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Influence of Parental Involvement and Academic Motivation on Mathematical Achievement: The Role of Students' Mathematics Interest

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Abstract

The study examines the influence of parental involvement and academic motivation on students' mathematics performance, mediated by students' interest in mathematics. The current study adopts a descriptive-correlational research design. The study population comprises all first-year and second-year senior high students in the Central Region of Ghana. A sample of 290 students was randomly selected from four senior high schools in the Central Region of Ghana. The researcher used stratified sampling techniques to categorize the students into the various courses offered in the schools and employed simple random sampling techniques to select respondents from each stratum for the study. A structured questionnaire was used as a research instrument to collect data from the target population. Analysis of Moment Structures (Amos) version 23 and IBM SPSS version 23 were used as analysis tools for data analysis. The analysis results show that parental involvement, academic motivation, and students' interest in mathematics have a significant positive effect on mathematics achievement. Furthermore, students' interest in mathematics partially mediates the link between parental involvement and mathematics achievement. Finally, students' interest in mathematics partially mediates the connection between mathematics motivation and mathematics achievement. The study recommends that parents must be fully involved in their children's education, especially in their mathematics learning, by providing students with the necessary support to improve their mathematics learning and performance.

Keywords: Academic Motivation, Mathematical Achievement, Mathematics Interest, Parent Involvement, Stratified Sampling

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INTRODUCTION

In West African countries, particularly Ghana, mathematics is perceived as a mandatory subject from primary school to senior high school levels (Amponsah et al., 2018), with some tertiary institutions incorporating it into their first and second-year curricula. Despite being regarded as a challenging course due to its complex theorems and concepts, students often prioritize studying mathematics. However, the performance of students in mathematics still needs to improve. Numerous studies have identified factors that impact students' mathematics performance. For instance, Chand et al. (2021) highlighted students' interests and perceptions as crucial determinants. Similarly, Igwe and Joseph (2019) identified motivation, peer learning, teacher quality, and parent involvement as contributing factors. Fauth et al. (2019) emphasized teacher competency and students' self-efficacy beliefs as influential. Moreover, Vaiopoulou et al. (2021) stressed the importance of motivation, students' self-efficacy belief, attitude, and mathematics anxiety in determining achievement. Arthur et al. (2018) stressed parents' motivation, teachers' ability to connect mathematics to real-life problems, and effective classroom management as significant determinants. Heyder et al. (2021) differentiated intrinsic and extrinsic motivations, highlighting their impact on mathematics learning. Tucker-Drob and Harden (2012) further elaborated

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on the role of extrinsic motivation.

In addition, prior studies have explored various aspects influencing mathematics achievement. Arthur et al. (2017) utilized factor analysis and regression to determine achievement factors, while Villa Villa and Tulod (2021) found gender differences positively impact performance. Fosu et al. (2022), Teodorović et al. (2022), and Arthur (2022) highlighted teacher effectiveness, student interest, and mathematical history as significant influencers. Furthermore, Perera and John (2020), Aguk et al. (2021), Guskey (1988), and Kelley et al. (2020) emphasized the positive impact of parental involvement on mathematics achievement.

Parental involvement in students' mathematics learning has been extensively studied, and research consistently indicates a positive correlation between parental involvement and students' mathematical achievement and attitudes towards mathematics (Cui et al., 2021). When parents are involved, students have more opportunities to reinforce what they learn in the classroom (Gonzalez-DeHass et al., 2005). Parents may participate in educational events, review homework, and discuss arithmetic ideas to help with learning and retention. They can also help reconcile the theoretical concepts taught in school with their practical implementations, and they can demonstrate math applications in real-world contexts through tasks like grocery shopping, cooking, or house remodeling.

At the same time, academic motivation is the eagerness and determination individuals have to achieve their educational goals and engage in learning (Tella, 2007). It includes everything that influences a person's propensity to start, continue, and put effort into academic assignments, both external and internal (Walter & Hart, 2009). Motivating students is essential to influencing their attitudes toward learning, academic performance, and overall educational achievements. In mathematics, students' learning outcomes are significantly impacted by their level of academic desire. Motivated students are more likely to have positive attitudes, perform better, and persevere more in the face of difficulties. They actively contribute to class discussions, activities, and problem-solving exercises and voluntarily devote time and energy to comprehending mathematical ideas (Guo et al, 2015).

Based on the literature reviewed above, there needs to be more understanding of the mediating effect of mathematics interest on the relationship between parental involvement, academic motivation, and mathematics achievement. Therefore, the current study aims to bridge this gap by examining how mathematics interest mediates this relationship, contributing further insights to the existing literature. The conceptual framework depicted in Figure 1 illustrates the key constructs under this study, parental involvement (PI), academic motivation (AM), mathematics interest (MI), and mathematics achievement (MA). From the framework, PI and AM emerge as independent variables, with MI serving as the mediating factor between PI and MA. Additionally, MI mediates the relationship between AM and MA. Ultimately, MA stands as the sole dependent variable influenced by PI, AM, and MI. Therefore, the research objectives of this study are: 1) to determine the effect of PI on MA; 2) to determine the effect of AM on MA; 3) to determine the effect of students' MI on MA; 4) to examine the mediating effect of

MI on the relationship between PI and MA; and 5) to examine the mediating effect of MI on the relationship between AM and MA.

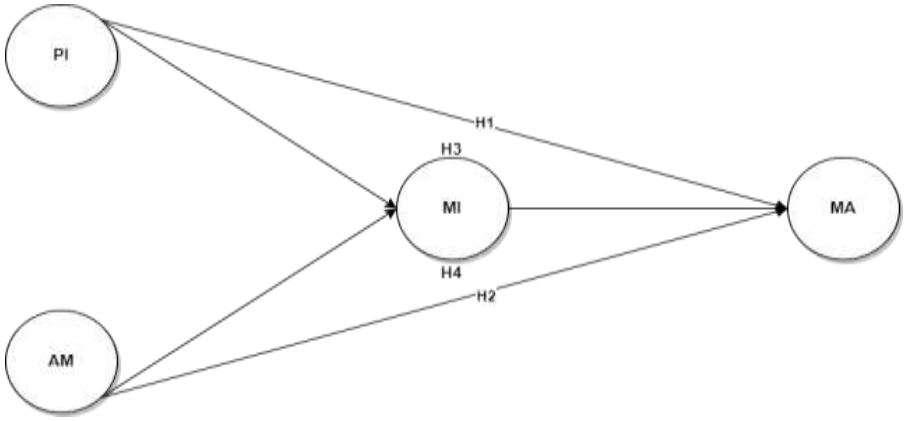

Figure 1. Framework of this study

Parent involvement has been the subject of extensive educational research, and numerous studies have investigated its impact on students' mathematics achievement. Kim (2020) documented that positive parent involvement is associated with improved mathematics performance in students. Parents who create a conducive home environment for learning, provide educational resources, and engage in math-related activities with their children positively influence their mathematical achievement (Kim & Chung, 2012). When parents actively participate in their children's homework by providing support and assistance, students tend to perform better in mathematics (Tan et al., 2020). This involvement fosters a deeper understanding of mathematical concepts. Effective communication between parents and teachers is crucial. Research indicates that when parents are involved in school activities and collaborate with teachers, students are more likely to excel in mathematics (Silinskas & Kikas, 2019). Parents with positive attitudes towards mathematics and high expectations for their children's success contribute to improved mathematics achievement (Šimunović & Babarović, 2020). The literature acknowledges the influence of cultural and socioeconomic factors on parent involvement. While some studies highlight the positive impact of involvement across various backgrounds, it is essential to consider the unique needs and challenges faced by different communities. Interventions and programs designed to enhance parent involvement have positively affected students' mathematics achievement (Cui et al., 2021). These programs often provide parents with strategies to support their children's learning at home. The positive effects of sustained parent involvement in early childhood mathematics education can extend into later academic years, demonstrating the long-term impact on students' achievement (Cui et al., 2021). Parents who encourage problem-solving skills and a positive attitude towards overcoming challenges in mathematics contribute significantly to their children's success (Williams & Williams, 2021). *H1: Parent involvement have a direct positive impact on students' mathematics achievement.*

Academic motivation plays a significant role in shaping students' attitudes toward learning and overall mathematics achievement. Numerous studies have investigated the relationship between academic motivation and mathematics performance, and the literature consistently highlights the

positive impact of motivation on student outcomes. Intrinsic motivation, characterized by a genuine interest and enjoyment in learning, is positively associated with mathematics achievement (El-adl & Alkharusi, 2020). Students who find mathematics intrinsically interesting are more likely to engage actively in learning activities and persist in facing challenges. Goal orientation, specifically a mastery orientation where students are motivated to learn and master the material, is linked to higher mathematics achievement (Suren & Kandemir, 2020).

Conversely, a performance orientation, driven by the desire to outperform others, may have mixed effects on achievement. Self-Determination Theory (Tang et al., 2020) emphasizes the importance of autonomy, competence, and relatedness in fostering motivation. When students feel a sense of autonomy in their learning, perceive themselves as competent in mathematics, and experience a connection with others, their motivation and achievement tend to be higher. Teachers' support and encouragement significantly influence students' motivation in mathematics (Habók et al., 2020). Teachers who create a supportive and autonomy-supportive classroom environment can enhance students' intrinsic motivation and achievement. Parental involvement and support are crucial in fostering academic motivation. When parents encourage their children, express high expectations, and provide a supportive learning environment at home, students are more likely to be motivated and succeed in mathematics (Wang et al., 2021). Cultural and gender differences can impact motivational beliefs in mathematics. Understanding and addressing these differences is essential for creating an inclusive and supportive motivational environment for all students (Saleem et al., 2022; Alam & Mohanty, 2023). Peer relationships and the social context of the classroom can influence students' motivation. Positive peer relationships and a supportive social environment contribute to a positive motivational climate, impacting mathematics achievement (Wu et al., 2022). Providing constructive feedback and recognizing students' efforts and achievements in mathematics positively contribute to their motivation (Ghasemi, 2021). *H2: Academic motivation has a direct positive impact on students' mathematics achievement.*

The relationship between students' interest in mathematics and their mathematics achievement has been the subject of extensive research. The literature consistently suggests a positive and intrinsic interest in mathematics is associated with higher academic performance. Students who exhibit intrinsic interest in mathematics and find enjoyment and satisfaction in the subject tend to perform better academically (Filgona et al., 2020). Intrinsic interest is often linked to increased motivation, engagement, and a willingness to invest effort in learning mathematics. Students' engagement in learning mediates the positive relationship between interest in mathematics and academic achievement. Interested students are more likely to participate in class actively, complete assignments, and seek additional opportunities for mathematical exploration (Ramzan et al., 2023). When students perceive mathematics as relevant to their lives and future goals, their interest in the subject increases, leading to higher achievement (Fong & Kremer, 2020). Understanding the real-world applications of mathematics can enhance interest and motivation. Allowing students to personalize their mathematical learning

experiences and providing opportunities for autonomy and choice can positively impact their interests and, subsequently, their achievement (Lo & Hew, 2021). Tailoring instruction to students' interests fosters a sense of ownership and engagement. Research acknowledges that cultural and gender differences can influence students' interest in mathematics. Making mathematics culturally relevant and inclusive can increase interest and achievement among underrepresented groups (Yu et al., 2021).

Therefore, teachers play a crucial role in shaping students' interest in mathematics. Enthusiastic and supportive teaching practices and varied instructional methods can enhance students' interest and create a positive learning environment (Dewaele & Li, 2021). Longitudinal studies suggest that students' interest in mathematics is a consequence of their prior achievement and a predictor of future academic success (Jiang et al., 2020). Sustained interest in mathematics is associated with continued high achievement over time. Interventions designed to increase students' interest in mathematics have positively affected achievement. These interventions may involve interactive and hands-on activities, exposure to real-world applications, and the incorporation of technology in mathematics education (Ran et al., 2021; Dietrichson et al., 2021). *H3: Students' mathematics interest has a direct positive impact on students' mathematics achievement.*

The degree to which interest in mathematics learning may explain how parent participation affects pupils' arithmetic performance is the mediating role of interest. Studies have shown that parent involvement in their children's mathematics education is positively associated with improved mathematics performance. However, the mechanism through which this relationship operates has yet to be fully understood. Parent involvement increases interest in mathematics learning, improving mathematics performance. Vaiopoulou et al. (2021) found that parent involvement was positively associated with students' interest in mathematics and their mathematics performance. Wright et al. (2018) point out that parent support for students' mathematics homework was positively associated with their interest in mathematics, which in turn was positively associated with their mathematics achievement. Other studies suggest that interest in mathematics learning may be a key mechanism through which parent involvement influences students' mathematics performance (Bah, 2022; Callaman & Itaas, 2020). Parents can help motivate their children to learn and achieve this vital subject by fostering interest in mathematics. *H4: Students' mathematics interest mediates the relationship between parent involvement and students' mathematics achievement*.

Academic motivation is an essential factor that drives students to engage in academic activities, including mathematics learning. However, the mechanism of academic motivation influencing students' mathematics performance is not fully understood. On the contrary, academic motivation leads to increased interest in mathematics learning, which in turn derives improved mathematics performance. Studies have shown that students interested in mathematics tend to perform better. When students are motivated to learn, they tend to be more engaged in the learning process, which can help to foster interest in mathematics and improve academic achievement. In their study, Casinillo et al. (2020) found that intrinsic motivation (motivated by personal interest in the subject) was positively associated with

their mathematics performance. Mokhtar et al. (2012) also insisted that students motivated to learn mathematics were more likely to engage in mathematics learning, which was positively associated with their mathematics performance. According to Kosel et al. (2021), interest in mathematics learning is a crucial mechanism through which academic motivation influences students' mathematics performance. Academic motivation encourages students to learn and perform better in mathematics by establishing an interest in the subject. *H5: The relationship between academic motivation and student mathematical achievement is mediated by the students' interest in mathematics.*

METHODS

This study adopted a descriptive-correlation research design. The population of this study is 1055 students from four different senior high schools. They were first and second-year students in the Central Region of Ghana. The criteria were that the students took mathematics as their core subject. The sample size for this study was determined by the sample size determination formula given:

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where $N = 1055$ is the total population of the participants, e represents the margin error of $0{,}05$ (5%), and $n = sample\ size$. Therefore, the sample size of this study is described below, and the Table 1 presents participants background information.

$$n = \frac{1055}{1+1055(0.05)^2} = 290.034 \approx 290 \quad (2)$$

This study used stratified sampling and simple random sampling techniques. Stratified sampling techniques were used to categorize the participants into the various courses the school offered, and simple random sampling techniques were employed. The study utilized four primary variables: student mathematics achievement, student mathematics interest, parental involvement in mathematics, and academic motivation. Variables measurement items were assessed on a five-point Likert scale, with respondents selecting 1 (strongly agree) to 5 (strongly disagree). Six measurement items for parental involvement were adapted from Panaoura's work (2021), while six items for academic motivation were drawn from Ocampo et al. (2023). Additionally, six measurement items for mathematics interest were taken from Asare et al. (2023). Finally, six measurement items for mathematics achievement were derived from study of Bright et al. (2024).

Table 1. Participants' background information

Demographics	Number of respondents (N)	Actual percentage of respondents (%)
Gender	290	100
Male	136	46.9
Female	154	53.1
Age	290	100
15-17	120	41.4

Demographics	Number of respondents (N)	Actual percentage of respondents (%)
18-20	100	34.5
21-23	70	24.1
Program	290	100
Science	54	18.6
Business	93	32.1
General Arts	51	17.6
Technical	63	21.7
Home Economics	29	10.0

RESULTS AND DISCUSSION

Reliability Results: Confirmatory Factor Analysis

Validity and reliability were assessed using SPSS software (ver. 23). Structural equation modelling was employed to estimate fitness and path coefficient values. The goodness of fit index was utilized following Kline's (2018) recommendations. It was required that the chi-square statistic's degree of freedom result be less than 3 (X2 /df < 3), the comparative fit index exceed 0.9, the approximate root mean square be less than 0.06 (RMSEA < 0.06), and the standardized root mean residual be less than 0.08 (SRMR < 0.08). The model fit results presented in Table 2 aligned with the goodness of fit index results suggested by Kline (2018), confirming internal consistency using a standardized scale. Additionally, the results of the CFA for this study affirmed the unidimensionality of the various constructs utilized. All measurement items in Table 2 exhibited significant factor loadings at a p-value of .001. The CFA findings supported a better model fit for the four-factor measurement model (X2 /df = 1.427; p-value = .012; PCLOSE = .866; TLI = .985; CFI = .989; RMSEA = .038; SRMR = .0420).

Table 2. Confirmatory factor analysis

Model Fitness: CMIN = 194.094; DF =79; CMIN/DF = 2.457; SRMR = 0.052; RMSEA = 0.071; GFI = .926; TLI = 0.956; CFI = 0.967;	Factor Loading
PARENTS INVOLVEMENTS (PAIN): Cronbach Alpha (CA) = .939; Composite Reliability (CR) = .904; Average Variance Extract (AVE) = .670;	
My parent helps me in solving mathematics task (PAIN1).	.888
My parent encourages me to learning mathematics (PAIN2).	.906
My parent teaches me mathematics at home (PAIN3).	.896
My parent provides me with mathematics teacher to assist me in learning mathematics (PAIN4).	.878
My parent sees to it that my performance in mathematics is excellent (PAIN5).	.785
My parent provides me with learning material that support my mathematics learning (PAIN6).	*
ACADEMIC MOTIVATION (AMO): Cronbach Alpha (CA) = .924; Composite Reliability (CR) = .910; Average Variance Extract (AVE) = .716;	
I enjoy mathematics when learning (AMO1).	*
I find learning mathematics interesting (AMO2).	.815

Model Fitness: CMIN = 194.094; DF =79; CMIN/DF = 2.457; SRMR = 0.052; RMSEA = 0.071; GFI = .926; TLI = 0.956; CFI = 0.967;	Factor Loading
I like math that challenges me (AMO3).	.884
My teacher motivates me to learning mathematics (AMO4).	.872
There are things that stimulate my curiosity in learning mathematics (AMO5).	.809
I am really enjoying learning mathematics (AMO6).	*
MATHEMATICS INTEREST (SIM): Cronbach Alpha (CA) = .909; Composite Reliability (CR) = .900; Average Variance Extract (AVE) = .670;	
I attend all math class throughout the term (SIM1).	*
I learn many interesting things in mathematics (SIM2)	*
I believe I am capable of learning complex math (SIM3).	.842
Whenever I missed mathematics class, I learn it with the help of my colleagues (SIM4).	.882
Doing mathematics class test and assignment regularly will help me to get good grade in mathematics (SIM5).	.809
I teach my classmates who do not understand some topics I do understand (SIM6).	.790
STUDENT MATHEMATICS ACHEIVEMENT (MACH): Cronbach Alpha (CA) = .827; Composite Reliability (CR) = .828; Average Variance Extract (AVE) = .707	
My performance in mathematics is far better than in any other subject (MACH1).	*
I believe I can perform well in mathematics than in any other subject (MACH2).	.849
I typically perform well in mathematics (MACH3).	*
I see a purpose in my life for learning mathematics (MACH4).	*
I need to do well in mathematics to get the job I want (MACH5).	.832
I think learning mathematics will help me in my daily life (MACH6).	.*

*represent item deleted with poor factor loading.

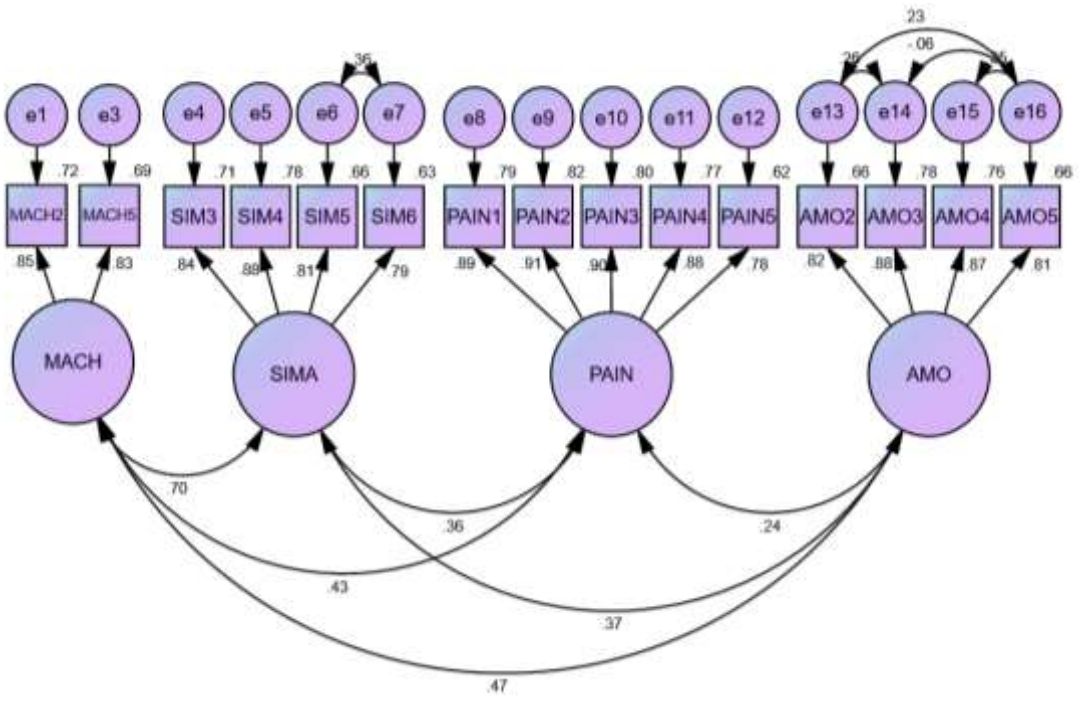

Figure 2. Confirmatory factor analysis

Convergent and Discriminant Validity

Convergent validity refers to the extent to which an instrument accurately measures the intended construct. Hock and Ringle (2006) suggest that the average variance extracted (AVE) should exceed 0.5. On the other hand, Discriminant validity is evaluated through the Fornell-Larcker criterion, which states that the square root of the AVE should surpass the correlations between the constructs. The validity outcomes align with the analysis, with the square roots of the AVEs in Table 3 indicating values of 0.896, 0.782, 0.823, and 0.818 for the study variables (parental participation, academic motivation, mathematics interest, and mathematical achievement). AVE results were deemed significant when p > 0.001 and surpassed the 0.50 threshold. The factor loading results indicate that the data are suitable for further analysis, with overall findings suggesting convergent validity.

Table 3. Mathematical communication indicators and descriptors

Variables	CR	AVE	MACH	SIMA	PAIN	AMO
MACH	.828	.707	.841			
SIMA	.900	.693	.720***	.833		
PAIN	.940	.670	.427***	.362***	.823	
AMO	.910	.716	.465***	.369***	.241***	.846

$\sqrt{AVE}$ are bolded; **~P-value significant at 1% (0.01)

The results indicate sufficient discriminant validity among the constructs. In the confirmatory factor analysis diagram presented in Figure 2 and detailed in Table 3, the highest correlation observed is 0.518, and all correlations surpass this value. Emphasis is placed on the square roots of the AVEs in Table 3, which are expected to exceed the individual intercorrelation factors. Consequently, the study achieved discriminant validity. In addition, Cronbach's alpha and composite reliability tests were conducted to assess internal consistency. The Cronbach's alpha values in Table 3 surpassed the cutoff point 0.70 recommended by Hair et al. (2010). Specifically, the Cronbach's alpha values for parental involvement (PI), academic motivation (AM), mathematics interest (MI), and mathematics achievement were 0.942, 0.853, 0.862, and 0.855, respectively. These findings affirm the reliability of the study's data and establish a solid foundation for further analysis.

Hypothesized Testing

Amos (v.23) was used to estimate the measurement model and structural equation modelling (as shown in Table 4 and Figure 3) as recommended by (Courage et al., 2023).

Table 4. Path analysis results

Paths	Std. Estimate	Std. Error	Composite Reliability	*P-Value*
AMO → SIMA	.397	.84	4.730	< 0.01
PAIN → SIMA	.300	.059	5.040	< 0.01
SIMA →MACH	.509	.060	8.428	< 0.01

Paths	Std. Estimate	Std. Error	Composite Reliability	*P-Value*
PAIN → MACH	.160	.049	3.321	< 0.01
AMO → MACH	.269	.069	3.882	< 0.01
Indirect Effect	Std. Estimate	Lower BC	Upper BC	*P-Value*
PAIN → SIMA → MACH	0.073	0.034	0.131	< 0.01
AMO → SIMA → MACH	0.081	0.044	0.144	< 0.01

The first hypothesis (H1) proposed that parental participation directly impacted students' mathematical proficiency. We accept H1 because Table 4's results indicate a statistically significant correlation between parental participation and mathematical achievement. The second hypothesis (H2) also made the case that academic motivation directly affects students' progress in mathematics. Since Table 4 demonstrates a statistically significant relationship between academic desire and students' mathematical achievement, we accept the H2 for this study. The third hypothesis (H3) claimed that a student's interest in mathematics will directly impact that student's mathematical performance. We accept hypothesis H3 since it was statistically significant and directly impacted students' mathematical achievement.

The fifth hypothesis (H4) further argues that the student's interest in mathematics may moderate the relationship between parental participation and kid achievement in mathematics. The results in Table 4 demonstrate that parental participation significantly boosted kids' interest in math and that interest in math significantly increased kids' math achievement. The mediating effect is only partially present since, despite a mathematical interest, parental involvement significantly positively impacted students' achievement. Using a bootstrap of 5000 samples, the statistical significance of the indirect impact was examined. According to Table 4, the indirect impact size of .135 was statistically significant (zero does not fall between the values of the lower bond, 0.85, and the higher bond, .125). Therefore, this study accepted H4.

Finally, the sixth hypothesis (H) proposes that mathematics interest mediates the relationship between academic motivation and mathematics achievement. The results in Table 4 indicate that academic motivation had a positive effect and was statistically significant on mathematics interest, and mathematics interest had a significant positive effect on mathematics achievement. The indirect effect size of .469 was statistically significant, as shown in Table 4 (zero does not lie within the range of the lower bound =.11 and the upper bound =.121). Therefore, our investigation accepted the fifth hypothesis (H).

Hypothesized Paths Illustration

Figure 3 illustrates the path analysis diagram, aligning with the findings presented in Table 4. It indicates that parental involvement and academic motivation directly influence mathematics achievement. Furthermore, mathematics interest mediates the relationship between the independent variables (parental involvement and academic motivation) and mathematics achievement. Additionally, parental involvement and academic motivation positively impact mathematics interests. Moreover, gender and program of students are shown to affect mathematics achievement positively.

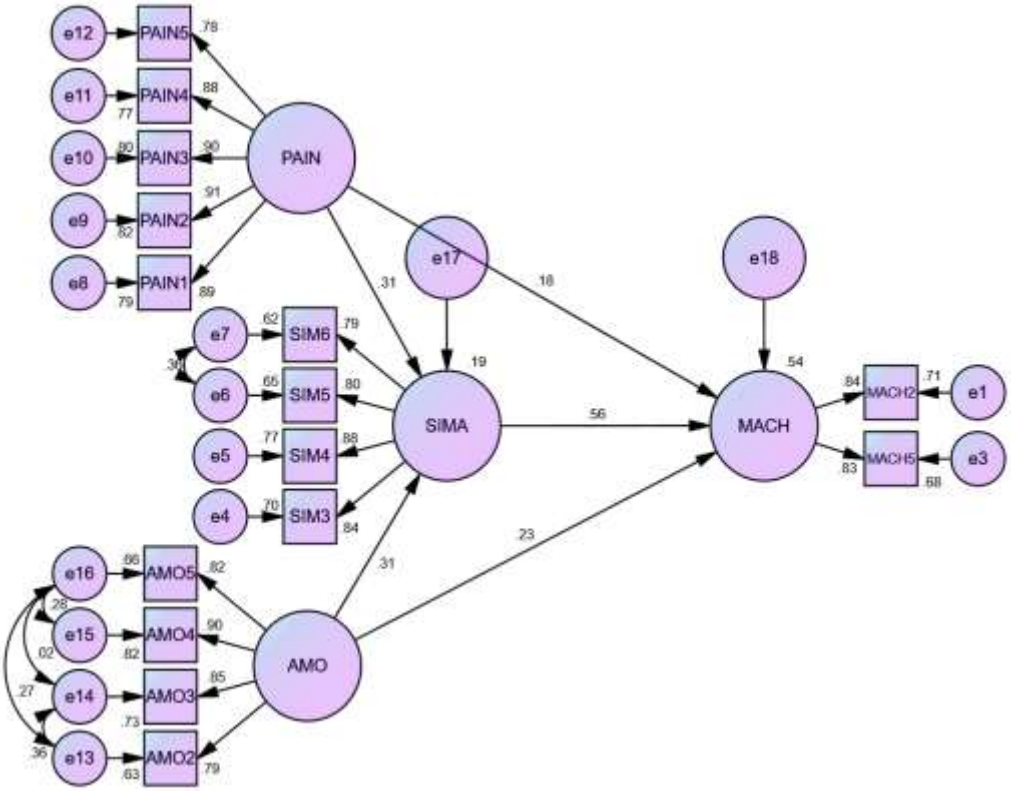

Figure 3. Path analysis

Examining the findings related to the research question, one revealed a statistically significant relationship between parental engagement in a child's math education and academic achievement, with a p-value of less than 5%. This signifies that parents' time in their children's mathematics learning, including providing learning materials, positively impacts their academic performance. These findings align with Suren and Kandemir's (2020) study, which found that parental involvement directly influenced students' mathematics achievement. Likewise, Lara and Saracostti (2019) conducted an analysis confirming that parent involvement in mathematics learning positively affected students' mathematics achievement, emphasizing the detrimental impact of parents' lack of interest in mathematics on their children's performance.

The analysis results regarding research question two demonstrated that academic motivation directly and statistically significantly affected students' mathematics achievement. This suggests that students' progress in mathematics is significantly influenced by the academic motivation provided by

parents and instructors. Strategies such as managing student anxiety, making mathematics enjoyable, fostering opportunities for success, and promoting positive competition among students can enhance students' interest and improve their mathematical achievement. These findings are consistent with previous studies by Ozkal (2019), Asvio (2017), and Higgins et al. (2019), which highlighted the positive impact of academic efficacy, learning environment, and academic motivation on students' mathematics achievement.

Moreover, students' interest in mathematics was found to have a significant positive effect on their achievement in mathematics. This finding is supported by research such as that of Asare et al. (2023) and Zhang and Wang (2020), which revealed that students' interest in mathematics significantly predicts their mathematics achievement. Additionally, Du et al. (2021) found that mathematics interest, anxiety, and self-efficacy beliefs significantly influence mathematics achievement.

Furthermore, the current study revealed that the effect of parental involvement on students' mathematics achievement is not only direct but also mediated through students' mathematics interests. This is consistent with Wong and Wong's (2019) findings, which demonstrated that parental involvement in children's mathematics learning positively impacted their mathematics achievement. Similarly, in English language education, parental assistance in written language skills significantly affected their children's letter-writing skills, as shown in Matriano (2020) and Chuang (2021) studies. Moreover, Arthur (2022) found that students' mathematics interest partially mediates the relationship between the history of mathematics and students' mathematics performance.

A novelty of the current study lies in its focus on the mediating role of students' mathematics interest in the relationship between academic motivation and mathematics achievement, a relationship not extensively explored in existing literature. While many studies have examined the effects of academic motivation and students' interest in mathematics achievement separately, this study contributes by investigating the mediating role of students' mathematics interest in the connection between academic motivation and mathematics achievement. Another significant contribution of the study is the finding that students' mathematics interest partially mediates the relationship between parental involvement and mathematics achievement and academic motivation and mathematics achievement.

CONCLUSION

According to the study's findings, the conceptual framework can ensure the proper assessment of secondary school students' academic achievement. It is evident that parental involvement and academic motivation positively impact students' interest in mathematics, with a mediating effect between academic motivation and mathematics achievement. Therefore, parental participation, academic motivation, and interest significantly influence students' interest in mathematics. Based on these results, the study proposes the following recommendations: Ghana Education Services (GES) should organize

workshops to educate parents on effective methods to support their child's mathematical development at home. Parents and teachers should collaborate to assist students in setting realistic short-term and long-term goals for their academic performance in mathematics, fostering motivation and a sense of purpose. School heads and teachers should involve students in conferences to discuss academic goals, progress, and strategies for improvement, enhancing motivation and fostering a sense of responsibility. Teachers should recognize and cater to the diverse learning styles and needs of students by providing differentiated instruction to ensure equal opportunities for success.

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