Journal of Advanced Sciences and Mathematics Education
Volume 6, Issue 2, 585-598.
e_ISSN: 2798-1606
DOI: 10.58524/jasme.v6i2.1268

Teacher classroom variables as determinants of senior secondary school students ' academic performance in mathematics in Southwest, Nigeria

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Article Info

Article history:

Received: April 02, 2026
Revised: May 17, 2026
Accepted: June 06, 2026

Keywords:

Experience; Mathematics Performance; Teacher Variables; Qualification.

Abstract

Background: Students' performance in Mathematics in Southwest Nigeria remains a concern, with teacher-related factors potentially influencing outcomes.
Aims: This study examined how teacher classroom variables predict senior secondary school students' academic performance in Mathematics.
Method: A predictive survey design was employed, involving 100 Mathematics teachers and 1,400 students selected via stratified and proportionate sampling across five Local Government Areas in three states. Data were collected using a self-developed questionnaire and Mathematics Performance Inventory, then analyzed using multiple regression and independent-samples t-tests at $\alpha = 0.05$.
Results: Teacher variables significantly predicted students' Mathematics self-efficacy ($R = 0.903$, $R^2 = 0.815$, $F(8, 512) = 54.26$). Performance feedback was the strongest contributor ($\beta = 0.276$), followed by use of learning materials ($\beta = 0.243$) and lesson delivery ($\beta = 0.228$). Teacher experience ($\beta = 0.312$) and qualification ($\beta = 0.228$) were the strongest determinants of student performance, whereas classroom management was not significant ($\beta = 0.023$). No significant gender differences were observed ($p > 0.05$).
Conclusion: Teacher experience, qualifications, and feedback are critical determinants of students' Mathematics achievement. Findings underscore the need for targeted professional development programs for Mathematics teachers to enhance student performance.

To cite this article: Olagoke, M. (2026). Teacher classroom variables as determinants of senior secondary school students' academic performance in mathematics in Southwest, Nigeria. *Journal of Advanced Sciences and Mathematics Education, 6*(2), 585-598.

INTRODUCTION

Mathematics is a critical discipline that underpins nearly all human activities, scientific inquiry, and technological innovation, making its mastery essential for personal and societal development. It provides the foundational skills necessary for problem-solving, logical reasoning, and analytical thinking across various fields. Proficiency in mathematics enhances academic performance and prepares students for higher education and professional success (Alsalhi et al., 2021; Alyahyan & Düştegör, 2020; Oppenheimer et al., n.d.; H. Wang et al., 2023). Despite its importance, student performance in mathematics remains a persistent challenge, especially in developing countries, where student achievement often remains below expected standards (Chand et al., 2021; Ekmekci & Serrano, 2022; Wu, 2025). Daily life applications, such as financial calculations, measurements, and decision-making, highlight the practical relevance of mathematics beyond the classroom. However, many students continue to struggle due to inconsistent teaching quality, limited access to instructional resources, and insufficient pedagogical support. The gap between curriculum demands and teaching effectiveness contributes to declining student confidence and motivation. Teachers' mastery of subject content, instructional strategies, and ability to engage learners are central to overcoming these challenges. A lack of professionally trained teachers further

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exacerbates underperformance, creating disparities in learning outcomes across schools. Ensuring effective teaching practices is therefore pivotal for improving mathematics achievement at all educational levels.

The quality of mathematics instruction significantly influences students' learning experiences and overall academic outcomes. Teachers who possess adequate academic qualifications and professional training are better equipped to design meaningful lessons, manage classrooms effectively, and provide constructive feedback (Nguyen et al., 2022; Padillo et al., 2021; Stevenson et al., 2020). Without sufficient training or content knowledge, teachers may inadvertently hinder students' self-efficacy and performance, contributing to a cycle of underachievement. Students' perceptions of teacher competence, instructional clarity, and classroom engagement directly affect their confidence and motivation to learn mathematics (Brandmiller et al., 2024; Chen, 2023; Lauermann & ten Hagen, 2021; Pečiuliauskienė, 2023; Zheng, 2021). Persistent underperformance at the senior secondary level limits students' opportunities for higher education and future career prospects. Even minor improvements in student performance often fall short of expectations, leaving educators and stakeholders concerned about the effectiveness of current teaching practices. Differences in teacher experience, pedagogical approach, and use of instructional materials can create variability in learning outcomes among students. Recognizing the factors that contribute to successful mathematics learning is essential for developing targeted interventions. Addressing these issues requires a focus on teacher-related determinants as key contributors to student achievement. Consequently, examining the teacher's role offers a pathway for enhancing mathematics education in secondary schools.

Teachers' qualifications, experience, and instructional practices serve as critical determinants of students' performance and learning confidence in mathematics. Effective lesson delivery, classroom management, and timely feedback enhance students' engagement and understanding of mathematical concepts (Stovner & Klette, 2022). Conversely, deficiencies in these areas can lower motivation, hinder comprehension, and negatively impact self-efficacy (Heydarnejad et al., 2022; Yan, 2022). The interplay between teacher variables and student outcomes highlights the importance of well-trained educators in shaping academic success. Identifying which teacher factors most strongly influence student achievement is vital for guiding professional development and instructional improvement. Gender differences and school contexts may also moderate the impact of teaching practices, requiring careful consideration in research and policy-making. Systematic analysis of these variables can inform evidence-based strategies to enhance learning experiences and outcomes. Understanding the combined effects of multiple teacher characteristics provides insight into how quality instruction translates into measurable student performance gains. A comprehensive approach that addresses content mastery, pedagogical skill, and student engagement is essential for educational advancement. Ultimately, strengthening teacher capacity is fundamental to improving mathematics proficiency and fostering positive self-efficacy among learners.

Despite numerous studies examining mathematics performance and student self-efficacy across various educational levels, most research has focused on middle school students, online learning environments, or higher education contexts (Spitzer & Musslick, 2021; L. Wang, 2023; Wei et al., 2020), leaving a gap in understanding the role of teacher variables in senior secondary school settings, particularly in developing countries such as Nigeria. While some studies have explored teacher variables, including feedback practices, teacher-student interactions, and emotional support (Li et al., 2025; Saloviita & Pakarinen, 2021; Vattøy, 2020), there is limited empirical evidence linking these factors directly to mathematics performance and self-efficacy in senior secondary students. Moreover, existing research often neglects potential moderators such as gender differences or school type (public vs private), and many reviews have emphasized language learning or AI integration

rather than mathematics instruction (Al-Abyadh & Azeem, 2022; Hwang & Tu, 2021). Consequently, there is a critical need for studies that systematically examine how teacher characteristics including experience, qualification, lesson delivery, classroom management, and instructional material usage predict student mathematics achievement and self-efficacy, thereby providing context-specific insights for policy and professional development in secondary education.

This study aims to examine how teacher classroom variables influence senior secondary students' mathematics performance and self-efficacy in a specific regional context. It seeks to identify the key teacher characteristics, including experience, academic qualification, lesson delivery, classroom management, use of instructional resources, and feedback practices. The research also explores the extent to which these variables predict students' learning outcomes and confidence in mathematics. Additionally, the study considers potential gender differences to evaluate equity in academic performance. By analyzing these relationships, the research provides practical insights for designing targeted teacher development programs. The study also aims to determine the relative contribution of each teacher variable to students' self-efficacy and achievement. Findings are expected to inform educational policy and instructional improvement initiatives. The research further seeks to bridge the gap between teacher preparation and student learning outcomes. It emphasizes evidence-based strategies to enhance mathematics instruction in secondary schools. Ultimately, the study aims to provide actionable recommendations for improving both teaching quality and student performance in mathematics.

LITERATURE REVIEW

Globally, Mathematics is regarded as one of the most important subjects in the school curriculum worldwide. It is seen as a subject that has direct correlation with other subjects, particularly with science and technology (Federal Republic of Nigeria (FRN), 2013). The subject cuts across primary and secondary levels of education. Mathematics remains one of the most difficult subjects in schools as perceived by students. There is a general impression that Mathematics is difficult by its very nature, and because of this impression, the majority of students have a phobia of it. The word "Mathematics" is a Greek word, meaning things that are learned. It defined it as the science of counting, measuring, and describing the shape of objects. It deals with logical reasoning and quantitative calculations. Mathematics as a subject is recognized as the foundation of science and technology, without which a nation will never become prosperous and economically independent. This underscores the importance of mathematical competence of all the learners at all levels of education, and is a reason for making Mathematics compulsory and one of the leading core subjects in the secondary schools' curriculum. Mathematics teachers had, on several accounts, been judged as the main determinant in the success or failure of students in the subject. This is true for many reasons; they are the main custodians of students, and the way and manner they perform this role is important (Olofin, 2019). Because of this, Mathematics teachers are expected to have the required knowledge necessary for teaching, as well as the ability to disseminate such knowledge appropriately, which will result in learning. Mathematics teachers, should be able to communicate the required knowledge in a clear, informative, and precise manner to their students (Kolawole & Olofin, 2017). This, unfortunately is not being done by the Mathematics teachers. According to both researchers, most teachers are not ready to go the extra mile in their teaching. In a study conducted the shortage of qualified Mathematics teachers was judged to be a contributing factor to poor performance.

Teacher's qualifications is pivotal on whether the teacher has a Bachelor's degree or a Master's degree or whether the teacher has passed the required licensure tests, and so forth. Defines qualifications as those qualities that teachers have even before they are employed as teachers and

that are often assumed to contribute to the quality of their teaching. These qualities, which she calls 'teachers' personal resources', include the following: knowledge, skills and expertise, beliefs, attitudes and values, credentials and personal traits. Defines qualifications as resources which teachers bring with them to the classroom and which are considered important in establishing who should be allowed to teach. These resources include teachers' coursework, grades, subject-matter education, degrees, test scores, experience, certification and credentials, as well as evidence of participation in continued learning such as internships, induction, and professional development. Define a well-qualified teacher as one who is fully certified and holds the equivalent of a major in the field being taught (Kolawole & Olofin, 2017). Although the formal qualification of teachers is an important indicator of their knowledge and competence in teaching, it has only limited utility in analyzing how well prepared teachers are for what they have to teach in schools. More detailed knowledge of the courses they have taken during their training needs to be compared to the actual content and skills required to teach the high school's curriculum. Teacher qualification in two ways: traditional and alternative qualification classification. Traditional certification is when an individual completes an undergraduate degree or a postgraduate program in education. An alternative category of certification is based on coursework in pedagogy and subject area without a degree in education. Cite short-term activities such as mentoring, peer evaluations, and workshops as ways other than formal qualifications for improving teaching (Hardy & Smith, 2016). More often, graduate teachers with a first degree in content go into teaching if they cannot find another job right away. Although they often get a somewhat lower salary than a fully qualified teacher, they choose not to enroll in the one-year post-graduate professional training and therefore lack a basic foundation for teaching.

Experienced teachers enhance content delivery and classroom management. Students taught by more experienced teachers achieve at a higher level because their teachers have mastered the content and acquired classroom management skills to deal with different types of classroom problems. Furthermore, more experienced teachers are considered to be more able to concentrate on the most appropriate way to teach particular topics to students who differ in their abilities, prior knowledge, and backgrounds. Teachers' attendance at in–service training is one of the indicators of experience. In-service training strengthens pedagogical skills, e.g., increase in salary, career planning, keeping up with developments, filling in lacunae, removing insecurity, and meeting colleagues.

Opined that teacher qualification accounted for approximately 40 to 60 percent of the variance in the average of students' achievement in assessment. Reveals that teachers' qualification influences students' performance in Mathematics. The researcher suggests that the availability of enough qualified teachers must have been a determinant for students' performance. However, some schools with less qualified teachers have performed better than those schools with more qualified teachers. Assert that the impact of certification status on student achievement in two large urban school districts in the United States of America. These school districts provided information about teachers hired for the 2008 - 2009 and 2009 - 2010 school years. Information included the school where they were currently teaching, the grade level taught, the teacher's certification status, highest degree earned, date and institution where it was achieved, age, and number of years of teaching experience. They found out that teachers' certification and experience influence students' achievement. Findings related to teachers' academic degrees (for example, bachelor's or master's, among others) are inconclusive. Some studies suggest positive effects of advanced degrees. Some argue that the requirement of a second degree raises the cost in terms of teacher education and the time it involves, and may prevent quality candidates from choosing this profession. This characteristic is related to the subject-matter knowledge teachers acquire during their formal studies and pre-service teacher education courses.

Carried out a study on Teacher characteristics and students' academic achievement in Biology in schools in Nandi South District, Kenya. A sample of 20 schools and 20 Biology teachers was

purposively selected. Data collected were analysed using descriptive and inferential statistics (SPSS Version 17). Findings revealed that teachers' qualifications do not influence students' academic achievement. On the contrary, Conducted a study on the effects of teachers' qualification on students' performance in secondary schools in Ikere Local Government Area of Ekiti state, Nigeria. A sample of 300 students was selected from 16 schools. Data were analysed using mean, standard deviation, and t-test. The findings revealed a significant difference in achievement of students taught by teachers whose highest qualifications were National Certificate in Education (NCE) and a Bachelor's of Science degree in Education. The author recommended that NCE teachers should strive to further their studies, while graduate teachers without professional qualifications should be encouraged to proceed with a graduate Diploma in Education to enhance teaching in their special area.

Research on differences between the performance of males and females in Mathematics has been well documented. One of the many reasons gender differences in Mathematics achievement have been studied so extensively is the quantity of contradictory evidence. For example, studies examining the relationship between gender and Mathematics achievement suggest that boys tend to perform better than girls (Butt & Dogar, 2014). Recent studies have shown that males continue to outperform females in Mathematics achievement, especially on more difficult items. However, other evidence suggests either a non-existent or declining gender gap in performance, with gender patterns differing between countries. For example, examined students' achievement and found no gender difference in Mathematics achievement.

Conducted a study on the effect of concept mapping instructional strategy on junior secondary school students' performance in ratio and proportion in Mathematics (Akinjiola, 2010). The result showed that there was a significant difference in the mean score of male and female students when taught ratio and proportion using the concept-mapping instructional strategy in favour of females. Also, investigated the influence of gender and class learning environment on students` academic achievement in Mathematics. The result of the study indicated a significant difference between gender and learning environment on students' academic achievement in senior secondary school Mathematics. On the contrary, that there was no significant effect of gender on students' achievement in Mathematics. Significant difference existed between students' performance on difficult topics in Mathematics by male and female students.

That students' cognitive achievement in Mathematics is not gender sensitive. Observed the influence of gender on the achievement motivation of students and found that male and female students perform differently in various subject areas of education. This gender gap in specific subjects, such as Mathematics and reading, has prompted researchers to examine the possible influences that gender has on students' academic performance in other subject areas. The issue of gender and its influence on academic performance in school subjects is yet to be fully resolved due to conflicting research findings arising from one school to another. Cross-national studies have suggested that the gender gap in Mathematics performance narrows or even reverses in societies with more gender equality, but not in those with more gender inequality. As a result, research on gender differences in Mathematics achievement has reported mixed findings. On the one hand, evidence seems to indicate that the gender gap is reducing, but on the other hand, recent research reveals differences in the Mathematics performance of boys and girls. As Taiwan has experienced a shift in gender roles due to sociopolitical and economic transformations, gender-based differences in Mathematics performance should become less marked. Further research should clarify the effect of sociopolitical changes on gender achievement gaps.

METHOD

Research Design

This study employed a descriptive survey design, utilizing existing student performance data to assess mathematics achievement among senior secondary students. The design allowed for the systematic collection and analysis of both student performance records and teacher-related variables, enabling the identification of relationships between teacher characteristics and student outcomes. The descriptive survey approach is appropriate for examining patterns and trends across a large population, while also permitting the investigation of predictive relationships among variables.

Participant

The population for the study consisted of 839,062 Senior Secondary II students across 2,168 public and 2,406 private secondary schools in the six states of Southwest Nigeria: Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti. The study sample comprised 1,500 students selected from 75 secondary schools (45 public and 30 private) through a multistage sampling procedure. In the first stage, three states were randomly selected from the six states. The second stage involved selecting five Local Government Areas from each of the three states using a stratified sampling technique. In the third stage, five secondary schools (three public and two private) were chosen from each Local Government using stratified and proportionate sampling. Finally, all SSII students from the selected 75 schools were included in the study, resulting in a representative sample from fifteen Local Government Areas across the three states.

Instrument

Two instruments were employed in this study: (1) the Mathematics Performance Inventory (MPI), which was based on classroom records to capture students' achievement levels in mathematics, and (2) the Teacher Variables Questionnaire in Mathematics (TVQM), designed to measure teacher characteristics. The TVQM addressed aspects such as qualification, experience, attitude, content knowledge, lesson preparation and delivery, use of learning materials, classroom management, and performance feedback, using a 4-point Likert scale. Data on student performance were obtained from school records, while teacher-related data were collected through the questionnaire administered to relevant teachers.

Data Analysis

Collected data were analyzed using both descriptive and inferential statistics. Frequencies, means, and standard deviations were computed to summarize the data. Inferential analysis involved testing hypotheses using independent-sample t-tests with a significance level set at $\alpha = 0.05$. Statistical analyses were conducted using SPSS version 26, which facilitated the examination of differences in student performance across groups as well as the assessment of relationships between teacher variables and student outcomes.

Research Procedure

The study was conducted in a structured multistage process. Permission was obtained from relevant educational authorities and school administrators before data collection. Selected schools were visited, and student performance records were accessed and compiled for the MPI. Teachers completed the TVQM under standardized conditions to ensure reliability and accuracy. Collected data were coded and entered into SPSS for analysis. Descriptive statistics provided an overview of the distribution of teacher variables and student performance. Independent-sample t-tests were then conducted to examine differences between public and private schools, as well as between gender groups. The procedure ensured that data collection was systematic, ethical, and aligned with the

objectives of the study, enabling robust analysis of the predictive role of teacher variables on students' mathematics performance and self-efficacy.

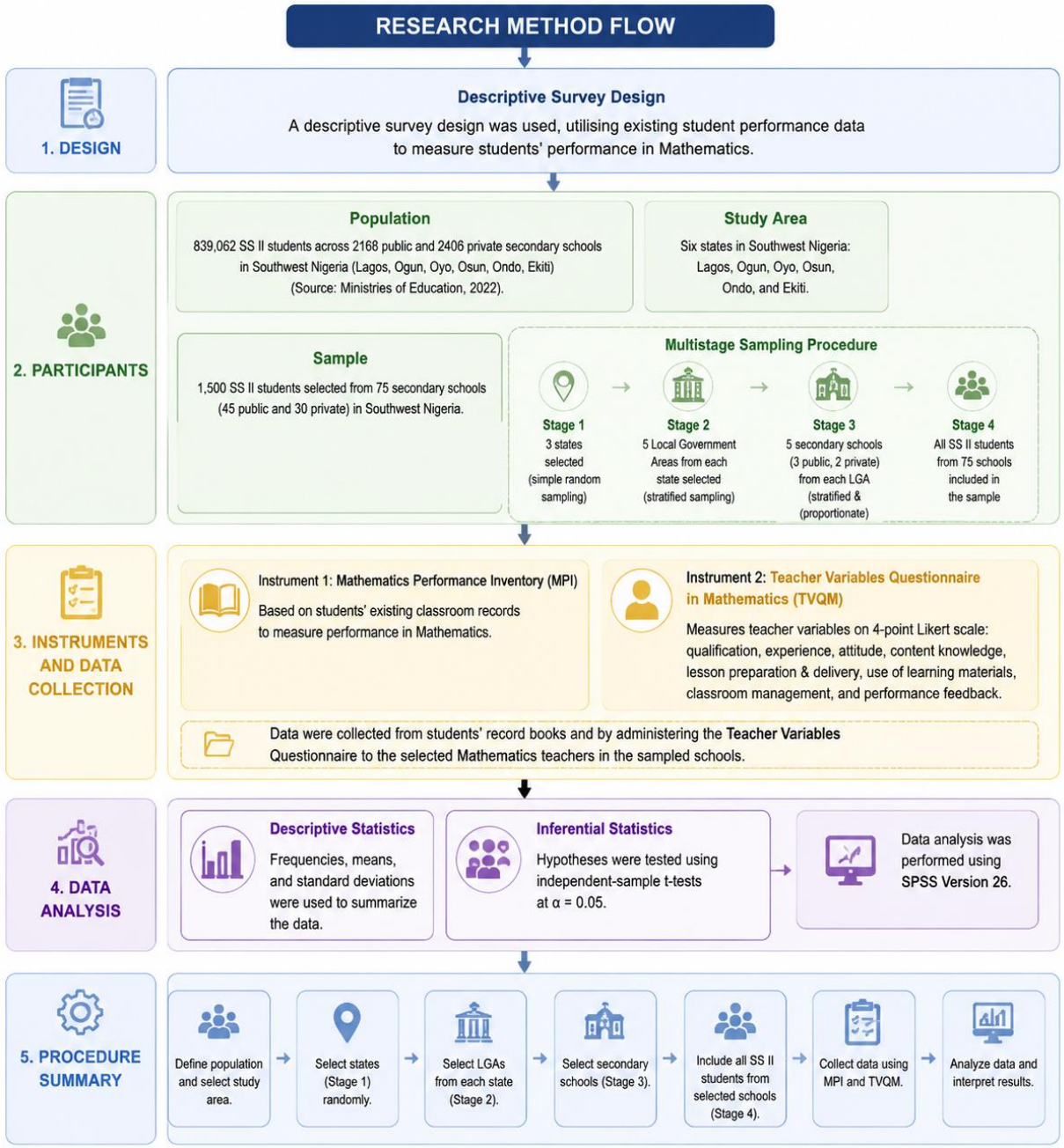

Figure 1. Research Method Flow.

RESULTS AND DISCUSSION

Results

Research Question 1: What are the predominant teacher variables (qualification, experience, attitude, content knowledge, lesson preparation, lesson delivery, use of learning materials, classroom management, and performance feedback) that predict students' performance and efficacy in Mathematics?

Table 1. Descriptive Analysis of Predominant Teacher Variables

S/N	Resource	Mean	S.D.	No of Items	Average Mean	Remark
1.	Qualification	15.18	1.41	5	2.89	Good

2.	Experience	16.25	1.72	5	3.11	Good
3.	Attitude	15.12	1.75	5	2.77	Good
4.	Content Knowledge	14.91	0.82	5	2.86	Good
5.	Lesson Preparation	13.60	2.50	5	2.73	Good
6.	Lesson Delivery	11.43	1.92	5	2.17	Poor
7.	Use of Learning Materials	9.71	2.27	5	1.82	Poor
8.	Classroom Management	12.29	3.15	5	2.61	Good
9.	Performance Feedback	13.05	1.33	5	2.84	Good

Mean Cut-Off: 2.50

Table 1 presents a detailed analysis of key teacher variables. Teacher qualifications are positively rated with a mean score of 2.89, indicating generally good qualifications. Teacher experience is also favorably rated with a mean of 3.11, suggesting good experience. Teachers' attitudes and content knowledge both receive favorable ratings, with mean scores of 2.77 and 2.86, respectively. Lesson preparation is rated adequate with a mean score of 2.73. Lesson delivery and use of learning materials scored below the mean cut-off, indicating areas for targeted intervention. Classroom management is rated as good (mean of 2.61), but it is close to the cut-off, suggesting room for improvement. Performance feedback is generally good, with a mean of 2.84. Summarily, teachers are rated as well-qualified and experienced.

Hypotheses Testing

Hypothesis 1: Teacher variables (qualification, experience, attitude, content knowledge, lesson preparation, lesson delivery, use of learning materials, classroom management, and performance feedback) would not significantly predict secondary school students' performance in Mathematics.

Table 2. Contribution of teacher variables to students' performance in Mathematics

Model	Unstandardized Coefficients		Standardized Coefficients					
	B	**Std. Error**	**Beta**	**t**	**P**	**R**	**R^2**	**F**
(Constant)	4.912	0.726		6.765				
Qualification	0.356	0.023	0.267	15.48	0.01	0.7	0.49	10.0
Experience	0.436	0.019	0.354	22.95	0.001			
Attitude	0.425	0.019	0.337	22.37	0.01			
Content Knowledge	0.402	0.038	0.301	10.58	0.01			
Lesson Preparation	0.411	0.036	0.324	11.42	0.01			
Lesson Delivery	0.415	0.02	0.325	20.75	0.01			
Use of Learning Materials	0.421	0.017	0.342	24.77	0.01			
Classroom Management	0.008	0.027	0.023	0.31	0.76			
Performance Feedback	0.419	0.027	0.323	15.52	0.01			

$p<0.05$

Table 2 indicates that teacher variables significantly influence students' performance in Mathematics, with the F-calculated value of 10.010 being significant at the 0.05 level, leading to the rejection of the null hypothesis. The model explains 49.0% of the variance in students' academic performance ($R^2 = 0.490$), demonstrating a substantial impact of teacher-related factors. All teacher variables including qualification ($\beta = 0.267$), experience ($\beta = 0.354$), attitude ($\beta = 0.337$), content knowledge ($\beta = 0.301$), lesson preparation ($\beta = 0.324$), lesson delivery ($\beta = 0.325$), use of learning

materials (β = 0.342), and performance feedback (β = 0.323) contributed positively and significantly to students' performance ($p < 0.05$). However, classroom management (β = 0.023) did not have a statistically significant effect ($p > 0.05$). Among all the variables, teacher experience was the strongest predictor of student performance, while classroom management was the least impactful.

Hypothesis 2: Teacher variables would not significantly predict secondary school students' self-efficacy in Mathematics.

Table 3. Contribution of teacher variables to students' self-efficacy in Mathematics

Model	Unstandardized Coefficients		Standardized Coefficients	T	R	R^2	F
	B	Std. Error	Beta				
(Constant)	17.478	1.272		13.744	0.90	0.82	721.72
Qualification	.509	.040	.403	12.725			
Experience	.013	.034	.005	.388			
Attitude	.030	.032	.011	.923			
Content Knowledge	.448	.066	.208	6.788			
Lesson Preparation	.432	.063	.234	6.873			
Lesson Delivery	.407	.035	.303	11.629			
Use of Learning Materials	.434	.029	.416	14.966			
Classroom Management	.798	.047	.544	16.916			
Performance Feedback	2.444	.048	.712	51.425			

p <0.05

Table 3 reveals that teacher variables significantly influence students' self-efficacy in Mathematics, as indicated by the F-calculated value of 721.720, which is significant at the 0.05 level. Consequently, the null hypothesis was rejected. The model accounts for 81.5% of the variance in students' self-efficacy ($R^2 = 0.815$), highlighting a strong relationship between teacher-related factors and students' belief in their mathematical abilities. Most teacher variables significantly predicted students' self-efficacy, with performance feedback showing the strongest effect (β = 0.712)."

Hypothesis 3: There is no significant gender difference in the performance of secondary school students in Mathematics.

Table 4. t-test Analysis showing students' gender difference in the performance of students in Mathematics

Gender	N	Mean	SD	df	t_{cal}	P
Male	725	4.875	1.104	1479	0.621	0.511
Female	675	4.837	1.212			

p>0.05

Table 4 shows that the t-value of 0.621 was not significant because the p-value (0.511) > 0.05. This implies that the null hypothesis was not rejected. Hence, there was no significant gender difference in the performance of secondary school students in Mathematics.

Discussion

The findings revealed that most teacher variables significantly predicted students' self-efficacy, with performance feedback showing the strongest effect. However, classroom management did not significantly influence students' performance (β = 0.023). The discussion of these findings is presented thematically in relation to existing literature. Teacher variables jointly contributed

significantly to students' academic performance in Mathematics, implying that the effectiveness and quality of teachers are crucial determinants of student outcomes (Olofin, 2019). Specifically, teacher experience (β = 0.312) emerged as the strongest predictor of students' performance, aligning with findings by Thomas (2014), who observed that students taught by more experienced teachers achieve at higher levels due to content mastery and classroom management skills. Similarly, noted that experienced teachers can adjust instructional methods to suit students' differing abilities and backgrounds. Teacher qualification was also a significant predictor, consistent with who defined well-qualified teachers as those fully certified in their subject area, and with, who emphasized that formal pedagogical training is essential for quality instruction (Kolawole & Olofin, 2017). Further underscored the importance of continuous professional development, such as mentoring and workshops, in enhancing teaching competence (Hardy & Smith, 2016).

Moreover, teachers' attitudes, content knowledge, lesson preparation, lesson delivery, and performance feedback significantly predicted students' performance, supporting the observations of (Kolawole & Olofin, 2017), who noted that motivated and competent mathematics teachers positively influence learning outcomes. Highlighted that inadequate lesson preparation and ineffective delivery contribute to poor student performance. The present study found that lesson delivery and use of learning materials were rated low, echoing finding that many teachers do not employ additional strategies to ensure understanding and retention of concepts. Classroom management did not predict performance (β = 0.023, p > 0.05), likely because mathematics instruction is predominantly cognitive-focused. However, observed that effective classroom management, when combined with experience, enhances learning environments and student engagement. The low contribution of classroom management in this study suggests that while behavioral control is important, cognitive variables such as teacher knowledge, preparation, and feedback are more decisive in influencing mathematics achievement. These results are consistent with previous studies linking declining mathematics performance to teaching quality and teacher preparedness (Daso, 2013; Olofin, 2019).

Teacher variables explained R^2 = 0.815 of the variance in students' self-efficacy in mathematics, indicating a strong relationship between teacher-related factors and students' confidence in their mathematical abilities. This underscores that teacher quality not only affects cognitive achievement but also influences affective dispositions toward learning. Performance feedback, classroom management, and use of learning materials were the strongest predictors of self-efficacy, aligning with who emphasized the motivational dimension of effective teaching. Lesson delivery, content knowledge, and qualification also significantly predicted self-efficacy, supporting who argued that teachers' competence and clarity in presenting mathematical concepts improve understanding and confidence (Kolawole & Olofin, 2017). Inadequate mastery or poor delivery generates anxiety and reinforces negative attitudes toward mathematics (Ampadu, 2012; Ojimba, 2012). These findings confirm that effective, confident, and well-prepared teachers are instrumental in shaping students' positive self-beliefs about their ability to learn mathematics.

The study found no significant gender differences in mathematics performance (t = 0.621, p = 0.511), supporting who observed no gender-based disparities in achievement. It also aligns with who concluded that cognitive achievement in mathematics is not gender-sensitive. However, these results contrast with studies reporting male superiority and studies showing female superiority under certain instructional strategies (Akinjiola, 2010). Inconsistencies in gender-related findings, as noted b likely reflect socio-cultural and contextual variations rather than inherent differences in ability. In the context of this study, the absence of gender disparity indicates that teacher variables influence both male and female students equally, suggesting that improving teacher quality can benefit all learners.

Implications

The findings of this study have several significant implications for educational practice and policy in mathematics instruction. Firstly, the strong predictive role of teacher experience, qualification, and performance feedback indicates that professional competence is central to student achievement, suggesting that educational authorities should prioritize continuous professional development programs. Secondly, the substantial contribution of lesson delivery, content knowledge, and use of learning materials to both performance and self-efficacy underscores the need for targeted instructional training that enhances pedagogical strategies. Thirdly, the minimal effect of classroom management suggests that cognitive-focused instructional quality may be more critical in mathematics than behavioral regulation alone, highlighting the importance of knowledge-driven teaching interventions. Fourthly, the significant link between teacher variables and student self-efficacy demonstrates that teachers influence not only cognitive outcomes but also students' confidence and motivation, implying that teacher preparation should incorporate strategies for fostering positive student beliefs. Fifthly, the absence of gender differences indicates that improvements in teacher quality benefit all learners, supporting equity-driven approaches in teacher training. Sixthly, schools and policymakers should consider teacher qualifications and experience as key criteria in recruitment and deployment to maximize educational outcomes. Seventhly, mentoring, workshops, and feedback-oriented professional development can enhance teacher effectiveness, ultimately translating into higher student achievement. Eighthly, curriculum designers should integrate opportunities for teachers to utilize learning resources effectively and adopt evidence-based teaching methods. Ninthly, ongoing assessment of teacher performance and instructional quality can help identify gaps and inform targeted interventions. Tenthly, the findings reinforce the importance of aligning teacher preparation with student-centered outcomes to ensure measurable improvements in mathematics learning. Eleventhly, policymakers should prioritize strategies that simultaneously improve both cognitive and affective dimensions of student learning, including self-efficacy. Finally, the study provides empirical evidence supporting investment in teacher quality as a pivotal mechanism for enhancing mathematics performance and student engagement in senior secondary schools.

Limitations and Suggestions for Future Research

Despite the significant findings, this study has several limitations that should be acknowledged. First, the research focused exclusively on senior secondary students in selected schools within Southwest Nigeria, limiting the generalizability of the findings to other regions or educational contexts. Second, the study relied on existing student performance records, which may not fully capture all dimensions of mathematics achievement or account for extraneous factors such as socioeconomic background or parental involvement. Third, the use of self-reported teacher questionnaires introduces potential bias in assessing teacher variables, particularly in areas such as attitudes and classroom practices. Fourth, the cross-sectional design restricts the ability to infer causality between teacher variables and student outcomes. Fifth, certain teacher-related factors, such as informal mentorship, collaboration with colleagues, and instructional innovations, were not included in the measurement, which could have provided additional explanatory power. Sixth, the study did not examine the longitudinal effects of teacher variables on student performance and self-efficacy over multiple academic years. Seventh, while gender differences were explored, other demographic factors such as school type, location, and class size were not analyzed in depth. Eighth, the study primarily emphasized cognitive and affective outcomes without considering students' behavioral engagement or problem-solving skills. Ninth, limitations in the measurement instruments, including the Likert scale and performance inventory, may affect precision and reliability. Tenth, the study did not account for curriculum variations across the sampled schools,

which could influence performance outcomes. Eleventh, future research should adopt longitudinal or experimental designs to establish causal relationships and examine teacher interventions over time. Finally, further studies could expand the scope to include other regions, incorporate qualitative approaches, and explore additional teacher and student variables to provide a more comprehensive understanding of factors influencing mathematics achievement and self-efficacy.

CONCLUSION

The study concluded that teacher variables play a pivotal role in determining senior secondary students' mathematics performance and self-efficacy. Teacher experience, qualification, and performance feedback emerged as the most significant predictors of student outcomes, highlighting the importance of professional competence in instructional effectiveness. Lesson delivery, content knowledge, and use of learning materials were also found to substantially influence both cognitive achievement and students' confidence in mathematics. Conversely, classroom management showed minimal direct impact, suggesting that cognitive and pedagogical factors outweigh behavioral regulation in mathematics instruction. The results further indicated that teacher-related variables affect both male and female students equally, demonstrating the universal benefit of improving teaching quality. Teacher competence not only enhances academic performance but also positively shapes students' self-beliefs and motivation to learn. These findings underscore the necessity for targeted professional development programs, including mentoring, workshops, and continuous training, to strengthen teachers' instructional capacity. Recruitment policies should consider teacher qualifications and experience to optimize student learning outcomes. Schools should encourage the effective utilization of instructional materials and adoption of evidence-based pedagogical strategies. Additionally, systematic evaluation of teacher performance can guide interventions and improve instructional quality. Overall, the study affirms that enhancing teacher quality is a critical mechanism for improving mathematics achievement and fostering positive affective dispositions among learners. Consequently, educational stakeholders should prioritize teacher capacity building as a key strategy for advancing mathematics education in secondary schools.

AUTHOR CONTRIBUTIONS STATEMENT

Michael Olagoke conceptualized the study, developed the research framework, research design, conducted data analysis, led the writing of the manuscript, and provided critical revisions. Also contributed to the data collection process, literature review development, and manuscript editing.

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