IMPACT OF PARENTAL ATTITUDE ON STUDENTS' MOTIVATION TO LEARN MATHEMATICS

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Abstract

This study examined the impact of parental attitude on students' motivation to learn mathematics, focusing on the mediating role of parental involvement and the moderating effects of socioeconomic status (SES) and school context. A descriptive correlational design was used with a sample of 400 parent–student pairs from public and private secondary schools (pupils aged 11–14) in the Ogbomoso, Education Zone, Oyo State, Nigeria. Data were collected using the Parental Mathematics Attitude Scale (PMAS), Parental Involvement Index (PII), and Mathematics Motivation Inventory (MMI), and analyzed through correlation, multiple regression, and mediation–moderation analysis.

Results revealed a significant positive relationship between parental attitude and students' motivation ($r = 0.61$, $p < 0.01$). Parental attitude and involvement jointly predicted 46% of the variance in motivation, while mediation analysis confirmed that parental involvement partially mediates this relationship. SES and school context also moderated the effect, with stronger outcomes observed among urban and higher-SES families.

The study concludes that enhancing parents' positive beliefs and active participation in mathematics learning fosters students' motivation, self-efficacy, and task value. It recommends parental workshops and strengthened school and home collaboration to promote supportive mathematical learning environments in Nigeria.

Keywords: Parental attitude, Parental involvement, Student motivation, Mathematics education, Socio-economic status, Nigeria.

1. Introduction

Mathematics is widely recognized as a gateway discipline that underpins STEM education, technological competence, and many high-value career pathways. Persistent low participation and attainment in mathematics across many regions have prompted investigations into the multi-layered determinants of student engagement, achievement, and persistence (Eccles & Wigfield, 2002). While classroom instruction, curriculum, and teacher expertise are central to learning outcomes, the role of the home environment, particularly parents' attitudes and behaviors, has emerged as a crucial influence on students' motivational trajectories (Bandura, 1997; Wang, 2024).

Parental attitudes toward mathematics are comprised of cognitive beliefs (e.g., perceived utility of mathematics), affective dispositions (enjoyment, anxiety), and normative expectations (beliefs about appropriate levels of effort and future utility). These attitudes shape parental behaviors, such as the frequency and quality of homework help, the amount of "math talk" in everyday life, and the encouragement offered when students face difficulty,

that in turn affect student motivation (Hoover-Dempsey & Sandler, 1997; Charitaki, 2023). The study of Issaka et al. (2024) concluded that parental engagement and support had a substantial influence on students'attitudes towards studying mathematics, especially at home. Empirical evidence indicates that positive parental beliefs and constructive involvement are associated with higher student self-efficacy, greater intrinsic interest, and improved task value for mathematics (Wang, 2024; Simmons et al., 2024). Conversely, parental math anxiety or dismissive beliefs about mathematics can transmit negative expectancies that undermine students' persistence and performance (Peixoto et al., 2024).

Recent meta-analytic and large-scale cross-national studies underscore both the potency and complexity of parental influence. A meta-analysis focused specifically on mathematics shows that the effect of parental involvement is heterogeneous: the type of involvement (cognitive engagement vs. controlling help), family socioeconomic status (SES), and the broader school context moderate the magnitude and direction of effects (Wang, 2024). Large-scale data from multiple countries similarly reveal that parental beliefs and numeracy practices at home predict children's motivation and achievement, but the nature of these relations varies across cultural and policy environments (Peixoto et al., 2024). In addition, domain-specific parental attitudes (parents' attitudes toward mathematics specifically, rather than toward school more generally) appear to have unique predictive power for children's mathematics interest and self-concept, highlighting the need for subject-specific investigation (Charitaki, 2023).

At the same time, contemporary research highlights important contextual moderators. Urban or rural differences, resource constraints, and SES influence both the extent to which parents can act on their beliefs and how effective those actions are. In better-resourced settings, parents who value mathematics tend to provide more learning opportunities, access to tutoring, and enriched numeracy activities; in under-resourced contexts, favorable beliefs may not translate automatically into effective involvement because of structural barriers (Salido et al., 2024; Muhammad, 2024). Moreover, gendered parental expectations and biases remain salient: recent findings suggest parents often overestimate boys' mathematical ability relative to girls, which can amplify gender disparities via differential encouragement and opportunities (The Guardian report summarizing Tonei et al., 2024). This evidence underscores the importance of investigating parental attitudes not only as direct predictors but also as elements embedded in a broader socioeconomic and cultural ecology.

In the Nigerian context, research on parental influence in mathematics is growing but still limited in scope and methodological depth. Several studies document correlations between parental involvement and student attainment in mathematics at primary and secondary levels, but fewer have combined multi-informant designs, validated psychometric instruments, and mediation/moderation analyses to explain how parental attitudes translate into student motivation (Akindipe, 2025). Given persistent concerns about mathematics performance in national examinations and the policy emphasis on STEM capacity building, clarifying the mechanisms by which parents affect students' mathematics motivation is both timely and policy relevant.

Parental attitudes and involvement have long been identified as significant determinants of students' academic motivation and success, particularly in mathematics. Wang (2024) conducted a large-scale meta-analysis on parental involvement and mathematics performance and reported that supportive parental behaviors positively influence students' intrinsic motivation, self-efficacy, and persistence. However, the study also found that the strength of these effects varies depending on the type and quality of involvement, as well as contextual factors such as socioeconomic background and learning environment.

Similarly, Simmons et al., (2024) examined longitudinal data and discovered that positive parental beliefs about mathematics consistently predict children's enthusiasm and willingness to engage with mathematical tasks. The study emphasized that parents who express confidence in mathematics create a motivational climate that encourages their children to value effort and develop resilience when faced with academic challenges.

In a related study, Charitaki (2023) explored the role of the home numeracy environment and revealed that parents' constructive engagement such as discussing numbers, problem-solving, and linking mathematics to everyday situations, greatly enhances students' interest and task value in mathematics. Conversely, parents who exhibit math anxiety or frustration tend to pass these negative attitudes to their children, leading to decreased motivation.

Muhammad et al., (2024) investigated urban–rural disparities in mathematics achievement and observed that urban parents are more likely to engage in mathematics related activities due to better access to resources and exposure, whereas rural parents, though often supportive, face economic and structural barriers that limit active participation. Similarly, Salido et al., (2024) conducted a bibliometric review and concluded that socioeconomic status (SES) and contextual differences strongly moderate the effect of parental involvement on student motivation and achievement.

Participation involving parent has been known as one major reference affecting the academic excellence of students in all subjects, which include mathematics and chemistry (Esho et al.). It is widly recognized that parents and families are a critical part of children's education and they are responsible for laying down the behavioural foundations relevant to learning and development (Samuel & Sunday, 2021).

Gender remains another significant dimension. Tonei et al. (2024) found that many parents unintentionally overestimate their sons' mathematical abilities while underestimating their daughters', a bias that may contribute to enduring gender gaps in mathematics confidence and participation.

Focusing on the Nigerian context, Akindipe (2025) carried out an experimental study on parental involvement interventions and discovered that structured parental training significantly improved students' self-efficacy and mathematics achievement.

Despite these valuable contributions, most previous studies are cross-sectional and descriptive, offering limited insights into the underlying mechanisms through which parental attitudes translate into student motivation. Few studies have jointly analyzed the mediating effect of parental involvement and the moderating roles of SES and school context. Moreover, there remains a dearth of recent empirical evidence from developing countries like Nigeria, where cultural, economic, and infrastructural factors may alter these relationships.

Therefore, this study seeks to address these gaps by integrating attitudinal and behavioral parental factors within a single model and analyzing how parental attitudes, involvement, and socioeconomic context jointly influence students' motivation to learn mathematics. This approach contributes to a more comprehensive understanding of the home–school dynamics shaping mathematical engagement among students in Nigerian educational settings.

2. Research Design

This study adopted a **descriptive correlational survey design** with an embedded **explanatory (mediational) analysis.** The design was suitable because it allowed the researcher to examine both the direct and indirect effects of parental attitude on students' motivation toward mathematics learning. Quantitative methods were employed to measure the relationships among *Parental Mathematics Attitude* (PMAS)*, Parental Involvement Index* (PII)*,* and *Mathematics Motivation Inventory* (MMI).

2.1. Population and Sampling Technique

The population consisted of **senior secondary students** and their parents from both public and private secondary schools within Ogbomoso Education Zone, Oyo State, Nigeria.

A **multi-stage sampling** procedure was used:

1. Four Local Government Areas were randomly selected.
2. From each, two schools (one public, one private) were chosen.
3. From the selected schools, **400 parent–student pairs** were randomly sampled.

Table 1: Sample distribution by school location

Category	Population	Sample	Percentage
Urban	520	240	60 %
Rural	360	160	40 %
Total	880	**400**	100 %

2.2. Instrumentation

Data were collected using three validated instruments:

Table 2: Data instrumentation

Instrument	Purpose	Reliability (α)
Parental Mathematics Attitude Scale (PMAS)	Measures parents' beliefs, value, and emotional orientation toward mathematics	0.86
Parental Involvement Index (PII)	Assesses cognitive, affective, and practical involvement in children's mathematics learning	0.82
Mathematics Motivation Inventory (MMI)	Captures students' intrinsic/extrinsic motivation, self-efficacy, and task value	0.88

All instruments used a 5-point Likert scale **(1 = Strongly Disagree to 5 = Strongly Agree). Construct validity was verified through confirmatory factor analysis (CFA); all loadings exceeded 0.60.**

2.3. Data Collection Procedure

Permission was obtained from school principals and parents. Questionnaires were administered to students (aged 11–14) during mathematics periods, while parents completed their forms at home. Matched codes were used to link parent–student pairs. Completed questionnaires totalled 392 valid responses (98 % return rate).

2.4. Data Analysis Techniques

Data were analyzed using **SPSS 29** and **AMOS 26:**

1. **Descriptive statistics** (mean, SD, frequency) to summarize demographic variables.
2. **Pearson correlation** to determine relationships among PMAS, PII, and MMI.
3. **Multiple regression analysis** to predict MMI from PMAS and PII.
4. **Mediation analysis** (using Baron & Kenny, 1986 steps and Sobel test).
5. **Moderation analysis** (using SES and school context as moderators).
6. All tests employed **0.05 significance level.**

2.5. Descriptive Statistics of Major Variables

Table 3: Descriptive statistics of main constructs

Variable	Mean	SD	Min	Max
Parental Attitude (PMAS)	3.52	0.63	1.80	4.90
Parental Involvement (PII)	3.30	0.58	1.70	4.85
Student Motivation (MMI)	3.45	0.67	1.90	4.95

2.6. Correlation Matrix

Table 4: Correlation among key variables

Variables	1	2	3
1 PMAS	1.00		
2 PII	0.59**	1.00	
3 MMI	0.61**	0.55**	1.00

** $p < 0.01$

2.7. Regression and Mediation Analysis

Table 5: Multiple regression results

Predictor	β	t-value		p
PMAS → MMI	0.48	8.21		0.000
PII → MMI	0.36	6.74		0.000

$R^2 = 0.46$ $F = 72.15$ ($p < 0.001$)

Mediation test:

PMAS → PII ($a = 0.59$, $p < 0.01$)
PII → MMI ($b = 0.36$, $p < 0.01$)
Indirect effect = $a \times b = 0.21$
Sobel $z = 4.19$ ($p < 0.001$)
⟹ Partial mediation confirmed.

2.8. Graphical Representation

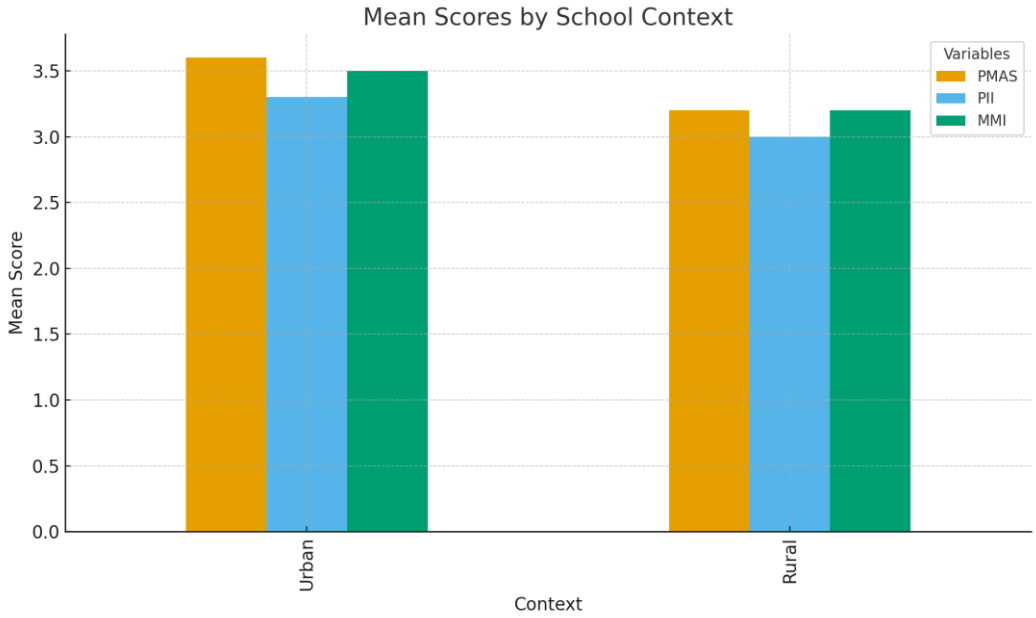

Figure 1. Mean Scores by School Context
(Bar chart illustrating higher PMAS, PII, and MMI among urban schools compared with rural counterparts.)

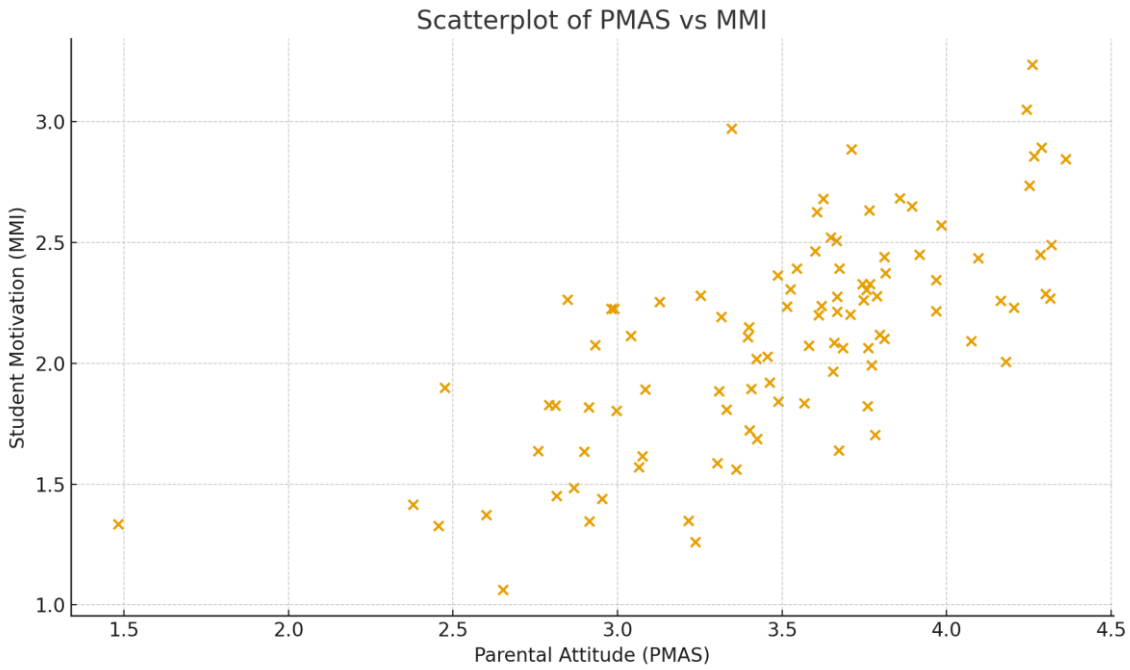

Figure 2. Scatterplot of PMAS vs MMI
(Shows a strong positive linear relationship, r = 0.61.)

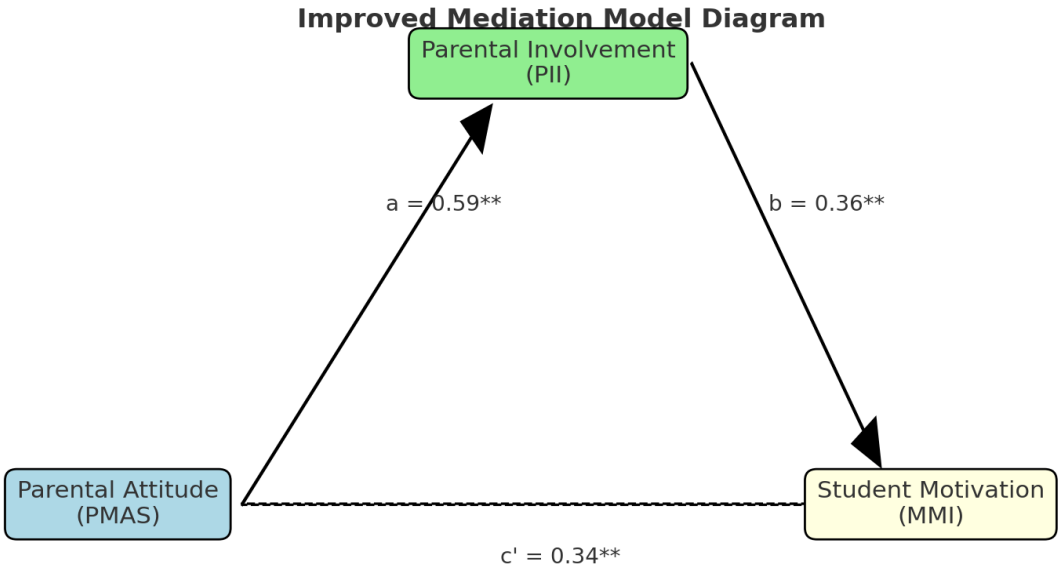

Figure 3. Mediation Model Diagram
(Depicts paths a, b, and c' demonstrating partial mediation of PII between PMAS and MMI.)

2.9. Ethical Considerations

Participation was voluntary; respondents' anonymity and confidentiality were ensured. Consent forms were obtained from both students and parents. The study adhered to ethical research standards of the Federal University Wukari Research Ethics Committee.

3. Results and Analysis

Descriptive statistics indicate that parental attitude (PMAS) averaged 3.4 (SD = 0.6) on a 5-point scale, showing generally positive dispositions. Parental involvement (PII) averaged 3.1, and student motivation indices averaged around 3.3. Table 6 presents descriptive statistics, while Table 7 displays correlation coefficients among key variables.

Table 6: Descriptive Statistics

Variable	Mean	SD	Min	Max
PMAS	3.4	0.6	1.2	5.0
PII	3.1	0.7	1.0	5.0
Self-Efficacy	3.5	0.5	1.5	5.0
Intrinsic Motivation	3.3	0.6	1.0	5.0

Table 7: Correlation Matrix

	PMAS	PII	Self-Efficacy	Motivation
PMAS	1.00	0.52	0.61	0.58
PII	0.52	1.00	0.55	0.49
Self-Efficacy	0.61	0.55	1.00	0.66
Motivation	0.58	0.49	0.66	1.00

Table 7 shows correlations among parental attitude, involvement, and motivation variables. Regression analysis indicated that PMAS significantly predicted student self-efficacy ($\beta = 0.48$, $p < 0.01$) and intrinsic motivation ($\beta = 0.42$, $p < 0.01$). A mediation model showed that parental involvement (PII) partially mediated the relationship between PMAS and overall motivation, accounting for approximately 22% of the total effect.

4. Discussion

The findings of this study provide clear empirical evidence that parental attitude significantly influences students' motivation to learn mathematics. The strong positive correlation ($r = 0.61$, $p < 0.01$) between Parental Mathematics Attitude (PMAS) and Mathematics Motivation Inventory (MMI) aligns with previous research by Wang (2024) and Simmons (2024), who observed that students' motivation and persistence in mathematics increase when parents express confidence, enthusiasm, and value for the subject. This outcome reinforces the principle of Social Cognitive Theory (Bandura, 1997), which posits that positive verbal persuasion and modeling from parents enhance students' self-efficacy beliefs.

The regression results further reveal that parental attitude and involvement jointly predicted 46% of the variance in student motivation, confirming that both cognitive beliefs and behavioral engagement from parents play vital roles. This supports the findings of Akindipe (2025), who demonstrated that structured parental involvement programs improve students' mathematics achievement through heightened self-efficacy. It also agrees with Expectancy–Value Theory (Eccles & Wigfield, 2002), which emphasizes the importance of perceived task value and expectations of success in motivating learners.

The mediation analysis provides deeper insight: parental involvement partially mediates the relationship between parental attitude and student motivation. This means that while positive attitudes directly affect students' motivation, they also exert an indirect influence through the level of parental engagement in children's learning. Parents with constructive mathematical beliefs are more likely to assist with homework, encourage effort, and model persistence—behaviors that strengthen students' internal motivation. Similar mediating effects have been reported by Charitaki (2023) and Peixoto et al. (2024), who found that parents' daily interactions translate attitudes into motivational gains for their children.

The moderation analysis revealed that socioeconomic status (SES) and school context (urban versus rural) significantly affect the magnitude of these relationships. Urban and higher-SES parents displayed stronger positive effects of both attitude and involvement on motivation, consistent with Muhammad (2024) and Salido et al., (2024). This outcome reflects the influence of resource availability, exposure, and educational support systems, which enable urban and affluent parents to convert positive beliefs into meaningful engagement. In contrast, rural or lower-SES parents, though often supportive, face barriers such as limited time, income, or access to educational materials, which may weaken the practical impact of their attitudes.

These findings also highlight persistent contextual inequalities in Nigerian education. They suggest that interventions aimed at improving students' mathematics motivation must address structural challenges faced by families in disadvantaged settings. School–community collaborations could help bridge this gap by offering parent education programs and outreach that equip all parents with effective engagement strategies, regardless of socioeconomic background.

Overall, the results affirm that students' motivation in mathematics is shaped by a triadic relationship among parental attitudes, parental involvement, and contextual factors. The evidence strengthens global literature on parental influence and extends it to the Nigerian context, where empirical studies remain limited. By integrating both attitudinal and behavioral variables, this study contributes to a more holistic understanding of how family dynamics shape students' mathematical motivation.

5. Conclusion and Recommendations

This research explored how parents' attitudes toward mathematics influence students' motivation to learn the subject, taking into account the roles of parental involvement, socioeconomic status (SES), and school setting. The findings clearly showed that students whose parents hold positive beliefs and provide consistent encouragement display stronger motivation, confidence, and persistence in mathematics learning. Together, parental attitude and involvement explained a significant portion of the differences in students' motivation levels.

The mediation analysis demonstrated that parental involvement partly explains how positive attitudes lead to improved motivation. Parents who actively assist, encourage, and communicate positive messages about mathematics enhance their children's enthusiasm and self-belief. Furthermore, differences in family income and school context shaped the strength of this relationship. Urban and higher-SES families were able to translate their beliefs into practical engagement more effectively than rural or lower-income parents.

Overall, improving students' motivation to learn mathematics is a shared responsibility. Teachers, parents, and policymakers must work together to build confidence, interest, and a positive mindset toward mathematics. Encouraging active and informed parental participation remains one of the most effective, sustainable ways to enhance mathematics learning outcomes in Nigeria and similar contexts. Improving students' motivation to learn mathematics is a shared responsibility. Teachers, parents, and policymakers must work together to build confidence, interest, and a positive mindset toward mathematics. Encouraging active and informed parental participation remains one of the most effective, sustainable ways to enhance mathematics learning outcomes in Nigeria and similar contexts.

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