

Students' Attitudes Towards Mathematics: The Case of Private and Public Junior High Schools in The East Mamprusi District, Ghana

Osman Kasimu¹, Majeed Imoro²

¹(Department of Mathematics/ICT, Gambaga College of Education, Ghana)

²(Department of Mathematics/ICT, Gambaga College of Education, Ghana)

Abstract: *The purpose of this study was to examine Private and Public Junior High School (JHS) students' attitude towards mathematics in the East Mamprusi District. Students' Attitudes Towards Mathematics (SATM) questionnaire with reliability coefficient (Cronbach alpha value) of 0.83 was used to collect data on 200 sampled students (Boys = 105, Girls = 95) from 8 public and private Junior High Schools in the study area. Principal component factor analyses were performed using Varimax rotation to capture Eigen values greater than 1, eliminate factors with loadings less than 0.4, and remove items with non-simple factor structure. Four subscales were identified as Anxiety, Confidence, Enjoyment, and Benefit/Value. Data collected were analysed using Means and Standard Deviations. t-test was also used to investigate whether there was significant difference between private and public JHS students' attitude towards mathematics. The results found no significant difference between the attitudes of both private and public JHS students towards mathematics. The results also showed a slightly high degree of confidence in favour of private students towards the learning of mathematics. The findings of the study in terms of gender difference towards mathematics revealed that boys and girls, irrespective of either private or public school, in the study area generally had similar attitude towards mathematics.*

Keywords: *Attitude towards mathematics, Factor analysis, Private and Public JHS, Ghana*

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I. Introduction

In several education systems all over the world, mathematics is one of the important subjects within the list of foundation subjects that constitute the core curriculum for basic education. The basic knowledge acquired in mathematics at the lower level is vital for a student to progress to upper classes in secondary schools. Mathematics is a core subject in schools all over the world and occupies a privileged position in the school curriculum. It is studied in private as well as public schools.

In Ghana, increased demands by the people and the limited resources available to the government have made it difficult for the government alone to finance education provision in the country. It has therefore become increasingly necessary for the private sector to get involved in the provision of educational facilities in the country [1]. Children of school going age are therefore enrolled either into a public or private school. Despite the fact that both private and public schools serve the interest of the Ghanaian population, there are significant differences between public and private schools. Public schools provide education to a large segment of the population, and children educated in public schools belong mainly to a poor segment of the society [2]. Public schools also have more qualified classroom teachers but lesser opportunities for quality education. Children who attend private schools on the other hand come from wealthier, more highly educated families, and have higher scores on early learning skills than children in public schools. Classroom teachers in private schools are less educated and less likely to have early childhood development training.

In recent times, performance in the subject mathematics by students in both public and private schools has not been impressive at the Junior High level. This is mainly associated or ascribed to students' negative attitudes towards mathematics among others. According to [3], attitude plays an important role in students' academic performance especially in mathematics.

Attempts have been made by researchers in defining attitude ([4]; [5]; [6]; [7]; [8]). [5] for instance defined attitude as a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept or another person. According to [4], attitude is the tendency of an individual to react favorably or unfavorably toward a designated class of stimuli. In reviewing numerous definitions of attitudes, [7] concluded that these definitions differ in almost every conceivable important way.

Available literature suggests that educational researchers have expended time and energy trying to research into the attitudes of students towards the learning of mathematics at various levels ([9]; [10]; [11]; [12]; [13]). [11] in their study “the influence of school type on students’ attitudes towards mathematics”, for instance, found that both public and private schools students had highly positive attitudes towards mathematics,

though students from the private schools showed a slightly high degree of confidence in learning mathematics as compared to students from the public schools. A similar research conducted by [14], [15], [16], and [17], found that students from private schools showed significantly more positive attitudes towards mathematics than students from public schools. [13] in studying the relationship between attitude of students towards mathematics and achievement found that there is strong positive correlation between students attitudes towards the learning of mathematics and their achievements. It was also clear from his study that urban boys and girls had a more positive attitude towards mathematics than rural boys and girls. According to [10], students with better attitudes towards mathematics have higher perceptions and better mathematical self-concept and are able to display approach behaviors towards mathematics.

Available literature revealed that studies that compared gender differences in mathematics are mostly in favour of boys ([18]; [19]) while others such as [20] reported in favour of girls. For instance, [18] in a study on the topic “attitude towards mathematics and academic achievement in mathematics among secondary level boys and girls” revealed that Girls achieved better results in mathematics as compared to boys. [20] on the other hand found that for all the attitudinal variables (anxiety, confidence and motivation), boys had higher mean scores than girls. That is, boys have a better attitude towards mathematics than girls. Other researchers like [21] saw no significant difference between the attitude of boys and girls towards mathematics.

During the past several years, a number of valuable studies have been conducted by researchers in an attempt to design instruments to investigate the underlying dimensions of attitudes towards mathematics ([22]; [23]; [24]; [25]; [26]). [26] for instance conducted a survey to measure students’ attitudes towards computer programming and computer science in general. A survey instrument consisting of 57 positive and negative statements was used. An evaluation for internal consistency of their instrument for five subscales namely confidence in learning , attitude toward success in computer science, computer science as a male domain, usefulness of computer science and the effective motivation in computer science gave a Cronbach’s Alpha values ranging from 0.83 to 0.91. [23] developed an instrument to measure computer science students’ attitude towards mathematics. The reliability coefficient, Cronbach alpha value, for the instrument was found to be 0.81 and coefficients for four subscales ranged from 0.81 to 0.92. The subscales were self-efficacy, enjoyment, anxiety and Relevance. The alpha values asserted that a successfully and efficient instrument was developed and can be used to carry out a study on students attitude towards mathematics. [22] examined the relationship among students’ attitude towards computer programming, their gender and academic achievement in programming. Responses of 179 students were collected through a survey. Exploratory Factor Analysis extracted four subscales namely; Confidence in learning computer, Usefulness of computer, Attitudes toward success in computer and Effective motivation in computer programming. Pearson Correlation showed a significant positive correlation between students’ attitudes and their achievements. The results also showed that male students had a more positive attitude than female students. [25] also conducted a study to find out the factors affecting the attitude of students towards the higher education system in India. Factor Analysis on 33 statements questionnaire showed that there are four major factors which impact the attitude of students; (1) Class participation and Practical approach; (2) Extra-curricular and Infrastructural facilities; (3) New undergraduate structure; and (4) Curriculum and Evaluation.

The researchers review of the previous works on students’ attitude towards mathematics confirmed the statement by [27] that “Most of the studies on student’s attitudes towards mathematics have centered on Western samples, whilst very few studies have been conducted from Africa”. Another interesting observation of the studies conducted so far showed that they are primarily focused on secondary students’ mathematics attitudes and the effect of gender. Very few studies looked at public and private Junior High students’ attitudes towards mathematics despite the claim by previous researchers that academic performances of students from private schools are better than students from public schools. This study therefore seeks to examine the attitude of public and private students’ towards mathematics at the Junior High level in the East Mamprusi District of the Northern Region of Ghana. Attempt to improve attitude towards mathematics at lower level will provide the base for higher studies in mathematics. It will also cause effect in achievement of mathematics at secondary school level as stated by [28].

1.1 Purpose of the Study

The research was conducted with the aim of achieving the following objectives;

- i. to find out the attitudes of private Junior High School students toward mathematics in the district.
- ii. to find out the attitudes of public Junior High School students toward mathematics in the district.

- iii. to investigate whether there was any significant difference between the attitudes of private and public Junior High School students toward mathematics.
- iv. to investigate whether there was any significant difference between the attitudes of JHS girls and boys toward mathematics.

1.2 Research Questions

This study sought to get answers to the following questions:

- i. What are the attitudes of private Junior High School students toward mathematics?
- ii. What are the attitudes of public Junior High School students toward mathematics?
- iii. Is there any significant difference between the attitudes of private and public JHS students toward mathematics?
- iv. Is there any significant difference between the attitudes of JHS girls and boys toward mathematics?

1.3 Hypotheses

The following hypotheses were formulated to guide the study:

H₀1: There is no significant difference between the attitudes of private and public JHS students toward mathematics

H₀2: There is no significant difference between the attitudes of JHS girls and boys toward mathematics

II. Methodology

2.1 Sample

A total of 200 final year students consisting of 105 boys and 95 girls were randomly sampled from 8 Junior High Schools (4 private and 4 public) in the East Mamprusi District of the Northern Region of Ghana to participate in this study. 51 boys and 49 girls were from the public Schools while 54 boys and 46 girls were from the private schools.

2.2 Research Instruments

Students' Attitudes Towards Mathematics (SATM) questionnaire was used to collect data for this study. The instrument was developed using items selected from a variety of established mathematics attitudes scales ([10]; [24]; [29]; [30]). The questionnaire had two sections. The first section of the questionnaire was used to collect data for demographical characteristics. The second part elicited information about the attitudes of JHS students towards mathematics. It consisted of 38 items where each item was a statement followed by a five-point Likert scale ranging from 'strongly disagree' through 'neither agree nor disagree' to 'strongly agree'. Reliability test of the instrument gave a Cronbach alpha value of 0.83.

2.3 Data Collection

Data collection was done in the East Mamprusi District of the Northern Region of Ghana. The questionnaire was distributed to the students in their respective schools with the assistance of some of their teachers. Before administering the questionnaire, the researchers explained the purpose of the study to the head teachers, teachers and students. The questionnaires were completed and returned to the researchers the same day they were administered.

2.4 Data Analysis Procedures

To analyze the data descriptive statistics and independent t-tests were used. Effect size was calculated using Cohen's 'd' [30]. [30] provided tentative benchmarks for the interpretation of effect sizes. The data was analyzed using SPSS 20.0. Principal component factor analyses were performed using Varimax to examine the factor structure and to remove any problematic items. The Exploratory Factor Analysis made use of Eigen values greater than 1. The analysis indicated that, the items could be reduced to 12 with the first accounting for 18.60% of the variability in all 38 variables. The cumulative variance of the 12 was 66.76%. As recommended by [31] and [32], a factor loading cut-off point of 0.40 was used as the inclusion criterion for factor interpretation. A reliability analysis (Cronbach's Alpha Coefficient) was checked using guidelines (benchmark) provided by [33]. The factors were further reduced to four based on factor loadings of the questions onto the factors. Based on these factor loadings, questions that load onto the same factors were identified with common themes (Sub-Scales). In all, 4 sub-scales were used: (i) Anxiety (fear to learn and talk about mathematics), (ii) Enjoyment (the pleasure someone experiences when learning and talking about mathematics), (iii) Confidence (one's ability to learn and to perform well on mathematical tasks), and (iv) Benefits/Value (perceived advantages of learning mathematics). Means and standard deviations of the subscales were also computed. Independent t-tests were used to determine the overall students' attitudes with respect to school type and gender. Table 1

shows the internal consistency reliabilities for the sub-scales and the factor loadings for the selected items as reported by the students.

Table 1: Internal consistency reliability for four sub-scale and their factor loadings

Extracted constructs	Items	Factor loadings	Reliability co-efficients
Anxiety	Working math makes me nervous	0.615	0.75
	I get a sinking feeling when I think of learning math	0.593	
	Learning math is very frustrating	0.546	
	I feel insecure about asking math questions in class	0.539	
	I get nervous when math teacher is in class	0.511	
Confidence	Math does not scare me at all	0.793	0.85
	I have self-confidence in learning math	0.768	
	I have confidence in taking math test	0.762	
	I can solve math problem within a given time	0.704	
	I am able to solve math problems without difficulty	0.703	
	I have confidence in asking math questions in class	0.663	
	I am able to answer math questions in class	0.532	
Enjoyment	I enjoy doing math	0.643	0.73
	Math word problems fascinate me	0.641	
	I look forward to a math class	0.626	
	Math is very interesting to me	0.554	
	I enjoy learning math with my friends	0.548	
	I feel comfortable working math problems	0.496	
Benefits/Value	Math is important in everyday life	0.750	0.92
	I want to develop my math skills	0.706	
	Math is a very necessary subject	0.681	
	Knowing math will help me earn a living	0.674	
	I will need math for my future work	0.664	
	Math helps people to make good decisions	0.649	
	Math improve my thinking capacity	0.639	
	Math is important for other subjects	0.623	

From Table 1 above, the Reliability co-efficient (Cronbach's Alpha Coefficient) for the four constructs (sub scales) ranged between 0.75 – 0.92.

III. Results And Discussion

The hypotheses for the study were;

H₀₁: there is no significant difference between the attitudes of private and public JHS students toward mathematics

H₀₂: there is no significant difference between the attitudes of JHS girls and boys toward mathematics.

Table 2 shows the attitudes of public and private JHS students toward mathematics. The difference of JHS boys and girls Attitude towards Mathematics in the study area are shown in Table 3.

Table 2: Differences of public and private JHS students' attitude towards mathematics

Sub-scale	Private Students		Public Students		t – value	Effect size (d)
	Mean	SD	Mean	SD		
Benefits/Value	4.346	0.486	4.271	0.461	0.320	0.005
Anxiety	2.521	0.733	2.350	0.706	0.136	0.013
Confidence	4.020	0.799	3.726	0.857	0.024*	0.028
Enjoyment	4.248	0.542	4.213	0.711	0.716	0.001
Overall	3.784	0.640	3.640	0.684	0.299	0.012

*Significant level at 0.05

The overall mean of the private students was 3.784 with standard deviation of 0.640. The overall mean of the public students stood at 3.640 with a standard deviation of 0.684. The results suggest that both the public and private JHS students in the study area had favorable attitudes toward mathematics. The t-values (0.320, 0.136 and 0.716) for the three subscales (Benefits, Anxiety and Enjoyment) were not significant at $P < 0.05$ between the two groups(private and public). A significant difference was however found with private JHS students scoring higher on Confidence (effect size $d = 0.028$). Furthermore the t-value (0.299) for overall attitude mean scores indicated no significant difference between the total mean scores of the two groups towards

mathematics. The null hypothesis that: "there is no significant difference between the attitudes of private and public JHS students toward mathematics" was therefore accepted.

Difference of JHS boys and girls Attitude towards Mathematics

Table 3: Difference of boys and girls attitudes toward Mathematics

Sub-scale	Boys (105)		Girls (95)		t-value
	Mean	SD	Mean	SD	
Benefits/Value	4.3401	0.480	4.239	0.466	0.276
Anxiety	2.4871	0.764	2.363	0.525	0.380
Confidence	3.9291	0.861	3.891	0.671	0.816
Enjoyment	4.2290	0.627	4.272	0.476	0.707
Overall	3.746	0.683	3.690	0.538	0.550

From table 3 above, the mean attitudes of boys and girls in both private and public JHS in the study area across all the four subscales (Benefits, Anxiety, Confidence and Enjoyment) shows that boys and girls had favorable attitudes toward mathematics. The overall mean attitudes toward mathematics for the boys (Mean = 3.746, Standard Deviation = 0.683) was not significantly higher than that of the girls (Mean = 3.690, Standard Deviation = 0.538). Furthermore, the t-value (0.550) for overall attitude mean scores indicated no significance difference between boys and girls at $p < 0.05$. This implies that JHS boys and girls of both private and public schools in the study area generally had similar attitudes toward mathematics.

The findings of the study in terms of gender difference towards mathematics agreed with those of [26] and [5] who reported that attitudes toward mathematics do not depend on gender. They however differed with those of [18] and [27] based on their findings that attitudes toward mathematics depend on the sex. Again, in terms of private and public students' attitudes toward mathematics, the findings of the study agreed with the results of [11] who stated that both private and public students show positive attitudes towards mathematics.

The difference in these research findings could be as a result of time lapse, geographical, religious, social and cultural differences [34]. It could also be based on the fact that students' responses to the questionnaire were influenced by their friends. Again, students at the Junior High School level have not had a feel of any external examination in mathematics like the Basic School Certificate Examination (BECE) and so might not have built a true attitude (Positive or negative) towards mathematics at that level.

IV. Conclusion

The aim of the study was to find out the attitudes of private and public Junior High Schools students toward mathematics in East Mamprusi District, Ghana. The study indicated that both private and public JHS students in the study area had favorable attitudes towards mathematics. The results showed that there is no significant difference between the attitudes of private and public JHS students toward mathematics. The study also showed that JHS boys and girls from both private and public schools shared similar attitudes towards mathematics. An indication that gender difference in the study area has no great impact on the students' attitudes towards mathematics.

V. Recommendations

Based on the findings and conclusions, the researchers recommend that mathematics teachers should incorporate new methods of teaching such as the use of audio visuals in presenting mathematics lessons to facilitate students understanding and sustain their interest in the subject. It is also recommended that head teachers of both private and public Junior High Schools ensure that teachers with the requisite qualifications are assigned to handle the subject. These will help foster a more positive attitude of students towards mathematics.

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