's inadequate performance hampers progress towards realizing Vision 2030, which relies on breakthroughs in science and technology.

Although numerous studies have examined factors affecting academic performance—such as teacher efficacy, personality, expectations, and teacher-student dynamics—few have specifically investigated the impact of teacher-student relationships on mathematics outcomes within the Kenyan context, particularly in Kwanza. Current study indicates that strong, supportive teacher-student relationships can improve academic achievement, underscoring the necessity to comprehend how these interactions influence mathematics learning results in underperforming areas.

This study aimed to explore how teacher-student relationships affect mathematics performance in public secondary schools located in Kwanza Sub-County. The objective was to address the existing knowledge gap by investigating critical factors including teacher availability, communication quality, motivation, and student perceptions. The study aimed to provide insights into education policy and practice, particularly during Kenya's shift from the 8-4-4 to the 2-6-3-3-3 curriculum, with the goal of enhancing academic performance and fostering more effective teaching and learning environments.

II. METHODOLOGY

The study utilized a mixed-methods approach, particularly the convergent parallel design, to examine the influence of teacher-student relationship on mathematics performance in Kwanza Sub-County, Kenya. This method enabled the simultaneous collection of quantitative and qualitative data, which were analyzed separately and later combined to yield a thorough explanation of the findings. The quantitative component employed a correlational methodology to examine the degree and nature of the relationship between teacher-student interactions and student performance. The use of both data sources ensured a comprehensive and nuanced understanding of the study problem.

The study assessed 47 public secondary schools, with 4,107 students and 94 mathematics instructors, as reported by the Kwanza Sub-County Education Office (2023). Four schools were chosen for pilot testing, while 43 were selected for primary study. Ten schools were selected proportionally from three categories—Extra-County, County, and Sub-County schools—with greater representation from County and Sub-County schools due to their larger enrollment numbers. The sample consisted of 10 Directors of Studies, 20 Form Four mathematics instructors selected purposefully, and 341 students determined using the Krejcie and Morgan (1970) formula for sample size estimation.

Data collecting instruments comprised of structured questionnaires for quantitative data and semi-structured interviews for qualitative insights. The qualitative component utilized a phenomenological framework to document participants lived experiences and views. Thematic analysis was employed to understand qualitative data, whereas quantitative responses were analyzed utilizing SPSS. Instrument validity was confirmed via expert evaluation by educators, Directors of Studies, and academic supervisors, addressing content, face, and criteria validity. The reliability was assessed by the test-retest method, yielding a robust Cronbach's Alpha coefficient of 0.805, so affirming the internal consistency of the study instruments.

III. FINDINGS

STUDENT RESPONSES ON COMMUNICATION AND MATHEMATICS PERFORMANCE

Results from student questionnaires revealed that most students recognized the significance of efficient communication with their mathematics teachers. Students who indicated regular engagement with their teachers—via class discussions, question-and-answer sessions, and individualized feedback—exhibited a superior comprehension of mathematical ideas. A multitude of pupils attributed their enhanced performance to the clarity and accessibility of their teachers' communication methods. A significant proportion of students emphasized the beneficial effect of fast feedback on their learning, enabling them to recognize and rectify mistakes swiftly. They valued educators who employed visual aids and practical examples, as this facilitated the comprehension of abstract mathematical concepts.

TEACHER RESPONSES ON COMMUNICATION AND MATHEMATICS PERFORMANCE

Teachers echoed students' viewpoints, emphasizing that clear and consistent communication significantly improves students' comprehension and performance in mathematics. Teachers indicated that they used various strategies to enhance effective communication, such as simplified explanations of complex concepts, consistent use of instructional aids (e.g., visual tools, manipulatives), and open-ended questions to encourage discussion and critical thinking.

The Directors of Studies emphasized the significance of effective communication in improving student learning and performance in mathematics. Prompt feedback on examinations enables students to quickly identify and rectify mistakes. A Director of Studies noted that "immediate feedback after assessments allows learners to reflect on their mistakes while the content remains fresh." DOS highlighted the importance of teaching aids and visual tools in enhancing engagement and understanding, especially in abstract disciplines like algebra and geometry. Effective communication cultivates a supportive classroom environment, promotes participation, and improves students' confidence. The correlation between active communication, inquiry, and the pursuit of clarification among students and enhanced academic performance highlights the importance of communication as a factor influencing student success. The results align with Hattie's (2020) research on the efficacy of prompt feedback and instructional tools in improving retention and achievement.

INFERENTIAL STATISTICS

Inferential statistics were employed to assess the statistical significance of the observed relationship between teacher-student communication and mathematics performance, thereby evaluating the null hypothesis: H_{o1}: There is significant no correlation between the relationship between teachers and learners and the performance in mathematics within Kwanza Sub-County, Kenya. A Pearson Product-Moment Correlation Coefficient (r) was utilized to examine the relationship between communication levels, as evaluated by both students and teachers, and the average mathematics results of the students. A One-Way ANOVA was conducted to assess whether the differences in mathematics performance across schools employing various communication strategies were statistically significant.

PEARSON CORRELATION ANALYSIS

The key variables included: Independent Variable: Teacher-Student Communication (measured using Likert-scale questionnaire items) and Dependent Variable that is Students' KCSE Mathematics Mean Scores

Variable	Mean	Std. Deviation
Communication Score (Students)	3.76	0.58
Mathematics Performance	3.17	0.71

Source: Research Data, 2025

The results revealed a correlation coefficient (r) of 0.634 and a p-value of 0.002 ($p < 0.05$). A moderate to strong positive correlation exists between teacher-student communication and mathematics performance. The outcome is statistically significant, suggesting that improved communication correlates with elevated mathematics scores among pupils.

ANOVA Table Summary:

Source	SS	Df	MS	F	p-value
Between Groups	5.23	2	2.615	6.84	0.009
Within Groups	9.17	24	0.382		

Source	SS	Df	MS	F	p-value
Total	14.40	26			

Source: Research Data, 2025The results indicated that there is a statistically significant difference in mathematics performance between schools with different levels of communication practices (F (2, 24) = 6.84, p = 0.009). Post hoc analysis (Tukey HSD) revealed that students in schools with high communication significantly outperformed those in schools with low communication.

PEARSON CORRELATION ANALYSIS

Variables included independent variable which is Teacher-Student Communication (measured using Likert-scale questionnaire items) and dependent variable which is Students' KCSE Mathematics Mean Scores

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ANOVA Table Summary:

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	17.600	1	17.600	7.345	.010
Within groups	3.800	340	.079		
Total	21.400	341			

The findings revealed an F-value of 7.345 and a p-value of 0.010 which $p < .05$, the results were therefore statistically significant. Subsequent analysis (Tukey HSD) indicated that students in institutions characterized by strong communication significantly outperformed their counterparts in institutions with weak communication.

III. CONCLUSION

Given that both the correlation and ANOVA results demonstrated statistical significance at $\alpha = 0.05$, the null hypothesis (H_{o1}) was rejected. It was concluded that there exists a statistically significant relationship between teacher-student communication and students' mathematics performance in Kwanza Sub-County, Kenya. The null hypothesis (H_0) was rejected. It is highly advisable to implement enhanced communication tactics, including prompt feedback and the utilization of instructional aids, to elevate mathematics proficiency in secondary schools. Statistical evidence indicates that improving communication techniques between teachers and students enhances academic success in mathematics. Educational institutions and stakeholders in Kwanza Sub-County are urged to use systematic communication tactics, including prompt feedback, utilization of instructional aids, and the promotion of open dialogue within classes. The results indicate a statistically significant correlation between teacher-student communication and student achievement in mathematics. Improved communication tactics, including prompt feedback and the utilization of instructional tools, are highly advised to enhance mathematics performance in secondary education.

IV. RECOMMENDATION

Incorporate effective communication strategies into teacher training programs, effective communication must be an essential element of both pre-service and in-service teacher training programs. Training should emphasize clear and simplified instruction delivery, provide prompt and helpful feedback, while promote an environment of open communication where students feel at ease to ask questions and share their challenges. These components are crucial for fostering trust and enhancing understanding in mathematics, particularly in schools with limited resources or high student numbers.

Establish Feedback Mechanisms: Educational institutions ought to adopt organized feedback systems—like weekly updates on student progress or prompt reviews of test results—to guarantee that learners recognize their strengths and areas needing enhancement. Timely feedback plays a crucial role in enhancing academic development while simultaneously boosting motivation and self-assurance in tackling mathematical challenges.

Investment in Visual Aids and Technology: Educational institutions ought to allocate resources towards teaching aids and technological tools (such as digital simulations, interactive whiteboards, or math software) that improve communication via visual and tactile methods. These tools accommodate various learning preferences and aid in elucidating complex mathematical ideas.

Enhancing Communication Policies Focused on Students: School leadership ought to foster classroom settings that emphasize student voice and inquiry. This may involve establishing communication standards, implementing student feedback mechanisms, or facilitating classroom discussions that promote interaction between peers and between students and teachers.

Assessing and Evaluating Communication Practices: Educational stakeholders need to establish performance indicators to evaluate the impact of communication practices on academic outcomes across various subjects. Systematic evaluations and classroom assessments can yield valuable insights and facilitate ongoing enhancement.

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