

## STATISTICAL ANALYSIS OF GHANAIAN STUDENTS ATTITUDE AND INTEREST TOWARDS LEARNING MATHEMATICS.

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### **Abstract.**

*This study used non-experimental, quantitative, exploratory, descriptive and inferential methods of statistical analysis to establish student's mathematics interest and to presents a logistics regression model for the student's interest in mathematics. Respondents were purposefully and randomly selected from University of education, Winneba Kumasi campus to participate in the research. Student's questionnaires on interest in mathematics, factors that affect teaching and learning of mathematics were used for the study. Results from 650 students who responded to the various questionnaire items revealed that student's interest in mathematics is dependent on whether or not students like mathematics as a subject. The teacher's motivation was also found to positively affect student interest in mathematics as well as the method and approach adopted by the teacher in teaching mathematics. Access to textbooks by students was also found to positively influence the student's interest. The analysis further reveals that variables such as age, the type of school attended was found to be independent on the student's interest in mathematics.*

*The paper recommend that further work on the factors and their level of effect of on the student interest should be undertaken.*

**Keywords.** Constructivism, interest, attitude, factors.

### **1.0 Introduction**

Motivation remains a primary force which leads to study of any course by students. The stronger the motivation the motivation one course the more actively and efficiently the students will learn it. The students interest is stimulated by their curiosity or the things the students know little or more about. (He, 2003). Keeping students interest in mathematics is paramount and without interest student incline to surface level learning (Entntwistle, 1998; Chin and Brown, 2000). Students are more likely to engage themselves in deep level learning of a particular subject since they have interest. There is the need to stimulate student interest in the learning of mathematics for the following reasons:

attracting students, keeping students active, increasing student's enthusiasm for mathematics as well as making the student keen and happy to study. (He, 2003). Motivation and strategy variables have been a key variable in determining student interest and have effectively predicted long term growth in students mathematics achievement. (Kuo et al, 2012). The study that looks at the unique contribution of motivation and cognitive strategies reveals that intelligence had no relation with the growth of achievement over years but motivation and learning strategies are predictors of learning growth.

## 2.0 Constructivism and Mathematics Interest

(Cobb et al, 1991) defends that students actively construct "their individual mathematical worlds by re-ordering their experiences in an attempt to resolve their problems". Students are expected to form a personal mathematical structure that is more complex, more powerful, and more abstract than it was prior to the reorganization (Davis et al., 1990). Implementation of constructivist approach in teaching and learning of mathematics must be done using student actions /mathematics and the teacher's actions/mathematics from the student perspectives (Cobb and Steffe, 1983). The role of teachers and instructional activities in a constructivist classroom is to provide motivating environments that lead to mathematical problems for students to resolve. However, each student will probably find a different problem in this rich environment because each student has a different knowledge base, different experiences, and different motivations. Thus, a teacher should avoid giving problems that are "ready-made" (Yackel et al., 1990). A fundamental principle underlying the constructivist approach to learning mathematics is that a student's activity and responses are always rational and meaningful to themselves, no matter how bizarre or off-the-wall they may seem to others. One of the teacher's responsibilities is to determine or interpret the student's "rationality" and meaning (Labinowicz, 1985; Yackel et al., 1990). Mathematics teachers must engage in "close listening" to each student, which requires a cognitive reorientation on their part that allows them to listen while imagining what the learning experience of the student might be like. Teachers must then act in the best way possible to further develop the mathematical experience of the student, sustain it, and modify it if necessary (Steffe and Wiegel, 1996). Young children enter school with a wide range of self-generated algorithms and problem solving strategies that represent their *a priori* conceptual understandings of mathematics. Students frequently receiving classroom instruction often separates the child's conceptual knowledge from the new procedures or knowledge they construct since the "students' informal ways of making meaning are given little attention" (Cobb, Yackel, and Wood, 1991). Yackel et al. (1990) concluded from their multiple research efforts on creating a constructivist classroom that "not only are children capable of developing their own methods for completing school mathematics tasks but that each child has to construct his or her own mathematical knowledge. That is, mathematical knowledge cannot be given to children. Rather, they develop mathematical concepts as they engage in mathematical activity including trying to make sense of methods and explanations they see and hear from others" In her survey of the research on arithmetic-based learning, Fuson (1992) concluded that students can "learn much more than is presented to them now if instruction is consistent with their thinking."

### **3.0 Factors affecting students interest mathematics**

When students perceive mathematics as useful and interesting, they develop positive attitudes toward mathematics. Similarly, students develop negative attitudes towards mathematics when they do not do well or view mathematics as boring (Callahan, 1971; Selkirk, 1975). Furthermore, high school students' perceptions about the usefulness of mathematics affect their decisions to continue to take elective mathematics courses (Fennema and Sherman, 1978). The expansion of positive mathematical interest and attitudes is linked to the direct involvement of students in activities that involve both quality mathematics and communication with significant others within a clearly defined community such as a classroom (van Oers, 1996). In mathematics classroom, Mathematics teachers are confronted with critical moments of making decision that reflect their personal belief and confidence about mathematics and how it should be taught (Shroyer, 1978). Reposing confidence and building students interest, the attitude of the mathematics teacher is a critical ingredient in the building of an environment that promotes problem solving and makes students feel comfortable to talk about their mathematics (Yackel et al., 1990). Student interest and attitudes toward mathematics has been found to correlate strongly with their mathematics teacher's clarity, i.e. how careful the teacher uses vocabulary during discussion of both the why and how in problem solving) and ability to generate a sense of continuity between the mathematics topics in the curriculum (Campbell and Schoen, 1977).

Students are motivated to learn mathematics when they attribute their success in mathematics to their high ability or effort, but in contrast, students who attribute their lack of success in mathematics to low ability or the material's difficulty will not be motivated to study mathematics and expect not to be able to learn mathematics. It must be noted that, the responsibility lies in mathematics teachers to intervene to help the unmotivated and uninterested students realize that success in learning mathematics is related to effort (Weiner, 1984). Teachers who teaches students to both set personal learning goals and take responsibility for their own learning of mathematics leads to increased motivation, interest and higher achievement in mathematics (DeCharms, 1984). In dealing with students interest and motivation the type of feedback students receives from teachers is an inevitable component in students learning of mathematics. If students perceive the teacher's feedback as being "controlling and stressing goals that are external to them" will decrease their intrinsic motivation to learn mathematics hence reducing their interest in mathematics. However, students who perceive the teacher's feedback as being "informational" and that it can be used to increase their competence will increase their intrinsic motivation to learn mathematics (Holmes, 1990).

### **4.0 Purpose of the study**

The purposes of this study included investigating into the variables perceived to influence students' interest in learning mathematics and the extent to which these variables affect student's interest in learning mathematics. It was also to investigate factors affecting Ghanaian students interest in Mathematics to enrich their mathematics potentials. This study used multivariate analysis and nonparametric statistical analysis to establish the significance of the relationship between the depending factors with the student's interest in mathematics. By conducting this study, it is hoped

that the key factors of affecting the students interest can be identified and be source of information to policy makers in government and educational institution for better management as far as students interest in mathematics.

## 5.0 Methodology

This study used non-experimental, quantitative, exploratory, descriptive and non parametric methods of statistical analysis to establish student's mathematics interest. The authors used survey approach to investigate a number of variables that is assumed to have influence on students' interest in the study of mathematics. The survey questionnaire was a self-constructed 36 questionnaire items, some of which used the 5-points Likert scale, others were dichotomous response using both nominal and ordinal scale of measurement to measure factors that affect teaching and learning of mathematics in Ghanaian senior secondary schools. This instrument was adapted and enhanced from an exercise earlier conducted in level 100 students from the University of education winneba Kumasi campus on their interest in mathematics and further enhanced. The participants involved were student from the faculty of vocational education and faculty of technical education .About six hundred students from both distance and regular classes were randomly selected to respond to the questionnaire items. The questionnaires were self-administered and the data was manipulated using SPSS version 16 to generate all the result.

## 6.0 Respondents and Their Profile

The target population for the study were all student who have gone through the Ghanaian secondary school system. Concent of the students were sort and they expressed wildness to respond to the questionnaire items having been assured that all information given will be kept confidentially. They were also interested in seeing students interest in mathematics improvement. The sample was selected in respect of the students' performance by good number of student coming out of the secondary schools into our tertiary institutions. Respondents were purposefully and randomly selected from University of education, Winneba Kumasi campus to participate in the research. Student's questionnaires on interest in mathematics, factors that affect teaching and learning of mathematics were used for the study.

## 7.0 Data Analysis, Result and Discussion

### 7.1 Demographics of the Respondents

**Table 1 Demographics of the respondents**

Gender	Frequency	Gender		
		Percent	Valid Percent	Cumulative Percent
Male	471	87.9	87.9	87.9
Female	65	12.1	12.1	100
Total	536	100	100	

age categories

Age	Frequency	Percent	Valid Percent	Cumulative Percent
15-20	49	9.1	9.1	9.1
21-25	216	40.3	40.3	49.4
26-30	114	21.3	21.3	70.7
31-40	136	25.4	25.4	96.1
41 and above	21	3.9	3.9	100
Total	536	100	100	

## type of basic school attended

Type of School	Frequency	Percent	Valid Percent	Cumulative Percent
Government school	458	85.4	85.4	85.4
private school	78	14.6	14.6	100
Total	536	100	100	

**Table 2. Responses to questions**

Do you like mathematics/				
	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	409	76.3	78.7	78.7
No	111	20.7	21.3	100
Total	520	97	100	
Missing Values	16	3		
Total	536	100		

## Are you interested in mathematics

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	400	74.6	76.9	76.9
No	120	22.4	23.1	100
Total	520	97	100	
Missing Values	16	3		
Total	536	100		

## Do your teacher motivate you to like mathematics

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	332	61.9	64.7	64.7
No	181	33.8	35.3	100
Total	513	95.7	100	
Missing Values	23	4.3		
Total	536	100		

## At what level of your education did you enjoyed mathematics

	Frequency	Percent	Valid Percent	Cumulative Percent
Primary	131	24.4	24.8	24.8
JHS	118	22	22.3	47.1
SHS	237	44.2	44.8	91.9
Tertiary	43	8	8.1	100
Total	529	98.7	100	

Is students interest in mathematics before better than now

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	314	58.6	58.6	58.6
No	222	41.4	41.4	100
Total	536	100	100	

Teaching Methods used by the Teacher

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	233	43.5	44	44
No	296	55.2	56	100
Total	529	98.7	100	
Total	536	100		

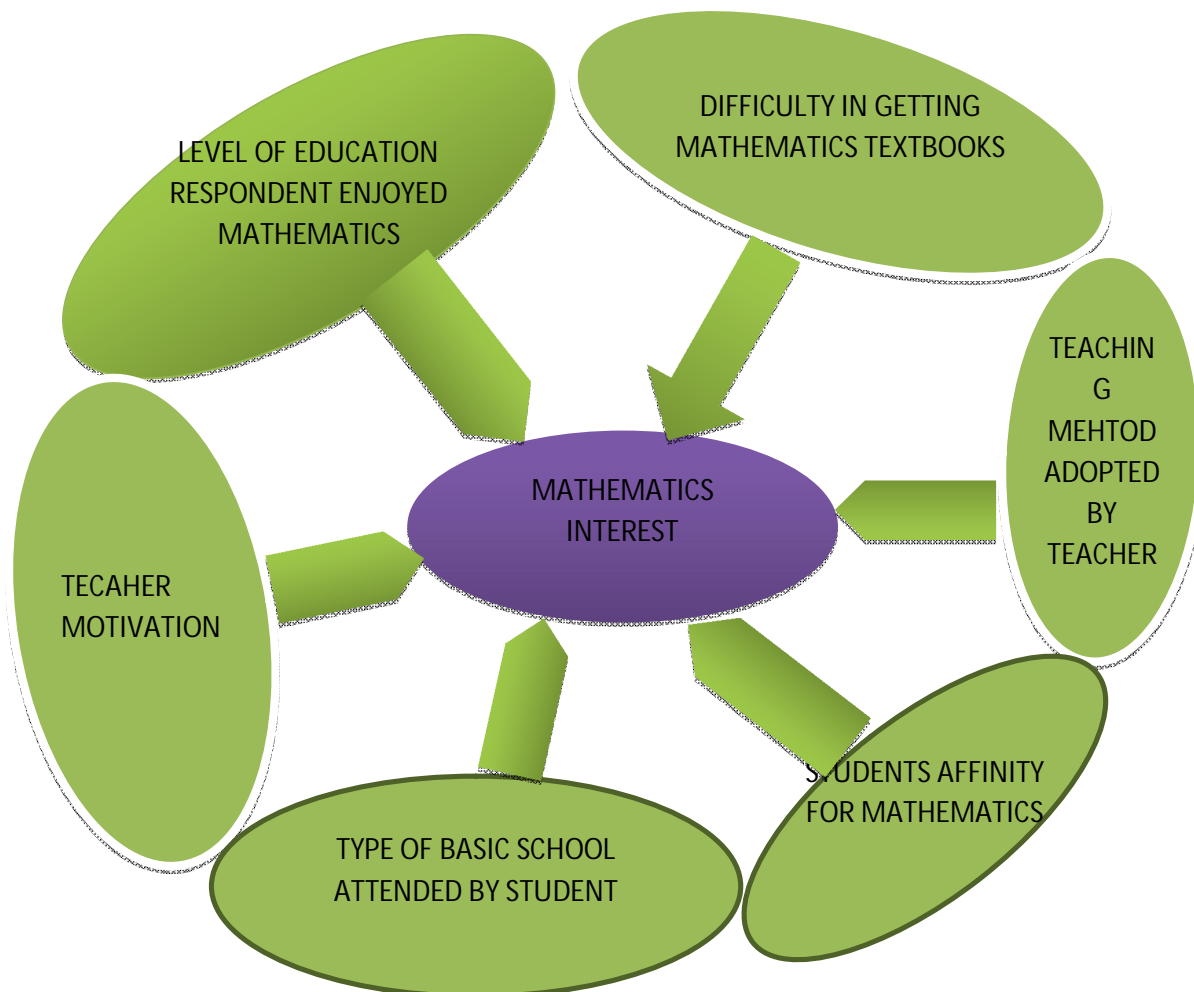
Did you have any problem with getting mathematics text books

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	240	44.8	44.8	44.8
No	296	55.2	55.2	100
Total	536	100	100	

**Table 7.2 Descriptive statistics of Mathematics interest factors**

**Table 3. Chi-square test of independence**

Variables	Student interested in Mathematics		
	Chi-Square value	P-value	Phi-Value
Gender	1.61	0.2	0.056
Age	12.017	0.17	0.152
Type of basic school respondent attended	8.497	0.004	-0.128
Respondents affinity for mathematics	293	0.000	0.751
Student are motivated by their teachers	50.818	0.000	0.315
Level of education respondent enjoyed mathematics	34.653	0.000	0.26
Teaching method used by the teacher	70.457	0.000	0.371
Problems of getting text books	16.77	0.000	-0.18



**Fig 1.0 Determinants Model of Student Interest in Mathematics**

## **7.2 Finding and Discussion**

### **7.2.1 Demographics:**

The researchers interviewed six hundred for which 471 valid respondents were male representing (87.9%) while 65 respondents were female representing (12.1%) of the valid respondents. The age distribution of the respondent was also analyzed to understand the age distribution of the respondents. It was noted that 216 respondents (40.3%) of the valid respondent were found between the age of 21-25 years while the least age category was found to be 41 years and above. The analysis also pointed out the fact that 458(85.4%) of the respondents had their basic school in government schools while the remaining respondents representing 14.6% of the valid respondents attended private basic schools as shown in Table 1

### **7.7.2 Mathematics interest Variables.**

The researcher asked the respondents questions to ascertain their mathematics interest. The respondents were asked the type of basic school attended, the respondents affinity for mathematics, whether the students were motivated by their teachers, the level in their education they enjoyed mathematics most, the teaching methods used by their teacher and if the students had difficulty in accessing mathematics text books.

The analysis of the final data reveals that 409(76.3%) of the valid respondents have strong affinity for mathematics, 400(74.6%) of the respondent were of the view that mathematics is interesting to them. 332 (61.9%) of the respondents are of the view that, their mathematics teachers motivate them to like mathematics while 33.8% of the total respondents view their teachers as not being motivational enough to trigger their interest in mathematics. The majority of the respondents, 44.2% enjoyed learning mathematics when they were in their senior high school but have not enjoyed mathematics in their university level as claimed by 8% of the respondents. The respondent further affirmed their interest in mathematics before they entered university was better than currently in the university.

The researchers further assessed the approach used by mathematics teachers whether students liked those methods. The results revealed that 55.2% of the respondents did not like the approach and the methods employed by the teachers in teaching mathematics. The respondents indicated that they didn't have any difficulty in assessing textbook even though those who had problems assessing textbook were close to half of the total respondents.

### **7.2.3 Non parametric Analysis**

The chi-square test of independent was deployed to look at the extent to which age, gender, the type of basic school, teachers' motivation, level of respondents' education they enjoyed mathematics, teaching methods adopted by teachers as well as respondents difficulty in getting mathematics text books influenced their interest in mathematics. The results produced a very interesting result which is worth sharing. The results revealed that student's interest in mathematics is independent of the age of the student as well as the gender with p-value  $>0.05$ . It was noted that the extent to which age and gender related with the respondents interest in mathematics was very weak with effect size less than 0.2. However the students interest in mathematics was found to depend on the type of basic



school attended, their affinity for mathematics, teacher motivation the level of education in which the student enjoyed mathematics, teaching methods used by the teachers during their delivery in mathematics class with  $p$ -value  $< 0.005$ . Students' affinity for mathematics was found to be strongly and positively related to their mathematics interest. The teaching method adopted by the teacher and the level of motivation derived from the teacher was also found to be strongly and positively related. This result is in conformity with the study conducted by Kuo et al, (2012) which suggest that motivation and strategy variables has been a key variables in determining student interest and has effectively predicted long term growth in students mathematics achievement. In addition, the type of feedback received from teachers by students also determine students motivation from teacher, students who perceive the teacher's feedback as being "informational" and that it can be used to increase their competence will increase their intrinsic motivation to learn mathematics as presented by Holmes, (1990).

Interestingly, the type of basic school the student attended influenced their level of interest but negatively related as well as the difficulty in getting textbooks. The difficulty in getting textbook is negatively related to the mathematics interest. This might be due to the fact that some school might have textbooks for which student can borrow. Also teacher give note in class for which every serious student can attain certain level of understanding and interest during class hours.

The model of factors that influence the students interest in mathematics is presented in Figure 1.0. The arrow directed to mathematics interest shows the effect of these factors on students interest in mathematics.

### **8.0 Conclusion and Recommendation for future Research.**

The paper after critical examination concludes that age and gender don't influence mathematics interest in students but the type of basic school the student attended, teachers motivation, level of education the respondents enjoyed mathematics, teaching methods adopted by teachers as well as respondents difficulty in getting mathematics text books influences their interest in mathematics. It is therefore recommended that more country based research should be conducted to look more closely at principal component factors that influence the teaching and learning of mathematics in the Ghanaian basic and senior high schools to help improve the students interest and performance in the subject from the foundation level. It is further recommends that the teacher should vary their teaching method as well as motivating students since student's interest in mathematics depends largely on teacher's motivation and the methods used in teaching. The teaching methods can be varied through attending workshops and conference where teacher from the same subject area share ideas and new methods. Well-crafted teaching notes, textbooks and libraries in schools might also help.

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