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Students' attitudes and mathematics teachers' self- efficacy in teaching and their relationships on student achievement in mathematics

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Abstract

Background: Mathematics holds a critical position within educational systems worldwide due to its extensive applications. At Dadieso Senior High School in Ghana, students consistently demonstrate low performance in mathematics, necessitating an investigation into potential determinants of academic achievement.
Aim: This study aims to examine the impact of students' attitudes towards mathematics and the self-efficacy of mathematics teachers on students' mathematical achievements.
Method: A descriptive-correlational research design was adopted, employing quantitative methods to analyze the relationships between students' attitudes, teachers' self-efficacy, and students' academic performance. The study sampled 218 students and 7 teachers, utilizing the Attitude towards Mathematics Inventory (ATMI), the Teacher Self-Efficacy Scale (TSES), and a Mathematics Achievement Test (MAT) for data collection.
Results: The analysis revealed a moderate positive correlation between students' attitudes towards mathematics and their academic performance, indicating that positive attitudes are linked to better outcomes. Furthermore, a significant, albeit smaller, positive correlation was identified between teachers' self-efficacy and student achievement, highlighting the impact of teacher confidence on student success.
Conclusion: Fostering positive attitudes towards mathematics among students is essential for improving academic performance. Likewise, enhancing teachers' self-efficacy substantially influences student achievement. These factors should be the focus of interventions aimed at enhancing mathematical outcomes in educational settings.

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INTRODUCTION

Mathematics is a cornerstone of educational programs globally, playing a vital role in both personal and national development due to its wide-ranging applications (Charles-Ogan et al., 2017). The subject's importance cannot be understated, as it provides the foundational knowledge required to grasp other academic disciplines and is crucial for numerous everyday tasks. When students lack proficiency in mathematics, it can significantly hinder their understanding of other subjects, which emphasizes the essential need for robust mathematical skills. Academic and national progress are often reflected in students' performance in mathematics, where high achievement is a positive indicator, while low performance is a cause for concern. Therefore, addressing the issues that affect mathematics education is imperative to ensure overall educational success.

Numerous reports have consistently highlighted the poor performance of Ghanaian senior high school students in mathematics (Mensah, 2017; Fletcher, 2018). At Dadieso Senior High School, this issue is particularly pronounced, with a significant proportion of students failing to meet the qualifications for higher education. Specifically, in 2015, 56.62% of students did not qualify, and this percentage increased to 60.78% in 2016 before slightly decreasing to 56.17% in 2017. Core mathematics has been identified as a major contributing factor to this high rate of disqualification.

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This trend of persistent low performance in mathematics raises serious concerns about the effectiveness of current teaching methods and student engagement. The data clearly indicate a need to investigate the underlying factors that affect students' achievement in mathematics. Understanding these factors is crucial for developing strategies to improve student performance and qualification rates. Therefore, this study aims to explore the key influences on students' mathematical achievements to address this ongoing educational challenge.

Several studies have sought to identify the causes of poor mathematics performance among Ghanaian senior high school students, attributing it to factors related to students, teachers, schools, and parents (Fokuo et al., 2022; Karikari et al., 2020; Amoah et al., 2023). One critical factor affecting students is their attitude towards mathematics, encompassing their likes, dislikes, and disposition towards the subject. Studies in Ghana have documented a positive relationship between students' attitudes and their performance in mathematics (Asante, 2010; Mensah, et al., 2013; Enu, Agyeman & Nkum, 2015). Positive attitudes towards mathematics often result in better academic performance, indicating the significant role of students' perceptions in their learning outcomes. Students' attitudes are influenced by how mathematics is presented and perceived (Wakhata, 2022; Davadas & Lay, 2020). Teachers' instructional methods and classroom environment play a crucial role in shaping these attitudes. Moreover, parental involvement and encouragement are essential in developing a positive disposition towards mathematics. It is also important to consider the impact of school resources and support systems on students' attitudes and performance. By examining these various factors, we can better understand how to foster positive attitudes and improve mathematics performance among students.

Another significant determinant of students' achievement in mathematics is the self-efficacy of mathematics teachers—their belief in their ability to influence student performance (Wheatley, 2001): Teachers with high self-efficacy are generally well-prepared and more effective in their teaching practices (Gurcay, 2015). Research has consistently shown positive correlations between teacher self-efficacy and student achievement, suggesting that confident teachers can significantly enhance student learning outcomes (Coffie & Doe, 2019). High self-efficacy in teachers often leads to innovative teaching methods and better classroom management, which positively impacts students' attitudes and performance. Effective teachers are more likely to create engaging and supportive learning environments, fostering students' interest and confidence in mathematics. Besides teacher factors, parental support also plays a crucial role in students' academic success. Students who receive encouragement and support from their parents tend to develop a more positive attitude towards mathematics, which in turn boosts their performance (Amoah et al., 2023). Conversely, students with low interest and achievement in mathematics often report a lack of parental encouragement, highlighting the importance of family involvement in education. Thus, both teacher self-efficacy and parental support are vital components in improving students' mathematical achievements, necessitating a comprehensive approach to address these factors.

Despite numerous studies on the factors affecting mathematics performance, the research team, led by a mathematics teacher from Dadieso Senior High School, aims to determine whether students' attitudes and teachers' self-efficacy contribute to the poor performance in mathematics. This study seeks to provide solutions to this issue by addressing the following research questions:

1. What are the students' attitudes towards learning mathematics at Dadieso Senior High School?
2. What is the relationship between students' attitudes towards learning mathematics and their achievement in mathematics at Dadieso Senior High School?
3. What is the relationship between teachers' self-efficacy in teaching mathematics and students' achievement in mathematics at Dadieso Senior High School?

METHOD

Design

This is a quantitative study which explores students' attitude towards mathematics and teachers' self-efficacy in teaching mathematics and their relationships to students' mathematics achievement in Dadieso Senior High School. Specifically, a descriptive-correlational research design was employed to examine the relationship between students' attitude towards learning mathematics

and their mathematic achievement in Dadieso Senior high school. Also, the design was employed to determine the relationship between mathematics teacher self-efficacy in teaching and student's mathematics achievement in Dadieso senior high school. Correlational design is concerned with assessing relationship between two or more phenomena (McMillan & Schumacher, 2014). The researcher has therefore opted for the correlational design because taking the purpose of the study into consideration; correlational design is the appropriate design that can lead the researcher in drawing the most valid, credible conclusions from the answers to the research questions. In selecting a method to conduct the descriptive correlational study, a survey method was chosen to collect data from students and mathematics teachers. Survey method was best because it is used frequently in educational research to describe attitudes, beliefs, opinions and other types of information (McMillan & Schumacher, 2014).

Sampling Strategy and Participants

This study was carried out with a sample of two hundred and twenty-five (225) respondents. There were two hundred and eighteen (218) students and seven (7) mathematics teachers. The student sample was calculated employing sample determination formula (Yamane, 1967) n=N/(1+N 〖(e)^2), where, n is the sample size, N is the population size and e is the level of precision (5%). Using the formula, the sample size was determined as: n=479/(1+479(0.05)2) = 217.975. Since we are dealing with human being and not figures, the study went to nearest whole number making the sample to be 218 students. Moreover, the two hundred and eighteen (218) students were made up of one hundred and twenty-three (123) male and ninety-five (95) female. Stratified Random Sampling procedure was used to select male and female Form three (F3) students for the study. The Form three (F3) students' population was divided into two subgroups or strata thus male and female. Proportional samples were drawn randomly from each subgroup by labeling on pieces of paper yes or no for each group. These pieces of papers were thoroughly mixed up and each student randomly picked in each group. All students that picked yes from each group were put together to make the required sample for the research. Stratified random sampling resulted in less sampling error and also allowed the researcher to compare subgroup results (McMillan & Schumacher, 2014). Adopting the purposive sampling techniques seven (7) Form three (F3) mathematics teachers (6 male, 1 female) was involved in the study. These teachers and students on the basis of the researcher's knowledge of the population provided the best information for the purpose of the research (McMillan & Schumacher, 2014).

Research Instruments

Two set of questionnaires namely Attitude towards Mathematics Inventory (ATMI) and Teacher Self- Efficacy Scale (TSES) were used to gather data for the study. The Attitude towards Mathematics Inventory elicited information about the student's attitudes towards learning mathematics whereas the Teacher Self- Efficacy Scale questionnaire was used to gather information about the mathematics teachers' self- efficacy in teaching. In addition, Mathematics Achievement Test (MAT) was administered to ascertain the mathematics achievement of students.

Instrument Validity and Reliability

The instruments for data collection were subjected to content analysis. Validity of the two set of questionaire (Student's Attitude toward Mathematics Inventory and Teacher Self-Efficacy Scale) were presented to a senior lecturer and researcher in education to evaluate the questionnaire for content, construct and face validity. The lecturer is an expert in educational research hence was consulted to validate the instruments. Slight modifications were done to the questionnaire based on his suggestions. Also, the validity of the achievement test items was obtained through scrutiny by two mathematics teachers' who were examiners from West African Senior Secondary Certificate Examination (WASSCE). The instruments were piloted in Nana Brentu SHS under the same condition as the real survey. The students did not indicate any problems with the clarity of the direction and understanding of the items. This school was selected because it was found in the same geographical precinct and therefore shares similar characteristics with the current place of the study (Amponsah, Milledzi, Ampofo & Gyambrah, 2018). The Cronbach's alpha was computed to determine the reliability of the Student's Attitude toward Mathematics Inventory (ATMI) and Teacher Self-Efficacy

Scale (TSES). The reliability coefficients were found to be .835 and .921 for Student's Attitude toward Mathematics Inventory (ATMI) and Teacher Self-Efficacy Scale (TSES) respectively.

Data Collection Procedures

Ethical clearance was received from the District Directorate of Education. The researchers upon the permission of the district went to introduce themselves to the head teacher of the school. The researchers were then introduced to the teachers of the school. The researchers assured the students and teachers who are participating in the study of confidentiality and anonymity. On the second visit of the researchers to the school, Attitude towards Mathematics Inventory and Mathematics Achievement Test were administered. The administration and collection of the data was done by the researchers. The Attitude towards Mathematics Inventory questionnaires and mathematics achievement test were administered simultaneously to enable easy match of student achievement score against their attitude. Students in a relax atmosphere in the school's assembly hall were given sixty (60) munities, thus thirty (30) minutes for each instrument.

The instruments were administered under the supervision of the researchers to ensure students do not share ideals on the items for accurate measure of students' attitude towards learning mathematics and their achievement in mathematics. The presence of the researcher also offered the respondents the opportunity to seek for clarification about issue relating to the items and increased return rate of the research instruments (Kusi, 2012). Arrangement was made for the researchers to visit the school to administer the teacher self-efficacy scale questionnaire.

The researchers administered the teacher self-efficacy scale questionnaire on their third visit to the school. The teacher participants individually completed the teacher self-efficacy scale questionnaire in a peaceful atmosphere in the presence of the researcher within (30) minutes. Teachers were approached personally to ensure that each teacher provides information that reflects his or her self- efficacy in teaching mathematics. The researchers were also there to help teachers address any difficulty while filling the questionnaire which ensured 100% return rate of instruments (Kusi, 2012).

RESULTS AND DISCUSSION

Background Information of Participants

The sample in this study consisted of 209 Form three (F3) students. Of these, 119 students (56.9%) were males and 90 (43.1%) were females. Age-wise, 30 students (14.4%) were aged between 10-14 years, 169 students (80.9%) were 15-19 years, and 10 students (4.8%) were 20-24 years. Additionally, the study involved seven (7) Form three (F3) mathematics teachers, comprising six (6) males (85.7%) and one (1) female (14.3%). All the mathematics teachers were degree holders.

Research Question 1: What are the students' attitudes towards learning mathematics in Dadieso Senior High School?

Students' Attitudes Towards Learning Mathematics

One key objective of the study was to determine students' attitudes towards the study of mathematics. Students were asked to respond to the Attitude toward Mathematics Inventory (ATMI) questionnaire, which consisted of twenty (20) items on a 4-point scale (strongly agree, agree, disagree, strongly disagree). Descriptive statistics such as frequencies and percentages were used for the analyses, with results presented in Tables 1, 2, and 3.

Table 1. Students' Responses on Self-Confidence Variables

ITEM	SA F (%)	A F (%)	D F (%)	SD F (%)
4. I get a great deal of satisfaction out of solving a mathematics problem.	36(17.2)	69 (33.0)	56(26.8)	48(23.0)
5. I am happier in mathematics class than any other class	54(25.8)	75(35.9)	54(25.8)	26(12.4)
6. I am able to solve mathematics problem without too much difficulty	32(15.3)	100(47.8)	52(24.9)	25(12.0)
7. I like to solve new problems in mathematics.	45(21.5)	84(40.2)	49(23.4)	31(14.8)
8. I plan to take as much mathematics as I can during my education	46(22.0)	68(32.5)	63(30.1)	32(15.3)

ITEM	SA F (%)	A F (%)	D F (%)	SD F (%)
9. I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in mathematics	48(23.0)	77(36.8)	59(28.2)	25(12.0)
10. It would not bother me at all to take more math course.	62(29.7)	70(33.5)	52(24.9)	25(12.0)
11. I have usually been at ease during math test or course.	48(23.0)	72(34.4)	61(29.2)	28(13.4)
12. I learn mathematics easily	41(19.6)	84(40.2)	43(20.6)	41(19.6)
13. I have a lot of self-confidence when it comes to mathematics.	32(15.3)	78(37.3)	62(29.7)	37(17.7)
Total	**444(21.2)**	**777(37.2)**	**551(26.4)**	**318(15.2)**

Table 1 shows students' responses regarding their self-confidence in learning mathematics. The results indicate that 50.2% of students agreed that they derive satisfaction from solving mathematics problems. Additionally, 61.7% reported being happier in mathematics class than in other classes, and 63.1% felt they could solve mathematics problems without much difficulty. This positive attitude is crucial for better performance in mathematics. The study also found that 54.5% of students intended to take as much mathematics as possible during their education, and 59.8% were comfortable expressing their ideas on solving difficult problems. Such attitudes are conducive to better performance in mathematics, as they foster motivation and engagement.

Furthermore, 63.2% of students indicated they would not be bothered by taking more mathematics courses, suggesting a general willingness to pursue further studies in the subject. More than half of the students (57.4%) reported feeling at ease during mathematics tests, while 59.8% found learning mathematics easy. Notably, 52.6% of students expressed high self-confidence in their mathematical abilities. Overall, the data suggests that a majority (58.4%) of the students at Dadieso Senior High School have a positive attitude towards mathematics, which is a significant factor in their academic success.

Table 2. Students' Responses on Anxiety Variables

Item	SA F (%)	A F (%)	D F (%)	SD F (%)
14. Mathematics is dull and boring.	31 (14.8)	76 (36.4)	54 (25.8)	48 (23.0)
15. I am always under a terrible strain in a mathematics class.	32 (15.3)	86 (41.1)	62 (29.7)	29 (13.9)
16. I am always confused in my mathematics class.	38 (18.2)	70 (33.5)	55 (26.3)	46 (22.0)
17. Mathematics makes me feel uneasy and uncomfortable.	32 (15.3)	83 (39.7)	77 (36.8)	17 (8.1)
18. I get a sinking feeling when I think of trying hard mathematics problem.	33 (15.8)	77 (36.8)	61 (29.2)	38 (18.2)
19. My mind goes blank and I am unable to think clearly when working mathematics.	31 (14.8)	62 (29.7)	68 (32.5)	48 (23.0)
Total	**197(15.7)**	**454(36.2)**	**377(30.1)**	**226(18.0)**

Table 2 illustrates the frequencies and percentages of students' responses regarding anxiety in mathematics. The data reveals that 51.2% of students agreed that mathematics is dull and boring, which can discourage engagement and lead to poor performance. Additionally, 56.4% of students felt they were always under strain in mathematics class, and 51.7% reported feeling confused. This indicates a significant level of anxiety, which negatively impacts motivation and performance. Moreover, 55% of students felt uneasy and uncomfortable in mathematics class, and 52.6% experienced a sinking feeling when attempting hard problems. Interestingly, 55.5% of students disagreed that their minds go blank during mathematics work, suggesting that some students retain clarity in their thinking despite anxiety. Overall, 51.9% of students reported anxiety towards mathematics, which is detrimental to their achievement.

Table 3. Students' Responses on Value Variables

Item	SA F (%)	A F (%)	D F (%)	SD F (%)
20. Mathematics is important in everyday life.	123(58.9)	60(28.7)	20(9.6)	6(2.9)
21. Mathematics helps develop the mind and teaches a person to think.	116(55.5)	66(31.6)	20(9.6)	7(3.3)
22. Mathematics is one of the most important subjects for people to study.	121(57.9)	66(31.6)	16(7.7)	6(2.9)

Item	SA F (%)	A F (%)	D F (%)	SD F (%)
23. Mathematics is a very worthwhile and necessary subject.	137(65.6)	65(31.1)	4(1.9)	3(1.4)
Total	**497(59.4)**	**257(30.7)**	**60(7.2)**	**22(2.6)**

Table 3 shows that a majority of students (87.6%) agreed that mathematics is important in their everyday lives. This recognition of the value of mathematics motivates students to learn and perform better in the subject. Additionally, 87.1% of students agreed that mathematics helps develop the mind and teaches a person to think, further reinforcing its importance. Consequently, 89.5% of students acknowledged that mathematics is one of the most important subjects to study, and 96.7% viewed it as a worthwhile and necessary subject. These positive perceptions are likely to encourage students to take their mathematics studies seriously, thereby enhancing their performance.

Research Question 2: What is the relationship between students' attitudes towards learning mathematics and their achievement in mathematics at Dadieso Senior High School?

Students' Performance in Mathematics Achievement Test

The table below shows the students' scores on the mathematics achievement test.

Table 4. Students' Performance in Achievement Test

Performance level	Marks	Frequencies(N)	Percentages (%)
Did not meet expectation	0-10	17	8.1
Fair satisfactory	11-20	35	16.7
Satisfactory	21-30	60	28.7
Very satisfactory	31-40	62	29.7
Average	29.7		

From Table 4, 8.1% of students scored within 0-10 marks, while 16.7% scored within 11-20 marks. Additionally, 28.7% scored within 21-30 marks, and 46.4% scored above 30 marks. These data suggest that the performance of the students needs improvement, as 53.5% of students scored below the average mark of 29.7.

The Relationship Between Students' Attitudes Towards Learning Mathematics and Their Achievement

The relationship between students' attitudes and their mathematics achievement was investigated using data from the Attitude towards Mathematics Inventory (ATMI) questionnaire and their scores on the achievement test. Pearson-product moment correlation was computed on these data, and the results are presented in Table 5.

Table 5. Correlation Between Students' Attitudes and Their Mathematics Achievement

	Mathematics Achievement	Students' Attitudes
Mathematics Achievement	Pearson Correlation	1
	Sig. (2-tailed)	.000
	N	209
Students' Attitudes	Pearson Correlation	.389**
	Sig. (2-tailed)	.000
	N	209
Correlation is significant at the 0.01 level (2-tailed).		

Table 5 shows a matrix of the correlation coefficient for the two variables, students' attitudes, and mathematics achievement. The correlation coefficient (r) of .389 indicates a medium positive relationship between the variables ($r = .386$, $n = 209$, $p < .01$). The correlation was statistically significant since the computed p-values were less than the critical value of 0.01 at the two-tailed level [$r(209) = .386$, $p = .000$]. Thus, the null hypothesis, "there is no significant relationship between students' attitudes and students' mathematics achievement in Dadieso Senior High School," was rejected. This implies that a higher attitude towards mathematics correlates with higher performance in mathematics and vice versa. The result supports the findings of Mensah et al., (2013),

Bhowmik and Banerjee (Roy) (2016), Larbi (2019), and others who found a positive and significant correlation between students' attitudes and mathematics achievement. The coefficient of determination (R^2) was calculated as $(.386)^2$, which equals 0.149. This value, when converted to a percentage (multiplied by 100), is 14.9%. Therefore, students' attitudes explain 14.9% of the variation in students' mathematics achievement, suggesting that other factors account for the remaining 85.1%.

Research Question 3: What is the relationship between teachers' self-efficacy in teaching mathematics and students' achievement in mathematics at Dadieso Senior High School?

Teachers' Efficacy Scores

Teachers responded to the Teacher Self-efficacy Scale (TSES) questionnaire, which included twelve (12) items divided into three sub-scales: Instructional Strategies (4 items), Classroom Management (4 items), and Student Engagement (4 items). The TSES used a 4-point response scale: 1-nothing, 2-very little, 3-quite a bit, and 4-a great deal. Mean and standard deviation were used to analyze the data, with results presented in Table 6.

Table 6. Mean and Standard Deviation on Teachers' Efficacy

Self-Efficacy Domain	Mean Score	Standard Deviation
Instructional Strategies	3.1071	.83986
Classroom Management	3.2143	.30375
Student Engagement	3.2500	.50000
Overall Teacher Efficacy	3.1667	.52264

Table 6 highlights the mean scores of teacher efficacy regarding the three domains: Instructional Strategies, Classroom Management, and Student Engagement. The mean score for teachers' efficacy in Instructional Strategies was 3.1071 (SD= .83986), while for Classroom Management it was 3.2143 (SD=.30375). Teachers' efficacy in Student Engagement was 3.1667 (SD=.50000). Overall, the mean teacher efficacy was 3.1667, indicating a high level of teacher efficacy since the mean value was above 2.5. The standard deviation for Instructional Strategies showed more variation compared to the other domains. Although mathematics teachers indicated a high level of efficacy, there is a need to improve their strategies in Instructional Strategies, Classroom Management, and Student Engagement to enhance student achievement, as previous studies (Gulistan, Hussain & Mushtaq, 2017; Ampofo, 2019) have shown a positive relationship between mathematics achievement and teacher self-efficacy.

The Relationship Between Teachers' Self-Efficacy in Teaching Mathematics and Students' Achievement

Teachers responded to the teacher efficacy scale questionnaire, while students' performance was ascertained through the achievement test. Pearson-product moment correlation was computed on these data, and the results are presented in Table 7.

Table 7. Correlation Between Teachers' Efficacy and Students' Mathematics Achievement

	Mathematics Achievement	Teacher Efficacy
Mathematics Achievement	Pearson Correlation	1
	Sig. (2-tailed)	.000
	N	209
Teacher Efficacy	Pearson Correlation	.265**
	Sig. (2-tailed)	.000
	N	209
Correlation is significant at the 0.01 level (2-tailed).		

Table 7 shows a matrix of the correlation coefficient between teachers' efficacy and students' mathematics achievement. The computed correlation coefficient (r) was .265, indicating a small positive correlation between teachers' efficacy and students' mathematics achievement, based on Cohen's (1992) classification of correlation coefficients. The correlation coefficient (r=.265) was

tested at the 1% significance level and was found to be statistically significant [r (209) = .265, p = .000]. Thus, the null hypothesis, "there is no significant relationship between teachers' efficacy and students' mathematics achievement in Dadieso Senior High School," was rejected. This suggests that higher teacher efficacy in teaching mathematics correlates with higher student achievement in mathematics and vice versa. The result supports the findings of Khan (2011), Shaukat and Iqbal (2012), Shahzad and Naureen (2017), and Ampofo (2019), among others, which found a positive and significant correlation between teacher efficacy and student mathematics achievement. However, the correlation coefficient does not imply that teacher efficacy alone explains student achievement. Other variables may influence achievement. The coefficient of determination (R^2) was calculated as $(.265)^2$, which equals .070. This implies that teacher efficacy explains 7% of the variation in students' achievement, suggesting that other factors are responsible for the remaining 93% of the variance.

CONCLUSION

In evaluating student responses to the STACK system, several benefits and areas for improvement have been identified. The flexibility in the evaluation tree structure offers both challenges and opportunities, such as the use of a tolerance node to reduce stress in exercises involving descriptive statistics. Student feedback highlights the need for STACK to better consider the thinking process, which can be addressed by segmenting exercises into multiple steps to track reasoning. The study found sex-based differences in responses, with more females concerned about the system's ability to assess thinking processes, though these concerns equalized after the exam. Despite females outperforming males, more males appreciated STACK's benefits, such as immediate feedback and convenience. Logistical challenges, like device availability, have been mitigated by allowing tablets, though further solutions, such as computer lab rotations, are needed. Minimal technical problems were reported, and a session to familiarize students with STACK syntax is proposed to alleviate stress. The randomization of exercise parameters also helps deter cheating, making STACK a valuable tool for enhancing STEM education.

AUTHOR CONTRIBUTION STATEMENT

Joseph Andoh Fordjour conceptualized the study, led the research design, and was primarily responsible for the interpretation of the data. He also played a pivotal role in drafting and revising the manuscript, ensuring the integration of all critical aspects of the research.
Philemon Mgnabil Tijotob contributed to the development of the study's methodology, particularly in the design and implementation of the data collection instruments. He assisted significantly in data collection and performed the statistical analysis.
Richmond Adu-Gyamfi contributed to the literature review and theoretical framework of the study. He was instrumental in refining the research questions and hypotheses, and contributed to the drafting and critical revision of the manuscript concerning intellectual content.
Romuald Koffi Mifetu was involved in the data acquisition and management, ensuring the integrity and accuracy of the data. He also contributed to the analysis and interpretation of data and assisted in drafting the manuscript with a focus on the results section.

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