



# **Students' Mathematics Interest Development in Ghana- the Role of Parental Involvement and Agents of Student Motivation**

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## **Authors' contributions**

*This work was produced through collaboration between all authors. Author YDA gathered all literature materials and designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Authors SAA and CA initiated the study design and supervised the statistical analysis as well as given valuable inputs into analysis and discussion of study findings. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Parental influence on the student's mathematics interest development process cannot be neglected if achievement in mathematics is connected to the student's' interest in mathematics. The advances in research regarding parental association to their children interest in terms of achievement, attitude and beliefs proves that parental values and beliefs system shape the student's values and performance. The study aims at exploring the effect of parent's level of education, parent's mathematics interest, as well as determining the role parental motivation play towards the student's mathematics interest development. In addition, the study also determined the effect of student's agent of motivation on student interest in mathematics. The study randomly selected 1,263 participants from ten randomly selected secondary schools in Ghana. Survey questionnaires were

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used to investigate parental involvement in student's interest in mathematics. We used SPSS version 16 to generate all statistics and tables. The non-parametric Chi-square test of independence was used to investigate the effect of parental factors on students' interest in mathematics. The findings suggest that students' interest in mathematics is influenced by their parents' educational background, parents' interest in mathematics, and agent of student motivation but independent on parental motivation. The study concluded that parental involvement is very essential in the interest development process, and could improve performance when taken seriously.

*Keywords: Parents' interest; parental influence; mathematics interest; students' interest.*

## 1. INTRODUCTION

The theories of parental involvement is paramount to the development of students' academic interest with parent participation affecting students' learning and creating better foundation for their future career [1,2]. The study by [3] identified some parental involvement factors such as communication and educational aspiration as these influence students' academic achievement.

The socialization model of parental effects on achievement, attitude and belief by [4-6] suggests that parental values and beliefs system shape students' own values and performance. It has been proved that parental efficacy may encourage as well as provide successful developmental pathway for children [7,8]. The theoretical assumptions were based upon [9] during their theory-based interventional study aiming at helping parents to convey the importance of mathematics and science to their secondary school children. It was interesting to find that the intervention had an indirect effect on students' perceived value for mathematics and science through mothers' perceived utility value and conversations. Although longitudinal studies reveal relations between parents' value of mathematics and students' mathematics interest [10] it has been suggested that parents' domain-specific value motivates students extrinsically [11]. The study by [2] affirms that parental involvement plays significant role in student academic success and it is a priority in American education. In addition to interest development, parental involvement in children education has been shown to positively influence student academic achievement [12].

The Self-Determination Theory suggests that intrinsic motivation, such as interest, is needed to enhance students' internal needs for competence, autonomy and relatedness in

learning situations is supported and facilitated by supportive behaviours [13]. This theory has provoked many researchers in most part of the world. The study by [14] demonstrated the theory of self-determination and concluded that as parent exhibit positive beliefs and expectation as well as they encourage their children influence their mathematical achievement. High levels of maternal support of their children's needs for autonomy and relatedness predicted mathematics interest of their children [15]. While there are mixed findings concerning the role of gender in perceptions of parental support: some studies suggest higher levels of perceived parental support for girls [15] whereas [16] did not find gender-related differences in perceived parental support of secondary students.

### 1.1 Interest Development Process

Theorists of interest in recent times suggest that students' interest develops in mathematics as students gain expertise in the area of mathematics. This view has further been confirmed by [17] in the model of Domain learning that says students will develop interest in a given subject or object will increase as the knowledge of the person in that field increase. It was further suggested by the model that the very beginning of the learning process is characterized by less individual interest and that as learning progresses, the interest level increases by introduction of situational interest. This developmental process will rely greatly on individual interest for student motivation with less emphasis on situational interest. It is further deduced that there exists relationship between student's individual interest and situational interest with individual interest emerging from situational interest [18]. The study explained the transformation of situational interest into individual emerging interest and finally individual enduring interest. The argument was further expanded with the proposal that, student interest

will occur when the student resolves the cognitive conflict emanated from the student's interaction with object or subject of interest. The points made by [19] suggest that students will develop new interest as they increased differentiation of an aspect of existing interest. The interest development review further suggests that interest also develops as learners are aroused to resolve the conflict created by some collating variables such as novelty, uncertainty and complexity. Despite the wide range of research on parental involvement around the globe, more of such studies are required and moreover country-specific results are needed to be able to make localized decision to ascertain it global conformity.

The role parents play in their children mathematics development process cannot be under estimated. Studies in mathematics have suggested that parents' educational background influence their children mathematics achievement. The higher the parents level of education the earlier their children are introduced to mathematics [20,21]. Further studies in mathematics education has indicated that the parents level of education and involvement plays significant role in their children's early and later development in mathematics achievement [21–23]. Previous studies have also indicated that parents with low educational background does not imply they do not care about their children's mathematics achievement and interest but due to their limitation in education, they feel helpless to help their children in solving problem related to Mathematics [21,24]

### 1.2 Research Objective

The study aimed at the following objectives

- i. To explore the effect of parents' level of education on students' interest in mathematics
- ii. Examine the effect of Parents' mathematics Interest on Students' Interest in Mathematics.
- iii. Understand the role of parents' motivation on students' interest in mathematics.
- iv. Determine the Effects of Students Agents of Motivation on students' Interest In Mathematics.

### 1.3 Research Questions

The study sought answers to the following research questions:

- i. Do the data collected suggest that parents' level of education significantly influence students' interest in mathematics?
- ii. Is there any reason to suggest that students' interest in mathematics is influenced by their parents' interest in mathematics?
- iii. Can parents' motivation of students' influence their interest in mathematics?
- iv. Does students' interest in mathematics depend on the agents of students' motivation?

### 1.4 Research Hypothesis

The study proposed the following hypothesis to help answer the research question hence to specifically address the objectives stated.

- H1: Students interest in mathematics is independent on the level of education of the parents of the student.
- H2: Student interest in mathematics is independent on the parent's interest in mathematics
- H3: Student interest in mathematics is independent of the parent's motivation on the students.
- H4: Student interest in mathematics is independent on the student agents of motivation in their pursuit of the course.

## 2. RESEARCH METHODS

In this study, quantitative descriptive non-parametric chi-square test of independent was used to assess the effect of parental influence on the student interest in mathematics. The study as well used the descriptive statistical technique such as percentages and embedded in tables as part of its statistical analysis. The population from which the participants were selected includes all Senior High School (SHS) students in the Ashanti Region of Ghana. The study began with the random selection of 10 SHS from the region and subsequently selection of participants from the selected schools. A total of one thousand five hundred (1500) students were selected from the schools to participate in the study but only one thousand two hundred and sixty three (1263) were fit for the purpose of analysis representing 84.2% response rate. The study used instrument developed by researchers which forms part of a bigger research instrument. One hundred level hundred undergraduate students were used for the pre-test of the instruments. The data analysis was performed using SPSS version 16 for both

descriptive and inferential analysis. The descriptive statistics was used to ascertain the participant's demographic characteristics and their views of the parent's interest and motivation in mathematics. The study further analyzed the effects of parental characteristics variables on student interest using chi-square test of independent at 5% level of significance.

### 3. RESULTS AND FINDINGS

#### 3.1 Demographic Characteristics

The effect of parents' educational background on student interest in mathematics was investigated to ascertain its influence on mathematics interest. The study categorized the education background into four ranging from uneducated, ordinary and advanced level certificates, graduate and others. Out of the 139 participants whose parents were uneducated, 87 of them said they are interested in mathematics while 52 of the respondents were not interested in mathematics. From the 303 participants whose parents have ordinary and advanced level certificates, 250 of the participants were interested in mathematics while 53 were not interested in mathematics. In addition, from the 417 participants whose parents were graduates from tertiary institutions, 307 of the participants were interested in mathematics while 110 were not interested in mathematics but out of the 383

participants whose parents' level of education fell on the others category 334 of the participants were interested in mathematics while 49 of them were not interested in mathematics. The study further investigated the effect of parental educational background on the student interest in mathematics. The results from the study revealed that, student interest in mathematics depends on the level of education of any of the parent with  $p < 0.05$ . The results further explain that although the student in Mathematics interest is dependent upon the level of education of the respondent yet in some cases the students may not have their parents educated at all or to some level but may be interested in Mathematics. This suggests that parents with high level of education influence their children better [20,21]. The reasons for which parental educational background may influence students' interest in mathematics may include the fact that, parents with high educational background turn to instil academic discipline in their children at their early stages in their academic career. Moreover, parents with higher academic background will turn to instil positive mathematics feeling and attitude as compared to parents who may not have been educated. The study further suggests that parents with higher educational background will turn to instil mathematics interest in their children as compared to children whose parents' educational background is lower.

**Table 1. Gender of participants**

Categories	Frequency	Percent	Valid Percent
Male	551	43.6	44
Female	700	55.4	56
Total valid participants	1251	99	100
Non response	12	1	
Total participants	1263	100	

**Table 2. Age categories of participants**

Categories	Frequency	Percent	Valid Percent
14 – 16	238	18.8	19
17 – 19	566	44.8	45.1
20 – 22	294	23.3	23.4
23 and above	156	12.4	12.4
Total Valid Participants	1254	99.3	100
Non Response	9	0.7	
Total Participants	1263	100	

**Table 3. Participants views about their basic school attended**

Categories	Frequency	Percent	Valid Percent
Public School	692	54.8	56.8
Private School	526	41.6	43.2
Total Valid Participants	1218	96.4	100
Non Response	45	3.6	
Total Participants	1263	100	

**Table 4. Participants views about their parents highest qualification**

Response categories	Frequency	Percent	Valid percent
Uneducated	139	11	11.1
'O' or 'A' level	303	24	24.3
Graduate	419	33.2	33.6
Others	386	30.6	31
Total valid participants	1247	98.7	100
Non response	16	1.3	
Total participants	1263	100	

**Table 5. Participants views about their parents interest in mathematics**

Response categories	Frequency	Percent	Valid percent
Yes	649	51.4	52.2
No	116	9.2	9.3
Don't know	479	37.9	38.5
Total valid participants	1244	98.5	100
Non response	19	1.5	
Total participants	1263	100	

**Table 6. Participants views about their parents motivation to study mathematics**

Response categories	Frequency	Percent	Valid percent
Yes	910	72.1	72.5
No	345	27.3	27.5
Total valid participants	1255	99.4	100
Non response	8	0.6	
Total participants	1263	100	

**Table 7. Effect of parents educational background on student interest in mathematics**

	Parents educational background				Total	Test statistics	P-value
	Uneducated	'O' or 'A' level	Graduate	Others			
Students	87	250	307	334	978	42.16	0.001
interest	52	53	110	49	264		
Total	139	303	417	383	1242		

**Table 8. Effect of parents' interest on student interest in mathematics**

		Parents interest in mathematics			Total	Test statistics	P-value
		Yes	No	Don't know			
Students	Yes	527	78	370	975	11.85	0.003
interest	No	121	38	103	262		
Total		648	116	473	1237		

The parent interest in mathematics is a very important factor that needs consideration and how the 'like or dislike' of mathematics by parents influence their interest in mathematics. The study constructed an item in the instrument that determined whether the participants' parents are interested in mathematics. The participants were made to respond to category range of YES, NO or DON'T KNOW whether parents are interested in mathematics or not. Out of the 1237 valid respondents, 648, 116 and 473 participants responded that YES their parent like mathematics, NO their parent don't like mathematics and DON'T KNOW whether their parent like mathematics or not respectively. The results further explained that, out of the 648 participants whose parents are interested in mathematics 527 were also interested in mathematics and 121 were not interested in mathematics. Furthermore, out of the 116 participants who responded that their parents don't like mathematics had 78 of the participants interested in mathematics while 38 of them were not. Also from the 473 participants who did not know whether or not their parents were interested in mathematics, 370 were interested in mathematics and 103 were not interested in mathematics. The study explains further by the chi-square test of independence that, student interest in mathematics is affected by the parent's interest in mathematics with  $p < 0.05$  as shown in Table 8. The result showed consistency with the study by [25] that parental value for mathematics influence student interest in mathematics since parents domain value motivates students extrinsically [11].

The effect of parental motivation in the search of factors that contribute to building student interest

cannot be over looked. The study further investigated the effect of parental motivation to study mathematics on the student interest in mathematics. From the results available from the survey, 712 participants who were interested in mathematics were motivated by their parents to study mathematics while 191 participants whose parent motivates them to study mathematics are not interested in mathematics. The study further informs that from the 345 participants whose parents do not motivate them to study mathematics, 270 of the participants are interested in mathematics and 75 of the participants were not interested in mathematics. To answer the question of whether parental motivation influence student interest in mathematics, the study used chi-square test of independence to investigate whether student interest in mathematics is influenced by the parental motivation. The study reveals that the student interest in mathematics is influenced by the parental motivation demonstrated. With  $p < 0.05$ , the hypothesis that student interest is independent on the parental motivation was rejected. This result disagrees with the study [26] that parental motivation significantly influence gender academic success.

The result of the present study was supported by [14] findings that parental demonstration of positive beliefs and expectations and encouragement given by parents influence their children's interest in mathematics. The findings were further strengthened by the study [27] and specifically affirmed that maternal motivation for children' need for autonomy and relatedness is a predictor of student interest in mathematics.

**Table 9. Effect of parental motivation on student interest in mathematics**

		Parental motivation		Total	Test Statistics	P-Value
		Yes	No			
Students interest	Yes	712	270	982	0.051	0.821
	No	191	75	266		
Total		903	345	1248		

**Table 10. Effects of students agents of motivation on interest in mathematics**

		Agent of students motivation			Total	Test statistics	P-value
		Parent	Teachers	Friends			
Students interest	Yes	277	548	141	966	80.99	0.001
	No	72	92	103			
Total		349	640	244	1233		

Students need motivation in other to ignite their self-determination. The quest to understand the role of the agents of motivation namely: The parent, the teacher and the friends was investigated to establish the effect of this agent of motivation on the student interest in mathematics. From randomly selected valid participants of 1233. Out of 349 participants who were motivated by the parents, 277 of the participants were of the views that, parents are their agent of motivation were also interested in mathematics, while 72 of them did not like mathematics. Out of the 640 participants who saw teachers as their agent of motivation, 548 were interested in mathematics while 92 were not interested in mathematics. From the 244 participants who saw friends as their agent of motivation found 141 were interested in mathematics while 103 were not interested in mathematics. The chi-square test of independence to investigate the effect of these agents of motivation on the student interest development process was found to be significant with p-value <0.05 meaning that, the student's interest in mathematics depends on these agents of motivation. The study also further extends that, the teacher remains the greater agent of motivation with the peers being the next agent of student motivation. The study however found the parental factor as the least of the agents of student motivation. This result, although partly consistent with the findings of [28] given that this study rated friends as second agent of motivation and further disagree with the same that parents are more important in contribution to student academic success [29]. This result state empirically that the teacher remains the greatest motivator to the Ghanaian student interest in mathematics which is consistent with the studies in [30,31], which emphasizes that the teacher's attitude, and teaching methods influences student academic achievement and interest in mathematics.

#### 4. CONCLUSION

The parental involvement in student interest in mathematics development process has been empirically proven by this study to be very essential. The study finally concluded as follows:

- i. Students' interest in mathematics depends significantly on the parent interest in mathematics, parent's educational background and the agents' of student motivation. The finding which is consistent with the study [32] that parental motivation

significantly influence gender academic success.

- ii. Parents demonstration of positive beliefs and encouragement has influence on their children's interest in mathematics [14]. The findings were further strengthened by the study [33] and specifically affirmed that maternal motivation for children' need for autonomy and relatedness is a predictor of student interest in mathematics.
- iii. The relationships established are fundamental in the student interest development process since the parents' forms integral parts of their children's development.

The study recommends that parents should engage their children in their mathematics academic career development since that has strong and significant influence on the students' mathematics interest development. Mathematics teachers are also advised to cordially engage students in the teaching and learning process by creating friendly atmosphere in the learning environment. The students should take cognizance of how their peers can help them develop their mathematics interest.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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